

**J. & P. RICHARDSON INDUSTRIES PTY. LTD.**  
**A.C.N. 001 952 325**

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**SOUTHBANK CORPORATION**

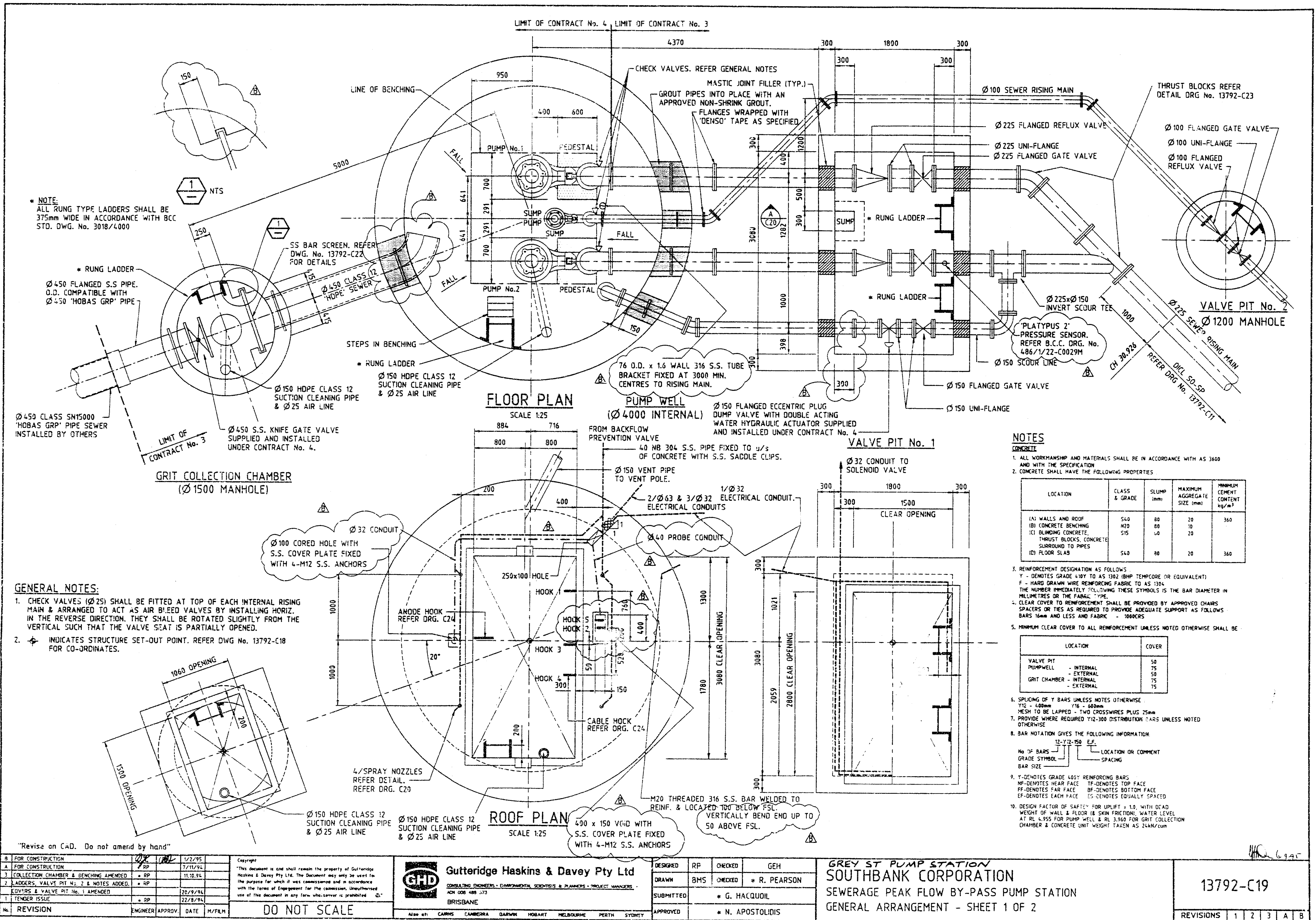
**GREY STREET SEWERAGE  
PEAK FLOW BY-PASS  
PUMPING STATION**

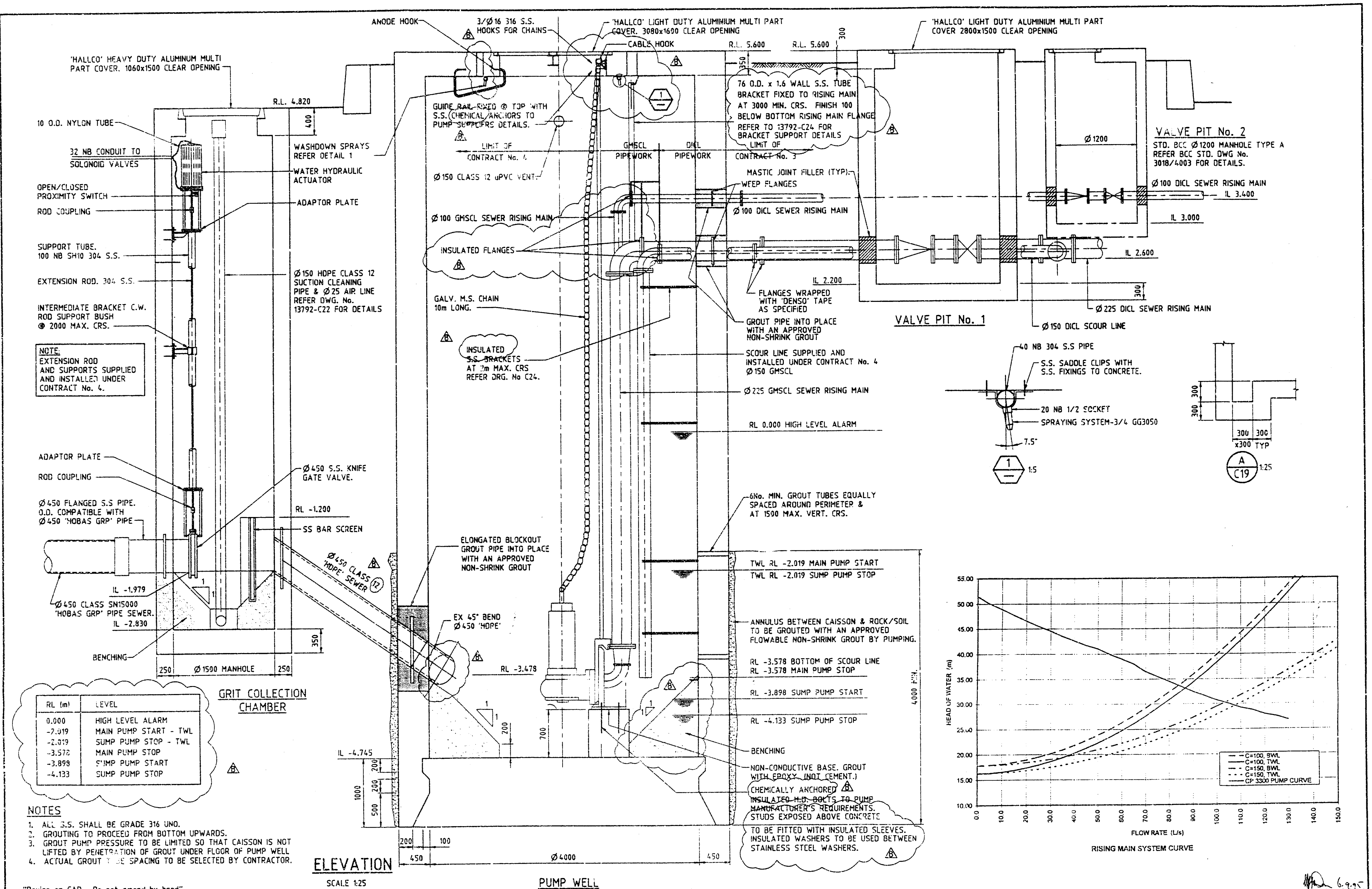




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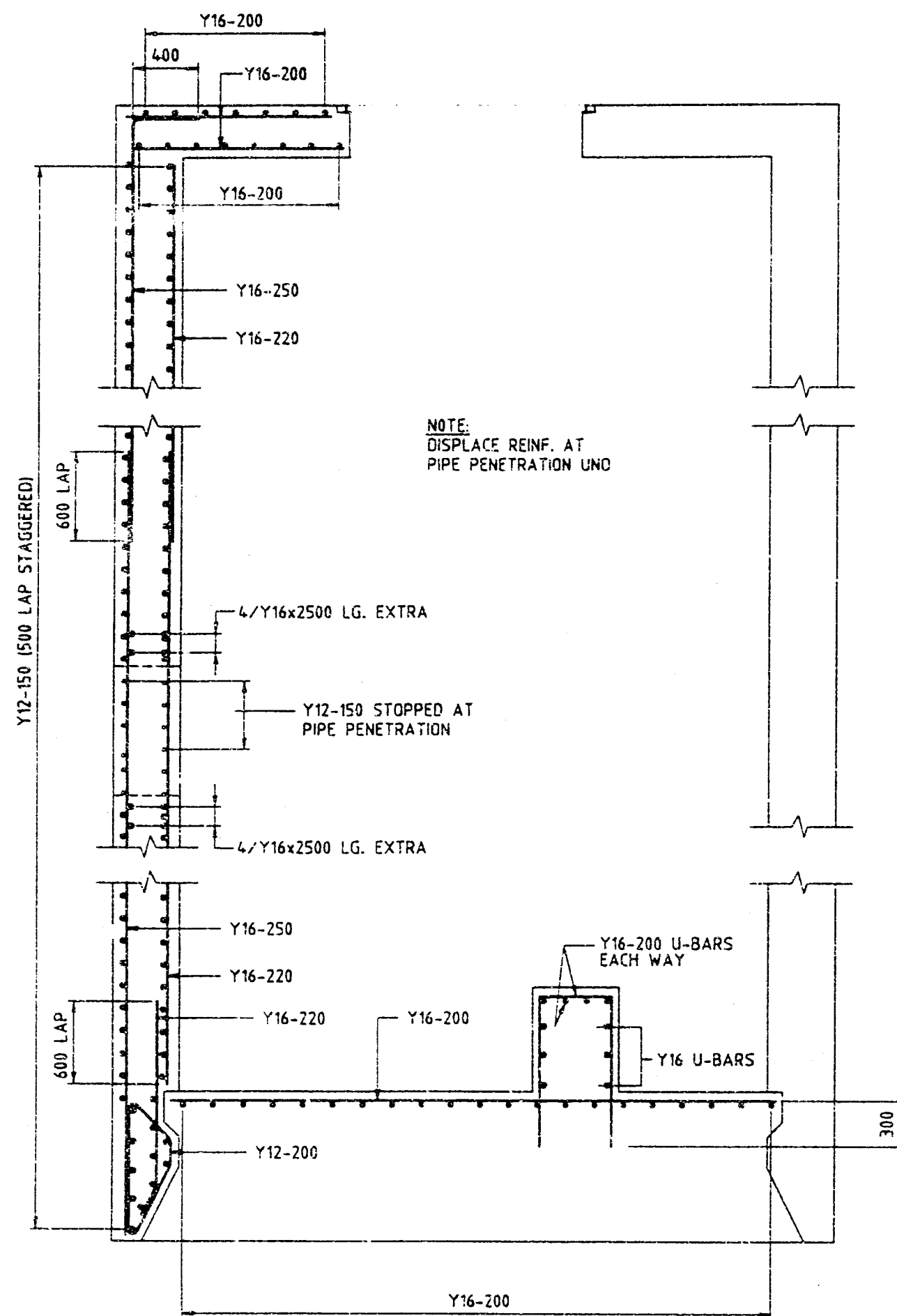
**OPERATION AND MAINTENANCE MANUAL**

BY  
**J & P RICHARDSON INDUSTRIES PTY LTD**  
**CAMPBELL AVENUE WACOL BRISBANE 4076**  
Ph. (07) 271 2911  
Fax. (07) 271 3623

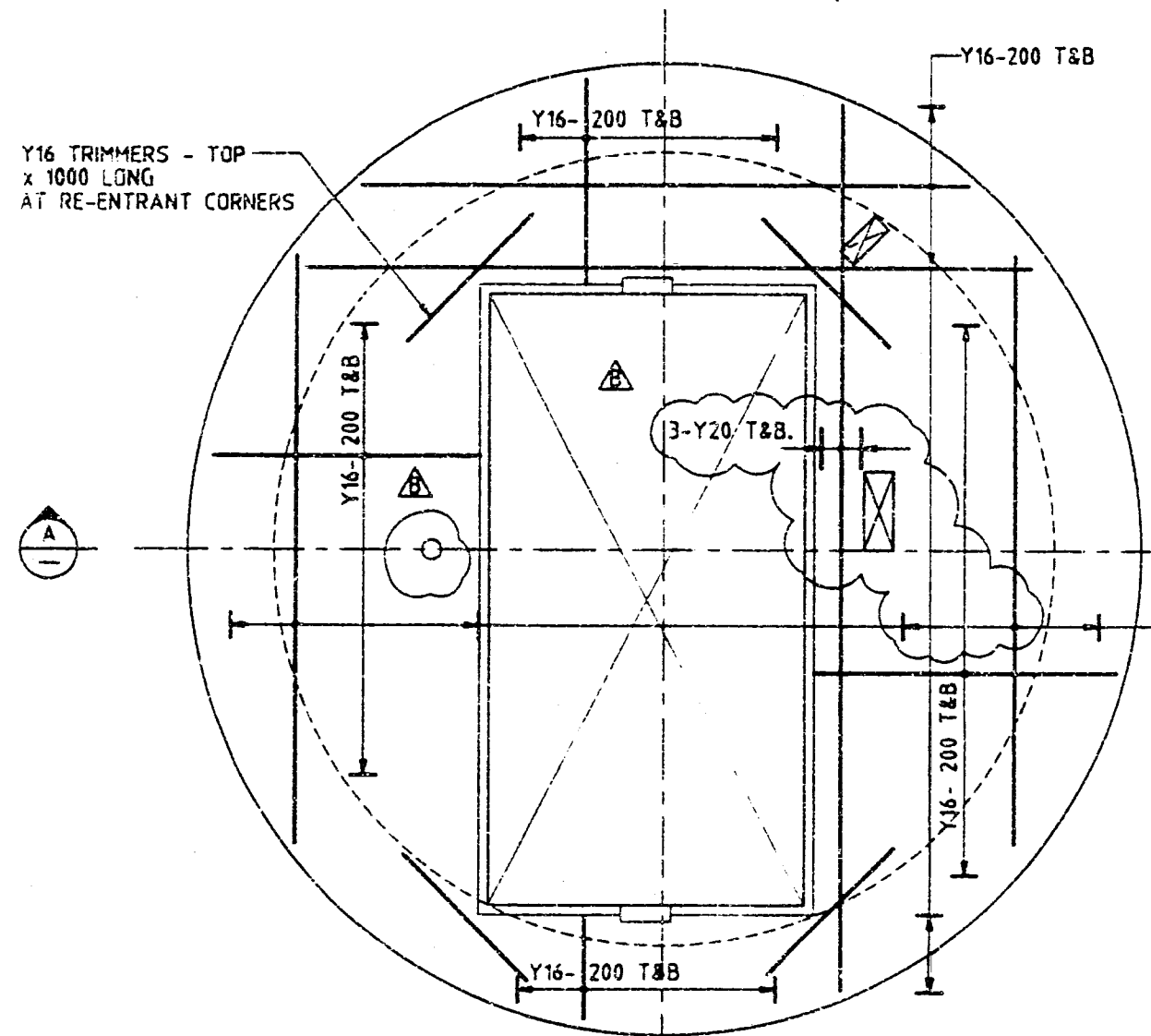




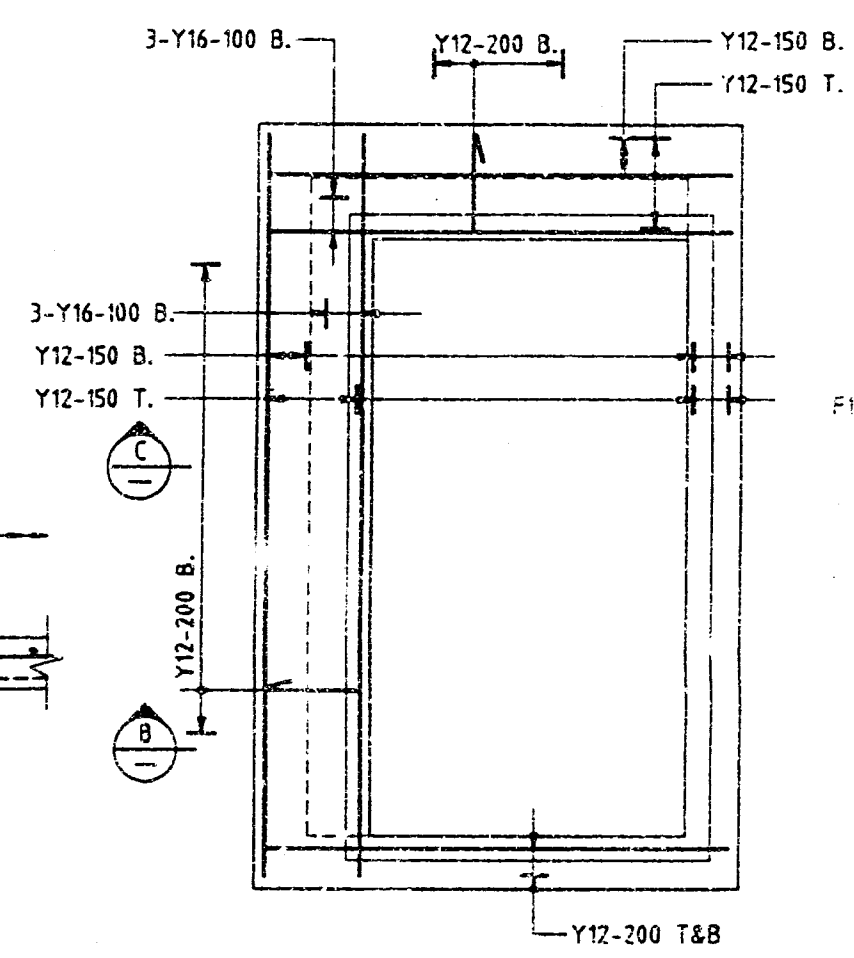
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7	FOR CONSTRUCTION	✓ RP	7.11.94																
6	MINOR REVISIONS	* RP	11.10.94																
5	VALVE PIT No. 7 ADDED. ACTUATOR DELETED	* RP																	
4	MINOR REVISIONS	* RP	6/9/94																
3	TENDER ISSUE	* RP	22/8/94																
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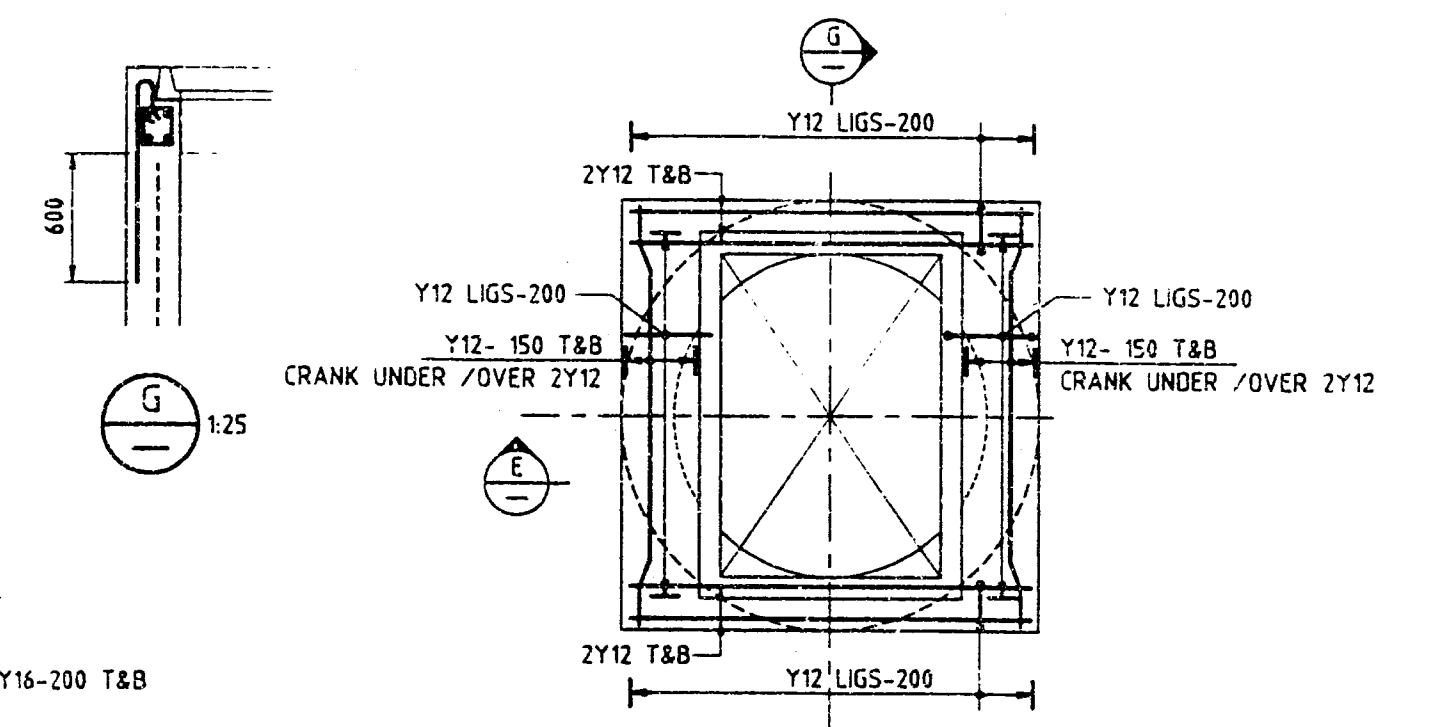
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DISPLACE REINF. AT  
PIPE PENETRATION UNO



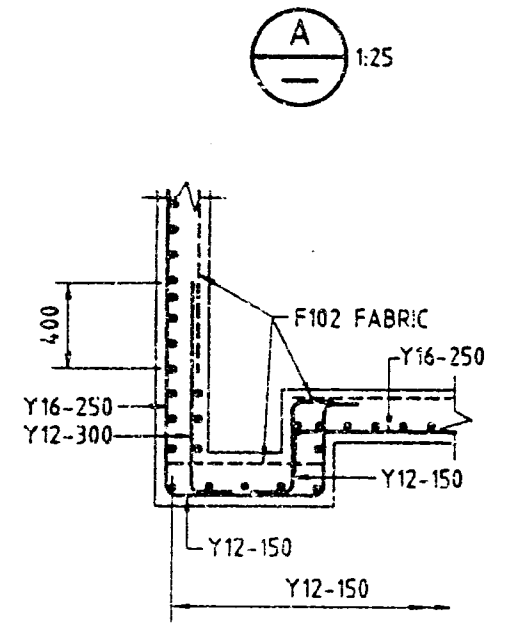
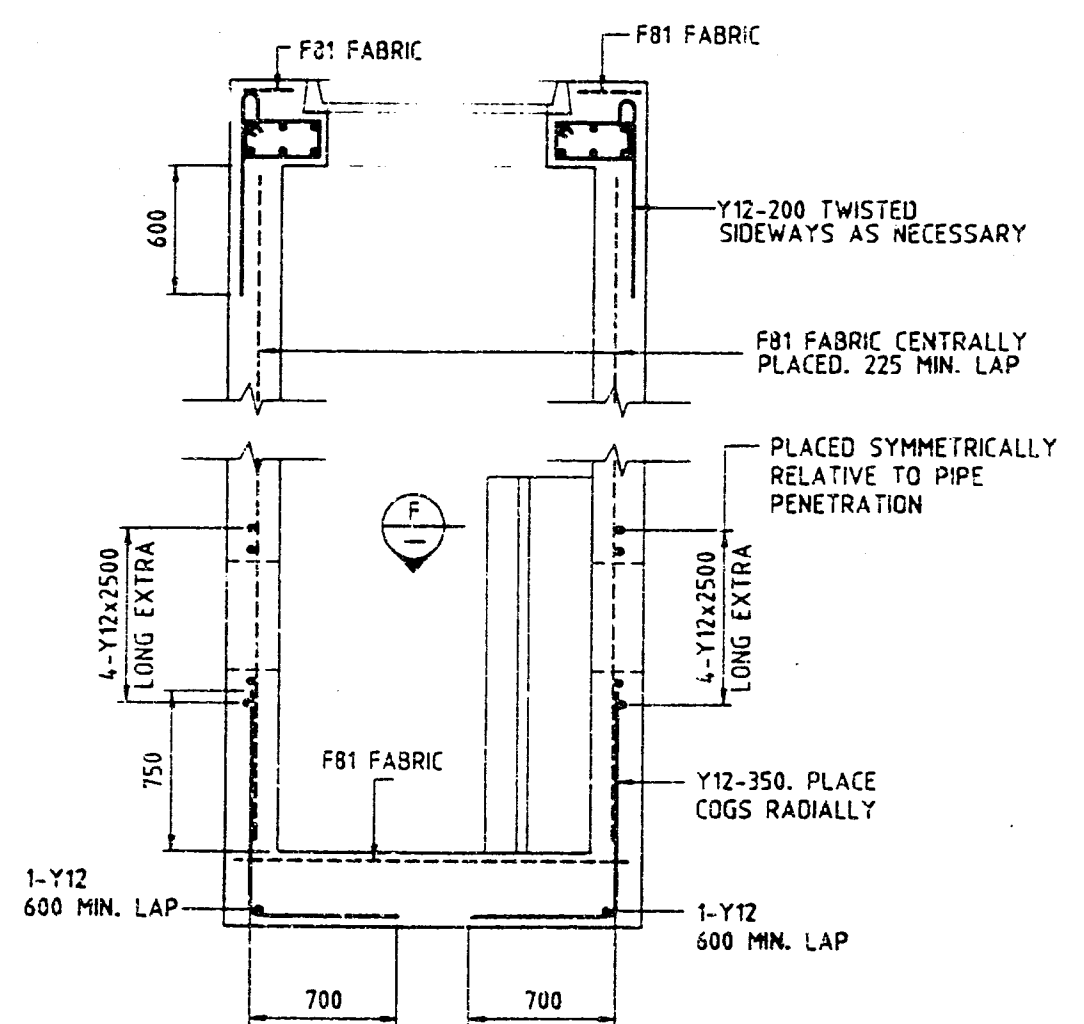
PUMP WELL ROOF - REINF.  
SCALE 1:25



VALVE PIT ROOF - REINF.  
SCALE 1:25

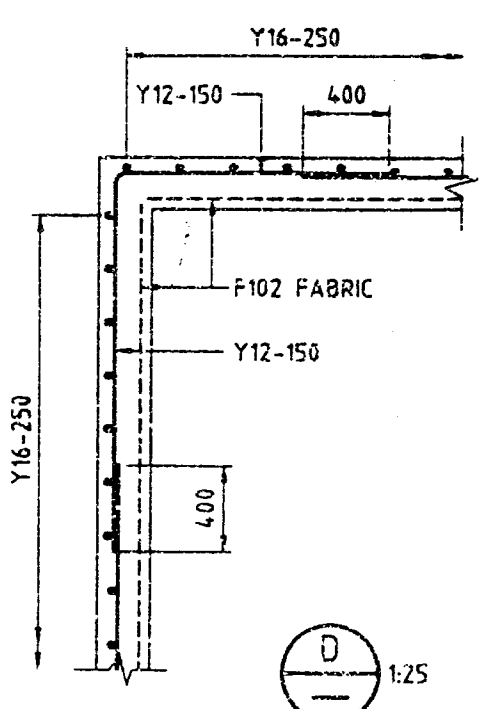


GRIT CHAMBER ROOF - REINF.  
SCALE 1:25

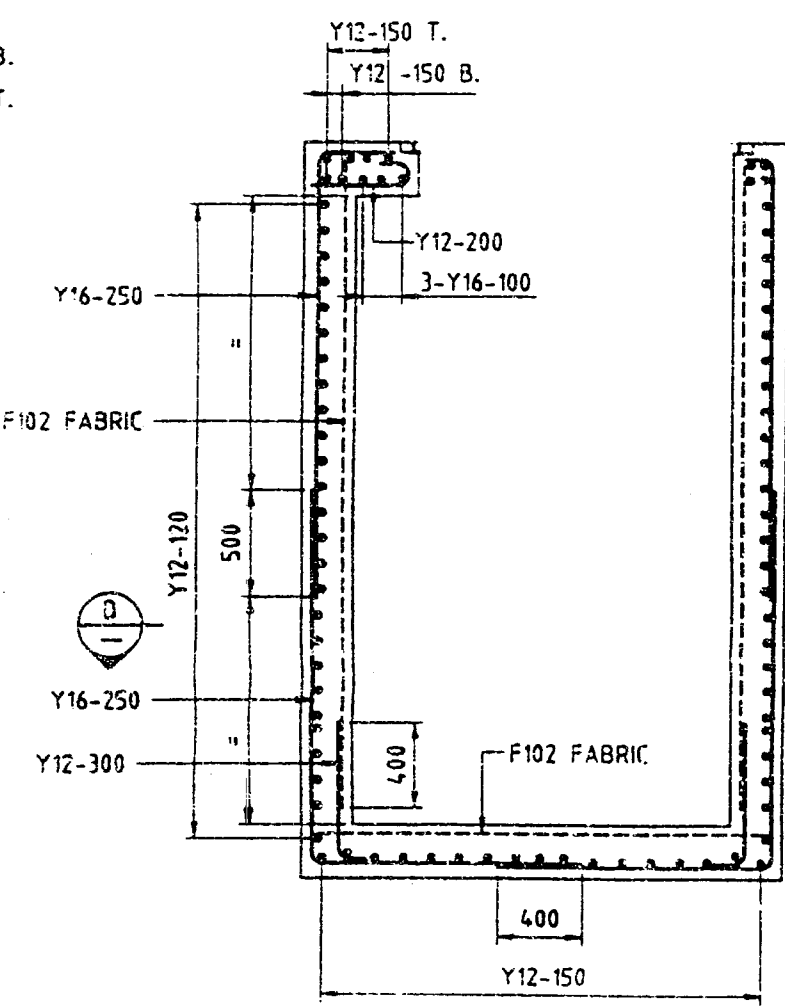


A 1:25

C 1:25



D 1:25



B 1:25

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1 ROOF REINF. AMENDED AS SHOWN			20/9/94	
1 TENDER ISSUE			22/8/94	

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DESIGNED	RO	CHECKED	* BJM
DRAWN	BMS	CHECKED	* R. PEARSON
SUBMITTED			* G. HACQUOIL
APPROVED			* N. APOSTOLIDIS

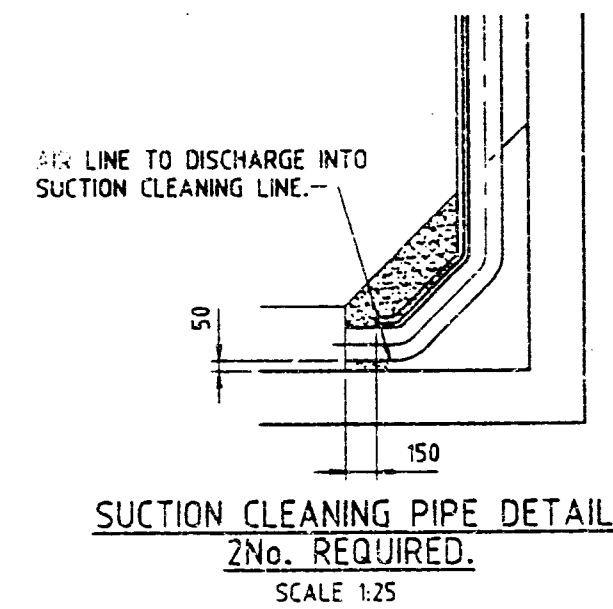
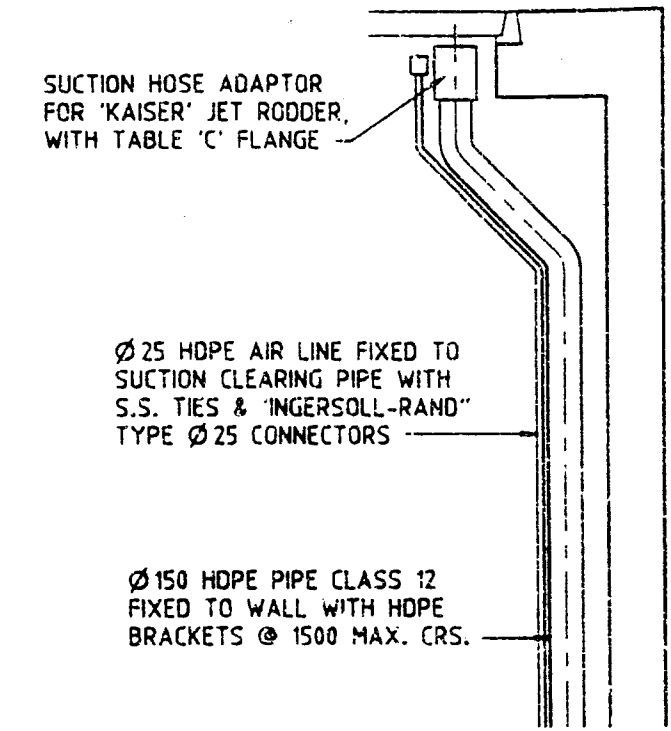
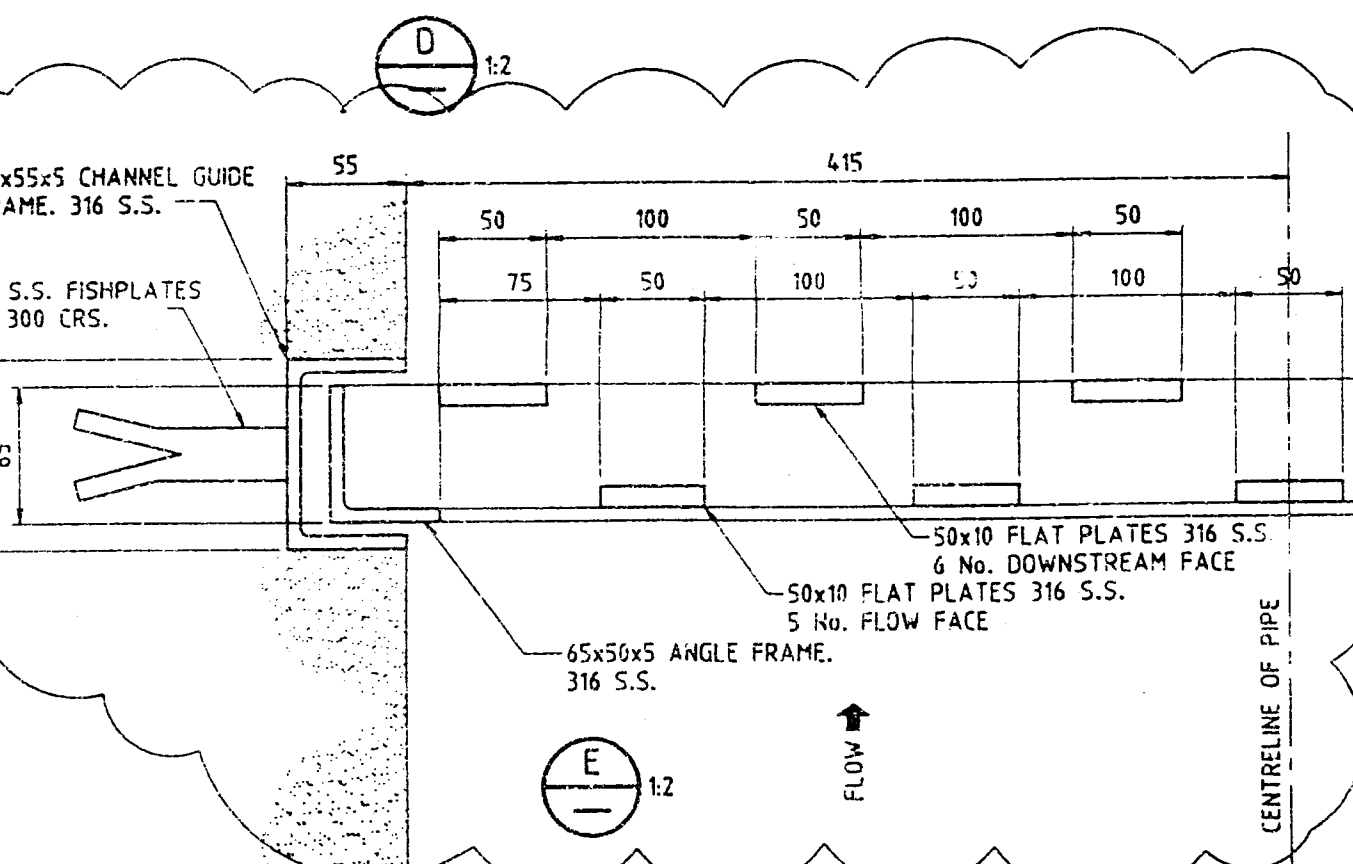
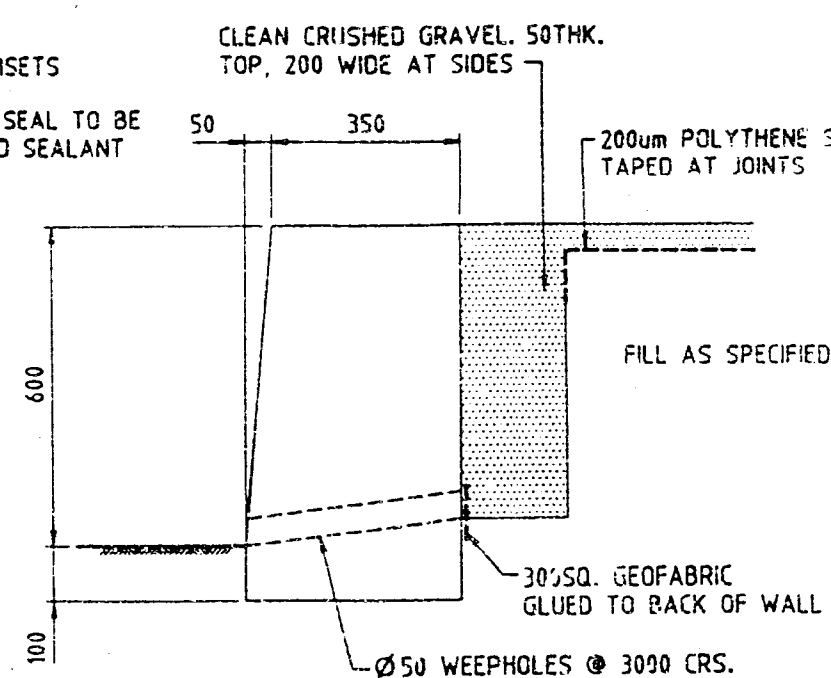
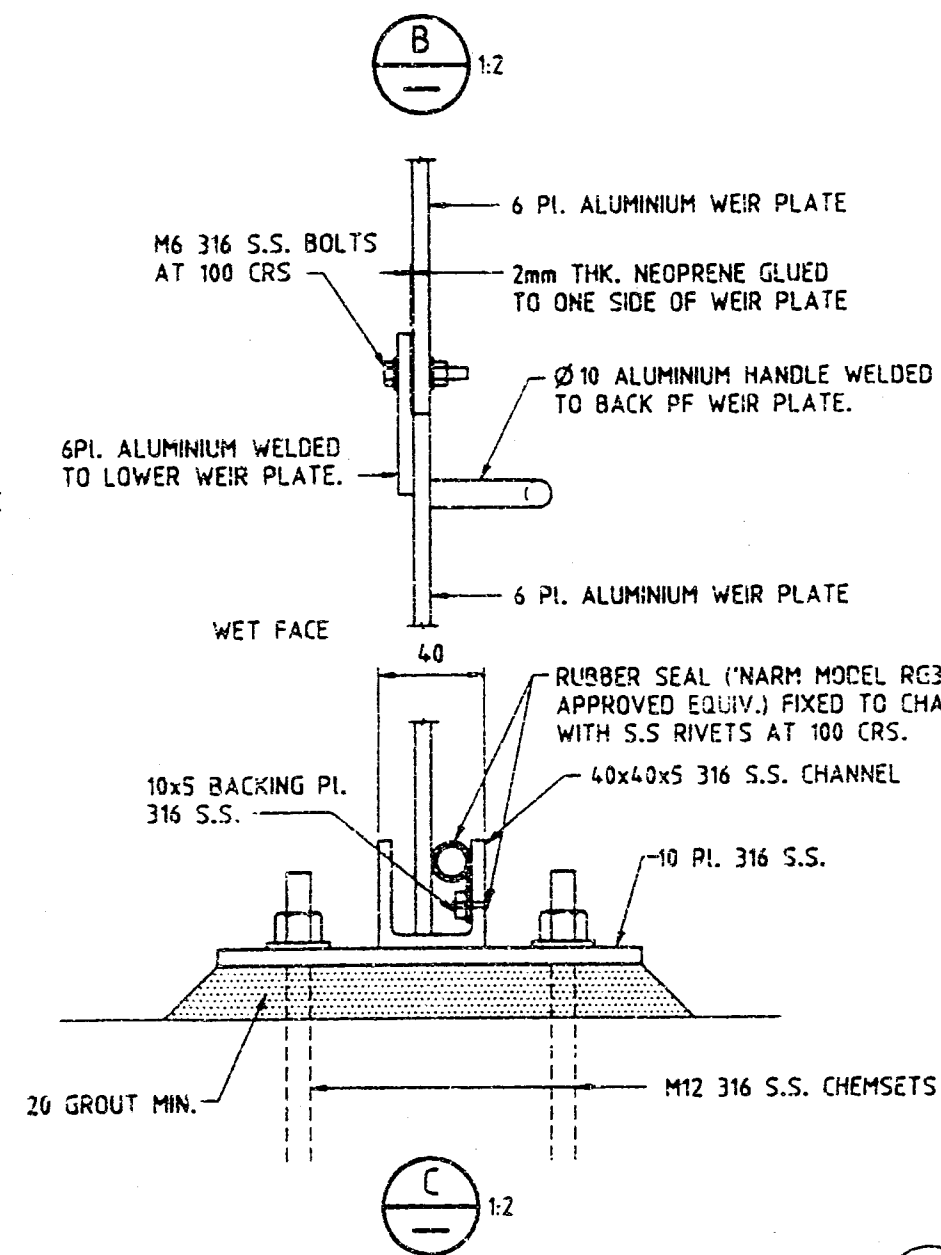
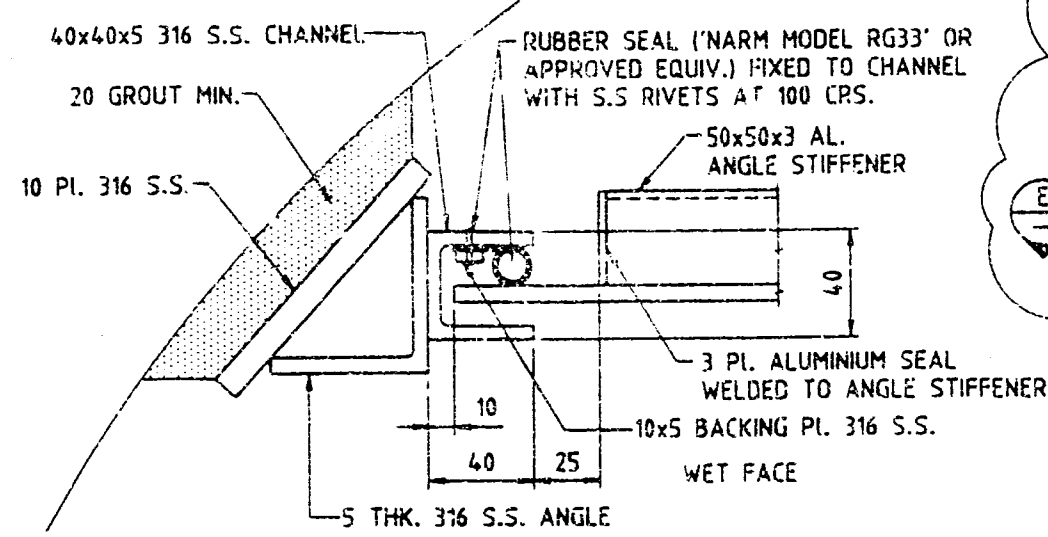
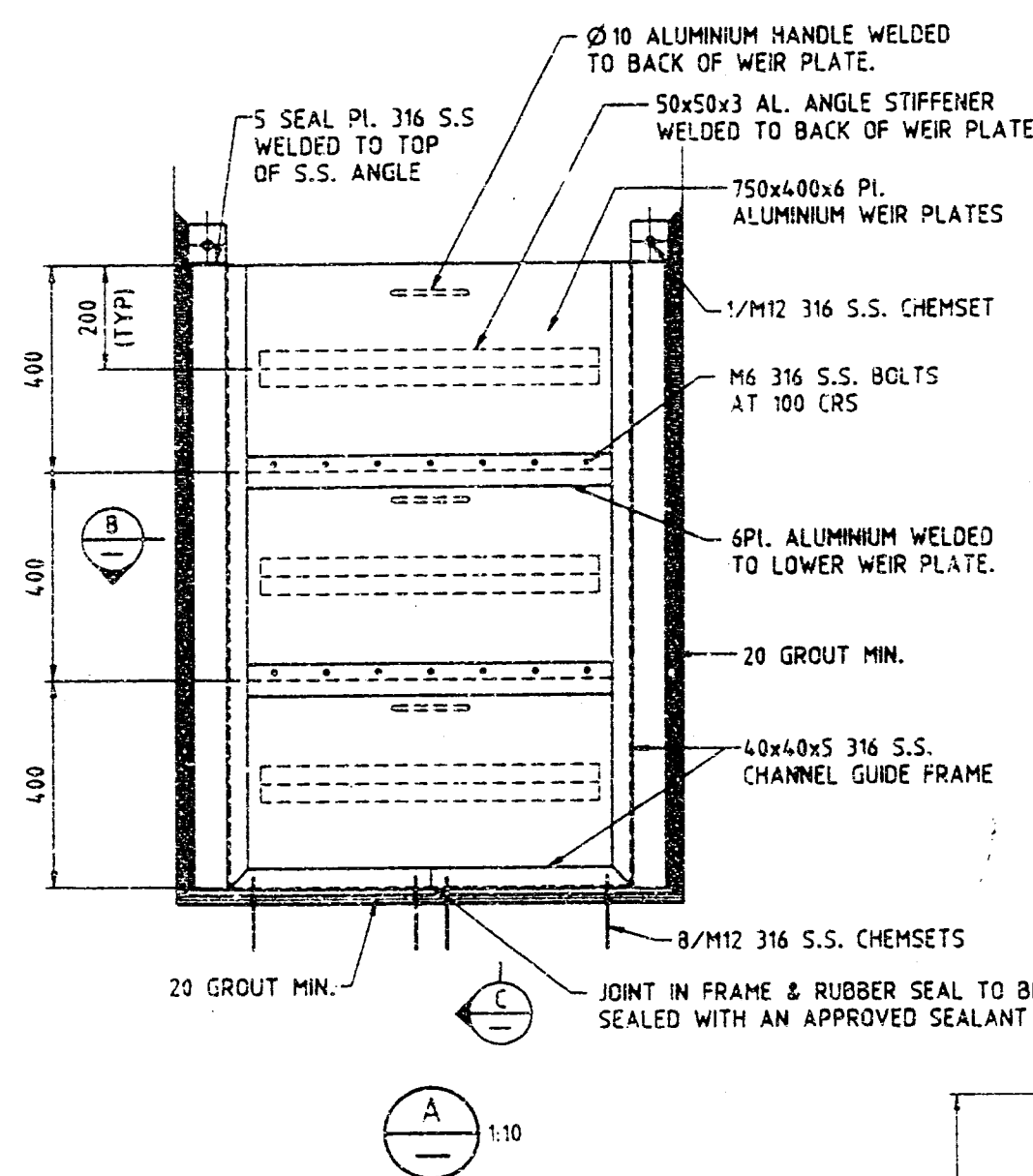
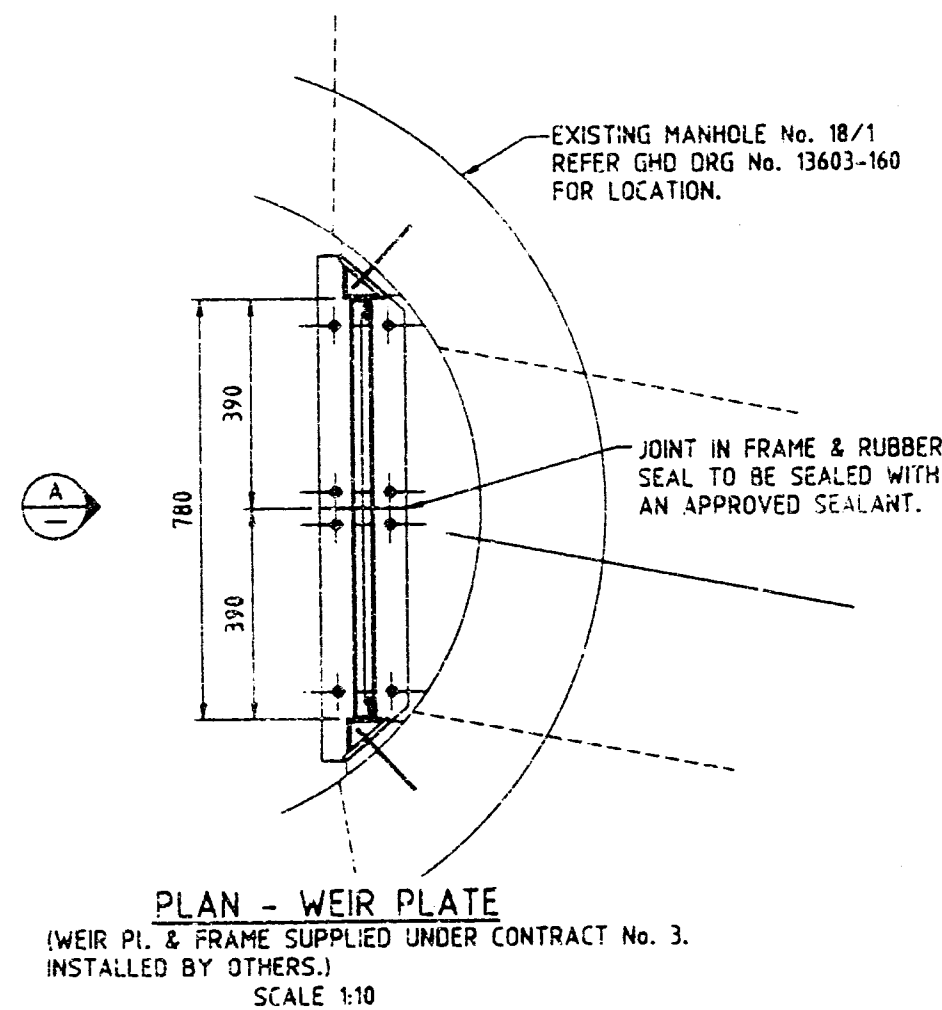
GREY ST PUMP STATION  
SOUTHBANK CORPORATION  
SEWERAGE PEAK FLOW BY-PASS PUMP STATION  
REINFORCEMENT DETAILS

13792-C21
REVISIONS
1 2 A B

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486/5/7-NK004





- NOTES:
1. ALL STAINLESS STEEL SHALL BE GRADE 316 UNO
  2. ALL ALUMINIUM SHALL BE GRADE 5083 UNO
  3. ALL WELDS TO STAINLESS STEEL SHALL BE 3 CFW UNO
  4. ALL WELDS TO ALUMINIUM SHALL BE 6 CFW UNO
  5. ALL BOLTS, NUTS & WASHERS SHALL BE GRADE 316 STAINLESS STEEL UNO. PROVIDE INSULATING WASHERS AND GROMMETS TO ALUMINIUM.

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Also at: CARINGBARRA, CAMBERRA, DARWIN, HOBART, MELBOURNE, PERTH, SYDNEY

DESIGNED	RP	CHECKED	GEH
DRAWN	BMS	CHECKED	* R. PEARSON
SUBMITTED			* G. HACQUOIL
APPROVED			* N. APOSTOLIDIS

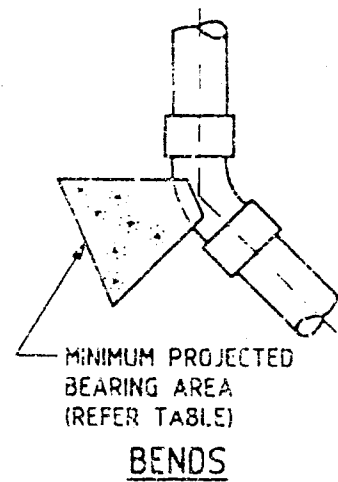
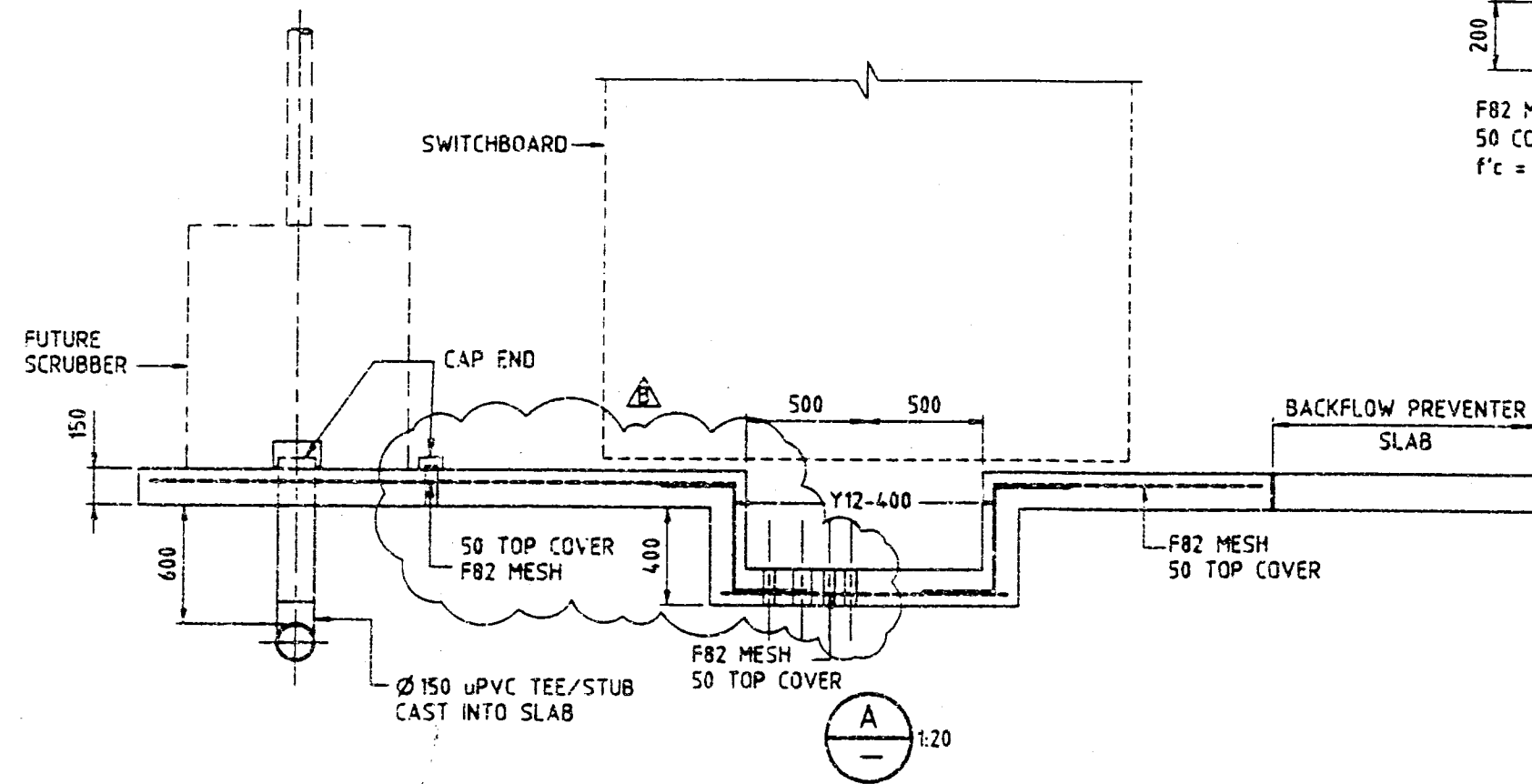
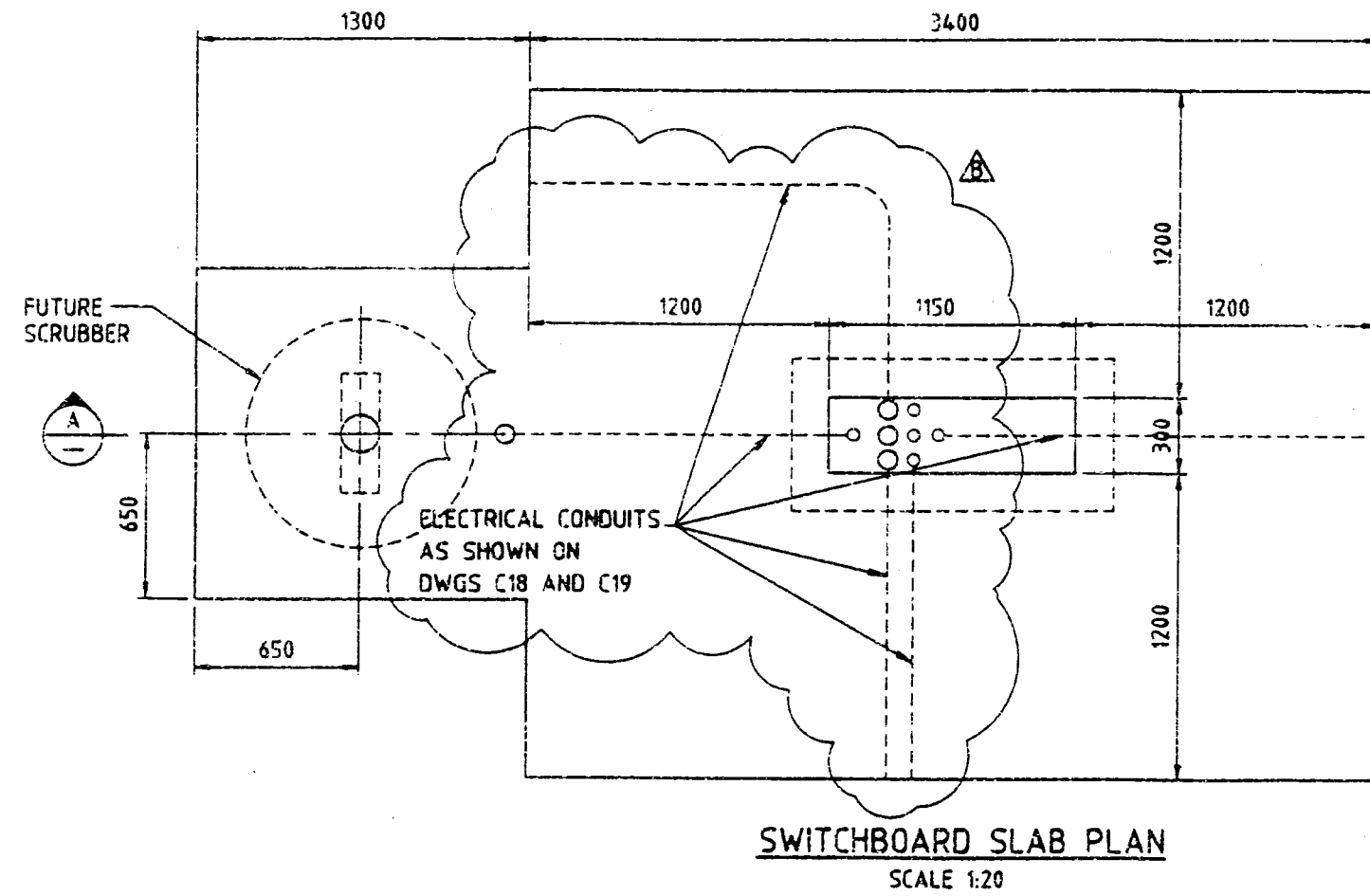
**GREY ST PUMP STATION**  
**SOUTHBANK CORPORATION**  
SEWERAGE PEAK FLOW BY-PASS PUMP STATION  
STANDARD DETAILS - SHEET 1

13792-C22

REVISIONS	1	2	A	B
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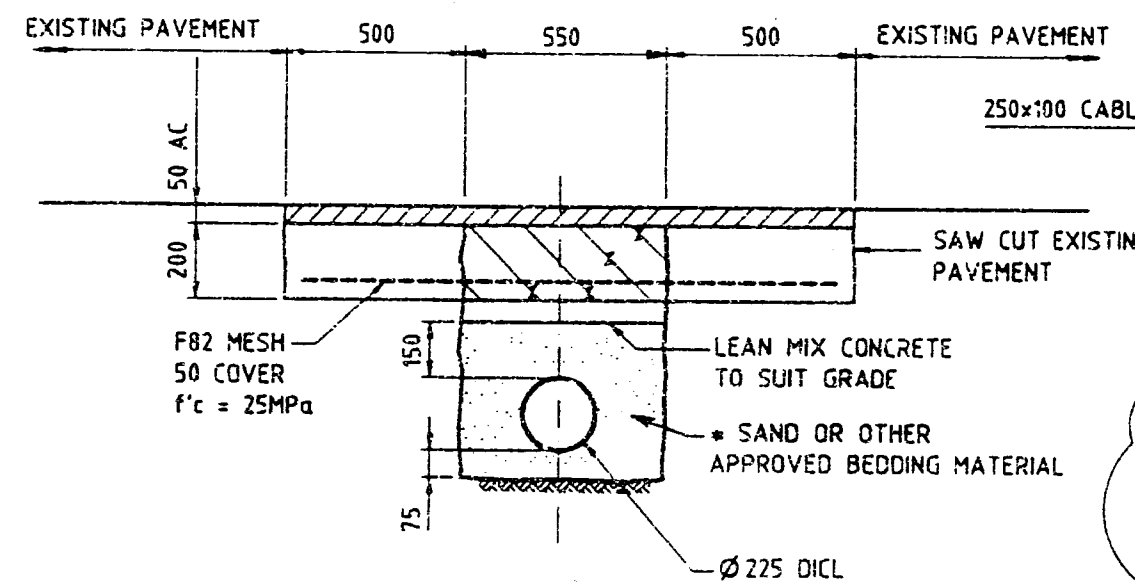
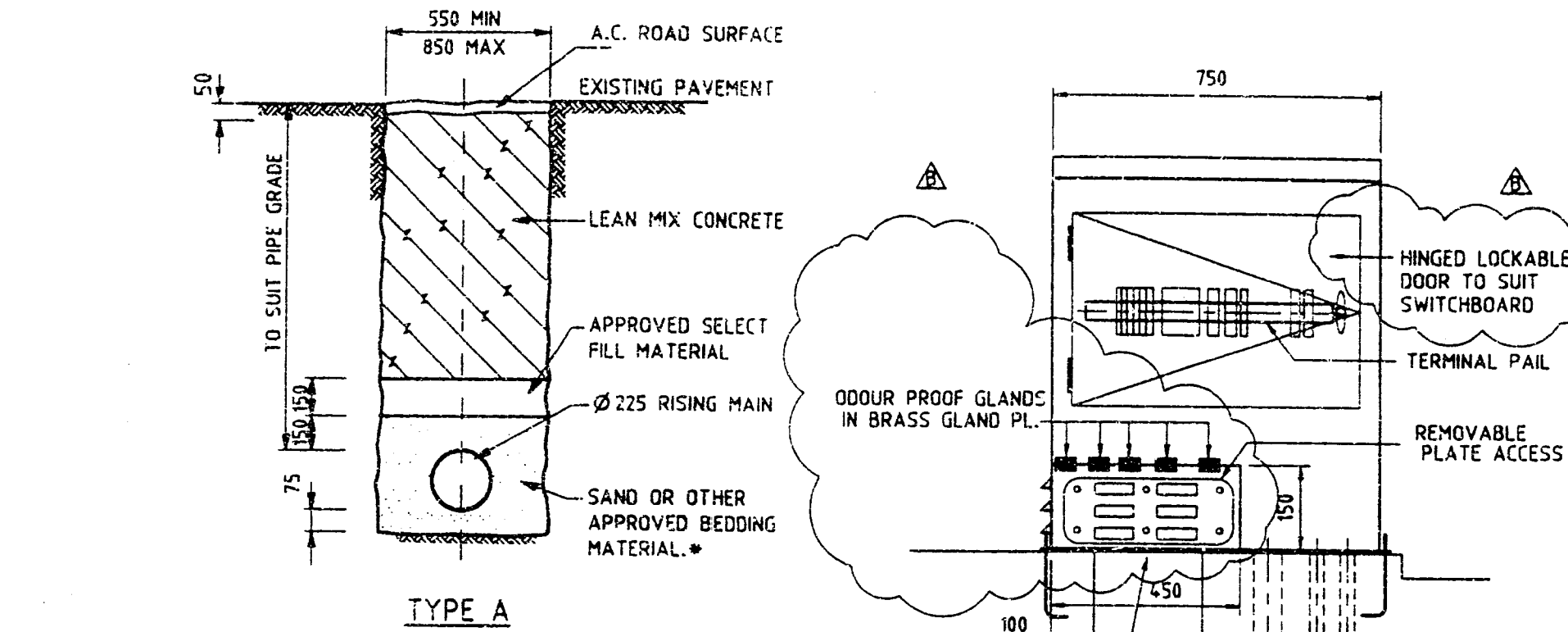
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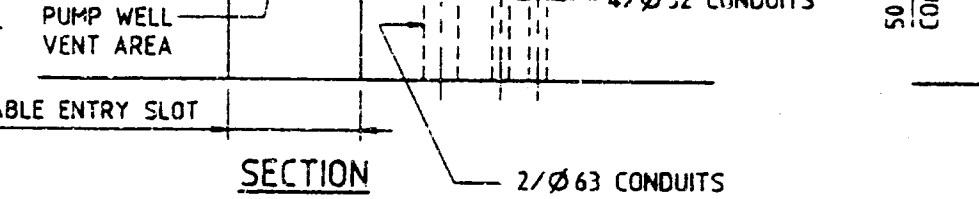
THRUST BLOCK DETAILS

PIPE SIZE	MINIMUM BEARING AREA (m <sup>2</sup> )				
	90° BENDS & TEES	45° BENDS	22 1/2° BENDS	11 1/4° BENDS	WYES
100		0.10			
225	0.68	0.36	0.19	0.10	0.34
250	0.80	0.43	0.22	0.11	0.42

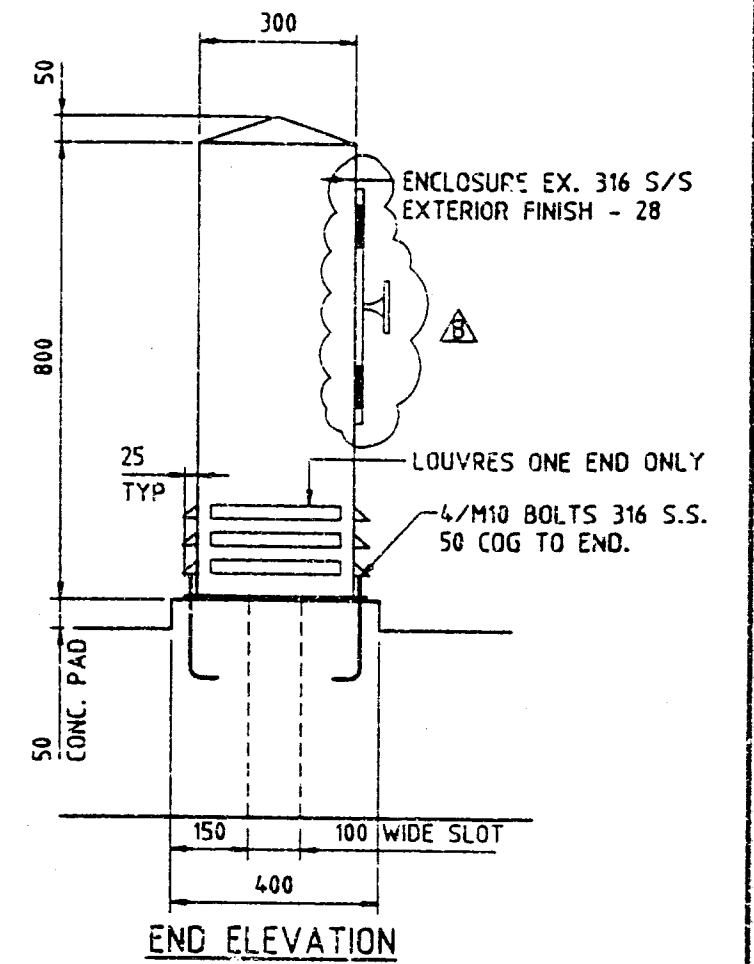
NOTE:- THRUST AREA CALCULATED ON UNDISTURBED GROUND AREA, BASED ON 1200kPa TEST PRESSURE & GROUND BEARING PRESSURE OF 100kPa



TYPE B  
CHGE. 142.750 TO 177.490  
CHGE. 136.450 TO 137.250



PUMP DISCONNECT BOX  
SCALE 1:10

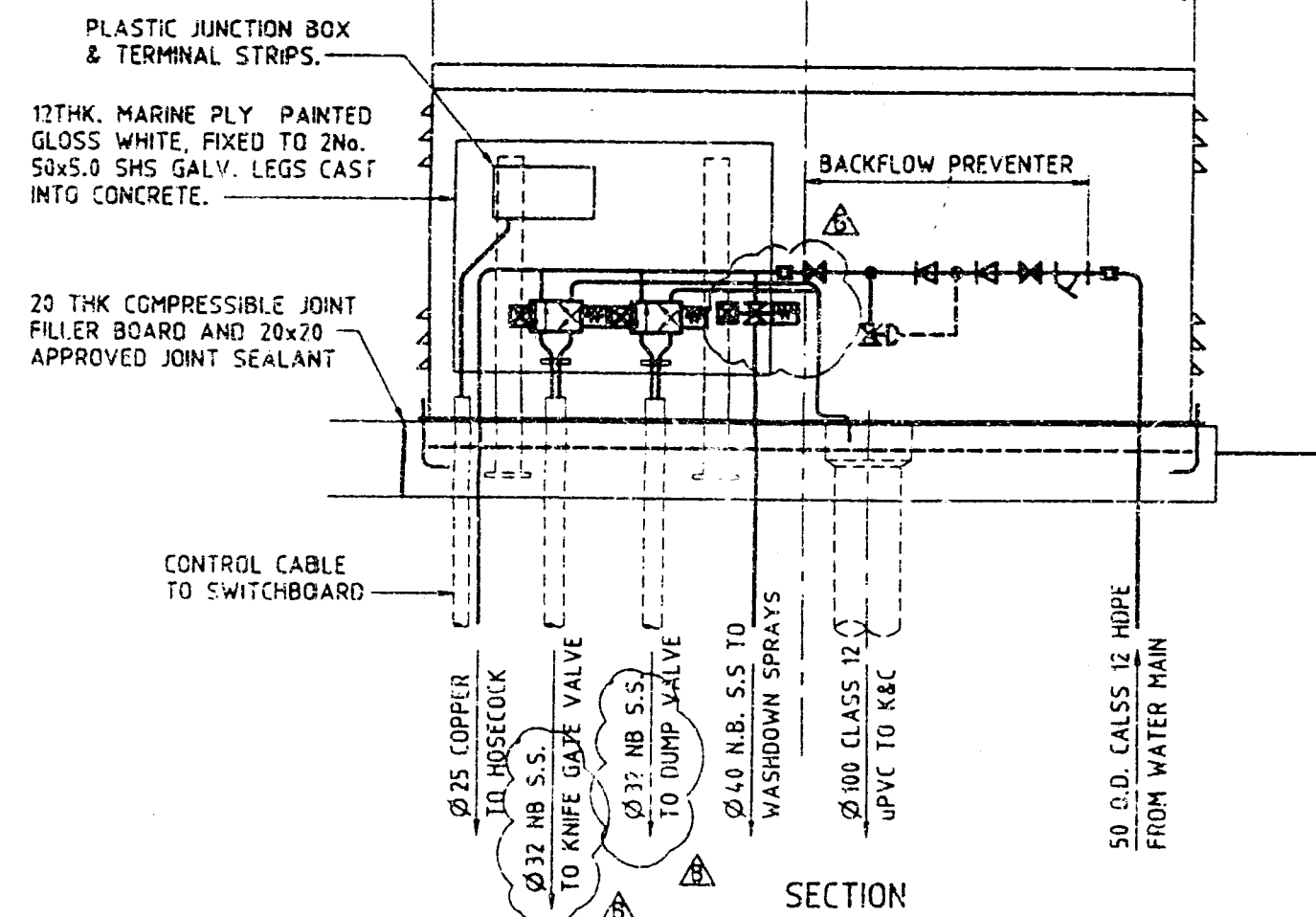


### BEDDING NOTES

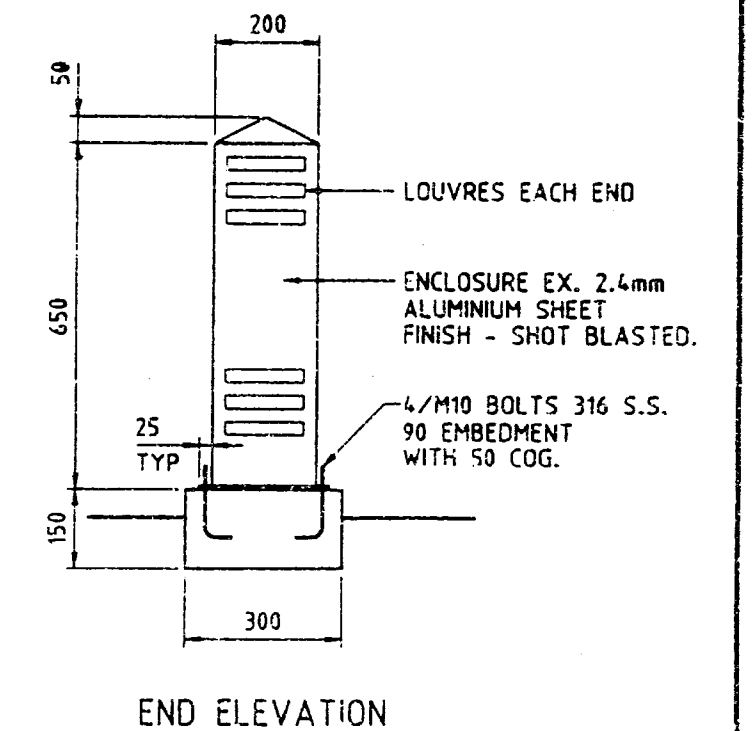
1. APPROVED BEDDING, SURROUND AND SELECT FILL SHALL BE COMPACTED TO 95% MAXIMUM DRY DENSITY DETERMINED IN ACCORDANCE WITH A.S. 1289 PART 5.1.1. AND TO 70% DENSITY INDEX DETERMINED IN ACCORDANCE WITH A.S. 1289 PART E6.1.

2. RESTORE ROADWAY & EXISTING SURFACE IN ACCORDANCE WITH SPECIFICATION

• IN LOCATIONS WHERE GROUNDWATER IS PRESENT IN THE EXCAVATION THE SUPERINTENDENT MAY ORDER CRUSHED ROCK BEDDING MATERIAL. PAYMENT FOR THIS TYPE 1A (ALTERNATIVE CRUSHED ROCK) BEDDING WILL BE MADE UNDER THE SCHEDULED ITEM ONLY FOR THAT WORK ORDERED IN WRITING BY THE SUPERINTENDENT (REFER SPECIFICATION).



BACKFLOW PREVENTER DETAILS  
SCALE 1:10



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7	FOR CONSTRUCTION	RP	7/11/94	
6	TRENCH TYPE C DELETED &			
5	BACKFLOW PREVENTER AMENDED	RP	20/7/94	
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DESIGNED	RP	CHECKED	GEH
DRAWN	BS/CH	CHECKED	* R. PEARSON
SUBMITTED			* G. HACQUOIL
APPROVED			* N. APOSTOLIDIS

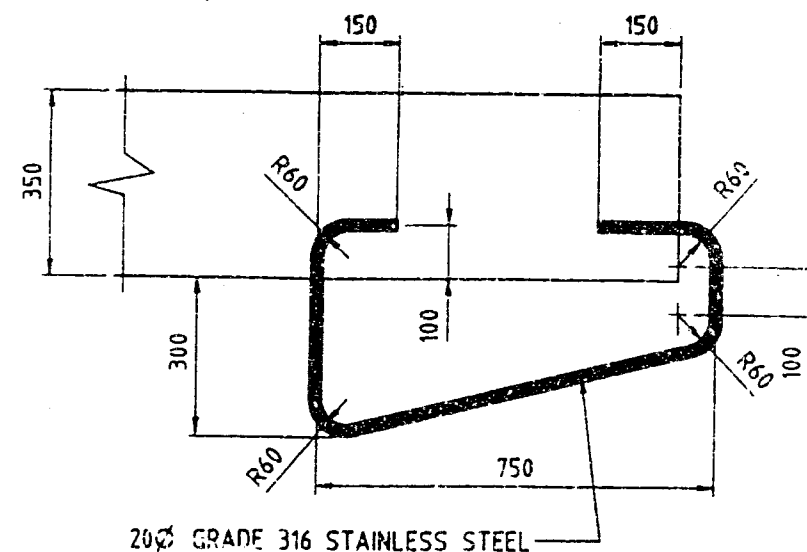
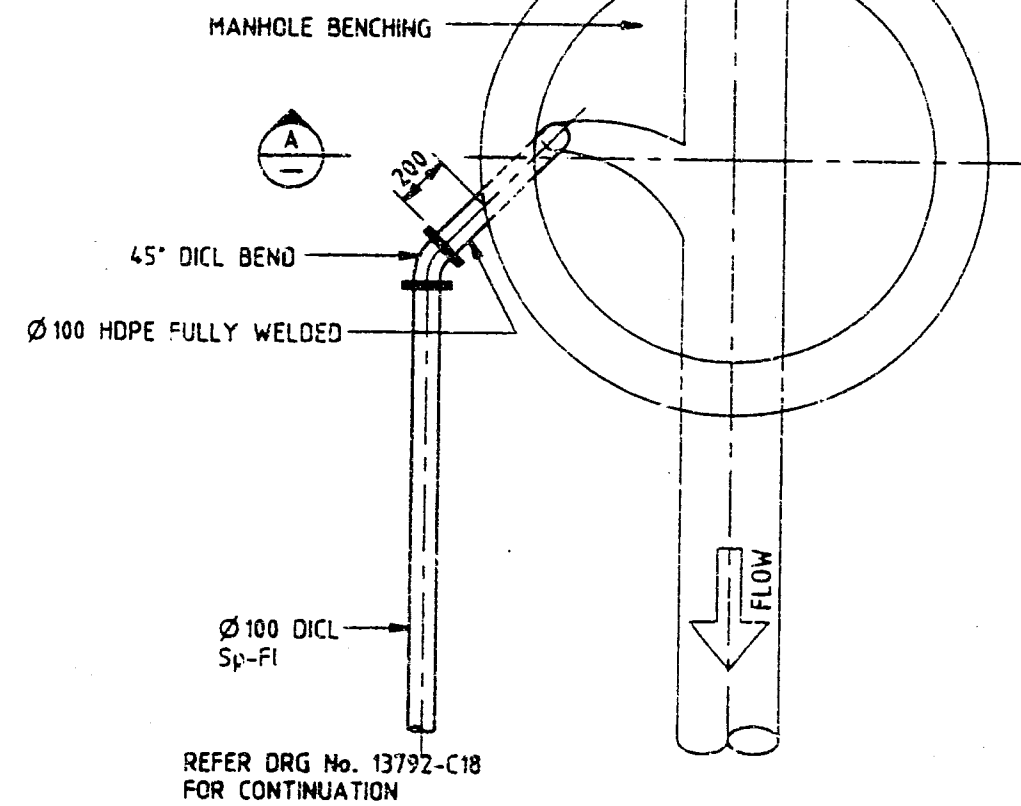
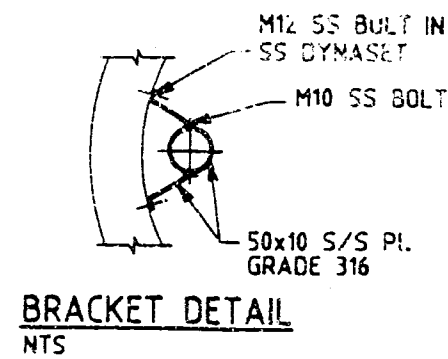
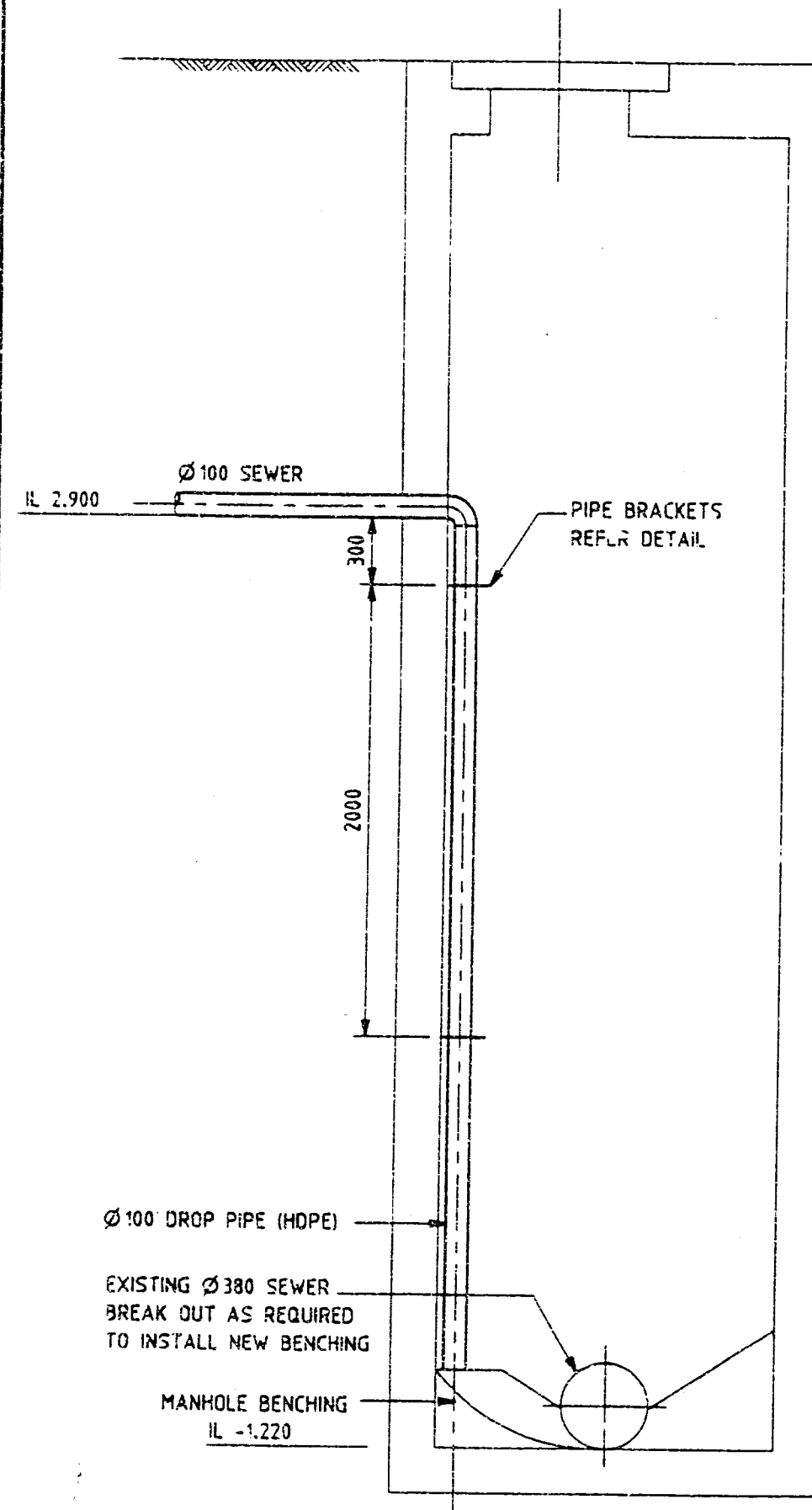
**GREY ST PUMP STATION**  
**SOUTHBANK CORPORATION**  
SEWERAGE PEAK FLOW BY-PASS PUMP STATION  
STANDARD DETAILS - SHEET 2

13792-C23

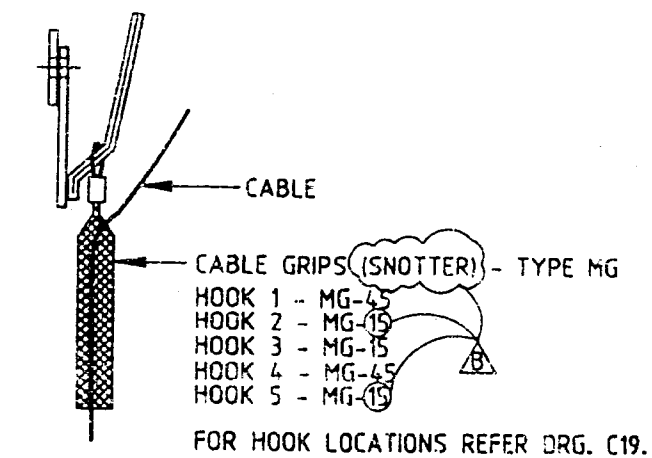
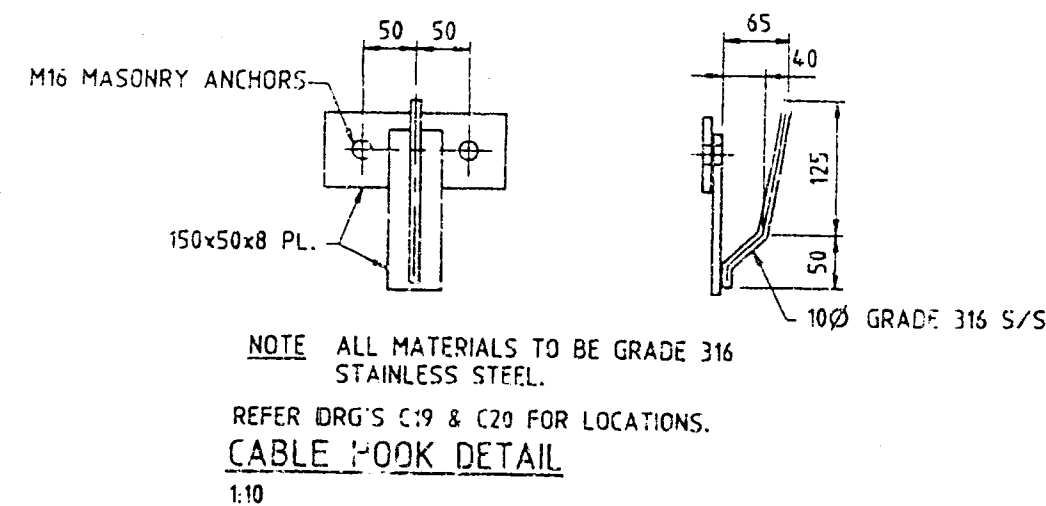
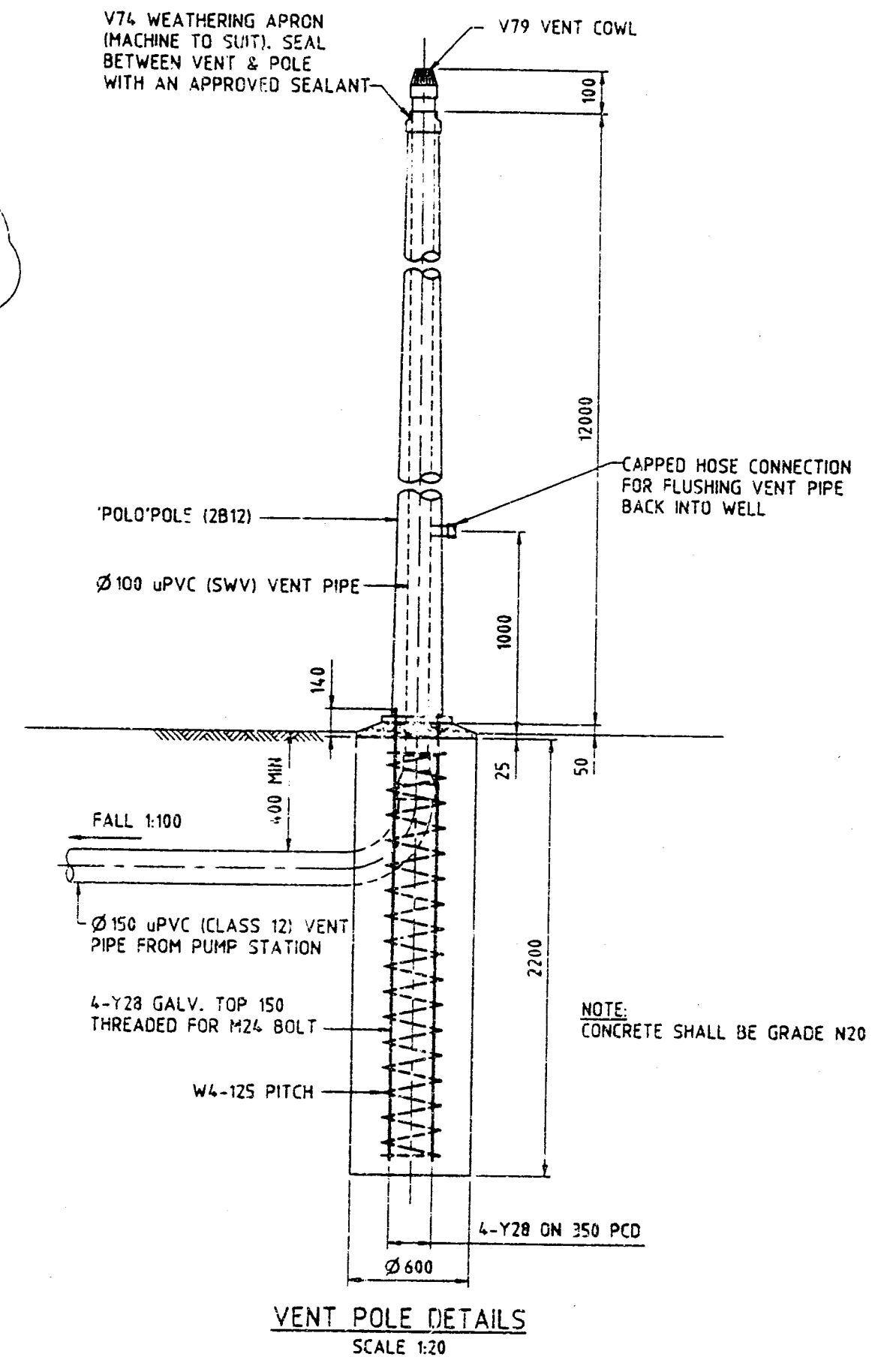
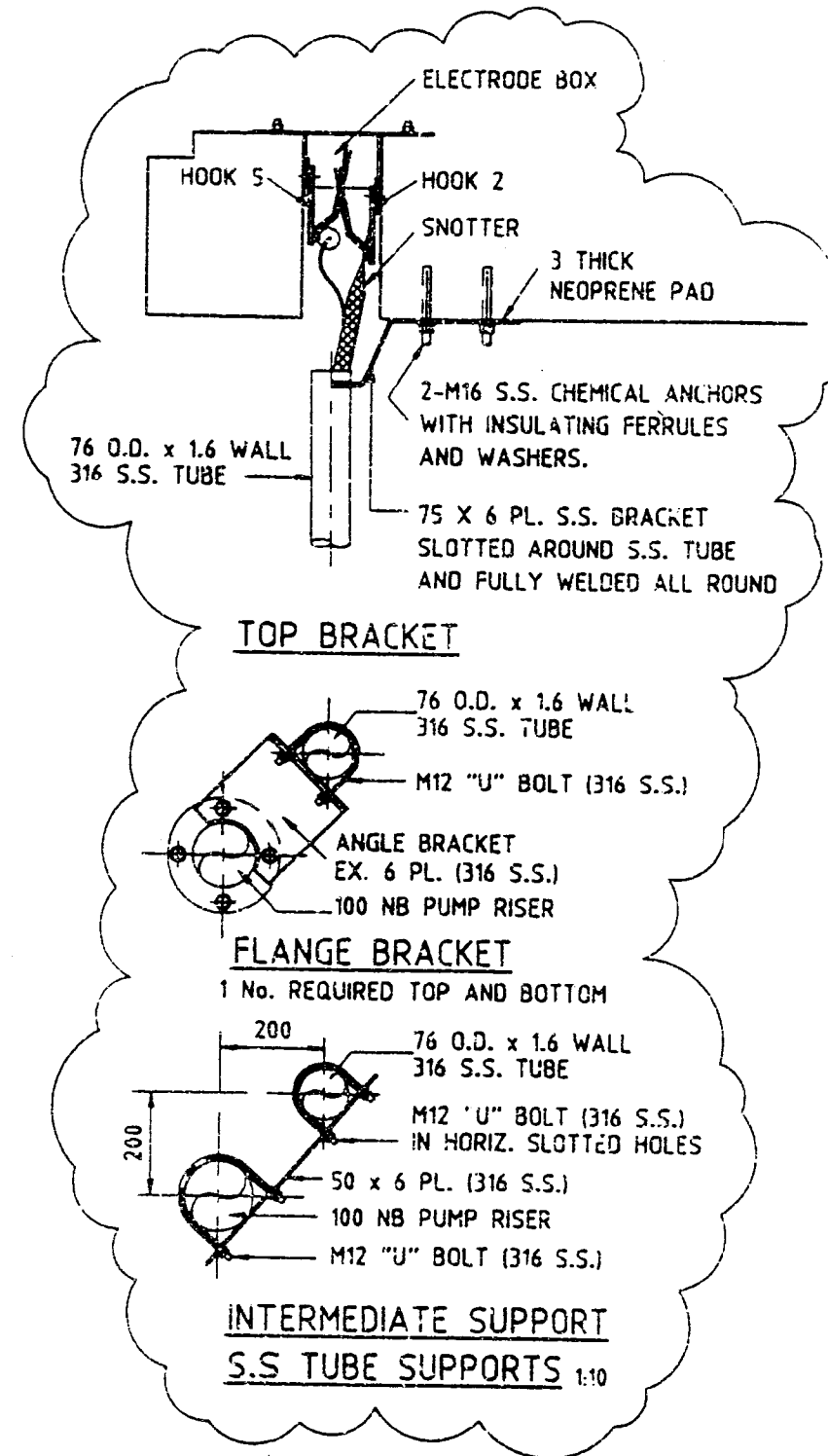
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ANODE HOOK DETAIL - 1 REQ'D.  
1:10  
REFER DRG'S C19 & C20 FOR LOCATION.



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8	FOR CONSTRUCTION			1/2/95	
7	FOR CONSTRUCTION			7/11/94	
6	VENT POLE ADDED			11/10/94	
5	TENDER ISSUE			22/8/94	

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DESIGNED	RP	CHECKED	GEH
DRAWN	CEH	CHECKED	* R. PEARSON
SUBMITTED			* G. HACQUOIL
APPROVED			* N. APOSTOLIDIS

GREY ST PUMP STATION  
SOUTHBANK CORPORATION  
SEWERAGE PEAK FLOW BY-PASS PUMP STATION  
MISCELLANEOUS DETAILS

13792-C24

REVISIONS	1	2	A	B
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**BRISBANE CITY COUNCIL**



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Infrastructure Design, Peter Gaw (ext. 33327)  
Process Design, David Philp (ext. 33321)  
Mechanical Design, Jeff van der Wiel (ext. 33360)  
Electrical Design, Steve Kean (ext. 33355)  
Plan Room, James Knowles (ext. 33366)  
A/Administration, Anne Taylor (ext. 33319)  
Facsimile Machine (340) 30205



**MEMORANDUM**

To : Jim Karydas, FFS  
From : Steve Mobbs, E4PD  
Date : 13th September 1996  
Subject : Grey Street Pump Station

Jim,

I enclose a copy of the O&M manual for the above PS as requested.

I will need it back in a few weeks time as it still needs to be modified to reflect the changes to the hydraulic actuators.

I also enclose some information as listed below on the hydraulic actuators which you may find of use. This information (when checked and approved) will be incorporated into the O&M manual.

- Installation and operating instructions - Grundfos Pressure Tank.
- Installation and operating instructions - Grundfos Pump
- Installation and operating instructions - Water Pressure System
- Setting up procedure for power pressure switches

Regards,

*Steve Mobbs*

Steve Mobbs



4  
IXI=

INDEX

1.0 PUMPS

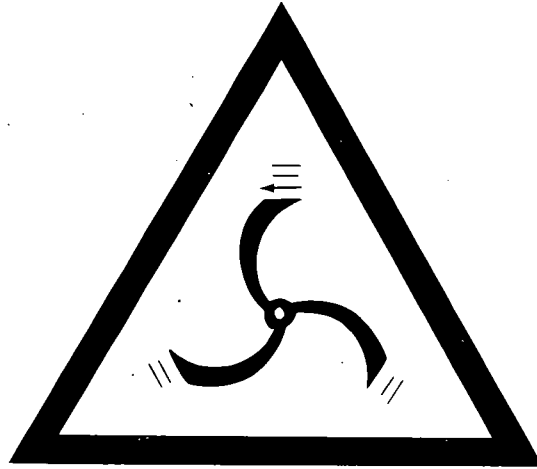
2.0 VALVES

3.0 TEST SHEETS

4.0 FUNCTIONAL SPECIFICATION

5.0 ELECTRICAL EQUIPMENT TECHNICAL INFORMATION

6.0 'AS CONSTRUCTED' DRAWINGS



**OPEN AND LOCK  
THE MASTER POWER SWITCH  
BEFORE WORKING ON THE MACHINE**

**POST THE SIGN SO THAT IT IS CLEARLY  
VISIBLE NEXT TO  
THE MACHINE INSTALLATION**



PUMPS

SUPPLIER: ITT FLYGT  
14A Devlan Street  
MANSFIELD QLD 4122  
PH: (07) 849 7477  
FAX: (07) 849 7633

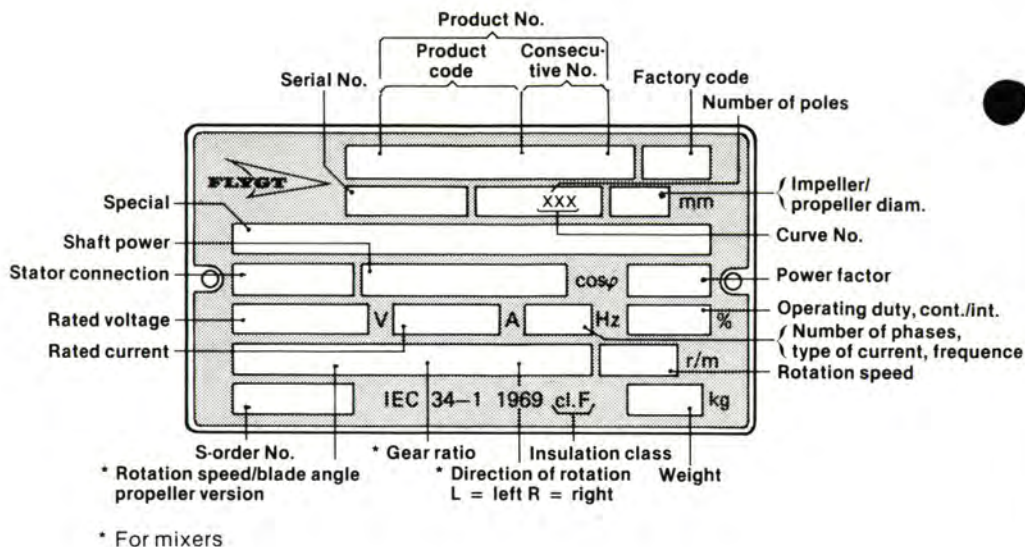
MODEL: CP3085.181 MT 432 (DRAIN DOWN PUMP)  
CP3300.181 HT 462 (MAIN PUMPS)

3085.181

INSTALLATION  
CARE AND  
MAINTENANCE



## DATA PLATE INTERPRETATION



Flygt undertakes to remedy faults in products sold by Flygt provided:

- that the fault is due to defects in design, materials or workmanship;
- that the fault is reported to Flygt or Flygt's representative during the guarantee period;
- that the product is used only under conditions described in the care and maintenance instructions and in applications for which it is intended;
- that the monitoring equipment incorporated in the product is correctly connected;
- that all service and repair work is done by a workshop authorized by Flygt;
- that genuine Flygt parts are used.

Hence, the guarantee does not cover faults caused by deficient maintenance, improper installation, incorrectly executed repair work or normal wear and tear.

Flygt assumes no liability for either bodily injuries, material damages or economic losses beyond what is stated above.

Flygt guarantees that a spare parts stock will be kept for 15 years after the manufacture of this product has been discontinued.

The manufacturer reserves the right to alter performance, specification or design without notice.

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**Product description** ..... 2

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## PRODUCT DESCRIPTION

### Applications

3085.181 is intended to be used for:

- pumping of waste water
- pumping of sludge
- pumping of ground water
- pumping of light liquid manure and urine

The pump is available in the following versions:

Pump type	Impeller types available		
CP	LT	MT	HT
CS	LT	MT	HT
DP	—	MT	HT
DS	—	MT	HT
FP	LT	—	—
FS	LT	—	—
GF	—	MT	—
LL	LT	—	—
CF	—	MT	—
DF	—	MT	—

LT = Low-head version

MT = Medium-head version

HT = High-head version

**CP** = for permanent installation in a sump. The pump slides down along guide bars and connects automatically to a discharge connection.

**CS** = portable, with hose connection, base stand and strainer.

**CF** = pedestal version for free standing installation in a pump sump.

**DP** has the same mode of installation as CP, but is equipped with a swirl-type impeller.

**DS** has the same mode of installation as CS, but is equipped with a swirl-type impeller.

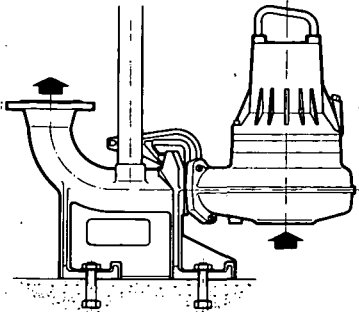
**DF** has the same mode of installation as CF, but is equipped with a swirl-type impeller.

**F** = one of the Flygt series of submersible manure pumps. The pump housing and impeller are specially designed for pumping liquid manure and urine of low litter content.

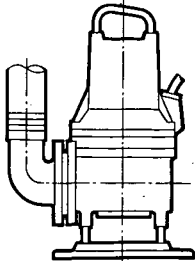
**GF** is intended for pure ground water pumping from e.g. basements, garages and laundry rooms. The pump is installed free-standing in a sump.

**LL** = one of the Flygt series of submersible lift pumps intended for land drainage systems. The pump system can be used for draining temporarily waterlogged land, or land which is low-lying in relation to the surrounding area.

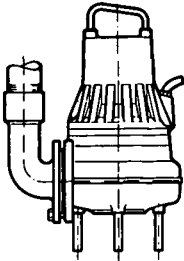
CP  
DP  
FP



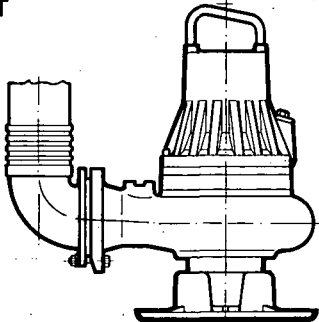
DS HT



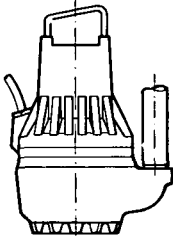
CF  
DF



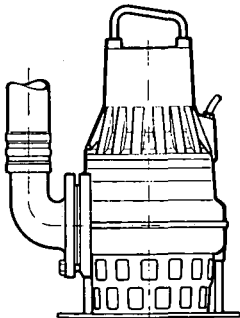
CS LT



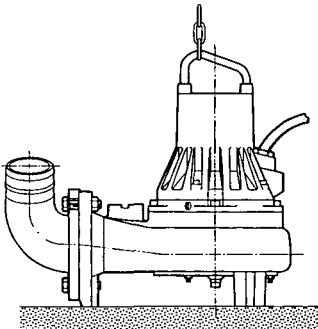
GF



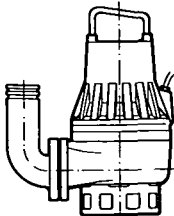
CS MT  
DS



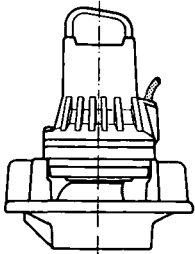
FS



CS HT



LL



**Liquid temperature:** max. 40°C (103°F).

The pump is available also in a version for liquid temperatures up to 90°C, called 3085.181-W. This version has certain operational limitations which are stated on a plate on these pumps.

**Liquid density:** Max. 1100 kg/m<sup>3</sup> (9.2 lb per US gal.)

The pumped liquid may contain particles up to a size which corresponds to the throughlet of the pump.

**The pH of the pumped liquid:** 6—11.

**Lowest liquid level:** The pump can work continuously under full load conditions provided that the liquid level covers the middle of the stator housing.

**Depth of immersion:** max. 20 m (65 ft).

Pumps with a swirl-type impeller may not be operated at a too low discharge head, since this causes overloading of the motor.

The pump shall not be used in explosive or flammable environments or with flammable liquids.

For other applications, contact your nearest Flygt representative for information.

## Design

3085.181 is a submersible, electric motor-driven pump.

## Impellers

The pump is available with the following types of impellers:

- single-vane impeller of cast iron.
  - two-vane impeller of cast iron.
  - swirl-type impeller of cast iron.
- manure impeller with cutting edges of cast iron.

## Shaft seals

The pump has two mechanical seals which provide the isolation necessary between the electric motor and the pumped liquid.

**Materials:**

Inner seal: ceramic — carbon.

Outer seal: tungsten carbide — tungsten carbide or ceramic — ceramic.

## Shaft

The shaft is delivered with the rotor as an integral part.

Shaft material: stainless steel.

## Bearings

The lower bearing consists of a double-row angular contact ball bearing.

The upper bearing consists of a single-row deep-groove ball bearing.

## Oil casing

The oil lubricates and cools the seals and acts as a buffer between the pump casing and the electric motor.

Pressure build-up within the oil casing is reduced by means of a built-in air volume.

## Motor

Squirrel-cage 1-phase or 3-phase induction motor for 50 Hz or 60 Hz.

The motor is started by means of: direct on-line start

The motor can be run: continuously or intermittently, with a maximum of 15 evenly spaced starts per hour.

The stator is insulated in accordance with class F (155°C, 310°F). The motor is designed to supply its rated output at  $\pm 5\%$  variation of the rated voltage.

Without overheating the motor,  $\pm 10\%$  variation of the rated voltage can be accepted provided that the motor does not run continuously at full load. The motor is designed to operate with a voltage imbalance of up to 2 % between the phases.

### Cooling

The pump is cooled by the surrounding liquid.

### Technical data

The tables show examples of available motors with currents at different voltages. For further information, see "Parts list".

#### 50 Hz 3 phase, 2780 r/min Rated output 0.75 kW

Voltage	Rated current A	Starting current A
220 V $\Delta$	3.3 A	12 A
380 V	1.9 A	7 A
440 V Y	1.6 A	6 A
500 V Y	1.4 A	5 A

#### 50 Hz 3 phase, 935 r/min Rated output 0.9 kW

Voltage	Rated current A	Starting current A
220 V $\Delta$	5.4 A	18 A
380 V	3.1 A	10 A
440 V Y	2.7 A	10 A
500 V Y	2.4 A	7 A

#### 50 Hz 3 phase, 1400 r/min Rated output 1.3 kW

Voltage	Rated current A	Starting current A
220 V $\Delta$	5.9 A	23 A
380 V	3.4 A	13 A
440 V Y	2.9 A	12 A
500 V Y	2.6 A	9 A

#### 50 Hz 3 phase, 1400 r/min Rated output 2.0 kW

Voltage	Rated current A	Starting current A
220 V $\Delta$	8.1 A	38 A
380 V	4.7 A	22 A
440 V Y	4.1 A	21 A
500 V Y	3.6 A	15 A

#### 50 Hz 3 phase, 2850 r/min Rated output 2.4 kW

Voltage	Rated current A	Starting current A
220 V $\Delta$	8.5 A	47 A
380 V	4.9 A	27 A
440 V Y	4.3 A	25 A
500 V Y	3.7 A	19 A

#### 50 Hz 1 phase, 2950 r/min Rated output 0.85 kW

Voltage	Rated current A	Starting current A
220 V	5.0 A	29 A
230 V	5.1 A	30 A

#### 50 Hz 1 phase, 1435 r/min Rated output 0.95 kW

Voltage	Rated current A	Starting current A
220 V	6.3 A	35 A
230 V	6.1 A	37 A

#### 50 Hz 1 phase, 1440 r/min Rated output 1.5 kW

Voltage	Rated current A	Starting current A
220 V	9.3 A	35 A
230 V	8.9 A	36 A



**60 Hz 3 phase, 3380 r/min**  
**Rated output 0.9 kW (1.2 hp)**

Voltage	Rated current A	Starting current A
200 V Y	4.2 A	14 A
220 V Y	3.8 A	15 A
220 V Δ	3.8 A	15 A
230 V Y //	3.6 A	15 A
380 V Y	2.2 A	9 A
440 V Yser.	1.9 A	7 A
460 V Δ	1.8 A	8 A
575 V Y	1.4 A	6 A

**60 Hz 3 phase, 3450 r/min**  
**Rated output 3.0 kW (4.0 hp)**

Voltage	Rated current A	Starting current A
200 V Y	11 A	60 A
220 V Y	10 A	65 A
220 V Y //	10 A	54 A
230 V Y //	10 A	56 A
380 V Δ	6 A	34 A
440 V Y	5.2 A	29 A
460 V Yser.	5 A	28 A
575 V Y	4.0 A	21 A

**60 Hz 3 phase, 1700 r/min**  
**Rated output 1.6 kW (2.2 hp)**

Voltage	Rated current A	Starting current A
200 V Y	7.4 A	28 A
220 V Y	6.7 A	31 A
220 V Y //	6.7 A	26 A
230 V Y //	6.4 A	28 A
380 V Δ	3.9 A	16 A
440 V Y	3.4 A	14 A
460 V Δ	3.2 A	15 A
575 V Y	2.6 A	10 A

**60 Hz 1 phase, 1700 r/min**  
**Rated output 1.2 kW (1.6 hp)**

Voltage	Rated current A	Starting current A
220 V	7.4 A	23 A
230 V	7.1 A	24 A

**60 Hz 1 phase, 1700 r/min**  
**Rated output 1.8 kW (2.4 hp)**

Voltage	Rated current A	Starting current A
220 V	11 A	34 A
230 V	10 A	35 A

**60 Hz 3 phase, 1700 r/min**  
**Rated output 2.4 kW (3.2 hp)**

Voltage	Rated current A	Starting current A
200 V Y	10 A	49 A
220 V Y	9.4 A	54 A
220 V Y //	9.4 A	44 A
230 V Y //	9.0 A	46 A
380 V Δ	5.4 A	27 A
440 V Y	4.7 A	24 A
460 V Y	4.5 A	23 A
575 V Y	3.6 A	17 A

**60 Hz 1 phase, 3440 r/min**  
**Rated output 2.2 kW (2.9 hp)**

Voltage	Rated current A	Starting current A
220 V	13 A	47 A
230 V	12 A	49 A

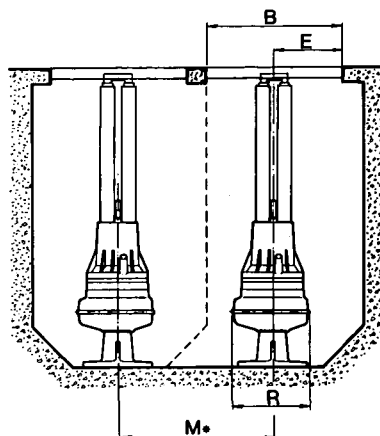
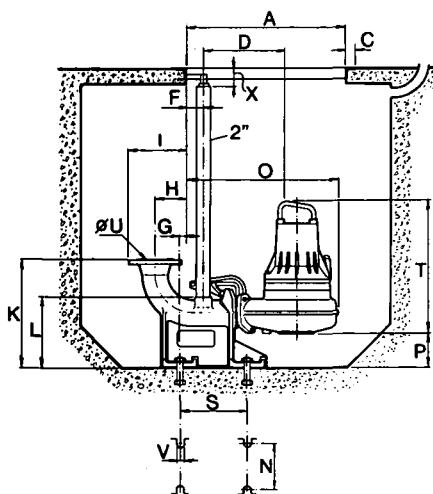
	CP/DP	CS/CF DS/DF
LT	73(161)	78(172)
MT (1.3 kw 50 Hz, 1.6 kw 60 Hz)	62(136)	68(150)
MT (2.0 kw 50 Hz, 2.4 kW 60 Hz)	65(143)	71(156)
HT	62(136)	68(150)

**Dimensions and weights**

All dimensions are in mm (in).

Weight in kg (lb) without motor cable  
 and discharge connection:

## CP, DP, FP



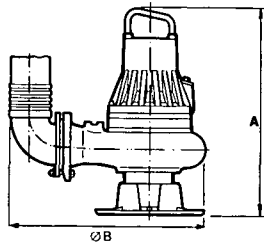
Type	A	B	C	D	E	F	G
LT Curve No. 412, 414, 612, 614	780(30.7)	570(22.4)	50(2.0)	368(14.5)	262(10.3)	85(3.3)	69(2.7)
LT Curve No. 420, 422	780(30.7)	570(22.4)	50(2.0)	373(14.7)	262(10.3)	85(3.3)	69(2.7)
CP/DP, MT	780(30.7)	570(22.4)	50(2.0)	317(12.5)	262(10.3)	85(3.3)	59(2.3)
CP, HT	780(30.7)	570(22.4)	50(2.0)	317(12.5)	262(10.3)	85(3.3)	59(2.3)
DP, HT	780(30.7)	570(22.4)	50(2.0)	317(12.5)	262(10.3)	85(3.3)	59(2.3)

Type	H	I	K	L	M*	N	O
LT Curve No. 412, 414, 612, 614	164(6.5)	274(10.8)	400(15.7)	258(10.2)	670(26.4)	200(7.9)	646(25.4)
LT Curve No. 420, 422	164(6.5)	274(10.8)	400(15.7)	258(10.2)	670(26.4)	200(7.9)	675(26.6)
CP/DP, MT	154(6.1)	254(10.0)	400(15.7)	258(10.2)	670(26.4)	200(7.9)	593(23.3)
CP, HT	154(6.1)	254(10.0)	400(15.7)	258(10.2)	670(26.4)	200(7.9)	576(22.7)
DP, HT	154(6.1)	254(10.0)	400(15.7)	258(10.2)	670(26.4)	200(7.9)	576(22.7)

Type	P	R	S	T	U	V	X
LT Curve No. 412, 414, 612, 614	68(2.7)	317(12.5)	250(9.8)	533(21.0)	DN 100(4.0)	23(0.9)	70(2.8)
LT Curve No. 420, 422	95(3.7)	365(14.4)	250(9.8)	520(20.5)	DN 100(4.0)	23(0.9)	70(2.8)
CP/DP, MT	119(4.7)	316(12.4)	250(9.8)	504(19.8)	DN 80(3.2)	23(0.9)	70(2.8)
CP, HT	140(5.5)	282(11.1)	250(9.8)	464(18.3)	DN 80(3.2)	23(0.9)	70(2.8)
DP, HT	135(5.3)	282(11.1)	250(9.8)	486(19.1)	DN 80(3.2)	23(0.9)	70(2.8)

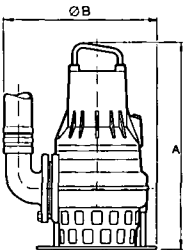
\* Minimum

**CS/FS, LT**



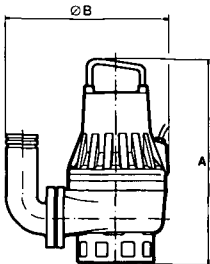
A	ØB
660(26.0)	638(25.2)

**CS/DS-MT**



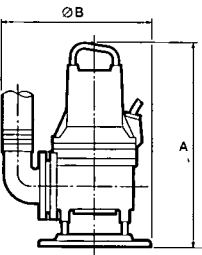
A	ØB
603(23.7)	480(19.0)

**CS-HT**



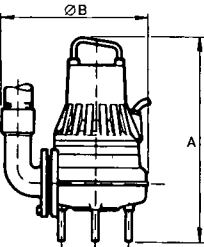
A	ØB
512(20.2)	450(17.8)

**DS-HT**



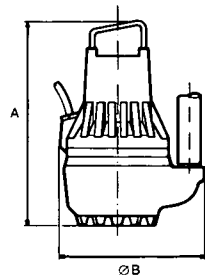
A	ØB
548(21.6)	460(18.2)

**CF/DF-MT**



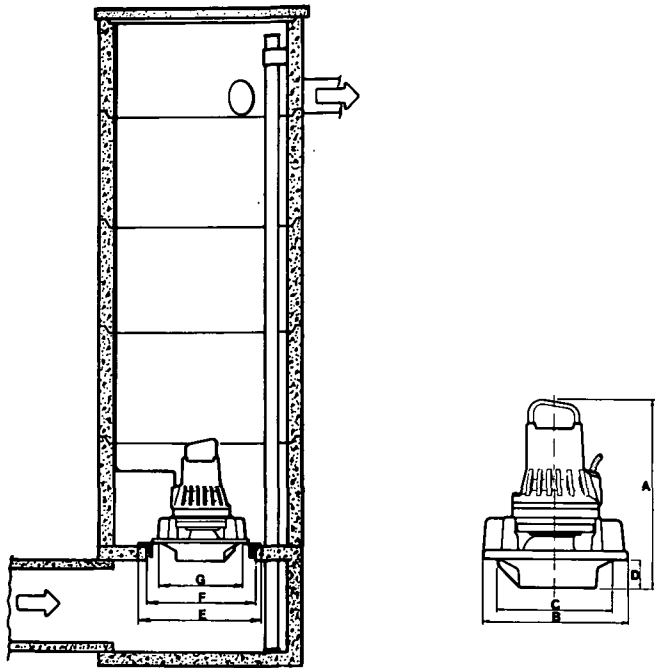
A	ØB
586(23.1)	472(18.6)

**GF**



A	ØB
462(18.5)	340(13.5)

LL



A	B	C	D	E	F	G
535 (21.4)	Ø 380 (15.2)	Ø 282 (11.3)	72 (2.9)	Ø 680 (27.2)	Ø 600 (24.0)	Ø 290 (11.6)

## TRANSPORTATION AND STORAGE

The pump may be transported and stored in a vertical or horizontal position. Make sure that it cannot roll or fall over.

Always lift the pump by its carrying handle or lifting eyes, **never** by the motor cable or the hose.

The pump is frostproof as long as it is operating or is immersed in the liquid. If the pump is taken up when the temperature is below freezing, the impeller may freeze. The pump shall be operated for a short period after being taken up in order to expel all remaining water.

A frozen impeller can be thawed by allowing the pump to stand immersed in the liquid for a short period before it is started. Never use an open flame to thaw the pump.

For longer periods of storage, the pump must be protected against moisture and heat. The impeller should be rotated by hand occasionally (for example every other month) to prevent the seals from sticking together. If the pump is stored for more than 6 months, this rotation is mandatory.

After a long period of storage, the pump should be inspected before it is put into operation. Pay special attention to the seals and the cable entry.

Follow the instructions under the heading "Before starting", page 21.

## INSTALLATION

### Safety precautions

In order to minimize the risk of accidents in connection with the service and installation work, the following rules should be followed:

1. Never work alone. Use a lifting harness (part No. 84 33 02), safety line (part No. 84 33 03) and a respirator (part No. 84 33 01), as required. Do not ignore the risk of drowning!
2. Make sure that there is sufficient oxygen and that there are no poisonous gases present.
3. Check the explosion risk before welding or using electric hand tools.
4. Do not ignore health hazards. Observe strict cleanliness.
5. Bear in mind the risk of electrical accidents.
6. Make sure that the lifting equipment is in good condition.
7. Provide a suitable barrier around the work area, for example a guard rail.
8. Make sure you have a clear path of retreat!
9. Use safety helmet, safety goggles and protective shoes.
10. All personnel who work with sewage systems shall be vaccinated against diseases that can occur.
11. A first-aid kit must be handy.

Follow all other health and safety rules and local codes and ordinances.

## Handling equipment

Lifting equipment is required for handling the pump.

The lifting equipment shall be able to hoist the pump straight up and down in the sump, preferably without necessitating resetting the lifting hook.

The minimum height between the lifting hook and the access frame/cover/floor shall be 0.6 m (2 ft) in order to lift the pump out of the sump.

Oversize lifting equipment could cause damage if pump gets stuck when being lifted.

Make sure that the lifting equipment is securely anchored.

**WARNING!** Keep out from under suspended loads.

**Level sensors or other control equipment** for start, stop and alarm.

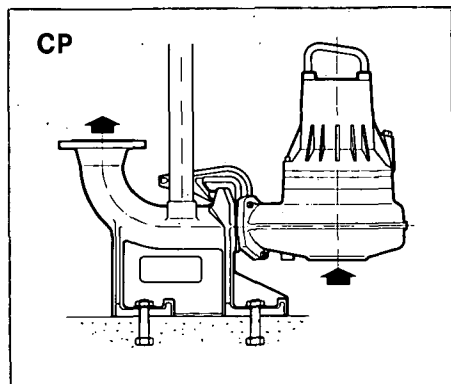
**Cable holder** for holding the cable and regulating the height of the level sensors.

**Access frame** (with covers) to which the upper guide bar bracket and cable holder can be attached.

**Discharge connection** for connecting the pump to the discharge line. The discharge connection has a flange which fits the flange on the station piping. The pump casing mates with the discharge connection, which also has bosses for holding the guide bars.

**Bushings** for vibration damping between the guide bars and the discharge connection.

## Installation alternatives



### CP version

In the CP version, the pump is installed on a stationary discharge connection and operates completely or partially submerged in the pumped liquid.

In addition to the pump, the following items are required:

**Guide bars** consisting of two hot-dip galvanized pipes.

**Upper guide bar bracket** for attaching the guide bars to the access cover or top of the station.

### CP installation

Provide a barrier around the pump pit, for example a guard rail.

Arrange for a cable between the sump and the electric control box. Make sure that the cables are not sharply bent or pinched.

**NOTE!** The end of the cable must not be submerged. Leads have to be above flood level, as water may penetrate through the cable into the junction box or the motor.

Place the access frame in position. Align the frame so that it is horizontal and then grout it in place.

Grout the anchor bolts in place. Be careful when aligning and positioning the discharge connection in relation to the access frame. See dimension drawing.

Place the discharge connection in position and tighten it. Secure the guide equipment in the brackets. Check that the guide equipment is placed vertically by using a level or a plumb line. Connect the discharge pipe to the discharge connection.

**Bolt the cable holder to the access frame.** Thread the level regulator cables through the holes in the cable holder and adjust the height of the sensors.

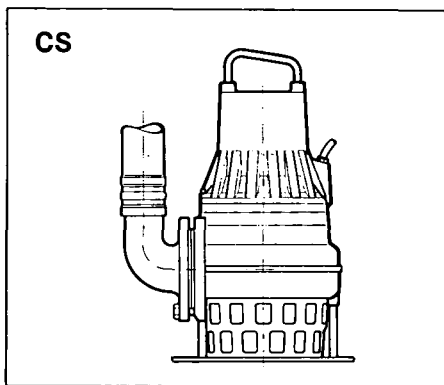
It is recommended that the level regulators be used with low voltage. The data sheet delivered with the regulators gives the permissible voltage. Local rules may specify otherwise.

Protect bolts and nuts with corrosion-preventive compound.

Lower the pump along the guide bars. On reaching its bottom position, the pump will automatically connect to the discharge connection. Fasten the lifting chain on the access frame and the cables on the cable holder. Cable supports are required for deep installations. Run the cables up to the electric control box.

Clean out debris from the sump before starting up the station.

The pump can be hoisted up along the guide bars for inspection without any connections having to be undone.



### CS version

In the CS version, the pump is transportable and intended to operate completely or partially submerged in the pumped liquid.

The pump is equipped with a connection for hose or pipe, see "Parts list".

**The MT-pump stands on a strainer with a support plate.**

**The LT-pump stands on a base stand.**

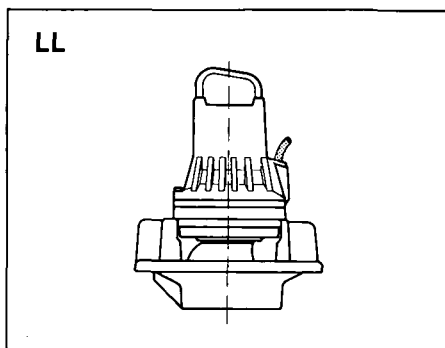
### CS installation

Run the cables so that they have no sharp bends, are not pinched and cannot be sucked into the pump inlet. Connect the discharge line and the motor cable. See "Electrical connections".

Lower the pump into the sump.

Place the pump on a base which prevents it from sinking into a soft sump bottom.

Alternatively, the pump can be suspended from above by its handle just above the bottom of the sump.



### LL version

In the LL version, the pump is installed in a stationary discharge arrangement.

The pump operates completely under water and requires no extra connections.

In addition to the pump, the following items are required:

**Discharge pipe** with bottom plate in which the pump is installed.

**Cable holder** for holding the cable and regulating the height of the level sensors.

**Screen** at intake.

**Level sensors** or other control equipment for start, stop or alarm.



## LL installation

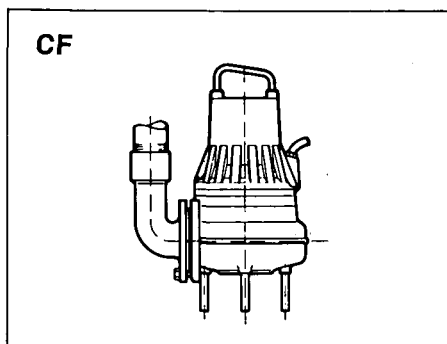
The pump is lowered into position in the finished station.

No additional anchoring of the pump is required.

Fasten the motor cables on the cable holder and run them to the electric control box.

**NOTE!** The end of the cable must not be submerged. Leads have to be above flood level, as water may penetrate through the cable into the junction box or the motor.

The pump can easily be hoisted for inspection without any connections having to be undone.



### CF version

In the CF version, the pump stands on the bottom of the sump and is held in place by the discharge pipe. It operates completely or partially submerged in the liquid.

### CF installation

Run the cables so that they do not have any sharp bends and are not pinched.

**NOTE!** The end of the cable must not be submerged. Leads have to be above flood level, as water may penetrate through the cable into the junction box or the motor.

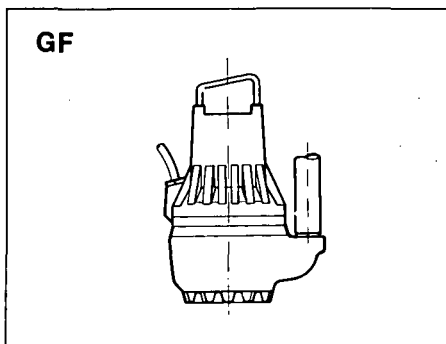
Clean out debris from the sump.

Protect bolts and nuts with corrosion-preventive compound.

Connect the discharge line and motor cable. See "Electrical connections".

Lower the pump into the sump.

With regard to cable entries, installation of access frame and adjustment of level sensors, see "CP installation".



### GF version

The GF version is intended for pumping ground water.

### GF installation

Clean out the sump.

Connect the discharge pipe and motor cable. See "Electrical connections".

**NOTE!** The end of the cable must not be submerged. Leads have to be above flood level, as water may penetrate through the cable into the junction box or the motor.

Lower the pump into the sump.

The pump is transportable and can be moved between different work sites. It is intended for operation completely or partially submerged in the pumped liquid.

The pump has a connection for a hose or pipe. See "Accessories and tools".

The pump stands on a strainer.

## 3085 in F installation

The same installation with discharge connection as described under CP installation can be used for the liquid manure version.

See page 12.



Poisonous or explosive gases may pose a risk in connection with the installation of pumps in liquid manure wells or tanks which have been in use for some time. Extra caution must therefore be exercised and the following rules should be followed.

1. **Never work alone.** There should always be one person on the surface to provide assistance and, if necessary, lift up the person working down in the tank.
2. The person working down in the tank shall always wear a **lifting harness** (84 33 02) and a **safety line** (84 33 03). The safety line should be arranged so that the person down in the tank can be lifted out quickly in an emergency.
3. **Air out the well or tank before starting work.** If there is a risk or a possibility that poisonous gases may form, use an **air-fed mask** (84 33 01). The most common poisonous gas is **hydrogen sulphide ( $H_2S$ )**, which has a threshold limit value of 10 ppm. Concentration of more than 100 ppm cause loss of consciousness and respiratory paralysis.
4. Before the installation work is begun, the tank shall be emptied and rinsed out in order to minimize the amount of liquid manure which can emit poisonous gases. Adding lime to the remaining manure (5—10 % lime) will prevent further generation of hydrogen sulphide and kill any salmonella bacteria. The lime-mixed manure and any lime water used to clean pumps and boots can be mixed in with the rest of the manure, but this will reduce the nitrogen content of the manure somewhat.
5. **Methane gas ( $CH_4$ )** may be present in sufficient quantity in manure handling facilities to create the **risk of explosion**. The lower explosion limit is 5 % by volume methane in an air-methane mixture. Check the explosion risk before welding or using electric hand tools.
6. **When the manure in the tank is mixed**, large quantities of hydrogen sulphide are released, so **it is advisable to keep away from the downwind side of the tank**.
7. Pumps which are moved from one farm to another shall be hosed down and bathed in lime water. Let the pump soak for several hours in the lime water solution before lifting it out and hosing it out. Use 4—5 kg (0.25—0.316 lbf) crushed burnt lime per  $m^3$  water. The water can dissolve 2 kg (0.13 lbf) lime per  $m^3$  ( $ft^3$ ). The excess lime keeps the pH value up even if some of the lime is bound to other substances.

## Electrical connections

All electrical work shall be carried out under the supervision of an authorized electrician. Local codes and regulations shall be complied with.

Check that the main (line) voltage and frequency agree with the specifications on the pump data plate.

The motor can be connected for different voltages as shown on the data plate.

If intermittent operation is prescribed (see Data Plate), the pump shall be provided with control equipment that provides such operation.

Under no circumstances may starter equipment be installed in the pump pit.

Install the motor cable as illustrated in the exploded view, page 41.

To avoid leakage into the pump, check:

- that the cable entry seal sleeve and washers conform to the outside diameter of the cable. See the parts list.
- that the outer jacket on the cable is not damaged. When refitting a cable which has been used before, **always** cut off a short piece of the cable so that the cable entry seal sleeve does not close around the cable at the same point again.

**NOTE.** For safety reasons, the earth lead should be approx. 50 mm (2.0") longer than the phase leads. If the motor cable is jerked loose by mistake, the earth lead should be the last lead to come loose from its terminal. This applies to both ends of the cable.

Check on the data plate which connection, Y or  $\Delta$ , is valid for the voltage supply. Then, depending on voltage, arrange the connection on the terminal board in accordance with Y or  $\Delta$ .

With a clockwise phase sequence L1-L2-L3 (R-S-T), the impeller will rotate correctly, i.e. clockwise as viewed from above (from the motor side). Check the phase sequence in the main (line) using a phase sequence indicator.

Make sure that the pump is correctly earthed (grounded).

Tighten the gland nut (33) so that the cable entry unit bottoms out.

Remember that the starting surge with the direct-on line start can be up to six times higher than the rated current. Make sure that the fuses or circuit breakers are of the proper amperage.

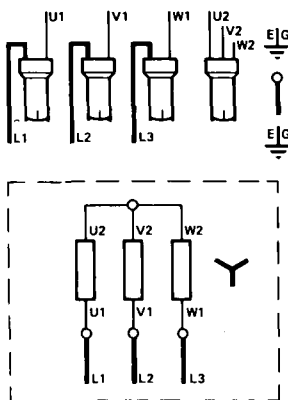
The tables on page 5 and 6 give rated current and starting current. Fuse amperage and cable shall be selected in accordance with local rules and regulations. Note that with long cables, the voltage drop in the cable must be taken into consideration.

The overload protection (motor protection breaker) shall always be set to the motor's rated current as given on the data plate.

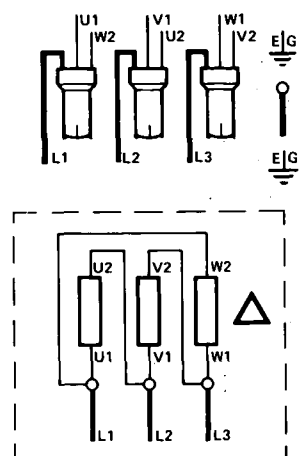
**NOTE.** The clamp (61) shall not be used in the warm liquid version ( $\geq 40^{\circ}\text{C}$ ,  $104^{\circ}\text{F}$ ) 3085.181-W.

6 stator leads

Y



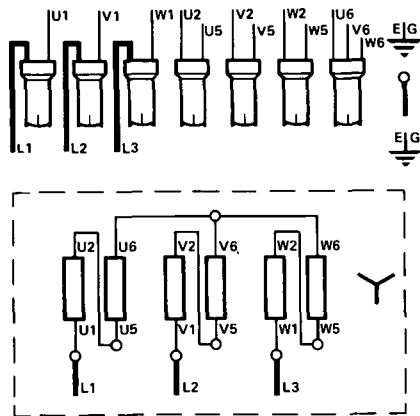
Δ



12 stator leads

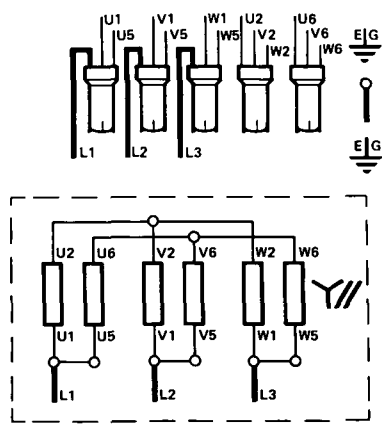
Y series

50 Hz 440 V  
60 Hz 460 V

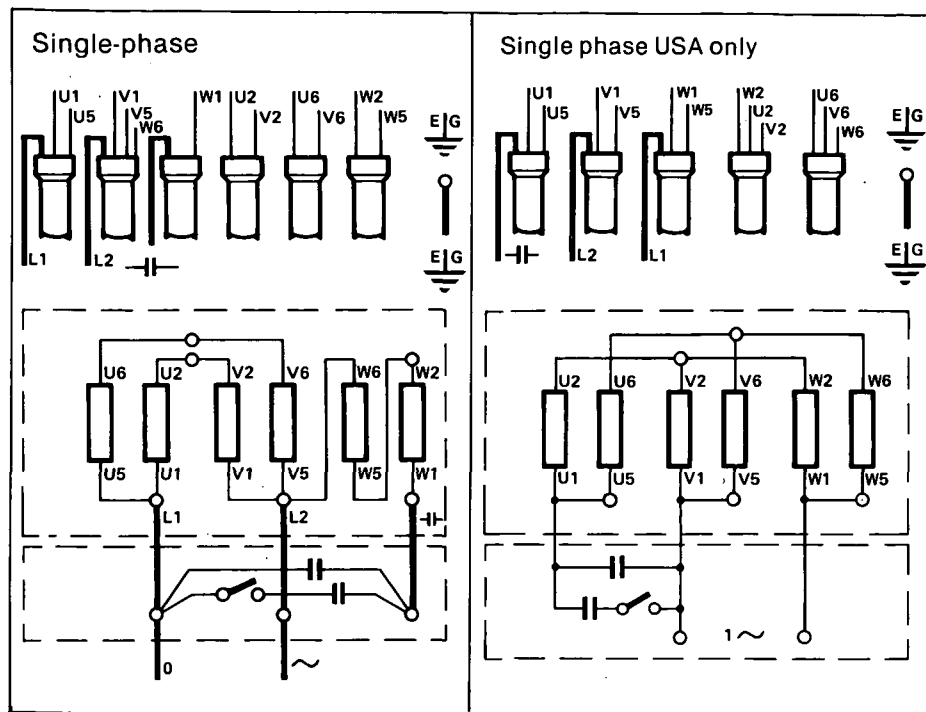


Y parallel

50 Hz 220 V  
60 Hz 230 V



## Electrical connection



### Stator

### Motor cable

#### Stator leads

U1, U5 = Red  
 V1, V5 = Brown  
 W1, W5 = Yellow  
 U2, U6 = Green  
 V2, V6 = Blue  
 W2, W6 = Black

#### 4-leads

Brown = L1  
 Black = L2  
 Blue = L3  
 Yellow/ =  $\epsilon/G$   
 Green

#### 7-leads

U1 = Brown = L1 (black)  
 V1 = Black = L2 (red)  
 W1 = Blue = L3 (white)  
 1 = Black (blue)  
 2 = Black (orange)  
 Isol. = Black (green)  
 Yellow/ =  $\epsilon/G$  (green =  $\epsilon/G$ )  
 Green (Yellow/green = Ground check)

**Leads not in use must be isolated.**

## Version with terminal board (CSA)

### 3-phase operation

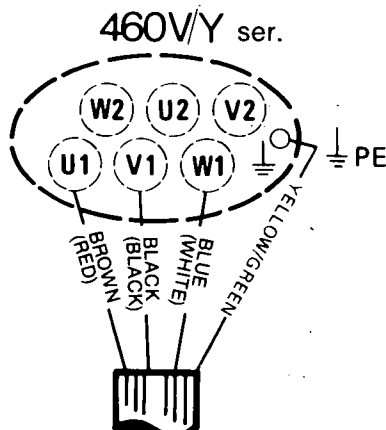
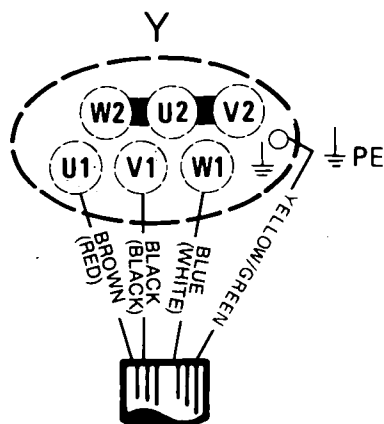
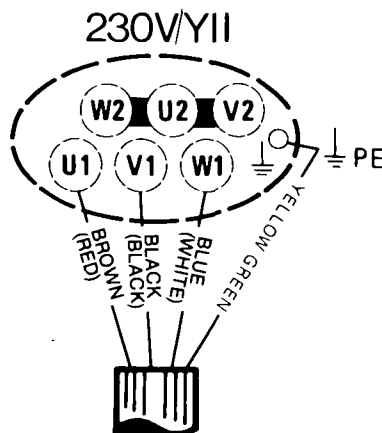
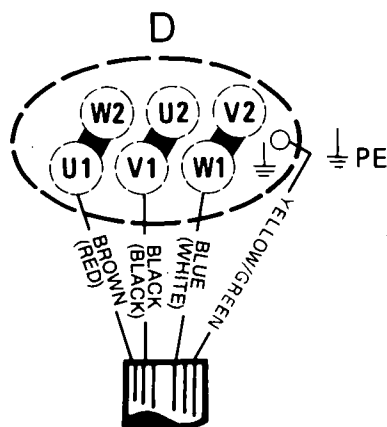
Check on the data plate which connection, Y or  $\Delta$ , is valid for the voltage supply. Then depending on voltage, arrange the connection on the terminal board in accordance with the figures.

Connect the motor cable as illustrated in the figures.

Connect the motor cable to the starter equipment. Check the direction of rotation, see "Before starting".

If the direction of rotation is wrong, transpose two of the phase leads.

### Motor cable

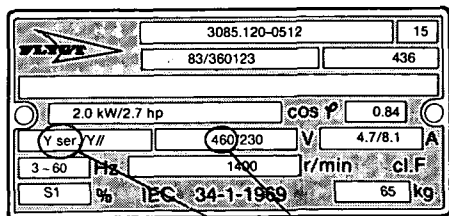


## Stator connection

The stator leads are colour-marked as follows:

U1 — red  
V1 — brown  
W1 — yellow  
U2 — green  
V2 — blue  
W2 — black  
U5 — red  
V5 — brown  
W5 — yellow  
U6 — green  
V6 — blue  
W6 — black

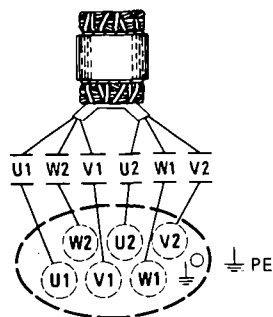
The stator leads are connected to the terminal board as illustrated in the figures.



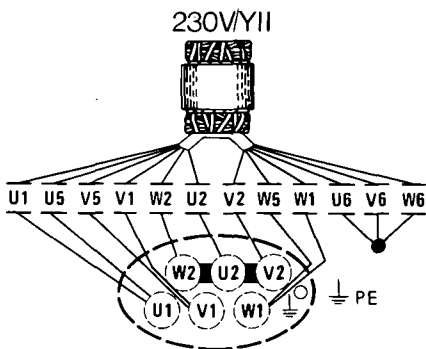
\* NOTE! When connecting pumps which have a 9 or 12 lead stator for 440—460V Y ser. 60 Hz, no closing links should be used. For correct connection, see inside of junction box cover.

## Stator connection

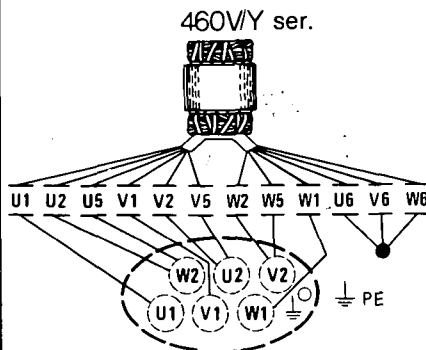
### 6 stator leads



### 12 stator leads



### 12 stator leads



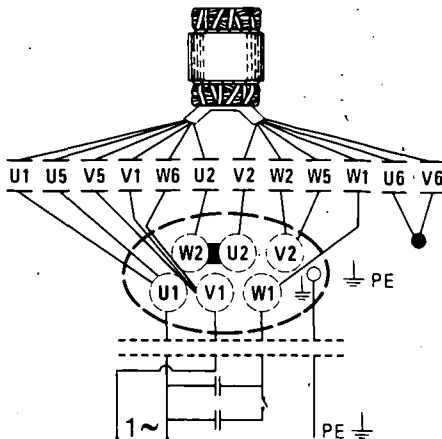
## Single phase operation

## 1 phase

Connect the motor cable and mount the closing links as illustrated in the figures.

The stator leads are colour-marked as follows:

- U1 — red
- V1 — brown
- W1 — yellow
- U2 — green
- V2 — blue
- W2 — black
- U5 — red
- V5 — brown
- W5 — yellow
- U6 — green
- V6 — blue
- W6 — black



Connect the motor cable to the starter equipment. Check the direction of rotation, see "Before starting".

For single phase pumps going in wrong direction, please contact your nearest Flygt representative.



**Capacitive leakage sensor CLS-30 and leakage sensor FLS (built-in version)**

The pump is available with leakage sensors for sensing the presence of any water in the oil and/or stator housing.

A plate in the junction box shows that the pump is equipped with sensors.

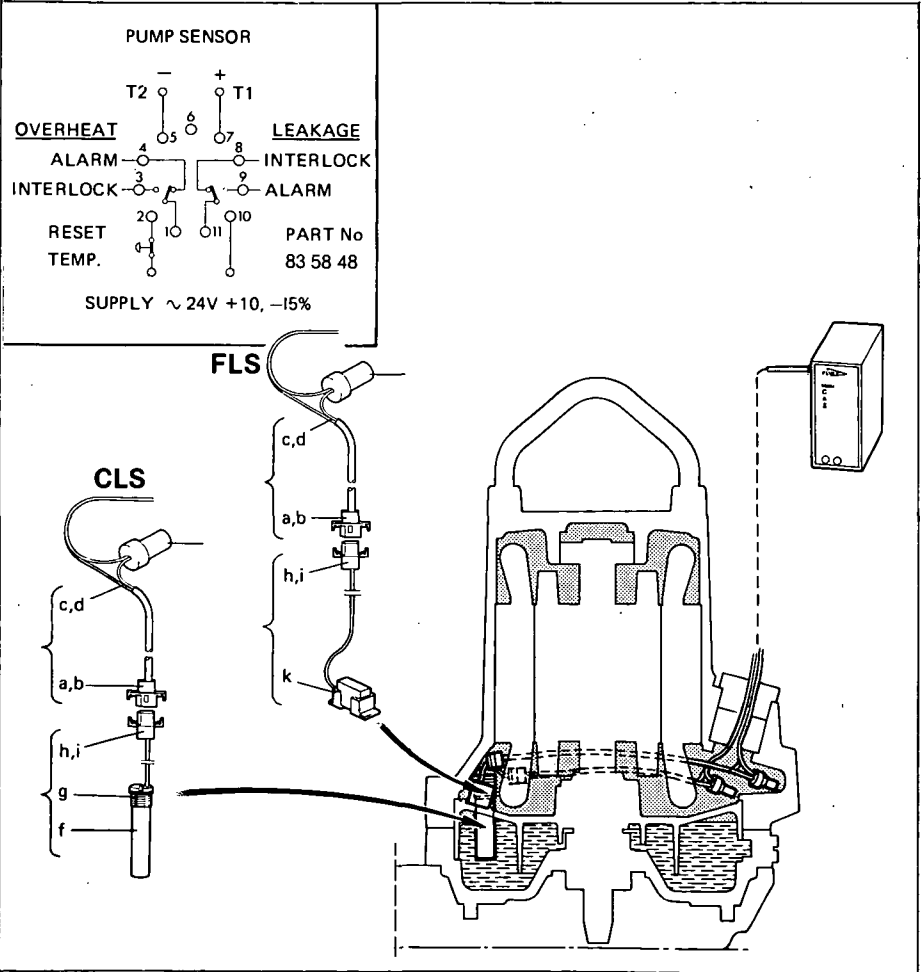
The CLS-30 is a leakage sensor for detection of water in the oil casing and activates an alarm when the oil contains 30% water. An oil change is recommended within 14 days after an alarm. If the sensor alarms again shortly after the oil change, contact your nearest Flygt representative.

The CLS-30 sensor is mounted in the bearing cage and sticks into the oil casing.

The FLS sensor is a miniature float switch for detection of water in the stator housing. Due to its design, it is meant to be used for pumps in vertical installations.

The FLS sensor is mounted in the bottom of the stator housing.

The two sensors CLS-30 and FLS can be used together in same pump. They are connected in parallel.



The parallel connected sensors are then connected in series with the thermal switches. They are connected to a Mini CAS alarm relay in accordance with the diagram below.

**IMPORTANT!** Be careful when disconnecting the pump's motor unit so that the leads are not damaged (disconnect the leads before lifting the rotor assembly and the stator casing completely apart). Also observe caution so that the sensors not are damaged.

Make sure that the leads are not pinched during installation.

## Before starting

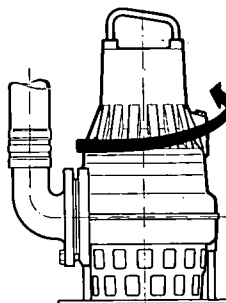
Check the oil level in the oil casing.

Remove the fuses or open the circuit breaker and check that the impeller can be rotated by hand.

Check that the monitoring equipment (if any) works.

Check the direction of rotation. See the figure. The impeller shall rotate clockwise, as viewed from above. When started, the pump will jerk in the opposite direction to the direction in which the impeller rotates.

### Starting jerk



## CARE AND MAINTENANCE

The figures in parentheses are item numbers and refer to the exploded view, page 41.

### Safety precautions

Before starting work on the pump, make sure that the pump is isolated from the power supply and cannot be energized.

**NOTE!** This applies to the control circuit as well.

The following points are important in connection with work on the pump:

- make sure that the pump has been thoroughly cleaned.
- observe good personal hygiene.
- beware the risk of infection.
- follow local safety regulations.

The pump is designed for use in liquids which can be hazardous to health. In order to prevent injury to the eyes and skin, observe the following points when working on the pump:

- Always wear goggles and rubber gloves.
- Rinse the pump thoroughly with clean water before starting work.
- Rinse the components in water after disassembly.
- Hold a rag over the oil casing screw (26) when removing it. Otherwise, pressure that may have built up in the pump due to the leakage of pumped liquid into the pump may cause splatter into the eyes or onto skin.

Proceed as follows if you get hazardous chemicals

in your eyes:

- rinse immediately in running water for 15 minutes. Hold your eyelids apart with your fingers.
- contact an eye doctor.

on your skin:

- remove contaminated clothes.
- wash skin with soap and water.
- seek medical attention if required.

### Inspection

Regular inspection and preventive maintenance ensure more reliable operation.

The pump should be inspected after 2 000 hours of operation or at least once a year, more frequently under severe operating conditions.

Under normal operating conditions, the pump should have a major overhaul in a service shop after 6 000 hours of operation or every third year for CP, every year for CS.

This requires special tools and should be done by an authorized service shop.

When the pump is new or when the seals have been replaced, inspection is recommended after one week of operation.

**Inspection 3085.181-W**

Pumps in hotwater applications shall, **depending on the time they have been immersed into the hot liquid**, pass a major overhaul according to the following maintenance schedule:

Temp.	Operating duty	Inspection	Overhaul
≤ 70°C (158°F)	Continuously	1000 hours	4000 hours
≤ 70°C (158°F)	Intermittent	Twice a year	Once a year
≤ 90°C (194°F)	Cont./Int.	Six times a year	Twice a year

**Service contract**

Flygt or its agent offers service agreements in accordance with a preventive maintenance plan. For further information, please contact your Flygt representative.

**Recommended inspections**

Inspection of	Action
Visible parts on pump and installation	<p>Replace or fix worn and damaged parts.</p> <p>Make sure that all screws, bolts and nuts are tight.</p> <p>Check the condition of carrying handle/lifting eyes, chains and wire ropes.</p> <p>Check that the guide bars are vertical.</p>
Pump casing and impeller	<p>Replace worn parts if they impair function.</p> <p>If the clearance between the impeller skirt and the pump casing exceeds 2 mm (0.08 in), see "Replacing the wear ring".</p> <p>Wear on the outlet flange on the pump casing usually causes corresponding wear on the discharge connection.</p> <p>Wear on the impeller and the parts around it necessitates fine adjustment of the impeller or replacement of worn parts. See "Replacing the impeller".</p>

Inspection of	Action
Oil quantity	<p><b>WARNING.</b> If the seals leak, the oil casing may be under pressure. Hold a rag over the oil casing screw in order to prevent splatter. See "Safety precautions" for additional information.</p> <p>Check that the oil reaches up to the oil hole when the pump is tilted about 18°.</p> <p>Add oil as needed. See "Changing the oil".</p>
Condition of the oil	<p>A check of the condition of the oil can show whether there has been an increased leakage. Note! Air/oil mixture can be confused with water/oil mixture.</p> <p>Insert a tube (or hose) into the oil hole. Cover the top end of the tube and take up a little oil from the bottom.</p> <p>Change the oil if it contains too much water, i.e., is heavily emulsified (cream-like), or if the water has settled out. See "Changing the oil". Check again one week after changing the oil.</p> <p>If the oil contains too much water again, the fault may be:</p> <ul style="list-style-type: none"> <li>— that an oil screw (26) is not sufficiently tight.</li> <li>— that an O-ring (12) or its sealing surface is damaged.</li> <li>— that the lower seal (43) is damaged. Contact a Flygt service shop.</li> </ul>
Liquid in the stator casing	<p><b>WARNING.</b> If there has been leakage, the stator casing may be under pressure. Hold a rag over the inspection screw to prevent splatter. See "Safety precautions" for additional information.</p> <p>If there is water in the stator casing, the cause may be:</p> <ul style="list-style-type: none"> <li>— that the inspection screw is not sufficiently tight.</li> <li>— that an O-ring (15) is damaged.</li> <li>— that the cable entry is leaking.</li> </ul> <p>If there is oil in the stator casing, the cause may be:</p> <ul style="list-style-type: none"> <li>— that the inner seal (43) is damaged. Contact a Flygt service shop.</li> </ul>

Inspection of	Action
Cable entry	<p>Make sure that the cable clamps are tight.</p> <p>If the cable entry leaks:</p> <ul style="list-style-type: none"> <li>— check that the entry is tightened so it bottoms out.</li> <li>— cut a piece of the cable off so that the seal sleeve (23) closes around a new position on the cable.</li> <li>— replace the seal sleeve (23).</li> <li>— check that the seal sleeve (23) and the washers (11) conform to the outside diameter of the cables.</li> </ul>
Cable	<p>Replace the cable if the outer jacket is damaged.</p> <p>Make sure that the cable does not have any sharp bends and is not pinched.</p>
Level sensors or other level equipment	<p>Check function. Clean, adjust, replace or repair damaged level sensing equipment. Follow the instructions for the level sensing equipment in question.</p> <p>Note! The level sensor contains a mercury switch. Damaged sensors should therefore be disposed of in a proper manner.</p>
Monitoring equipment (should be checked often)	<p>Follow the instructions for monitoring equipment.</p> <p>Check:</p> <ul style="list-style-type: none"> <li>— signals and tripping function.</li> <li>— that relays, lamps, fuses and connections are intact.</li> </ul>
Rotation direction of pump (requires voltage)	<p>Transpose two phase leads if the impeller does not rotate clockwise as viewed from above. Rotation in the wrong direction reduces the capacity of the pump and the motor may be overloaded. Check the direction of rotation every time the pump is reconnected.</p>
Pipes, valves and other peripheral equipment	<p>Repair faults and notify supervisor of any faults or defects.</p>
Insulation resistance in the stator	<p>Use insulation tester. With a 1000 V-DC megger the insulation between the phases and between any phase and earth (ground) should be <math>&gt; 1 \text{ M}\Omega</math>.</p>

## Changing the oil

**WARNING.** If a seal leaks, the oil casing may be under pressure. Hold a rag over the oil screw to prevent splatter.

Lay the pump on its side on a bench or over two supports.

Unscrew the oil casing screw (26).

Emptying the oil must be done through the "Oil out" hole.

Turn the pump so that the oil hole faces downwards.

It is easier to drain the oil if the other oil hole screw is also removed.

In order to get out all the oil, the pump must be raised upright for a short while during drainage.

**Replace the O-rings under the oil casing screws with new ones.** Install the "Oil out" screw and fill with oil through the other hole. It is important that the oil be added through the hole marked "Oil in" since the oil casing must contain some air for pressure equalization. The pump should be slightly tilted and put down again horizontally in order to get the full amount of oil in. To check that the pump contains the right amount of oil, raise the pump again to an angle of roughly 18° to the horizontal and oil will begin to seep out through the hole, marked "Oil in".

Fill with 0.9 litre (0.9 quarts) of new oil. Use an ordinary SAE 10W-30 motor oil. Always replace the O-rings under the oil casing screws. Place the screws back in. Tightening torque 10 Nm (7.4 ft lb).

Mobil Whiterex 309 or an equivalent paraffin oil is recommended for raw or clean water pumping.



## Replacing the wear ring

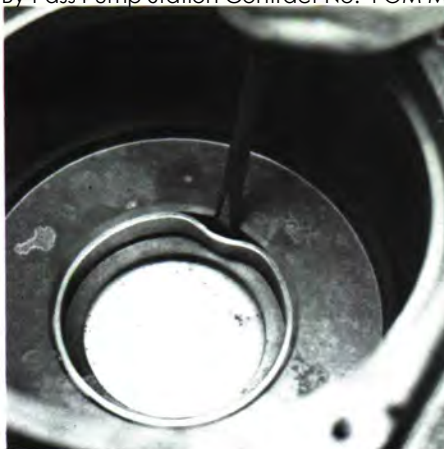
When the clearance between the impeller skirt and the pump casing exceeds 2 mm (0.08 in), one or more of the following replacements must be made.

### Replacing the wear ring in the pump casing.

Disconnect and lift off the motor section from the pump casing.

Knock out the wear ring using a chisel.

Remove the wear ring.



Drive in the new wear ring. Use a rubber mallet or wooden block to prevent deformation.

The work will proceed more easily if the pump casing is first heated and/or the wear ring cooled.





## Replacing the impeller

### Removing the impeller

**WARNING!** Worn impellers often have very sharp edges.

Remove bolts (5) and lift the motor section off of the pump casing.

Lay the motor section on its side.

Remove impeller screw (3).

Pull off the impeller.

Use impeller puller according to the table or pry off carefully with two strong screwdrivers or bars.



## Installing the impeller

Make sure that the end of the shaft is clean and free of burrs. Polish off any flaws.

Check:

- that the conical sleeve (42) is seated in the impeller hub.

Press the impeller onto the shaft with the impeller screw.

Note the following points when replacing the impeller:

The **F**, **LL** and **LT**-impeller have a separate washer under the impeller screw. The **MT** and **HT**-impellers have a press-fit washer which is integral with the impeller.

Make sure that the separate washer fits properly into the recess of the impeller. If the washer (for LT and LL, 303 45 03 for F 403 94 00) is not properly positioned, the impeller can scrub against the oil casing bottom.

Tighten the impeller screw.

Tighten torque 34 Nm (25 ft lb).

Check that the impeller can be rotated by hand.

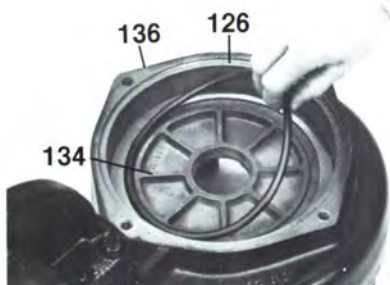
Fit the motor section to the pump casing. Make sure that the pump casing has the right orientation. Tightening torque of screws (5) 44 Nm (32.5 ft lb).



The F-impellers require an adjustment to get correct cutting ability.



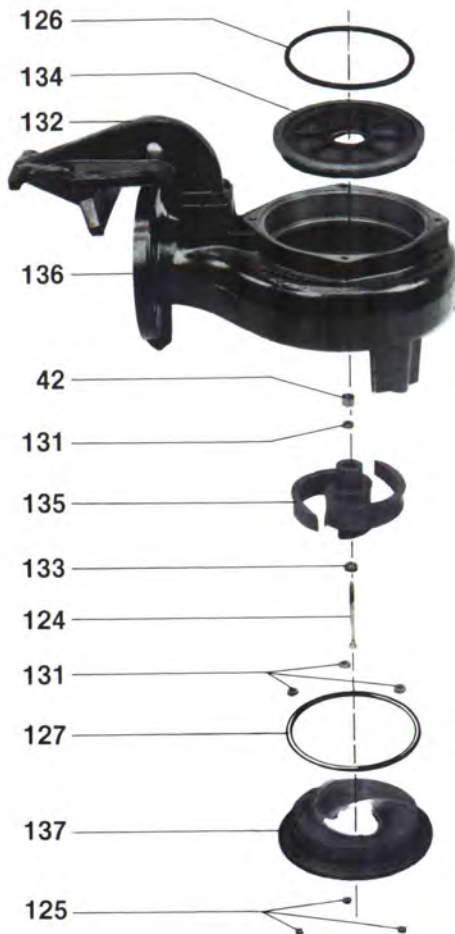
Start with placing the cover in the pump casing. Look after that the guide boss fits into the corresponding recess of the pump casing.



Then put O-ring (126) between the washer and the pump motor which then should be bolted to the pump casing.



The play is to be adjusted by means of the adjusting washers 250 23 00 (1 mm (0.04")) and 250 23 02 (0.25 mm (0.01")).







The play between the tightened impeller's upper edge and the washer shall be 0.5—1.5 mm (0.02"—0.06").



Then fit and adjust the pump housing bottom so that there is a clearance of 0.5—1 mm (0.02"—0.04") between the impeller and the pump housing bottom.



Use the same adjusting washers for adjusting the pump housing bottom as are used in the impeller hub.



## ACCESSORIES AND TOOLS

### Zinc anode set

In order to reduce corrosion on the pump, it can be fitted with zinc anodes.

Order No.

443 26 00	Hydraulic end LT
443 26 01	Hydraulic end HT
443 26 02	Hydraulic end GF
443 26 03	Hydraulic end D
443 26 04	Hydraulic end MT
443 26 05	Motor unit

Zinc anodes cannot be used in warm liquid applications above 60°C (140°F).

### Level sensor

Flygt supplies level sensors suited for different liquid densities and with different cable lengths. See separate brochure.

### Start and control equipment

Flygt has suitable start and control equipment for the pump. Contact Flygt for further information.

## Tools

Besides ordinary standard tools, the following tools are required in order to perform the necessary care and maintenance of the pump:

Order No.	Description
249 92 00 } or 395 70 00	LL, LT Impeller puller
303 60 00 }	MT Impeller puller
251 35 01	HT Impeller puller
389 25 01	F Impeller puller
251 35 00	GF Impeller puller
84 13 60	D Impeller puller
82 04 90	Socket head screw for Neva Clog impeller
84 13 62	Puller for Neva clog impeller
84 15 66	Torque wrench 0—137 Nm
84 13 04	Hexagon bit adapter 6 mm
85 15 55	Extension bar length = 125 mm
84 17 08	Allen key

For further information on tools, see Flygt's Tool Catalogue.

## FAULT TRACING (TROUBLESHOOTING)

A universal instrument (VOM), a test lamp (continuity tester) and a wiring diagram are required in order to carry out fault tracing on the electrical equipment.

Fault tracing shall be done with the power supply disconnected and locked off, except for those checks which cannot be performed without voltage.

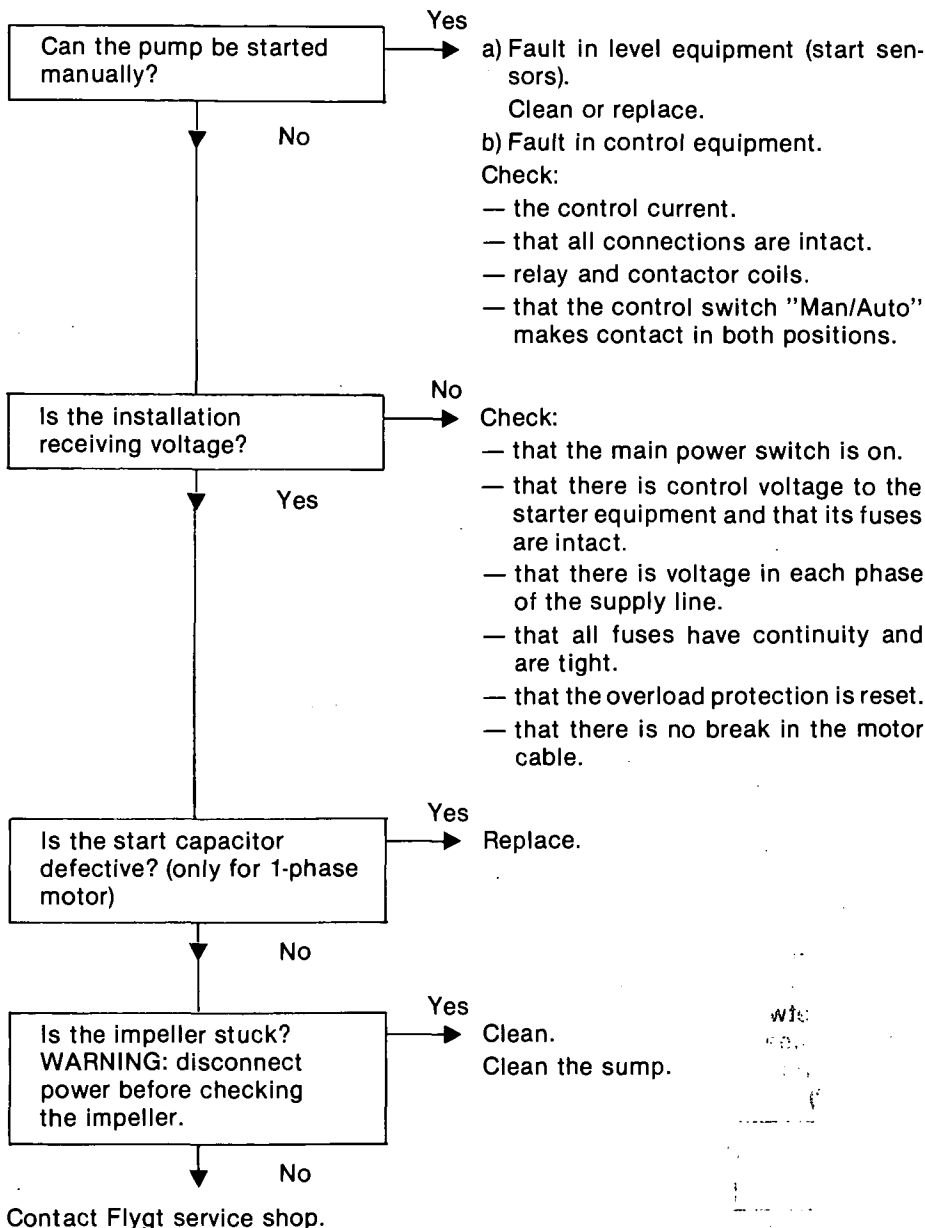
Always make sure that there is no one near the pump when the power supply is turned on.

Use the following checklist as an aid to fault tracing. It is assumed that the pump and installation have formerly functioned satisfactorily.

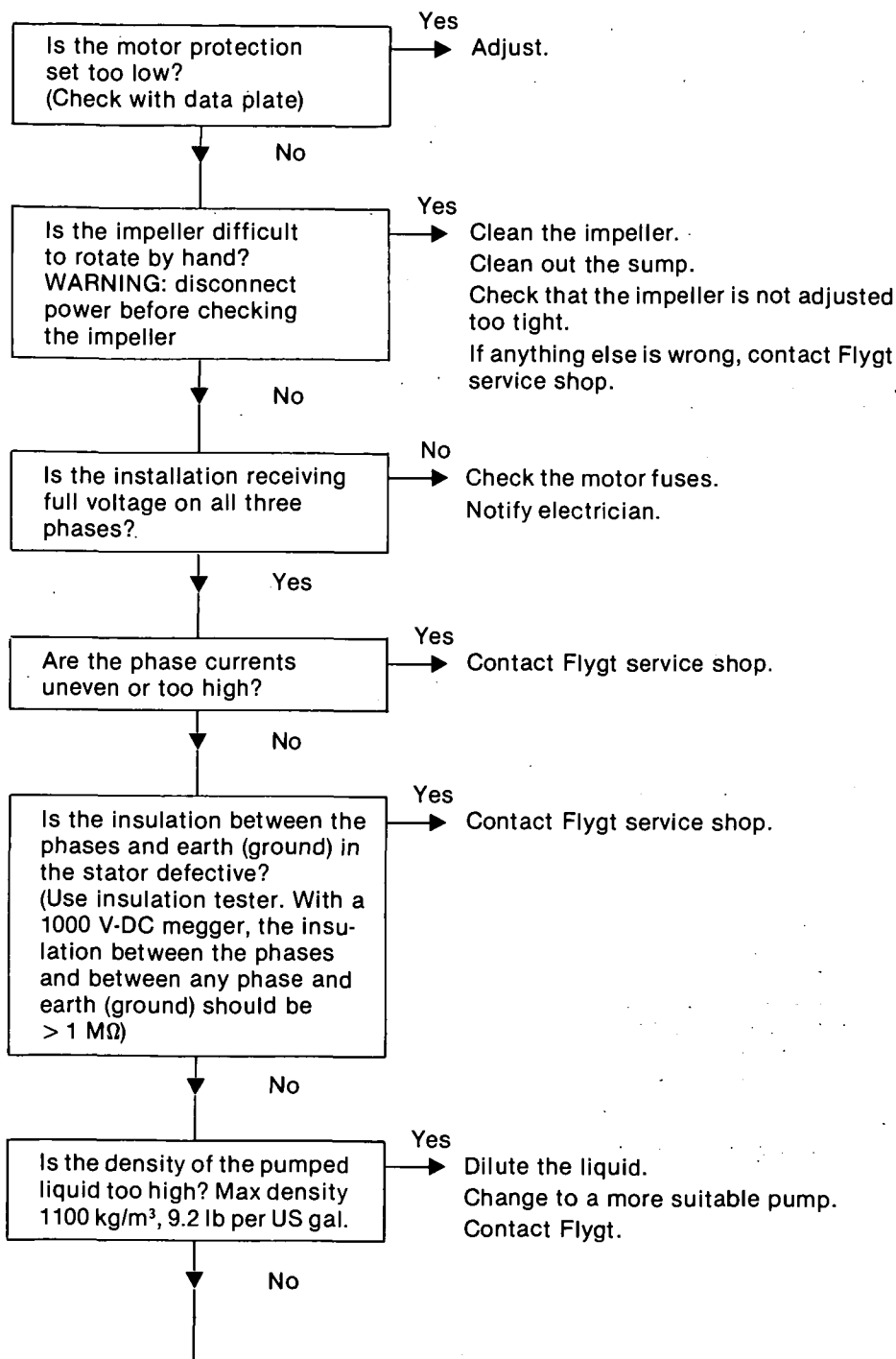
Electrical work shall be performed by an authorized electrician.

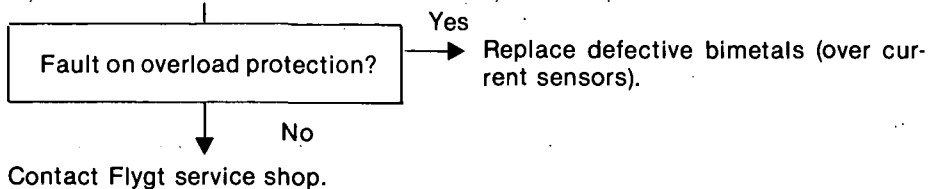
Follow local safety regulations and observe recommended safety precautions.

# 1. Pump fails to start

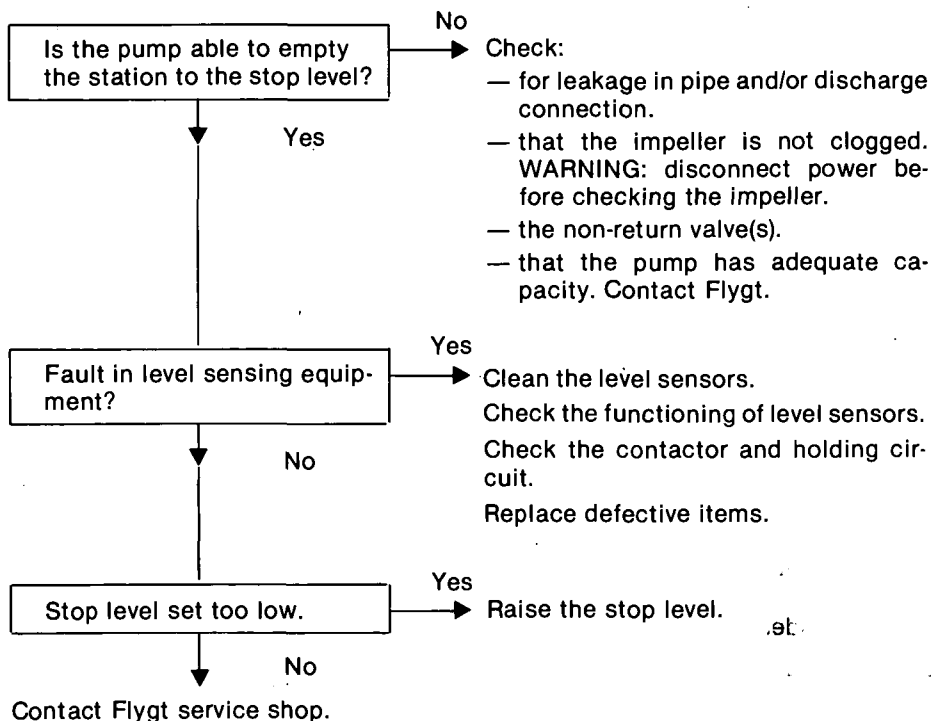


## 2. Pump starts but motor protection trips



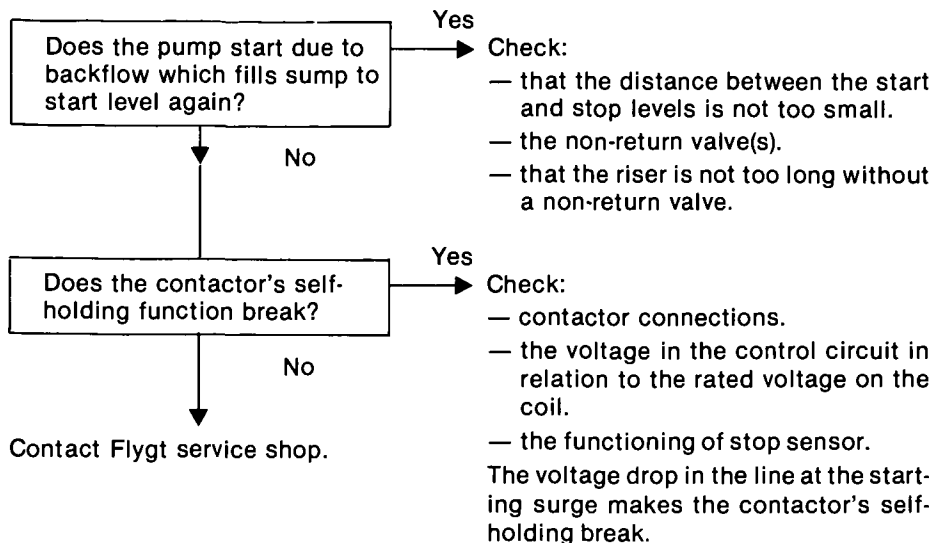


### 3. The pump does not stop





#### 4. The pump starts-stops-starts in rapid sequence



#### 5. Pump runs but delivers too little or no water

Check:

- direction of rotation of pump, see "Before starting".
- that valves are open and intact.
- that pipes, impeller and strainer are not clogged.
- that the impeller rotates easily.
- that the suction lift has not been altered.
- for leakage in the pump installation.
- for wear on wear ring, impeller, pump casing.

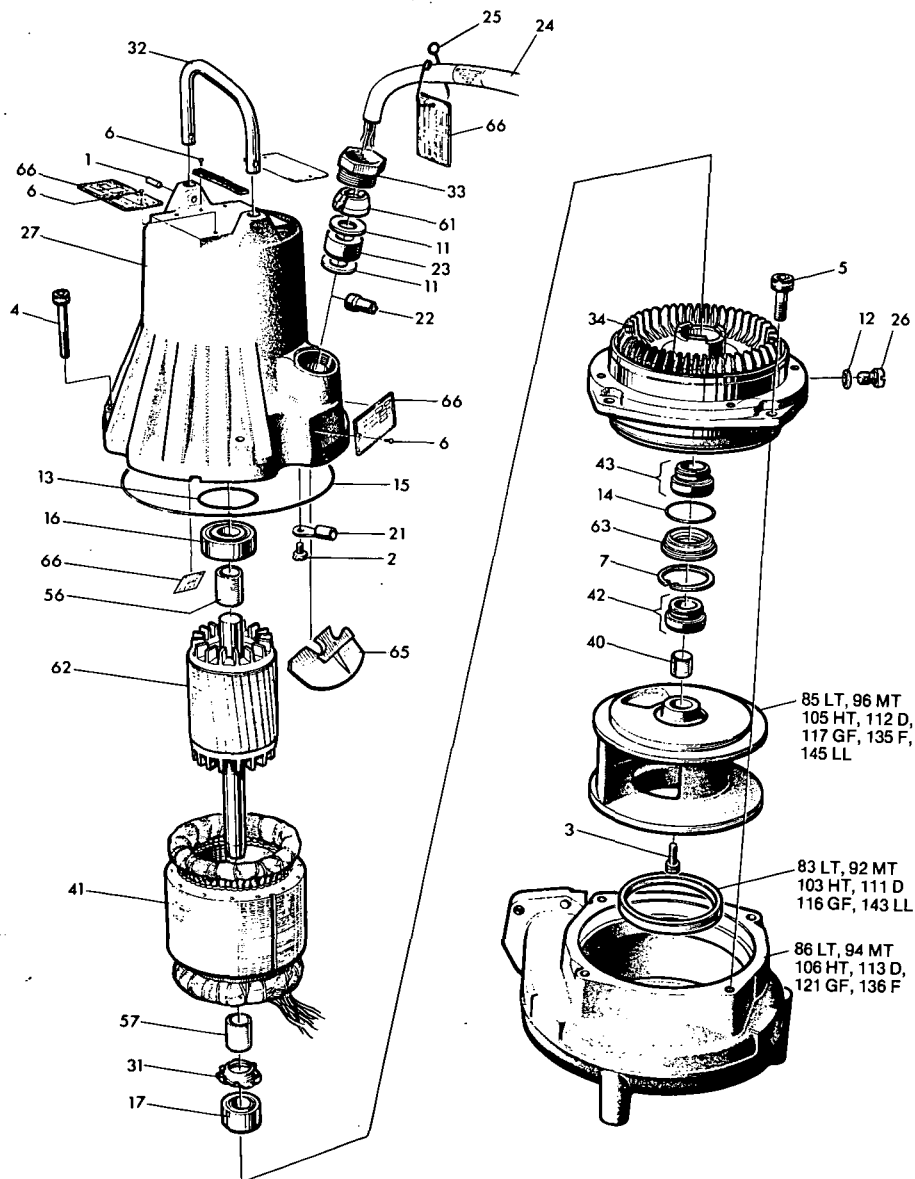
See also under "Inspection".

**Do not override the motor protection repeatedly if it has tripped.**

Most recent service date	Pump No.	Hours of operation	Remarks	Sign.

Service log

Most recent service date	Pump No.	Hours of operation	Remarks	Sign.







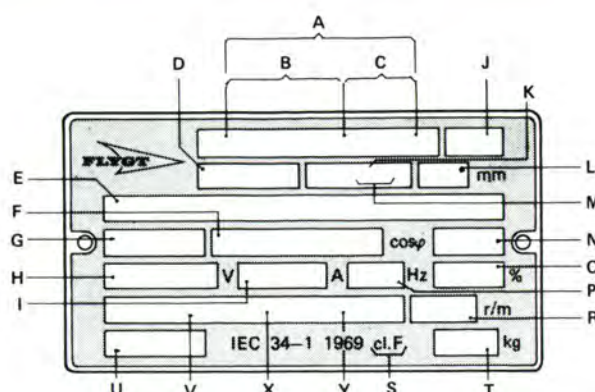
**3085.181**  
**3085.181-W**

**PARTS LIST**  
**DETALJLISTA**  
**ERSATZTEILLISTE**  
**LISTE DES PIÈCES DE RECHANGE**



## How to read the data plate Das bedeuten die Angaben auf dem Datenschild

## Hur man läser dataskylten Comment lire la plaque signalétique



### Data plate interpretation:

- A Product No
- B Product code
- C Consecutive No
- D Serial No.
- E Special
- F Shaft power
- G Stator connection
- H Rated voltage
- I Rated current
- J Factory code
- K Number of poles
- L Impeller/propeller diam.
- M Curve No.
- N Power factor
- O Operating duty, cont./int.
- P Number of phases, type of current, frequency
- R Rotation speed
- S Insulation class
- T Weight
- U S-order No.
- V \*Rotation speed/blade angle propeller version
- X \*Gear ratio
- Y \*Direction of rotation L = left R = right

\*For mixers

### Dataskylt inskription:

- A Produktnummer
- B Produktkod
- C Löpnummer
- D Tillverkningsnummer
- E Special
- F Axeffekt, motor
- G Statorkoppling
- H Märkspänning
- I Märkström
- J Fabrikskod
- K Poltal
- L Pumphjul/Propeller diam.
- M Kurvnummer
- N Effektfaktor
- O Driftart, kont./int.drift
- P Fastal, strömart, frekvens
- R Varvtal
- S Isolationsklass
- T Vikt
- U S-order nummer
- V \*Propellervarvtal/bladvinkel propellertyp
- X \*Utväxlingsförhållande
- Y \*Rotationsriktning L = vänster R = höger

\*För omrörare

### Datenschild, Beschriftung:

- A Produkt Nr.
- B Produktkode
- C Lfd. Nr.
- D Fabrikations-Nr.
- E Sonderbezeichnung
- F Leistungsabgabe
- G Statorschaltung
- H Nennspannung
- I Nennstrom
- J Fabrikskode
- K Polzahl
- L Laufrad/Propeller Durchmesser
- M Kurve Nr.
- N Leistungsfaktor
- O Betriebsart, kont./int.
- P Phasenzahl, Stromart, Frequenz
- R Drehzahl
- S Isolationsklasse
- T Gewicht
- U S-Auftragsnummer
- V \*Propellerdrehzahl/Winkel des Propeller flügels Propellerausführung
- X \*Übersetzungsverhältnis
- Y \*Drehrichtung L = links R = rechts

\*Für Rührwerke

### Légende de la plaque signalétique:

- A N° de produit
- B Code de produit
- C N° d'ordre
- D N° de série
- E Indications spéciales
- F Puissance sur l'arbre, moteur
- G Couplage du stator
- H Tension nominale
- I Intensité nominale
- J Code d'usine
- K Nombre de pôles
- L Roue/Hélice diamètre
- M N° de courbe
- N Facteur de puissance
- O Type de fonctionnement, continu/intermittent
- P Nombre de phases, type de courant, fréquence
- R Régime
- S Classe d'isolation
- T Poids
- U Numero d'ordre S
- V \*Vitesse de rotation d'hélice/angle des pales d'hélice version à hélice
- X \*Rapport de réduction
- Y \*Sens de rotation L = gauche R = droite

\*Pour les agitateurs



## Ordering spare parts Ersatzteilbestellung

State product No. and serial No. of pump when ordering parts.

Do not use item Nos. when ordering spare parts or for stock records.

The warm liquid version of this pump has a product code that ends with W, for example 3085.181-W (see the pump's data plate.) Certain parts are different in the standard and warm liquid versions. Make sure that spare parts with part numbers marked (W) in the parts list are used for warm liquid pumps.

Bei Bestellung bitte die Produkt Nr. und die Fabrikations Nr. des Pumpe angeben.

Die Pos. Nummern sind nicht für die Lagerorganisation vorgesehen.

Die Warmwasserversion dieser Pumpe hat einen Produktcode, der mit W aufhört, z.B. 3085.181-W (siehe Datenschild der Pumpe). Bestimmte Teile sind verschieden für die Standard- und Warmwasserversion. Es ist darauf zu achten, daß für Warmwasserpumpen stets nur Ersatzteile verwendet werden, die in der Ersatzteilliste bei der Ersatzteilnummer mit (W) gekennzeichnet sind.

## Reservdelsbeställning Commande des pièces de rechange

Uppge pumpens produktnummer och tillverkningsnummer vid reservdelsbeställning.

Använd inte pos.nr utan dataljnr vid reservdelsbeställning och lagerhållning.

Varmvattenversionen av denna pump har en produktkod som slutar med W, t ex 3085.181-W (se pumpens dataskylt). Vissa delar är olika i standard- och varmvattenversionen. Se till att reservdelar med detaljnummer märkta (W) i detaljlistan används för varmvattenpumpar.

Pour toute commande de pièces de rechange, prière d'indiquer le N° de produit et le N° de série de la pompe à laquelle ces pièces sont destinées.

Ne pas utiliser les numéros de repérage lors de la commande de pièces de rechange, ou sur les fiches de stocks. Utiliser les numéros de pièces.

La version pour eau chaude de cette pompe a un code de produit finissant par W, par exemple 3085.181-W (voir plaque signalétique). Certains éléments étant différents pour les versions standard et pour eau chaude, il convient donc de veiller à ce que les pièces de rechange utilisées pour les pompes à eau chaude soient celles dont le numéro de référence est complété par (W).

## Guarantee Garantie

The provision of the manufacturer's guarantee applies only under the condition that genuine Flygt spare parts are used and that the repair and service work is carried out by a workshop authorized by Flygt.

The manufacturer reserves the right to alter specification and design.

The terms of the guarantee apply only providing the pump is used in accordance with the instructions and in applications for which it is intended.

Die Garantiebestimmungen des Herstellers gelten nur unter der Voraussetzung, daß Original Flygt-Ersatzteile verwendet werden, und daß Reparatur- und Wartungsarbeiten von einer von Flygt autorisierten Werkstatt durchgeführt werden.

Änderungen in bezug auf Ausführung und Spezifikationen vorbehalten.

Die Garantiebedingungen voraussetzen daß die Pumpe laut der Instruktion und in Applikationen, zu welchen sie bestimmt ist, verwendet wird.

## Garanti Garantie

Tillverkarens garantibestämmelser gäller endast under förutsättning att Flygts originaldelar används samt att reparations- och servicearbetet utförs av en av Flygt auktoriserad verkstad.

Rätt till ändringar i utförande och specifikationer förbehålles.

Garantivillkoren förutsätter att pumpen används enligt instruktionen och i applikationer för vilka den är avsedd.

La garantie du constructeur n'est valable que dans la mesure où sont exclusivement utilisées des pièces de rechange Flygt d'origine et où les réparations et interventions sont assurées par un atelier agréé par Flygt.

Nous nous réservons le droit de modifier l'exécution et les spécifications de nos produits.

La garantie n'est valable que dans la mesure où la pompe est utilisée conformément aux directives du constructeur et uniquement affectée aux usages auxquels elle est destinée.



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## Sales codes Verkaufskodes

## Säljkoder Codes de vente

<b>C-LT</b> = Low-head version (Curve No. 412—414, 622—624) Niederdruckausführung	Lågtrycksutförande Modèle basse pression
<b>C-MT</b> = Medium-head version (Curve No. 432—440) Mitteldruckausführung	Medeltrycksutförande Modèle moyenne pression
<b>C-HT</b> = High-head version (Curve No. 250—252) Hochdruckausführung	Högtrycksutförande Modèle haute pression
<b>D</b> = Swirl-type impeller version (Curve No. 276—284—470—477) Wirbelradausführung	Virvelhjulsutförande Version roue vortex
<b>G</b> = Groundwater pump (Curve No. 242—244) Grundwasserpumpe	Grundvattenpump Pour eau de souterraine
<b>F</b> = For pumping liquid manure (Curve No. 490—493) Für Gülleförderung	För flygtgödselpumpning Pour pompage de lisier
<b>L</b> = Lift pump version (Curve No. LL 412, LL 414) Hebepumpeausführung	Invallningsutförande Modèle pompe de levage

Item No Pos. nr. Pos.-Nr. N° de répérage	Part No. Detalj nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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## Motor parts Motorteile

## Motordetaljer Pièces du moteur

1	80 58 89	Tension pin Federstift	Fjädrande rörpinne Goupille	2
2	82 17 61	Screw (M6 x 12) Schraube	Skruv Vis	2
3	82 00 34	Socket head screw (M8 x 25) Schraube	Insexskruv Vis allen	1
4	82 00 39	Socket head screw (M8 x 50) Schraube	Insexskruv Vis allen	4
5		SOCKET HEAD SCREW SCHRAUBE	INSEXSKRUV VIS ALLEN	
	82 00 68	(M12 x 25)		4
	82 00 71	(M12 x 40) only for D 3085.181 (swirl-type impeller version)		4
6	82 20 88	Drive screw (4 x 5) Treibschraube	Drivskruv Vis autotaraudeuse	6
7	82 63 68	Retaining ring (SgH 65) Nutring	Spårring Circlip	1
9	83 65 00	Insulating hose Isolierschlauch	Isolerslang Tuyau isolante	2
10	83 45 59	Cable tie Spannband	Buntband Collier de câble	3
11		WASHER SCHEIBE	BRICKA RONDELLE	2
	82 41 08	For power cable	(10)—12 mm (0.39"—0.47")	
	82 40 84	För motorsladd	(12)—14 mm (0.47"—0.55")	
	82 40 55	Für Motorleitung	(14)—16 mm (0.55"—0.63")	
	82 40 57	Pour câble	(16)—18 mm (0.63"—0.71")	
	82 40 59		(18)—20 mm (0.71"—0.79")	
		O-RING O-RING	O-RING ANNEAU TORIQUE	
12	82 73 85 (W)82 79 12	13.3 x 2.4		6
13	82 77 95 (W)82 79 28	52.5 x 3.0		1
14	82 77 97 (W)82 79 29	53.0 x 4.0		1
15	82 78 37 (W)82 79 34	200.0 x 3.0		1
		BALL BEARING KUGELLAGER	KULLAGER ROULEMENT	
16	83 34 40	SKF 6304 RS		1
17	83 36 24	SKF 3204/C-3		1

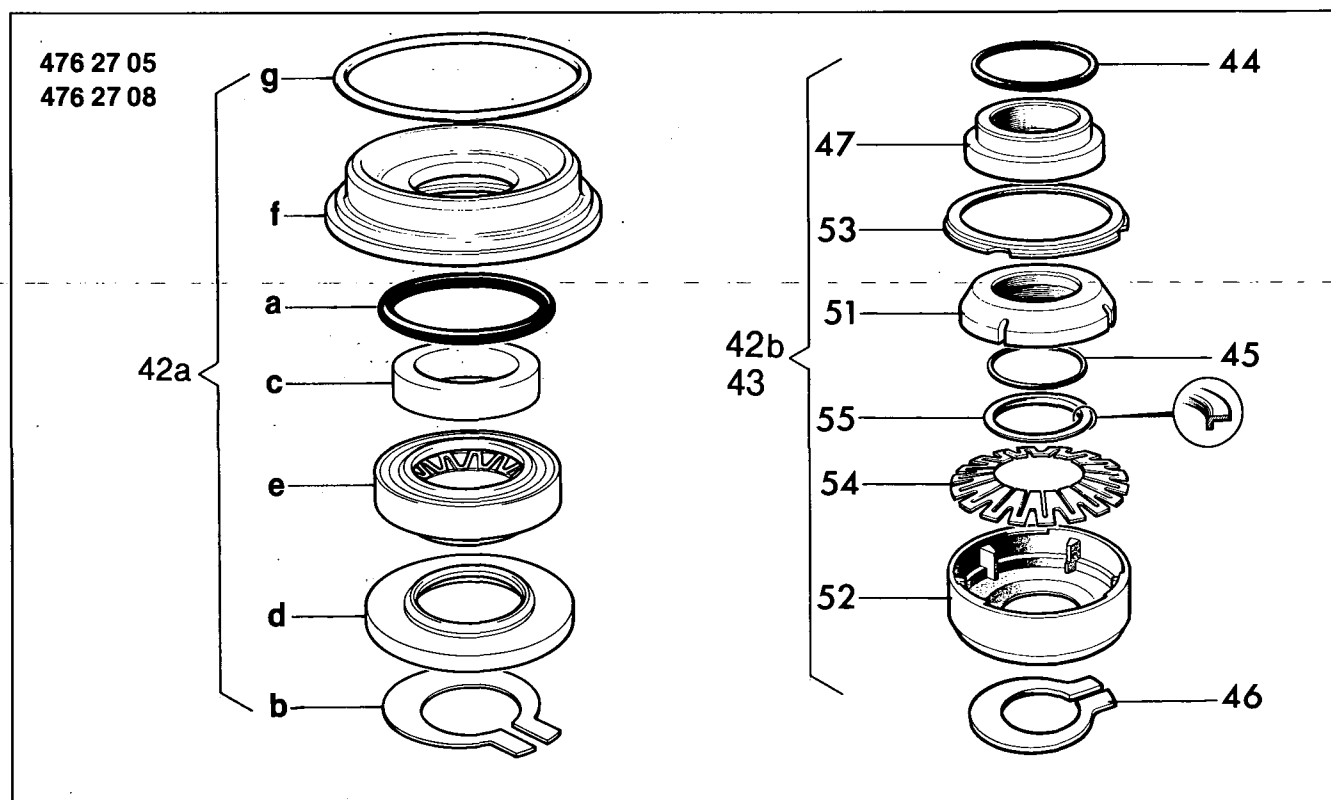
Item No Pos nr. Pos.-Nr. N° de répérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
21	83 43 45	Cable lug Kabelschuh	Kabelsko Cosse	1
22	83 44 24	End-sleeve Hülse	Ändhylsa Douille	4—7
23		SEAL SLEEVE DICHTUNGSHÜLSE	TÄTNINGSHYLSA MANCHON	1
	84 35 66	For motor cable	(10)—12 mm (0.39"—0.47")	
	84 35 59	För motorsladd	(12)—14 mm (0.47"—0.55")	
	84 35 32	Für Motorleitung	(14)—15 mm (0.55"—0.59")	
	84 36 40	Pour câble	(15)—16 mm (0.59"—0.63")	
	84 35 33		(16)—17 mm (0.63"—0.67")	
	84 36 39		(17)—18 mm (0.67"—0.71")	
	84 35 34		(18)—20 mm (0.71"—0.79")	
24		MOTOR CABLE MOTORLEITUNG	MOTORSLADD CABLE	1
	94 20 41	SUBCAB, 4 × 1.5 mm <sup>2</sup> (10.5)—11.5 mm (0.41"—0.45")		
	94 20 61	SUBCAB, 4G1.5 + 2 × 1.5 mm <sup>2</sup> 15.5—16.5 mm (0.61"—0.65")		
	94 20 42	SUBCAB, 4 × 2.5 mm <sup>2</sup> , max 70°C (158°F) (12.5)—13.5 mm (0.49"—0.53")		
	94 20 59	SUBCAB, 4G2.5 + 2 × 1.5 mm <sup>2</sup> 17—18 mm (0.67"—0.71")		
	94 20 54	SUBCAB 7 × 2.5 mm <sup>2</sup> (18)—20 mm (0.71"—0.79")		
	94 21 02	SUBCAB, 14 AWG/7 (18)—20 mm (0.71"—0.79") max 70°C (158°F)		
	(W)94 19 75	SIH-J 4 × 2.5 mm <sup>2</sup> , max 90°C (194°F)		
25	262 05 00	Fixing eye Hebeöse	Fästögla Ecrou à oeil	1
26	303 44 03	Inspection screw Inspektionsschraube	Inspektionsskruv Vis d'inspection	2
27	556 15 00	Stator housing Statorgehäuse	Statorhus Logement de stator	1
31	397 76 00	Bearing cover Lagerdeckel	Lagerlock Cache roulement	1
32	397 80 01	Lifting handle Tragbügel	Bärbygel Poignée	1
33	397 81 00	Gland screw Verschraubung	Hylsskruv Ecrou de serrage	1
34		OIL HOUSING UNIT ÖLGEHÄUSEEINHEIT	OLJEHUSENHET BAC À HUILE COMPL.	
	397 85 04	For version without leakage sensor or only with FLS sensor Für Ausführung ohne Leckagedetektor oder Ausführung nur mit FLS Leckagedetektor	För utförande utan läckage sensor eller endast med FLS läckage sensor Pour modèle sans de'tecteur de fuites ou modèle seulement avec détecteur de fuites FLS	
37	397 74 03	Bearing holder Lagerhalter	Lagerhållare Boîtier de roulement	
38	397 84 00	Sleeve Hülse	Hylsa Douille	

Item No Pos nr. Pos.-Nr. N° de répérage	Part No Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
	397 85 05	For version with leakage sensor unit CLS 30 or CLS 30 and FLS Für Ausführung mit Leckagedetektoreinheit CLS 30 oder Ausführung mit CLS 30 und FLS	För utförande med läckage sensor enhet, CLS 30 eller CLS 30 och FLS Pour modèle avec unite de détecteur de fuites CLS 30 ou modèle avec CLS 30 et FLS	
37	397 74 05	Bearing holder Lagerhalter	Lagerhållare Boîtier de roulement	
38	397 84 00	Sleeve Hülse	Hylsa Douille	
40	397 88 00	Sleeve Hülse	Hylsa Douille	1
41		STATOR STATOR	STATOR STATOR	1
		50 Hz, 2.0 kW, 1400 r/min	60 Hz, 2.4 kW (3.2 hp), 1700 r/min	
408 40 12	—	—	440—460V Y ser./220—230V Y par.	
408 40 27	190—200V Y	—	200—220V Y	
408 40 29	—	—	380VY/220V△	
408 40 30	—	—	380V △	
408 40 31	400V Y/230V △	—	—	
408 40 32	346—350V Y/200—208V △	—	400V Y/230—240V △	
408 40 34	380V Y/220V △	—	440—460V Y/260V △	
408 40 38	660V Y/380V △	—	440—460V △	
408 40 39	690V Y/400V △	—	—	
408 40 40	400V △	—	400V △	
408 40 43	400—440V Y	—	480V Y	
408 40 51	500—550V Y	—	575—600V Y	
		50 Hz, 1.3 kW, 1400 r/min	60 Hz, 1.6 kW (2.2 hp), 1700 r/min	
408 41 12	—	—	440—460V Y ser./220—230V Y par.	
408 41 27	190—200V Y	—	200—220V Y	
408 41 30	—	—	380V △	
408 41 31	400V Y/230V △	—	—	
408 41 32	346—350V Y/200—208V △	—	400V Y/230—240V △	
408 41 34	380V Y/220V △	—	440—460V Y/260V △	
408 41 38	660V Y/380V △	—	440—460V △	
408 41 39	690V Y/400V △	—	—	
408 41 40	400V △	—	400V △	
408 41 43	400—440V Y	—	480V Y	
408 41 51	500—550V Y	—	575—600V Y	
		50 Hz, 2.4 kW, 2850 r/min	60 Hz, 3.0 kW (4.0 hp), 3450 r/min	
408 42 12	—	—	440—460V Y ser./220—230V Y par.	
408 42 27	190—200V Y	—	200—220V Y	
408 42 29	—	—	380V Y/220—230V △	
408 42 30	—	—	380V △	
408 42 31	400V Y/230V △	—	—	
408 42 32	346—350V Y/200—208V △	—	400V Y/230—240V △	
408 42 34	380V Y/220V △	—	440—460V Y/260V △	

Item No Pos nr. Pos.-Nr. N° de répérage	Part No. Detail nr Bestell.-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
	408 42 38	660V Y/380V △	440—460V △	
	408 42 39	690V Y/400V △	—	
	408 42 40	400V △	400V △	
	408 42 43	400—440V Y	480V Y	
	408 42 51	500—550V Y	575—600V Y	
		50 Hz, 0.77 kW, 2780 r/min	60 Hz, 0.9 kW (1.2 hp), 3380 r/min	
	434 84 29**	—	380V Y/220—230V △	
	434 84 31**	400V Y/230V △	—	
	434 84 32**	—	400V Y/230—240V △	
	434 84 34**	380V Y/220V △	440—460V Y/260V △	
	434 84 37**	—	440—460V Y ser./220—230V Y par.	
	434 84 38**	660V Y/380V △	440—460V △	
	434 84 39**	690V Y/400V △	—	
	434 84 40**	400V △	400V △	
	434 84 43**	400—440V Y	480V Y	
	434 84 51**	500—550V Y	575—600V Y	
		50 Hz, 0.9 kW, 935 r/min	—	
	427 11 27	190—200V Y	—	
	427 11 32	346—350V Y/200—208V △	—	
	427 11 34	380V Y/220V △	—	
	427 11 38	660V Y/380V △	—	
	427 11 43	400—440V Y	—	
	427 11 51	500—550V Y	—	

\*\* Only for GF-version  
Nur für GF-Ausführung

Endast för GF utförande  
Pour Modèle GF



Item No Pos nr Pos.-Nr. N° de répérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
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		1-Phase 1-Phase	1-Fas 1-Phase	
	408 42 12	50 Hz —	60 Hz 2.2 kW (2.9 hp), 3440 r/min, 220—240V	
	404 07 72**	0.85 kW, 2950 r/min, 190—200V	—	
	404 07 76**	0.85 kW, 2950 r/min, 220—240V	—	
	408 40 12	—	1.8 kW (2.4 hp), 1700 r/min, 220—240V	
	408 40 14	1.5 kW, 1440 r/min, 220—240V	—	
	408 41 12	—	1.2 kW (1.6 hp), 1700 r/min, 220—240V	
	408 41 14	0.95 kW, 1435 r/min, 220—240V	—	
42a		SEAL UNIT, OUTER GLEITRINGDICHTUNG, ÄUSSER	YTTRE PLANTÄTNINGSENHET JOINT MECANIQUE, EXTERIEUR	2
	476 27 05	Seal rings of tungsten carbide Dichtungsringe aus Hartmetall	Tättningsringar i hårdmetall Anneaux en carbide, inf.	
	476 27 08	Seal rings of silicone carbide Dichtungsringe aus Siliziumkarbid	Tättningsringar i kiselkarbid Anneaux en carbure de silicium, inf.	
a	82 80 96	O-ring (34.2 × 3.0 mm) O-Ring	O-ring Anneau torique	(1)
b	*	Grip ring Greifring	Gripring Circlip	(1)
c	*	Seal ring, stationary Dichtungsring, stationärer	Tättningsring, stationär Anneau, fixe	(1)
d	*	Drive washer Mitnehmerscheibe	Medbringarbricka Rondelle a toc	(1)
e	*	Seal ring unit, rotating Dichtungsringeinheit, rot.	Tättningsringenhet, roterande Anneau compl. tournant	(1)
f	*	Seal ring, stat. Dichtungsring, stat.	Tättningsring, stat. Joint, fixe	(1)
g	82 79 29	O-ring (53.0 × 4.0 mm) O-ring	O-ring Anneau torique	(1)
42b		SEAL UNIT, OUTER GLEITRINGDICHTUNG, ÄUSSER	YTTRE PLANTÄTNINGSENHET JOINT MECANIQUE, EXTERIEUR	1
	397 90 06	Seal ring of ceramics Dichtungsringe aus Keramik	Tättningsringar i keramik Anneaux en céramique	
	397 90 07	Seal rings of tungsten carbide Dichtungsringe aus Hartmetall	Tättningsringar i hårdmetall Anneaux en carbide	

\*\* Only for GF-version  
Nur für GF-Ausführung

Endast för GF utförande  
Pour Modèle GF

\* Not separately delivered  
Keine separate Lieferung

Levereras ej separat  
N'est pas livré séparément

Item No Pos nr. Pos.-Nr. N° de répérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
43		SEAL UNIT, INNER GLEITRINGDICHTUNG, INNER	INRE PLANTÄTNINGSENHET JOINT MECANIQUE, INTERIEUR	1
	397 90 08	Seal rings of ceramic-carbon Dichtungsringe aus Keramik- Graphit	Tättningsringar i kol-keramik Anneaux en céramique-carbone	
44	82 79 23	O-ring (28 x 4 mm) O-Ring	O-ring Anneau torique	(2)
45	82 72 95	O-ring (19.2 x 3 mm) O-Ring	O-ring Anneau torique	(2)
46	397 94 01	Locking ring Federring	Låsring Circlip	(2)
47	*	Seal ring, stat. Dichtungsring, stat.	Tättningsring, stat. Joint, fixe	(2)
51	*	Seal ring, rot. Dichtungsring, rot.	Tättningsring, rot. Joint, tournant	(2)
52	*	Spring housing Federehäuse	Fjäderhus Boîtier de ressort	(2)
53	*	Ring Ring	Ring Anneau	(2)
54	*	Spring Feder	Fjäder Ressort	(2)
55	*	Supporting ring Stützring	Stödning Anneau de support	(2)
56	398 97 06	Spacing sleeve Distanshülse	Distanshylsa Manchon d'ecartement	1
57		SPACING SLEEVE DISTANSHÜLSE	DISTANSHYLSA MANCHON D'ECARTEMENT	1
	398 97 00	For shaft-rotor unit	397 79 12 L = 31.4 mm	
	398 97 01	För axel-rotorenhet	399 07 05 L = 42.4 mm	
	398 97 02	Für Rotoreinheit	397 79 13 L = 62.4 mm	
	398 97 04	Pour arbre-rotor complet	399 07 06 L = 91.4 mm	
61		CLAMP (Not for 3085.181-W) KLAMME (Nicht für 3085.181-W)	KLÄMMA (Ej för 3085.181-W) COLLIER (Pas pour 3085.181-W)	1
	398 98 00	10 — 12 mm (0.39" — 0.47")		
	398 98 01	(12) — 14 mm (0.47" — 0.55")		
	398 98 02	(14) — 15 mm (0.55" — 0.59")		
	398 98 06	(15) — 16 mm (0.59" — 0.63")		
	398 98 03	(16) — 17 mm (0.63" — 0.67")		
	398 98 07	(17) — 18 mm (0.67" — 0.71")		
	398 98 05	(18) — 20 mm (0.71" — 0.79")		

\* Not delivered separately  
Keine separate Lieferung

Levereras ej separat  
N'est pas livré séparément

Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr. Bestell.-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
62		SHAFT-ROTOR UNIT ROTOREINHEIT	AXEL-ROTORENHET ARBRE-ROTOR COMPLET	1
	397 79 12	For stator	408 40 xx 427 11 xx	
	397 79 13	För stator	408 41 xx	
	399 07 05	Für Stator	404 07 xx 408 42 xx	
	399 07 06	Pour stator	434 84 xx	
63	426 32 00	Seal ring, holder Dichtungsringhalter	Släpringshållare Boîtier de joint	1
64	433 47 02	Plate Platte	Täckplåt Plaque	1
66		PLATE SCHILD	SKYLT PLAQUE	
	274 52 00	"Made in Sweden"		1
	371 52 09	"Use with certified starter...."		1
		"Employer avec un démarreur..."		
	392 16 00	"Use with certified starter Cat. No."		1
		"Employer avec un démarreur certifié Cat.No."		
	585 07 00	Tape, "60 Hz connections", U1—W5		1
	426 69 00	Tape, "60 Hz connections", U1—W6		1
	426 69 00	Tape, "50 Hz connections", U1—W6		1
	582 11 00	Tape, "Y/Δ-connection", U1—W2		1
	585 03 00	Tape, "1 ~ connection", U1—Z2		1
	438 37 00	Data plate Datenschild	Dataskylt Plaque signalétique	2



Item No	Part No.	Denomination	Benämning	Quantity
Pos. nr.	Detalj nr.	Bezeichnung	Designation	Antal
N° de repérage	N° de pièce			Anzahl
				Nombre

**Version with leakage sensor  
FLS, floating type and capacitiv  
leakage sensor CLS-30,  
built-in-type**

**Ausführung mit Leckagedetektor  
FLS und kapazitive leckagedetektor  
CLS-30, eingebaut Modell**

**Utförande med läckagegivare FLS  
och läckagesensor CLS-30,  
inbyggd version**

**Modèle avec détecteur de fuites FLS  
et détecteur de fuites à condensateur  
CLS 30, du type intérieur.**

75	83 58 48	Alarm relay unit Alarmeinheit	Larmreläenhet Unité l'alarme	1
76	83 44 24	End sleeve Aderendhülse	Ändhylsa Douille de boul	2
77		CABLE UNIT KABELEINHEIT	KABELENHET UNITÉ DE CÂBLE	

	504 78 06	CLS 30		
	504 78 07	FLS		1

a	*	Receptacle Kontakthülse	Kontakthylsa Manchon d'accouplement	(2)
b	*	Terminale device Kontakt vorrichtung	Kopplingsdon Pince de raccordement	(1)
c	*	Cable Kabel	Ledning Câble	(1)
d	*	Cable Kabel	Ledning Câble	(1)

78	505 12 00	LEAKAGE SENSOR UNIT, CLS 30 LECKAGE DETEKTOR EINHEIT, CLS 30	LÄCKAGE SENSOR ENHET, CLS 30 UNITE DE DÉTECTEUR DE FUITES, CLS 30	
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f	*	Sensor Detektor	Detektor Détecteur	(1)
g	*	O-ring O-Ring	O-ring Anneau torique	(1)
h	*	Terminal device Kontakt vorrichtung	Kopplingsdon Pince de raccordement	(1)
i	*	Terminal Anschlusssteck	Kontaktstift Contact à fiches	(2)

\* Not separate delivered  
Nicht separat geliefert

Levereras ej separat  
N'est pas livré séparément

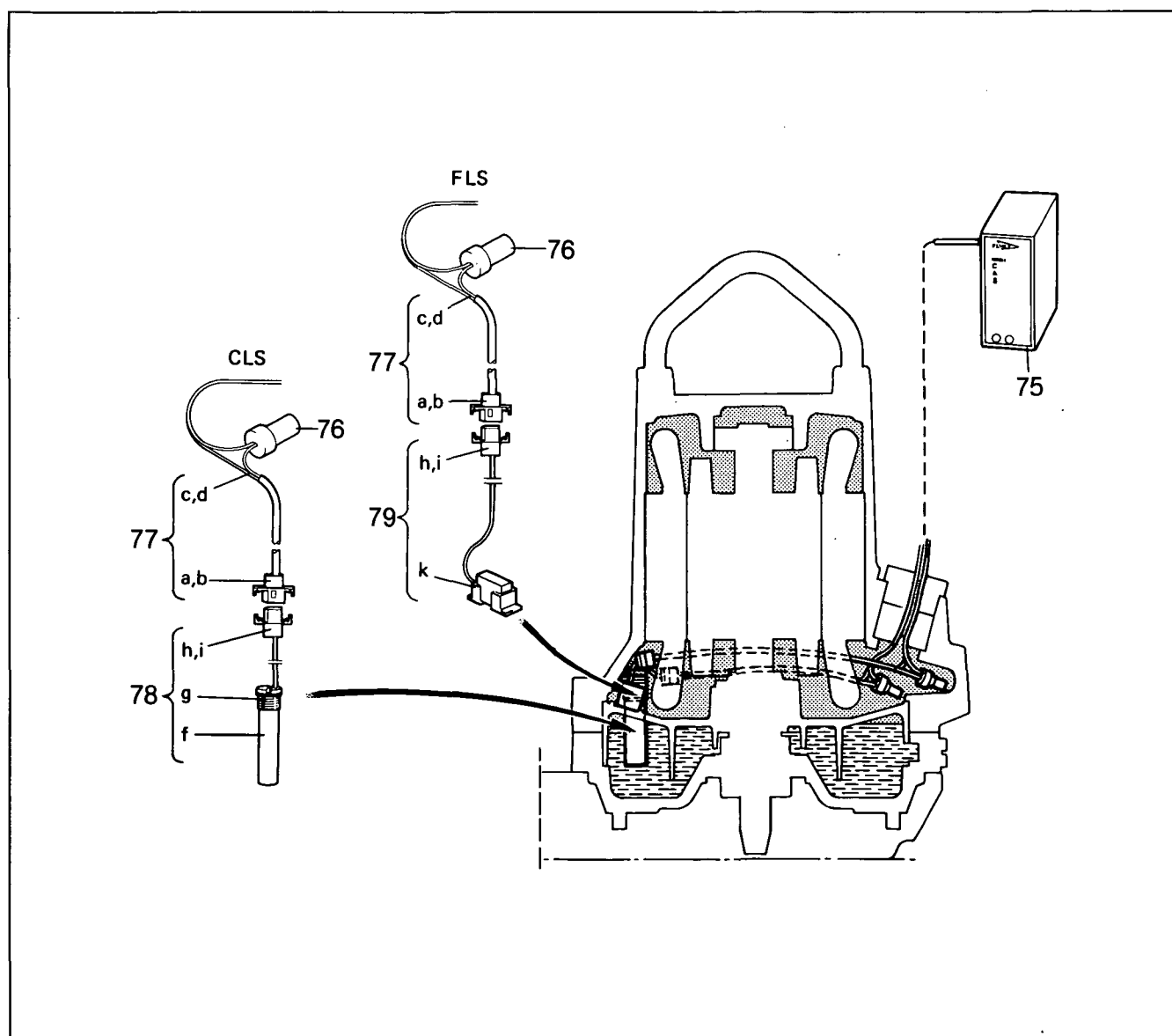
Item No Pos nr Pos.-Nr. N° de reperage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
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79	518 89 01	LEAKAGE SENSOR UNIT, FLS LECKAGE DETEKTOR EINHEIT, FLS	LÄCKAGE SENSOR ENHET, FLS UNITE DE DÉTECTEUR DE FUITES, FLS	1
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k	*	Level switch unit Pegelgeber-Einheit	Nivåvaktenhet Unité de regulateurs de niveau	(1)
h	*	Terminal device Kontakt vorrichtung	Kopplingsdon Pince de raccordement	(1)
i	*	Terminal Anschlusssteck	Kontaktstift Contact à fiches	(2)

\* Not delivered separately  
Keine separate Lieferung

Levereras ej separat  
N'est pas livré séparément



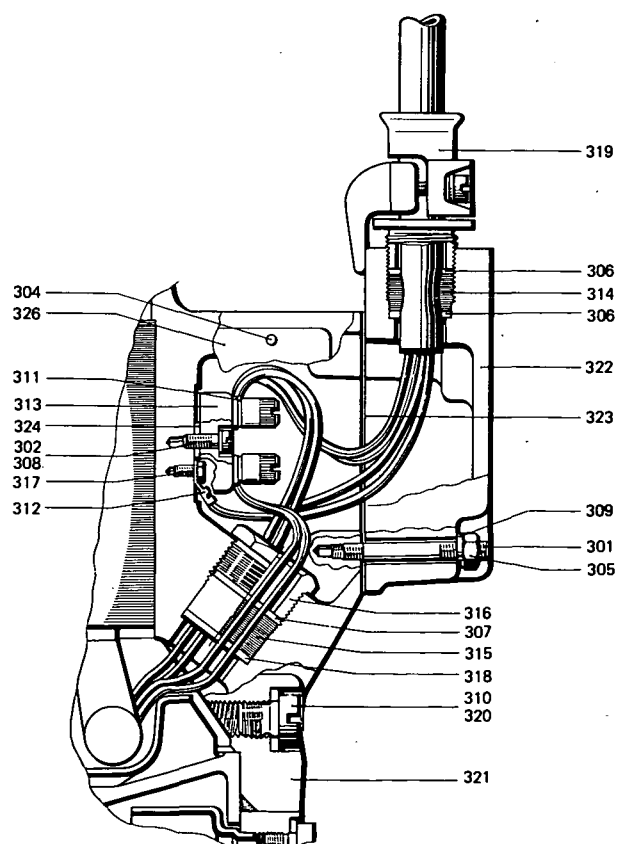
Item No Pos nr. Pos.-Nr. N° de répérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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**Version with terminal board  
(CSA)**  
**Ausführung mit Schaltbrett  
(CSA)**

**Utförande med kopplingsplint  
(CSA)**  
**Modèle avec plaque à bornes  
(CSA)**

301	80 94 77	Stud (M6 x 50) Stiftschraube	Pinnskruv Goujon	4
302	81 73 42	Slotted screw (M4 x 12) Schraube	Spårskruv Vis	2
304	82 20 88	Drive screw (4 x 5) Treibschraube	Drivskruv Vis autotaraudeuse	2
305	82 23 56	Nut (M6) Mutter	Mutter Ecrou	4
306		WASHER SCHEIBE	BRICKA RONDELLE	2
	82 40 56	(16.5)—19.0 mm (0.65"—0.75")		
	82 40 54	(14)—16 mm (0.55"—0.63")		
		SPRING WASHER FEDERSCHEIBE	FJÄDERBRICKA RONDELLE ELASTIQUE	
308	82 48 55	FBB 4:1		2
309	82 48 58	FBB 6:1		4
310	82 73 85 (W)82 79 12	O-ring (13.3 x 2.4) O-Ring	O-ring Anneau torique	1
311	83 42 36	End sleeve Hülse	Ändhylsa Douille	10
312	83 42 95	Cable lug Kabelschuh	Kabelsko Cosse de câble	1
313	83 50 75	Terminal board unit Schaltbretteinheit	Kopplingsplintenhet Plaque à bornes compl.	1
314		SEAL SLEEVE DICHTUNGSHÜLSE	TÄTNINGSHYLSA MANCHON	1
	84 35 28	(12)—14 mm (0.47"—0.55")		
	84 35 30	(16.5)—19 mm (0.65"—0.75")		
	84 35 29	(14)—16 mm (0.55"—0.63")		
318	443 69 00	Lead through Durchführung	Genomföring Passage	1
319		CABLE ENTRY UNIT LEITUNGSEINFÜHRUNGS- EINHEIT	MOTORSLADDINFÖRING ENTRÉE DE CÂBLE COMPL.	1
	254 03 00	(16.5)—19.0 mm (0.65"—0.75")		
	254 03 03	(14)—16 mm (0.55"—0.63")		

Item No Pos nr Pos.-Nr. N° de répérage	Part No. Detail nr Bestell.-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
320	303 44 03	Inspection screw Inspektionschraube	Inspektionsskruv Vis d'inspection	1
321	415 65 02	Stator casing Statorgehäuse	Statorhus Logement de stator	1
322	415 66 01	Entrance cover Anschlußdosendeckel	Införingslock Couvercle	1
323	415 68 01	Gasket Packung	Packning Joint	1
324	415 69 00	Packing Packung	Packning Joint	2
325	433 47 01	Plate Platte	Täckplåt Plaque	1
326		PLATE SCHILD	SKYLT PLAQUE	
	550 24 00	Tape, T1—°C—T2		1

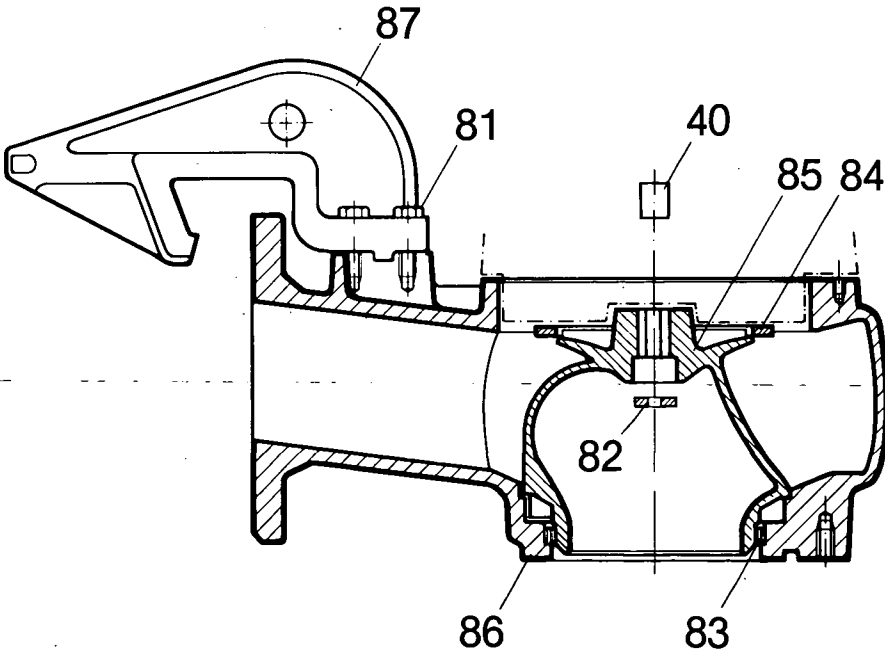











Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
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Pump parts, C-LT-version  
 Pumpenteile, C-LT-Ausführung

Pumpdetaljer, C-LT-utförande  
 Pièces de la pompe, Modèle C-LT

81	81 41 58	Screw (M12 x 45) Schraube	Skruv Vis	4
82	303 45 03	Washer Scheibe	Bricka Rondelle	1
83	314 88 01	Wear ring Verschleißring	Slitring Anneau d'usure	1
84	379 79 00	Washer Scheibe	Bricka Rondelle	1



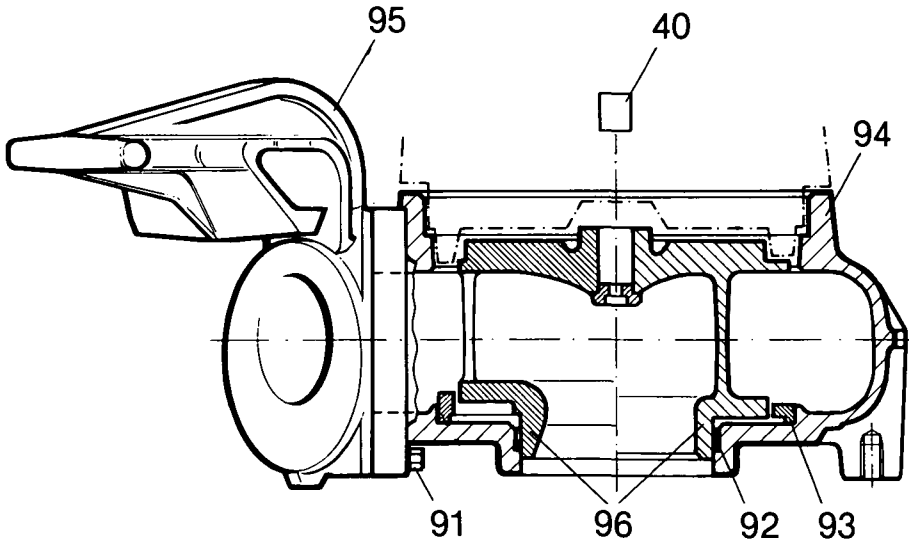
Item No Pos.nr. Pos.-Nr. N° de répérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
85		IMPELLER, Curve No... LAUFRAD, Kurve Nr...	PUMPHJUL, Kurva nr... ROUE, Courbe N°...	1
	(W)379 76 00	412, 612, 50 Hz	Throughlet	diam. 100 mm (4.0")
	(W)379 33 00	414, 50—60 Hz, 614, 50 Hz	Genomlopp	diam. 80 mm (3.2")
	373 12 01	620, 50 Hz	Durchgang	diam. 100 mm (4.0")
	373 10 01	622, 50 Hz	Section de passage	diam. 100 mm (4.0")
	431 69 01	621, 50 Hz		diam. 100 mm (4.0")
86		PUMP CASING PUMPENGHÄUSE	PUMPHUS VOLUTE	1
		Curve No 412, 414, 612, 614 Kurve Nr...	Kurva nr... Courbe N°...	
	379 75 00	DN 100 4"		
	379 75 20	For flush valve Für Rührwerkventil	 För omrörarventil Pour soupape d'agitateur	
	379 75 01	DN 100 4"	 SMS 342 DIN 2533 BS 4622:1970 Table 11	
	379 75 02	DN 100 4"	 1882 Standard	
		Curve No. 620—622 Kurve Nr...	Kurva nr... Courbe N°...	
	383 99 00	DN 100 4"		
	383 99 20	For flush valve Für Rührwerkventil	 För omrörarventil Pour soupape d'agitateur	
	383 99 01	DN 100 4"	 SMS 342 DIN 2533 BS 4622:1970 Table 11	
	383 99 02	DN 100 4"	 1882 Standard	
	383 99 05	DN 100 4"	 ANSI B 16.1:1967 Table 5	
87		SLIDING BRACKET GLEITKLAUE	GLIDSKO GLISSIÈRE	1
	380 91 00	For pipes Für Rohr	För rör Pour tube	



Item No Pos nr Pos.-Nr. N° de repérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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Pump parts, C-MT-version  
Pumpenteile, C-MT-Ausführung

Pumpdetaljer, C-MT-utförande  
Pièces de la pompe, Modèle C-MT

90	543 14 00	Conversion part, CT Umbauteil	Ombyggnadsdel, CT Pièce de conversion, CT	1
91	81 41 58	Screw (M12 x 45) Schraube	Skruv Vis	2
92	398 92 00	Wear ring Verschleißring	Slitring Anneau d'usure	1
93	399 11 00	Distance ring for impeller 430 07 00, 430 07 01 Distanzring für Laufrad 430 07 00, 430 07 01	Distansring för pumpjul 430 07 00, 430 07 01 Anneau d'ecartement pour roue 430 07 00, 430 07 01	1



Item No Pos nr. Pos.-Nr. N° de répérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
94		PUMP CASING PUMPENGHÄUSE	PUMPHUS VOLUTE	1
	398 90 01	DN 80 3"		
	398 90 02	For CT-version, MT Für CT-Ausführung, MT  DN 80 3"	För CT-utförande, MT Pour modèle CT, MT   SMS 342, DIN 2533 BS 4622:1970 table 1 ANSI BI 6.1:1967 table S	
	398 90 21	For flush valve Für Rührwerkventil	För omrörarventil Pour soupape d'agitateur	
95		SLIDING BRACKET GLEITKLAUE	GLIDSKO GLISSIÈRE	1
	398 93 00	For pipes Für Rohr	För rör Pour tube	
96		IMPELLER LAUFRAD	PUMPHJUL ROUE	1
	(W)430 07 00	50 Hz/60 Hz Kurva nr 438	Genomlopp Throughlet	diam. 64 mm (2.5")
	(W)430 07 01	50 Hz/60 Hz Kurve Nr 440	Durchgang	diam. 64 mm (2.5")
	461 78 00	50 Hz 432	Section de passage	diam. 76 mm (3.0")
	(W)461 80 00	50 Hz/60 Hz 434		diam. 76 mm (3.0")
	(W)461 82 00	50 Hz/60 Hz 436		diam. 76 mm (3.0")

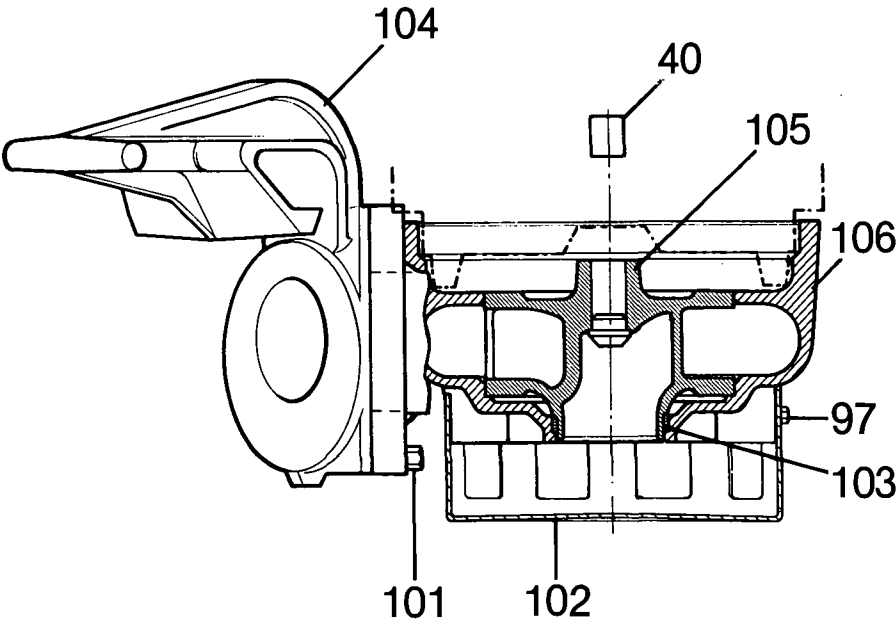



Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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Pump parts, C-HT-version  
Pumpenteile, C-HT-Ausführung

Pumpdetaljer, C-HT-utförande  
Pièces de la pompe, Modèle C-HT

97	81 41 29	Screw (M10 × 20) Schraube	Skruv Vis	3
101	81 41 58	Screw M12 × 45) Schraube	Skruv Vis	2
102	384 07 00	Strainer (size of hole 32 × 35 mm) Sieb (Lochgrösse 32 × 35 mm)	Sil (hålstorlek 32 × 35 mm) Crépine (grandeur de trou 32 × 35 mm)	
103	398 92 01	Wear ring Verschleißring	Slitring Anneau d'usure	1



Item No Pos nr Pos.-Nr. N° de répérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
104		SLIDING BRACKET GLEITKLAUE	GLIDSKO GLISSIÈRE	1
	398 93 00	For pipes Führ Rohr	För rör Pour tube	
105		IMPELLER LAUFRAD	PUMPHJUL ROUE	1
	492 44 00	50 Hz Kurva nr 250 Curve No.	Genomlopp Throughlet	diam. 40 mm (1.4")
	492 44 01	50 Hz/60 Hz Kurve Nr 252 Courbe N°	Durchgang Section de passage	diam. 40 mm (1.4")
106		PUMP CASING PUMPENGHÄUSE	PUMPHUS VOLUTE	1
	408 44 00	DN 80 3"		
	408 44 20	For flush valve Für Rührwerkventil	För omrörarventil Pour soupape d'agitateur	

Item No Pos. nr. Pos.-Nr. N° de reperage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre		
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**Pump parts, D-version**  
**Pumpenteile, D-Ausführung**

**Pumpdetaljer, D-utförande**  
**Pièces de la pompe, Modèle D**

				2-pol	4-pol, 50 Hz	4-pol, 60 Hz
107	81 41 58	Screw (M12 x 45) Schraube	Skruv Vis	2	2	2
108	521 46 00	Sliding bracket Gleitklau	Glidsko Glissière	1	—	1
109a	82 74 95	O-ring O-Ring	O-ring Anneau torique	—	1	—
109b	526 20 00	Seal ring Dichtungsring	Tätningring Anneau de joint	—	1	—
110	429 67 00	Nut Mutter	Mutter Ecrou	—	4	—
111	403 85 00	Ring Ring	Ring Anneau	—	1	1

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IMPELLER  
LAUFRAD  
Curve No.  
Kurva nr  
Kurve Nr.  
Courbe N°


PUMPHJUL  
ROUE  
Impeller diam.  
Pumphjulsdiam.  
Laufraddiam.  
Roue diam.

521 45 00	470, 50 Hz 3~	188 mm	—	1	—
521 45 03	472, 50 Hz 1~, 3~	175 mm	—	1	—
521 45 06	474, 50 Hz 1~, 3~	160 mm	—	1	—
339 69 12	473, 60 Hz 3~	150 mm	—	—	1
339 69 14	475, 60 Hz 1~, 3~	135 mm	—	—	1
339 69 16	477, 60 Hz 1~, 3~	120 mm	—	—	1
403 86 00	276, 50 Hz 3~	120 mm	1	—	—
403 86 01	280, 60 Hz 3~	114 mm	1	—	—
403 86 02	278, 50 Hz 3~	104 mm	1	—	—
403 86 03	282, 60 Hz 3~	101 mm	1	—	—
403 86 24	284, 60 Hz 1~	88 mm	1	—	—

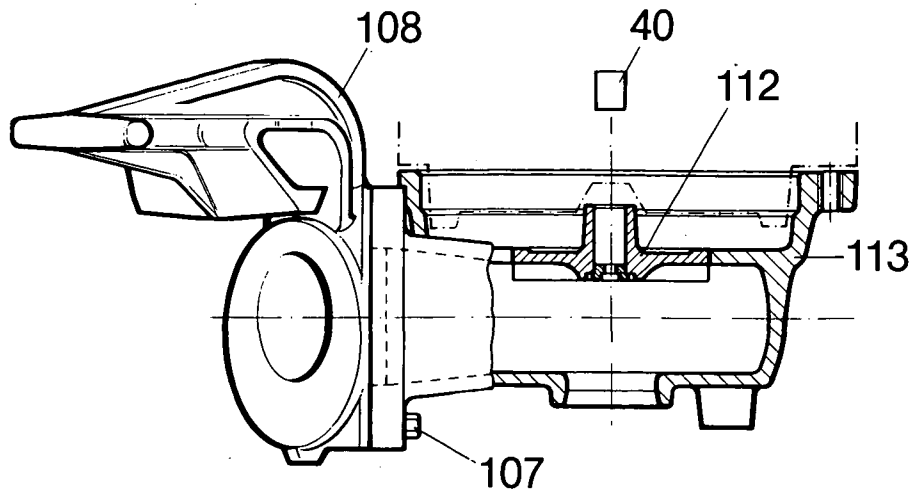
113

PUMP CASING  
PUMPENGHÄUSE

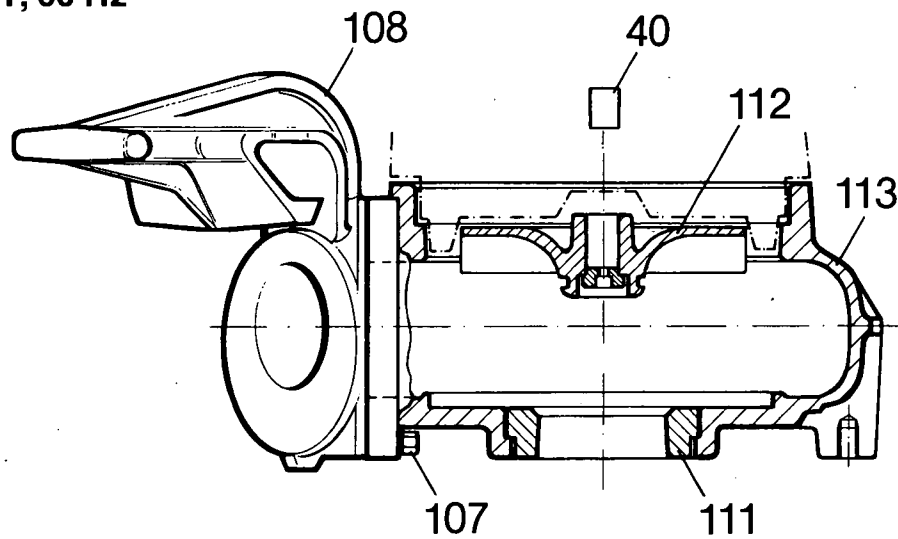
PUMPHUS  
VOLUTE

521 47 00	DN 80, 3"		—	1	—
403 87 00	DN 80, 3"		1	—	—
	Throughlet Durchgang	Genomlopp Section de passage	diam. 52 mm (2.1")	diam. 76 mm (3.0")	
398 90 01	DN 80, 3", 60 Hz		—	—	1

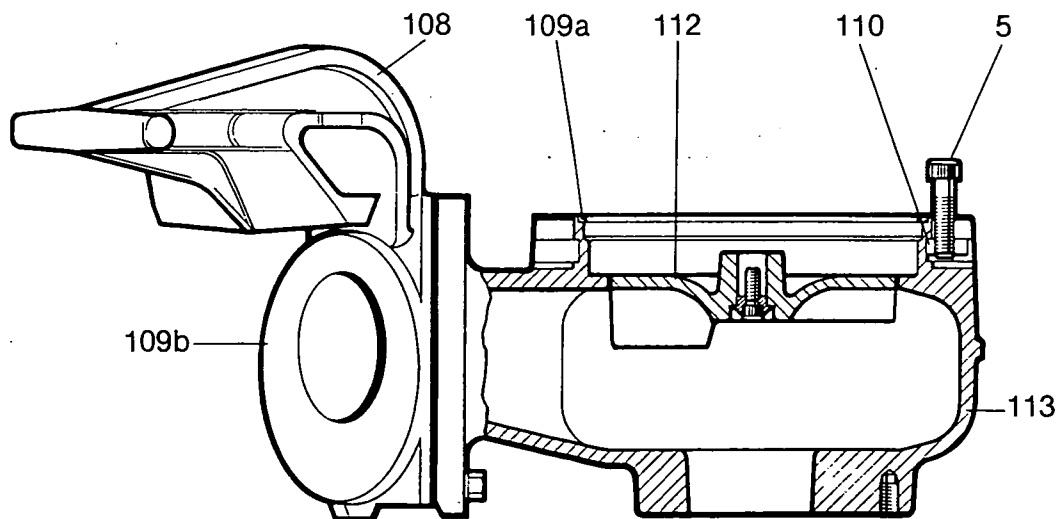
**2 pol, HT**



**4 pol, MT, 60 Hz**



**4 pol, MT, 50 Hz**

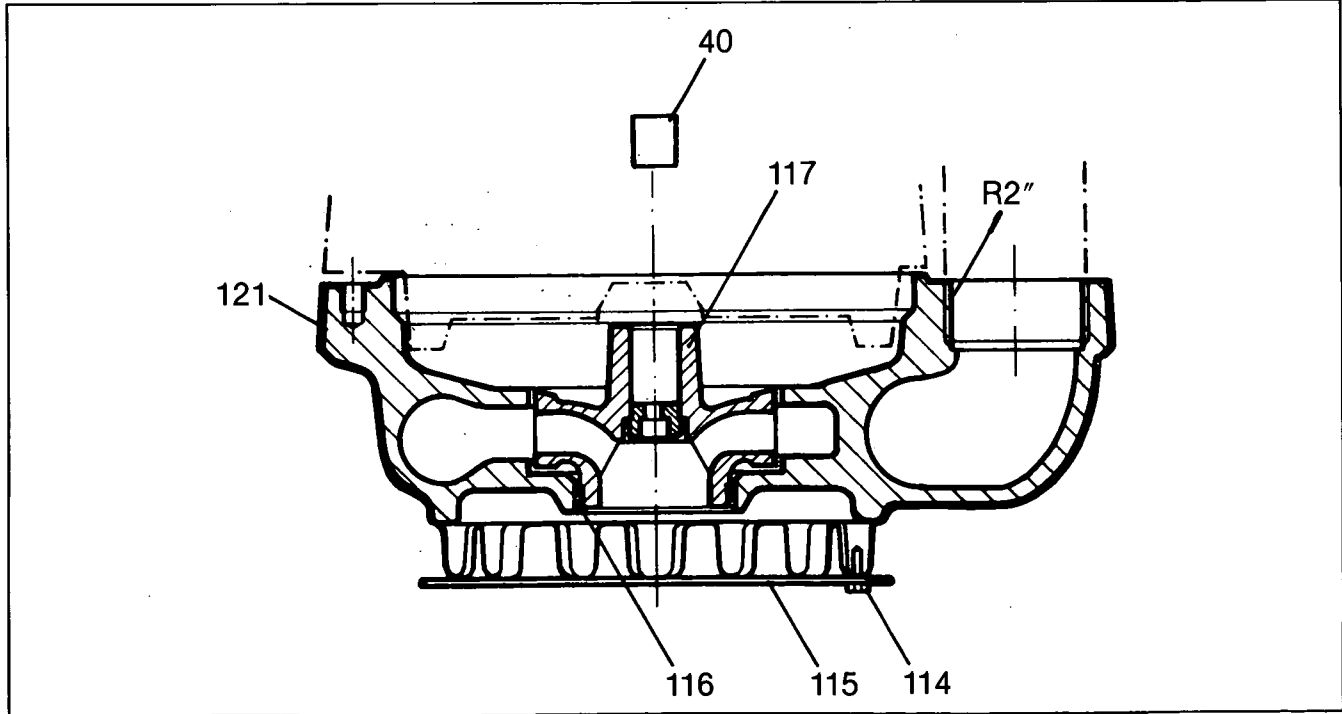


Item No	Part No.	Denomination	Benämning	Quantity
Pos. nr.	Detalj nr.	Bezeichnung	Designation	Antal
N° de repérage	N° de pièce			Anzahl
				Nombre

Pump parts, G-version  
 Pumpenteile, G-Ausführung

Pumpdetaljer, G-utförande  
 Pièces de la pompe, Modèle G

114	81 40 80	Screw (M6 x 15) Schraube	Skruv Vis	3
115	253 66 01	Strainer bottom Siebboden	Silbotten Fond de crépine	1
116	398 92 01	Wear ring Verschleißring	Slitring Anneau d'usure	1
117		IMPELLER LAUFRAD Curve No. Kurva nr Kurve Nr Courbe N°	PUMPHJUL ROUE Throughlet Genomlopp Durchgang Section de passage	1
	399 18 00	242, 50 Hz 1~, 3~	diam. 19 mm (0.76")	
	399 18 01	244, 50 Hz 1~, 3~ 60 Hz 3~	diam, 19 mm (0.76")	
121		PUMP CASING, DN 50 PUMPENGHÄUSE, DN 50	PUMPHUS, DN 50 VOLUTE, DN 50	1
	403 83 00	With connection R2" Med anslutning R2" Mit Anschluß R2" Avec connexion R2"  Throughlet diam. 17 mm (0.68") Durchgang	SMS 36 ISO/228-1961  Genomlopp Section de passage	

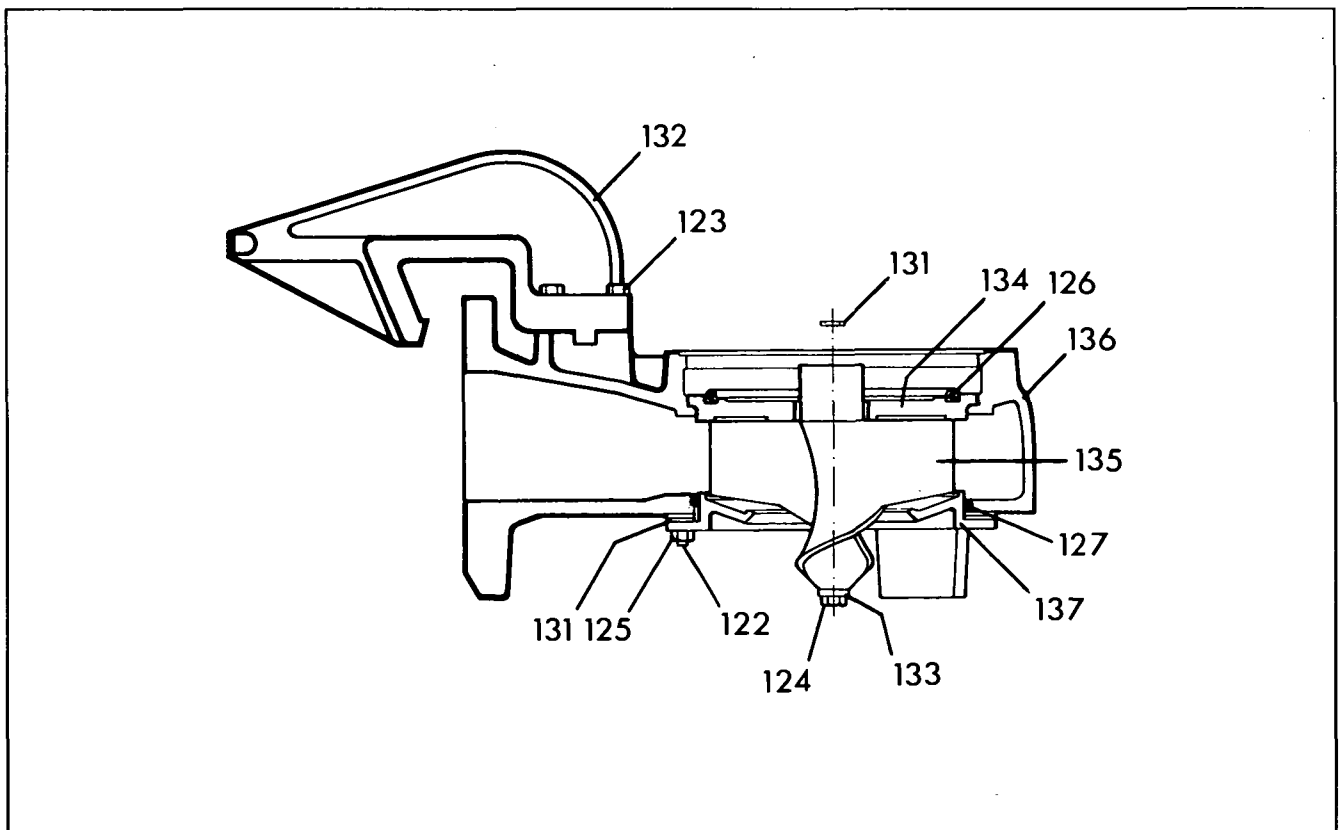




Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
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### Pump parts, F-version Pumpenteile, F-Ausführung

### Pumpdetaljer, F-utförande Pièces de la pompe, Modèle F

122	80 94 87	Stud (M8 x 40) Stiftschraube	Pinnskruv Goujo	3
123	81 41 58	Screw (M12 x 45) Schraube	Skruv Vis	4
124	82 03 12	Socket head screw (M8 x 115) Schraube	Insexskruv Vis allen	1
125	82 27 27	Nut (M8) Mutter	Mutter Ecrou	3
		O-RING O-RING	O-RING ANNEAU TORIQUE	
126	82 78 27	174.6 x 6.99		1
127	82 74 94	209.3 x 5.7		1
131		ADJUSTING WASHER JUSTIERSCHEIBE	JUSTERBRICKA RONDELLE DE REGLAGE	
	82 35 17	18 x 10 x 2		6
	250 23 02	18 x 10 x 0,25		27



Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
132	380 91 00	Sliding bracket Gleitklaue	Glidsko Glissière	1
133	403 94 00	Ring Ring	Ring Anneau	1
134		PUMP CASING COVER PUMPENGHÄUSEDECKEL	PUMPHUSLOCK COUVERCLE DE VOLUTE	1
	394 39 00 410 15 00	50 Hz 60 Hz		
135		IMPELLER, Curve No... LAUFRAD, Kurve Nr...	PUMPHJUL, Kurva nr... ROUE, Courbe N°...	1
	410 33 00 410 33 01 410 33 02 410 33 03	490, 50 Hz 3 ~ 492, 50 Hz 1 ~, 3 ~ 491, 60 Hz, 3 ~ 493, 60 Hz 1 ~, 3 ~		
136		PUMP CASING PUMPENGHÄUSE	PUMPHUS VOLUTE	1
	435 34 01	DN 100 4"	 SMS 342 BS 4622:1970 table 11 DIN 2533	
	435 34 05	DN 100 4"	 ANSI B 16.1:1967 table 5	
137	435 36 00	Pump casing bottom Pumpengehäuseboden	Suglock Fond de volute	1

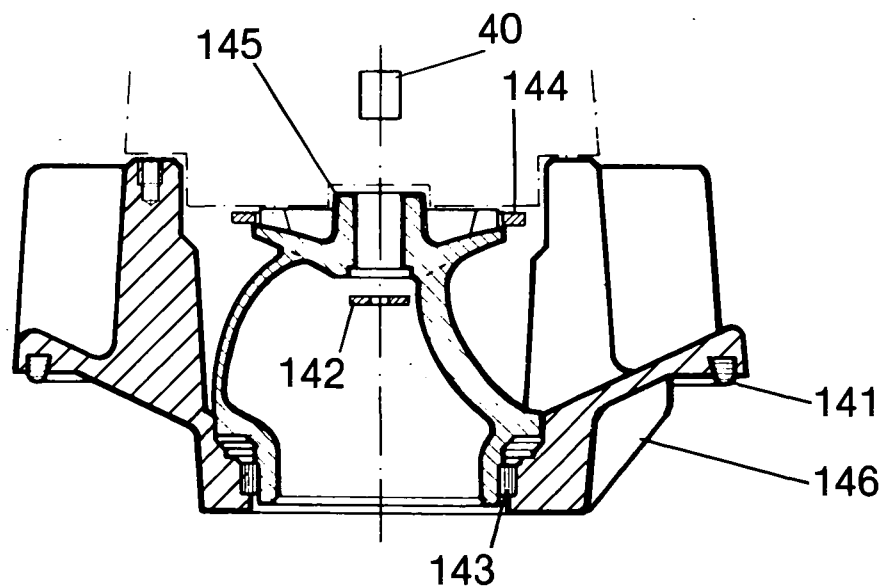
Item No Pos nr. Pos.-Nr. N° de répérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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**Pump parts, LL-version**  
**Pumpenteile, LL-Ausführung**

**Pumpdetaljer, LL-utförande**  
**Pièces de la pompe, Modèle LL**

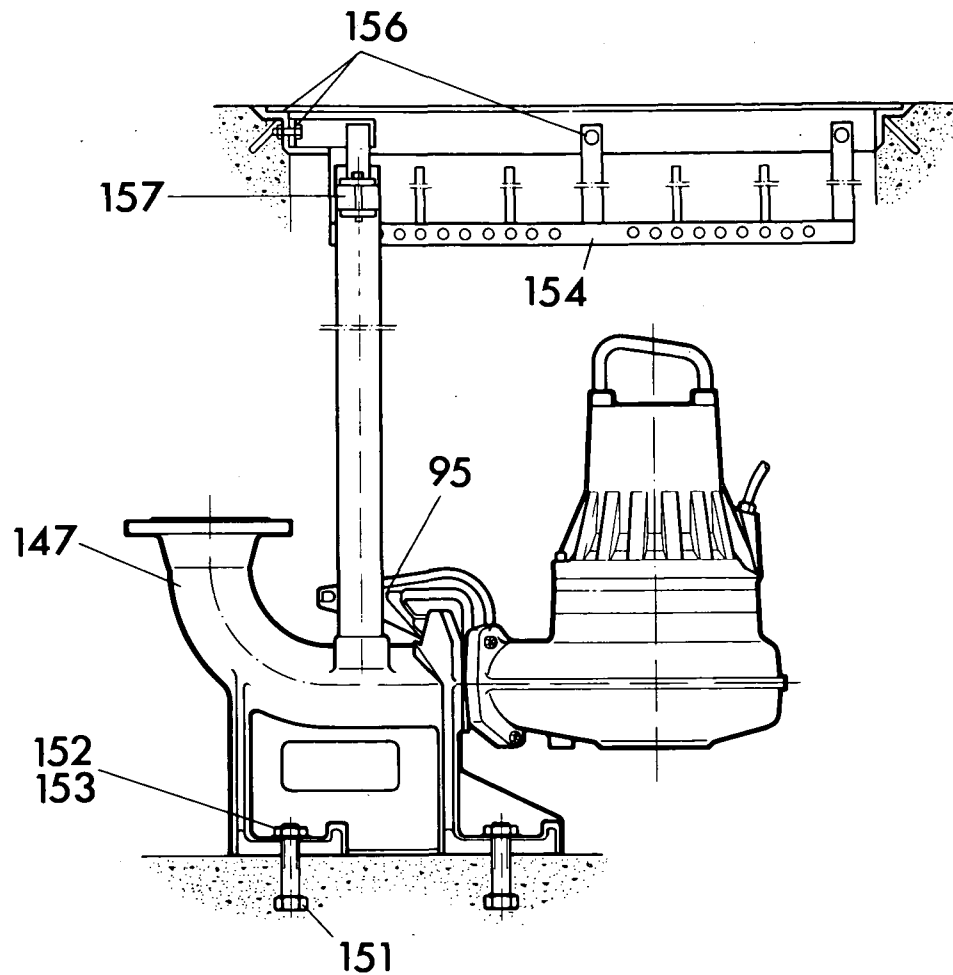
141	82 83 40	G-ring G-Ring	G-ring Anneau G	1
142	303 45 03	Washer Scheibe	Bricka Rondelle	1
143	314 88 01	Wear ring Verschleißring	Slitring Anneau d'usure	1
144	379 79 00	Washer Scheibe	Bricka Rondelle	1
145		IMPELLER, Curve No... LAUFRAD, Kurve Nr...	PUMPHJUL, Kurva nr... ROUE, Courbe N°...	1

	379 76 00	412, 50 Hz 3~	Genomlopp	Throughlet	diam. 100 mm (4.0")
	379 33 00	414, 50—60 Hz 3~	Durchgang	Section de passage	diam. 80 mm (3.2")
146	396 72 00	Diffuser Diffusor	Ledskenedel Anneau diffuseur		1

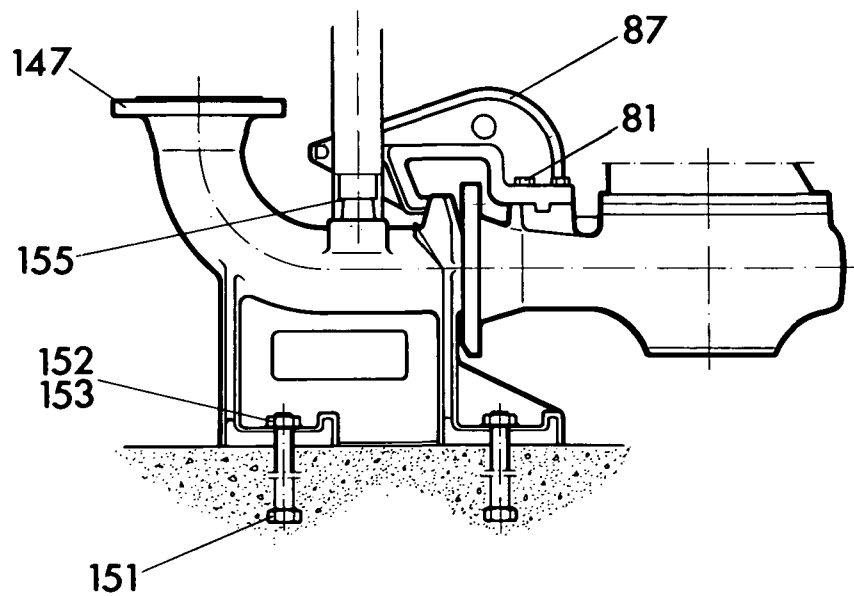




# CP, DP (MT, HT)



# CP (LT), FP



Item No Pos. nr. N° de répérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
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**Sump Components CP and FP 3085**

FP only in LT-version  
CP in all versions

**Schachteinbauteile CP und FP 3085**

FP nur in LT-Ausführung  
CP in alle Ausführungen

**Pumpgropsdetaljer CP och FP 3085**

FP endast i LT-utförande  
CP i samtliga utföranden

**Equipement du puisard CP et FP 3085**

FP seulement en modèle LT  
Tous les modèles CP

147

DISCHARGE CONNECTION  
ASSY.  
KUPPLUNGSFÜß

KOPPLINGSFOT  
PIED D'ASSISE

F/LT C/MT D/MT D/HT  
C/HT



444 68 00 DN 80 (3.2")  
540 13 00 DN 100 (4.0")

— 1 1 1  
1 1 1 —



540 13 01 DN 100 (4.0")  
540 13 05 DN 100 (4.0")

SMS 342, DIN 2533  
BS 4622:1970 Table 11  
ANSI B16.1:1967  
Table 5

1 1 1 —  
1 1 1 —



444 68 01 DN 80 (3.2")  
444 68 05 DN 80 (3.2")

SMS 342, DIN 2533,  
1882 Standard  
ANSI B16.1:1967  
Table 5

— 1 1 1  
— 1 1 1



444 68 07 DN 80 (3.2")

BS 4622:1970 Table 11

— 1 1 1

151 81 39 82 Screw (M20 x 120)  
Schraube  
152 82 23 62 Nut (M20)  
Mutter  
153 82 35 26 Washer (21 x 36)  
Scheibe  
154 251 36 00 Cable holder  
Kabelhalter  
155 255 47 00 Rubber sleeve  
Gummihülse

Skruv  
Vis  
Mutter  
Ecrou  
Bricka  
Rondelle  
Sladdhållare  
Fixe-câbles  
Mellanlägg  
Manchon




4  
4  
4  
1  
2

Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
156		ACCESS FRAME EINSTIEGRAHMEN	INMURNINGSRAMENHET CADRE DE TRAPPE D'ACCES	1
	304 18 00	Single station Black painted Einpumpenstation Schwartzgemalt	Enkel station Svartmålad Station simplex Peinte en noir	
	304 18 01	Single station Hot dip galv. Einpumpenstation Feuerverzinkte Station	Enkel station Varmgalvaniserad Station simplex Galvanisée à chaud	
157		UPPER GUIDE HOLDER OBERER FÜHRUNGS- ROHRHALTER	ÖVRE GEJDFÄSTE ATTACHE SUPERIEURE POUR BARRES DE GUIDAGE	1
	304 28 01	Hot dip galv. Feuerverzinkt	Varmförsinkad Galvanisée à chaud	

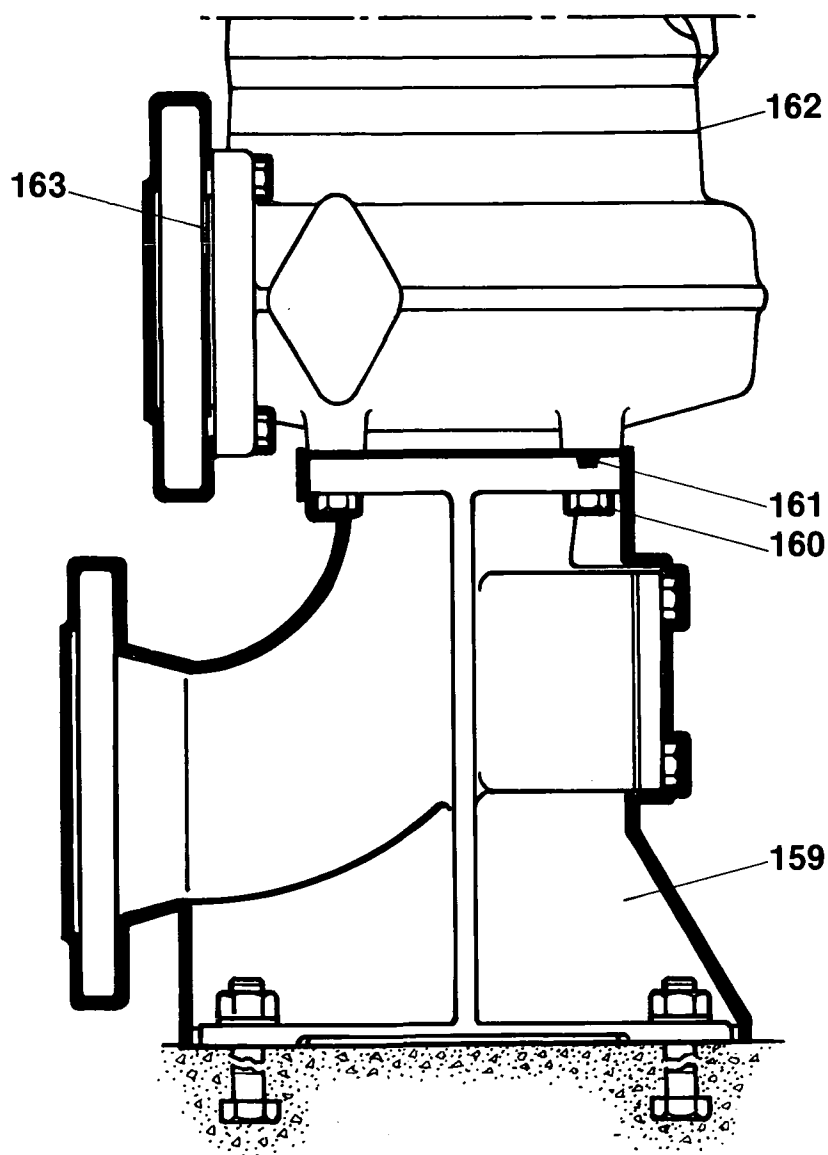
Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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## Sump Components CT Pumpenraum-Zubehör für CT

## Pumpgropsdetaljer CT Equipment complémentaire pour pompe CT

159		SUCTION PIPE UNIT SAUGROHREINHEIT	SUGRÖRSENHET CONDUITE D'ASPIRATION COMPLET	1
	303 72 00			
	303 72 01	 SMS 342, DIN 2533 BS 4622:1970 Table 11		
	303 72 05	 ANSI B 16.1:1967 Table 5 (USA)		
160		Screw M12 x 30 Schraube	Skruv Vis	4
161		O-ring 124.3 x 5.7 O-Ring	O-ring Anneau torique	1
162	82 78 49	O-ring 221.8 x 3.5 O-Ring	O-ring Anneau torique	1
163	310 05 01	Gasket Packung	Packning joint	1

CT 3085.181

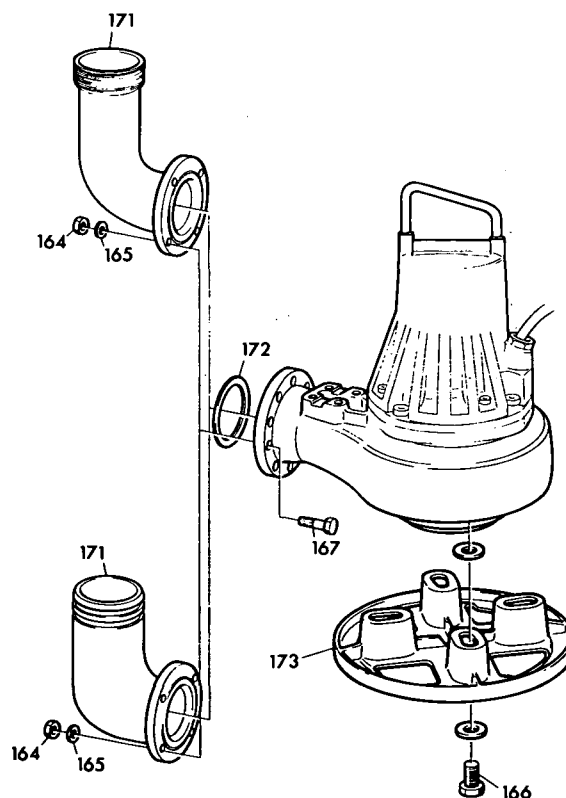


Item No Pos nr. Pos.-Nr. N° de répérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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**CS-version, LT**  
**CS-Ausführung, LT**

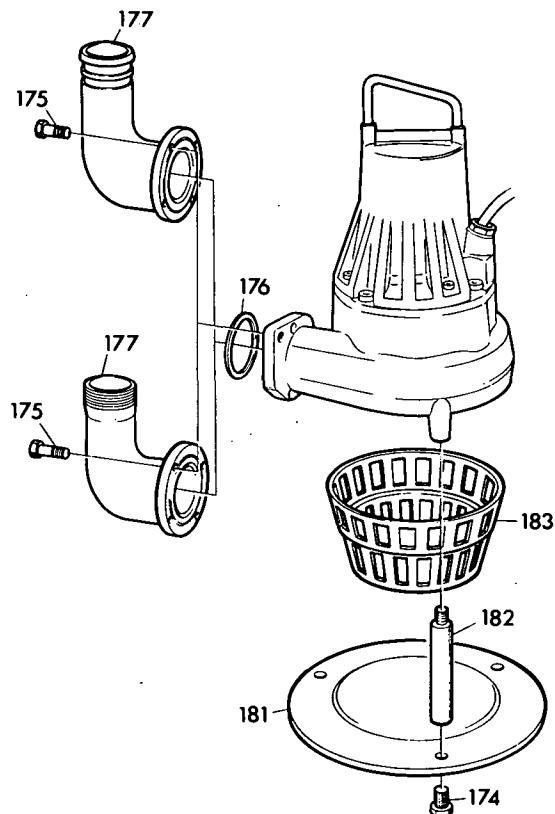
**CS-utförande, LT**  
**Modèle CS, LT**

164	82 23 62	Nut (M20) Mutter	Mutter Ecrou	4
165	82 35 26	Washer (21 × 36) Scheibe	Bricka Rondelle	4
166	84 3403	Screw (M16 × 40) Schraube	Skruv Vis	4
167	84 34 30	Screw (M20 × 60) Schraube	Skruv Vis	4
171		DISCHARGE CONNECTION SCHLAUCHSTUTZEN	SLANGANSLUTNING COUDE DE REFOULEMENT	1
	259 82 00 259 84 01	4" (for hose) R 4"		
172	259 83 00	Gasket Packung	Packning Joint	1
173	436 94 01	Stand unit Stativeinheit	Stativenhet Support complet	1



Item No Pos nr. Pos.-Nr. N° de répérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre	
				CF	CS
174	81 41 52	Screw (M12 x 20) Schraube	Skruv Vis	—	3
175	84 34 04	Screw (M16 x 45) Schraube	Skruv Vis	2	2
176	310 05 01	Gasket (3") Packung	Packning Joint	1	1
177		DISCHARGE CONNECTION SCHLAUCHSTUTZEN	SLANGANSLOTNING COUDE DE REFOULEMENT	1	1
	310 03 00	3" (for hose)			
	385 52 00	3—8 NPSM			
	385 52 01	R3"			
181	398 94 01	Base plate Grundplatte	Silbotten Plaque de fondation	—	1
182	398 95 00	Stud (M16/M12) Stiftschraube	Pinnskruv Goujon	3	3
183	398 96 00	Strainer Sieb	Sil Crépine	—	1

CF—CS, MT,  
DF—DS 4 pol 60 Hz



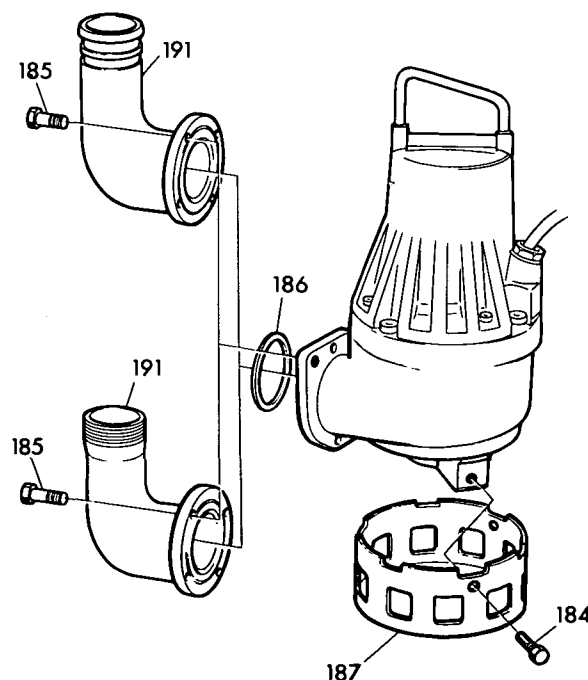
Item No Pos nr Pos.-Nr. N° de répérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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**CS-version, HT**  
**CS-Ausführung, HT**

**CS-utförande, HT**  
**Modèle CS, HT**

184	81 41 29	Screw (M10 × 20) Schraube	Skruv Vis	3
185	84 34 04	Screw (M16 × 45) Schraube	Skruv Vis	2
186	310 05 00	Gasket (3") Packung	Packning Joint	1
187	384 07 00	Strainer (size of hole 32 × 35 mm) Sieb (Lochgrösse 32 × 35 mm)	Sil (hålstorlek 32 × 35 mm) Crépine (grandeur de trou 32 × 35 mm)	1
191		DISCHARGE CONNECTION SCHLAUCHSTUTZEN	SLANGANSLUTNING COUDE DE REFOULEMENT	1

310 03 00 3" (for hose)  
385 52 00 3—8 NPSM  
385 52 01 R 3"



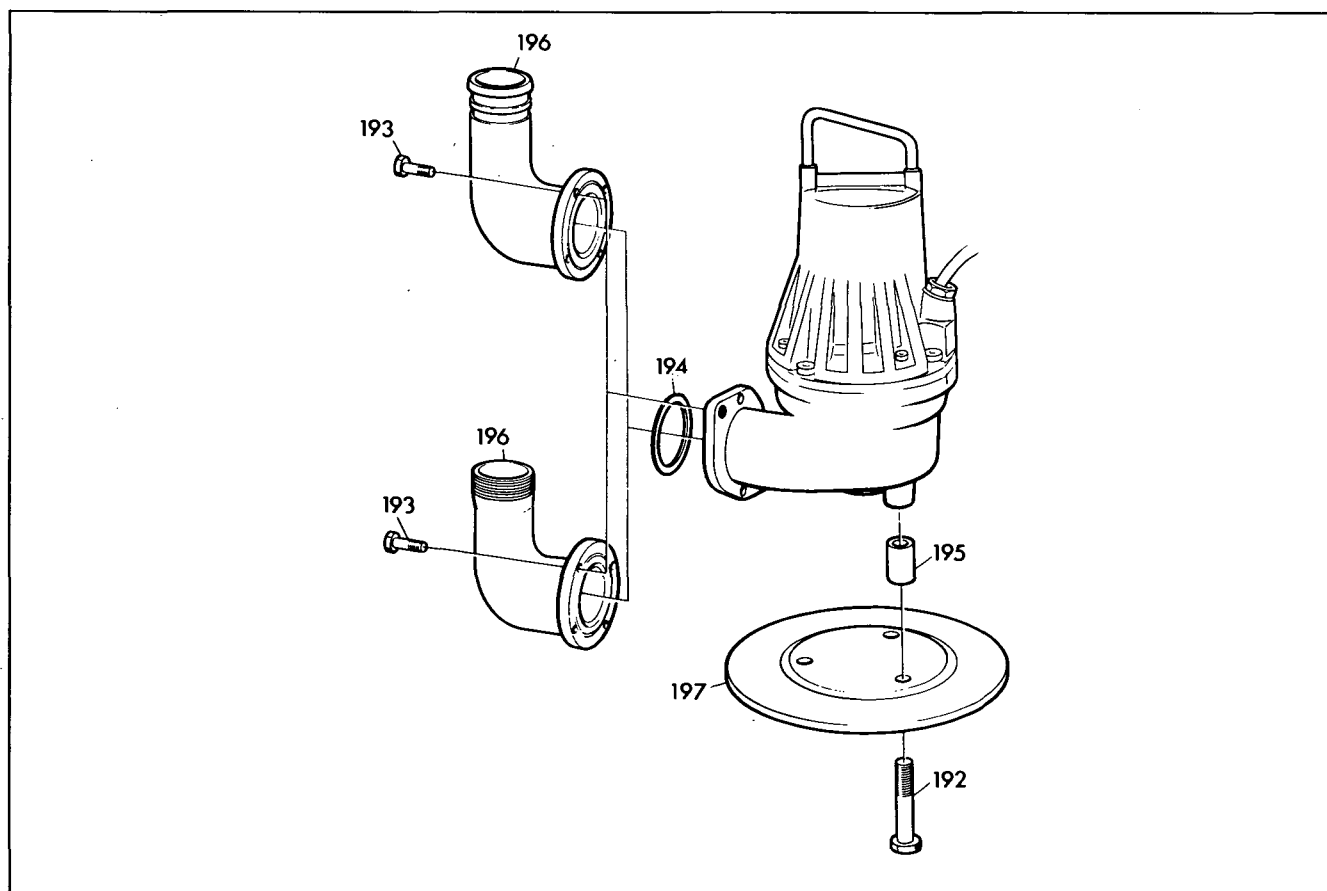


Item No Pos. nr. Pos.-Nr. N° de répérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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**DS-version, 2 pole**  
**DS-Ausführung, 2 pol.**

**DS-utförande, 2 pol.**  
**Modèle DS, 2 pôles**

192	81 41 37	Screw (M10 x 55) Schraube	Skruv Vis	3
193	84 34 04	Screw (M16 x 45) Schraube	Skruv Vis	2
194	310 05 00	Gasket (3") Packung	Packning Joint	1
195	345 24 00	Sleeve Hülse	Hylsa Douille	3
196		DISCHARGE CONNECTION SCHLAUCHSTUTZEN	SLANGANSLUTNING COUDE DE REFOULEMENT	1
	310 03 00 385 52 00 385 52 01	3" (for hose) 3—8 NPSM R3"		
197	398 94 01	Base plate Grundplatte	Silbotten Plaque de fondation	1

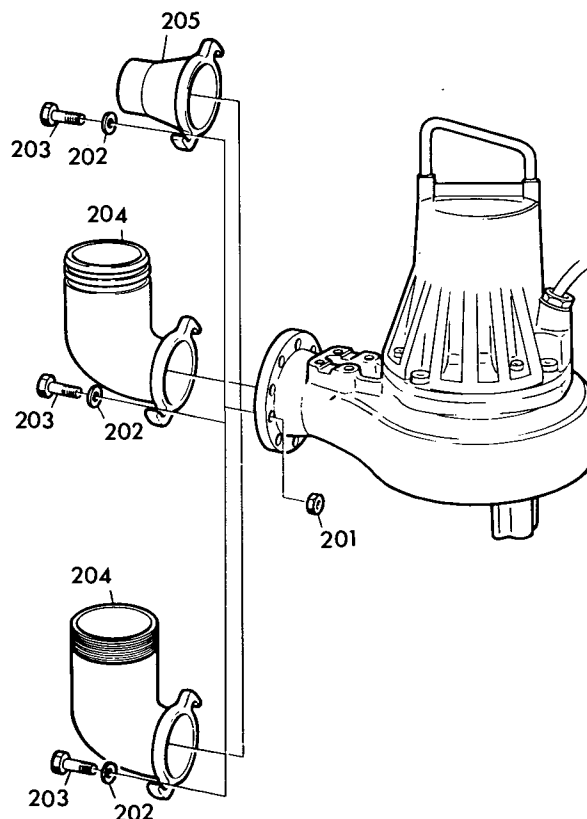


Item No Pos nr. Pos.-Nr. N° de répérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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## FS-version FS-Ausführung

## FS-utförande Modèle FS

201	82 23 61	Nut (M16) Mutter	Mutter Ecrou	2
202	82 37 29	Washer (17 × 42) Scheibe	Bricka Rondelle	2
203	84 34 11	Screw (M16 × 80) Schraube	Skruv Vis	2
204		DISCHARGE CONNECTION SCHLAUCHSTUTZEN	SLANGANSLUTNING COUDE DE REFOULEMENT	1
	391 40 00 391 41 00	4" (for hose) 4—8 NPSM		
205	391 44 00	Nozzle Düse	Munstycke Suceuse	1



Item No Pos.-Nr. N° de répérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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## LL-installation LL-Montage

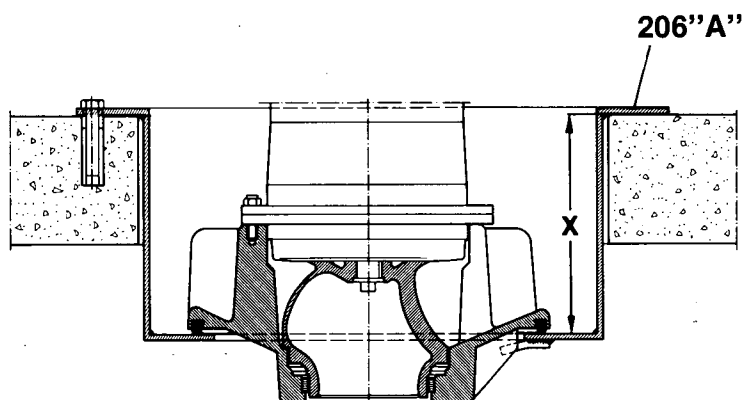
## LL-installation LL-installation

206		BOTTOM PLATE BODEN-PLATTE	BOTTENPLATTA PLAQUE DE FONDATION	1
	**416 12 00	For LL, type A Für LL, Typ A	För LL, typ A Pour LL, modèle A	
	416 13 00	For LL, type B Für LL, Typ B	För LL, typ B Pour LL, modèle B	

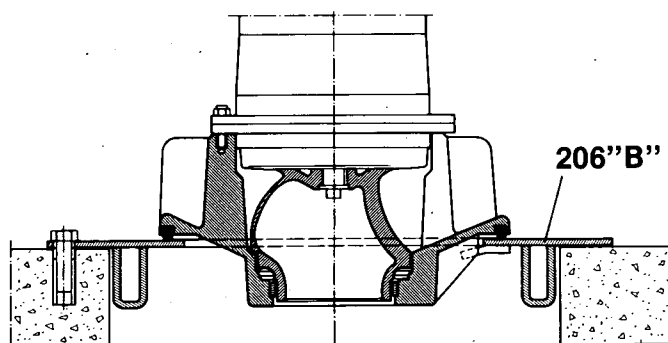
\*\* When placing orders, please state dimension "X"  
Bei Bestellung bitte das Maß "X" angeben

Ange måttet "X" v id beställning  
Veuillez indiquer la cote "X" à la commande

LL



LL



Item No Pos. nr. Pos.-Nr. N° de répérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
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		HOSE SCHLAUCH	SLANG TUYAU	1
		Flygt Standard	2-ply 2 Gewebeeinlagen	2 kordlager double armature
	94 06 28	3" 10, 20, 40 m (33, 66, 132 ft)		
	94 06 29	4" 5, 10, 20, 40 m (16.5, 33, 66, 132 ft)		
		Flygt High Head	2-ply 2 Gewebeeinlagen	2 kordlager double armature
	94 06 58	3" 10, 20, 40 m (33, 66, 132 ft)		
	94 06 59	4" 5, 10, 20, 40 m (16.5, 33, 66, 132 ft)		
		Flygt PVC Standard	1-ply 1 Gewebeeinlagen	1 kordlager mono-armature
	94 06 65	3" 10, 20, 40 m (33, 66, 132 ft)		
	94 06 66	4" 5, 10, 20, 40 m (16.5, 33, 66, 132 ft)		
		Flygt PVC Superior	2-ply 2 Gewebeeinlagen	2 kordlager double armature
	94 06 70	3" 10, 20, 40 m (33, 66, 132 ft)		
	94 06 71	4" 5, 10, 20, 40 m (16.5, 33, 66, 132 ft)		

### Sump components, FS-version Schachteinbauteile, FS-Ausführung

### Pumpgropsdetaljer, FS-version Équipement du puisard, Modèle FS

211	82 93 53	Chain sling Kette	Kättinglänga Chaîne	1
212	404 90 01	SLIDING BRACKET UNIT GLEITKLAUEEINHEIT	STYRKLOENHET GLISSIÈRE COMPLET	1
213	82 35 23	Washer (17 x 30) Scheibe	Bricka Rondelle	(8)
214	84 34 03	Screw (M16 x 40) Schraube	Skruv Vis	(2)
215	80 65 94	Lock pin Querstift	Sprint Goupille de blocage	(1)
216	404 93 01	Sliding bracket Gleitklau	Styrklo Glissière	(1)
217	404 97 00	Guide bar holder, lower Unterer Führungsrohr-Halter	Gejdrörsfäste, nedre Attache inf. pour barres de guidage	1

Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
221	404 98 00	HANDLE UNIT GRIFFEINHEIT	HANDTAGSENHET MANETTE COMPLET	1
222	82 23 59	Nut (M12) Mutter	Mutter Ecrou	(1)
223	82 35 20	Washer (13 x 24 x 2) Scheibe	Bricka Rondelle	(2)
224	81 39 37	Screw (M12 x 140) Schraube	Skruv Vis	(1)
	*	Handle Griff	Handtag Poignée	(1)
225	495 57 00	LIFTING DAVIT UNIT DREHKRANEINHEIT	LYFTBOMSENHET GRUE COMPLET	1
226	82 33 14	Shackle Schäkel	Schackel Manille	(3)
227	84 36 30	Hook Haken	Krok Crochet	(2)
231	466 41 00	Lifting davit Drehkran	Lyftbom Grue	(1)
232		GUIDE BAR HOLDER, UPPER OBERER FÜHRUNGS- ROHR-HALTER	GEJDRÖRSFÄSTE, ÖVRE ATTACHE SUP. POUR BARRES DE GUIDAGE	1
	405 77 00	For on-side fitting Für Seitenmontage	För sidmontage Pour montage latérale	
	408 05 00	For on-top fitting Für Obenmontage	För toppmontage Pour montage supérieur	
233	410 13 00	Base bearing Grundlager	Bottenlager Roulement de fondation	1
234	499 69 00	GUIDE, ring unit ROHRLAGER, einheit	GEJD, ringenhet ANNEAU DE GUIDAGE	1
235	81 73 62	Slotted screw (M5 x 25) Schlitzschraube	Spårskruv Vis	(4)
	*	Plastic bearing Plastik Lager	Plastlager Anneau, plastique	(2)
236	410 23 00	Protective washer Schutzscheibe	Skyddsbricka Disque de protection	2

\* Not separately delivered  
Nicht separat geliefert

Levereras ej separat  
N'est pas livré séparément

Item No	Part No.	Denomination	Benämning	Quantity
Pos. nr.	Detail nr.	Bezeichnung	Benämning	Antal
Pos. Nr.	Bestell-Nr.	Bezeichnung	Désignation	Anzahl
N° de répérage	N° de pièce			Nombre

## Accessories and tools Zubehör und Werkzeug

## Tillbehör och verktyg Accessoires et outillage

	HOSE CLAMP SCHLAUCHSCHELLE	SLANGKLÄMMA COLLIER DE SERRAGE POUR TUYAU
82 31 33	3"	
82 31 36	4"	
	SET OF ZINC ANODES ZINKANODENSATZ	ZINKANODSATS JEU D'ANODES
443 26 00	LT	
443 26 01	HT	
443 26 02	GF	
443 26 03	D	
443 26 04	MT	
443 26 05	Motor unit Motoreinheit	Motordel Unité motrice
463 78 00	Assembling tool Montagewerkzeug	Monteringsverktyg Outil de montage

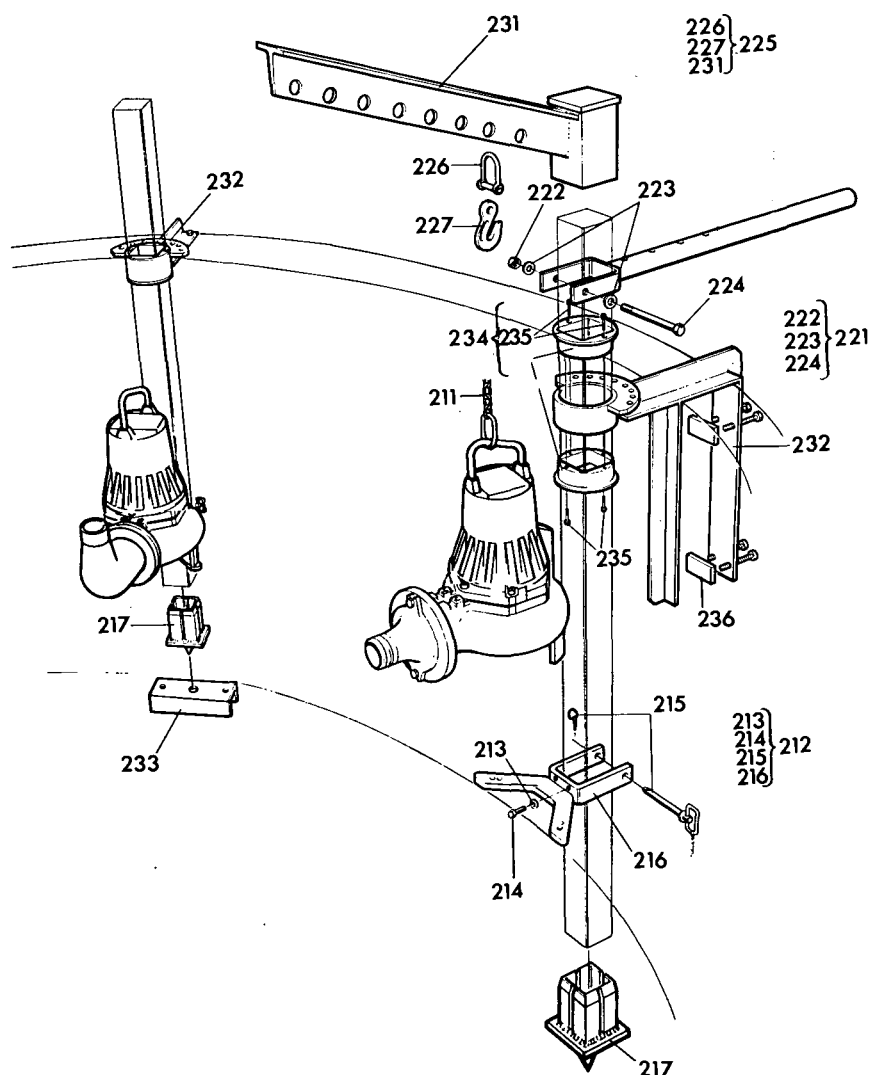
## Sump Components FS

(Not valid for USA, see accessory parts list.)

## Schachteinbauteile FS

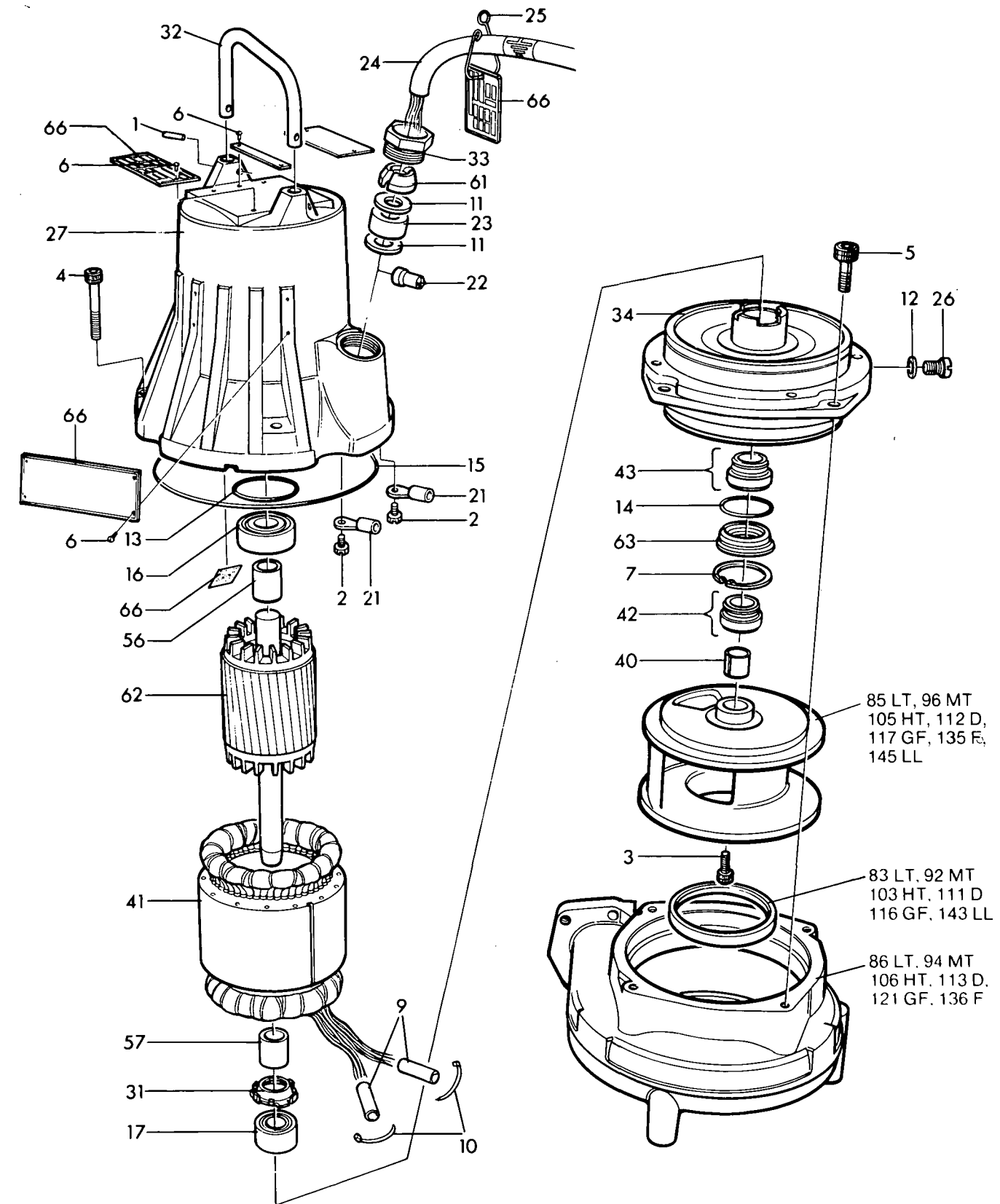
## Pumpgropsdetaljer FS

## Equipement du puisard FS



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# NOTES







3085.181.07.20. Int. 7M. 12.93 © FLYGT AB

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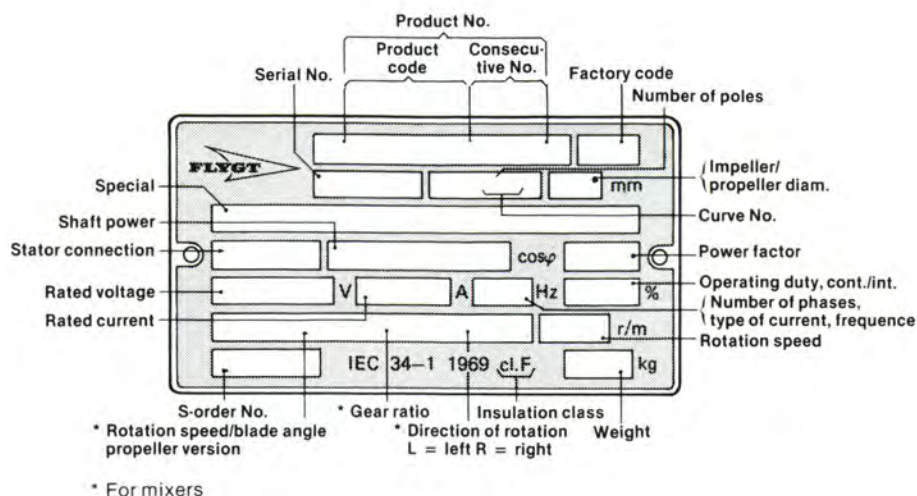


## INSTALLATION, CARE AND MAINTENANCE



890483/04

## DATA PLATE INTERPRETATION



Flygt undertakes to remedy faults in products sold by Flygt provided:

- that the fault is due to defects in design, materials or workmanship;
- that the fault is reported to Flygt or Flygt's representative during the guarantee period;
- that the product is used only under conditions described in the care and maintenance instructions and in applications for which it is intended;
- that the monitoring equipment incorporated in the product is correctly connected;
- that all service and repair work is done by a workshop authorized by Flygt;
- that genuine Flygt parts are used.

Hence, the guarantee does not cover faults caused by deficient maintenance, improper installation, incorrectly executed repair work or normal wear and tear.

Flygt assumes no liability for either bodily injuries, material damages or economic losses beyond what is stated above.

Flygt guarantees that a spare parts stock will be kept for 15 years after the manufacture of this product has been discontinued.

The manufacturer reserves the right to alter performance, specification or design without notice.

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# PRODUCT DESCRIPTION

## Applications

3300 is intended to be used for:

- pumping of waste water
- pumping of raw or clean water
- pumping of sludge

The pump is available in the following versions:

**The basic model**, which is designed to pump liquids containing solid particles, such as waste water. The pump casing and the one- or two-vane impellers allow solid particles with diameters of up to 190 mm (7.5") to pass.

**CP** = for permanent installation in a sump. The pump slides down along the guide arrangement and connects automatically to a discharge connection.

**CS** = portable, with hose connection, stand and strainer.

**CT** = for dry stationary installation on a base and directly connected to the inlet and outlet lines.

**The raw and clean water model (RP, RT)**, which is used for pumping clean or raw water. The R version (RP, RT) has a six-vane impeller and a throughlet of up to 37 mm (1.5").

**RP** = for permanent installation in a sump. The pump slides down along the guide arrangement and connects automatically to a discharge connection.

**RT** = for dry stationary installation on a base and directly connected to the inlet and outlet lines.

### The lift model

**LL** = a pump in the Flygt series of submersible lift pumps intended for land drainage systems. The pump system can be used for drainage of temporarily flooded land or low-lying land.

**Liquid temperature:** max. 40°C (105°F)

**Liquid density:** max. 1100 kg/m<sup>3</sup> (9.2 lb per US gal.)

The pumped liquid may contain particles up to a size which corresponds to the throughlet of the pump.

**The pH of the pumped liquid:** 6—11.

**Depth of immersion:** max. 20 m (65 ft).

### WARNING!

**The pump may not be used in an explosive or flammable environment or for pumping flammable liquids.**

For other applications, than the above, contact your nearest Flygt representative for information.

## Weights

Weight without motor cable: kg ( lb).

Pump type	Pump unit	Discharge connection
CP 3300 LT	998 (2198)	210 (463)
CP 3300 MT	1096 (2414)	207 (456)
CP 3300 HT	935 (2059)	64 (141)
CS 3300 LT	1045 (2301)	incl. hose conn and base stand
CS 3300 MT	1176 (2590)	
CS 3300 HT	1003 (2209)	
RP 3300 HT	820 (1806)	Discharge connection
		64 (141)
CT 3300 LT	1229 (2707)	incl. inlet bend and base stand
CT 3300 MT	1236 (2722)	
CT 3300 HT	1043 (2297)	
RT 3300 HT	943 (2077)	
LL 3300 LT	840 (1850)	

## Materials

		DIN	BS	AISI
Major castings, Impeller, Hydraulic parts	Cast iron	1691 GG 25	1452: Grade 260	ASTM No 35B
Outer casing	Steel	17100	4360:	A284
Cooling Jacket	Galvanized	RST 37-2	Grade 40 B	Grade D A 573
Lifting Handle				Grade 65
Shaft	Steel	17200 C 35	970 080M36	C 1035
Screws, Studs, and Nuts	Stainless Steel	X5CrNi 18 10	970:1 1449:2 304 S31	304 UNS/ S30400
O-Ring	Nitrile Rubber			
Stationary Wear Ring	Nitrile Rubber Steel			
Stationary Wear ring	Brass	1705 Gz-Rg 5	1400 LG 2	B584
Rotating Wear Ring	Stainless steel	X5CrNi 18 10	970:1 1449:2 304 S31	304 UNS/ S30400
Mechanical Face Seals:	Inner Stationary: Tungsten Carbide Inner Rotating: Tungsten Carbide Outer Stationary: Tungsten carbide Outer Rotating: Tungsten carbide			

### Surface treatment

Impeller: Sprayed with a primer.  
Outer Casing: After priming the outer casing is coated with black chlorinated rubber paint.

## Motor data

**50 Hz, 27 kW, 730 r/min  
3~, 8-Pole**

Voltage V	Rated current A	Starting current A
220	114	610
230	96	485
380	58	273
400	56	281
415	53	236
500	44	194
660	33	158
690	32	169

**50 Hz, 34 kW, 975 r/min  
3~, 6-Pole**

Voltage V	Rated current A	Starting current A
220	116	770
230	112	835
380	67	435
400	65	475
415	61	385
500	51	315
660	39	253
690	37	274

**60 Hz, 45 hp (34 kW)  
875 r/min, 3~, 8-Pole**

Voltage V	Rated current A	Starting current A
230	118	620
460	60	305
575	48	202
600	46	214

**60 Hz, 60 hp (45 kW)  
1780 r/min, 3~, 4-Pole**

Voltage V	Rated current A	Starting current A
230	160	1110
460	77	485
575	59	320
600	57	370

**50 Hz, 37 kW, 725 r/min  
3~, 8-Pole**

Voltage V	Rated current A	Starting current A
220	138	815
230	134	675
380	80	355
400	77	390
415	73	315
500	61	251
660	46	206
690	44	220

**50 Hz, 40 kW, 1475 r/min,  
3~, 4-Pole**

Voltage V	Rated current A	Starting current A
220	139	810
230	137	860
380	82	490
400	78	490
415	74	435
500	61	345
660	47	288
690	45	280

**60 Hz, 60 hp (45 kW)  
1170 r/min, 3~, 6-Pole**

Voltage V	Rated current A	Starting current A
230	146	900
460	73	485
575	58	325
600	56	345

**60 Hz, 60 hp (45 kW)  
875 r/min, 3~, 8-Pole**

Voltage V	Rated current A	Starting current A
230	159	785
460	80	395
575	64	260
600	60	275

**50 Hz, 44 kW, 975 r/min  
3~, 6-Pole**

Voltage V	Rated current A	Starting current A
220	149	885
230	143	950
380	87	535
400	82	515
415	79	490
500	66	375
660	50	310
690	47	310

**50 Hz, 54 kW, 1470 r/min  
3~, 4-Pole**

Voltage V	Rated current A	Starting current A
220	185	220
230	175	990
380	107	530
400	100	535
415	98	465
500	82	430
660	62	315
690	58	330

**60 Hz, 75 hp (56 kW)  
1170 r/min, 3~, 6-Pole**

Voltage V	Rated current A	Starting current A
230	178	975
460	91	555
575	73	385
600	70	405

**60 Hz, 88 hp (66 kW)  
1770 r/min, 3~, 4-Pole**

Voltage V	Rated current A	Starting current A
230	224	995
460	108	570
575	86	380
600	82	400



## Performance curves

Each pump is tested in accordance with ISO 2548 class C standard.

8XX, 6XX, 4XX = curve numbers

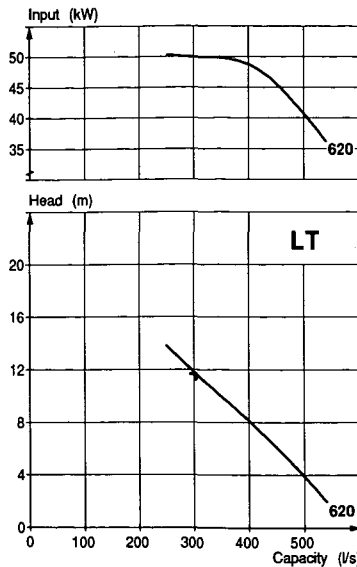
└ = best operating point

LT = low-head version

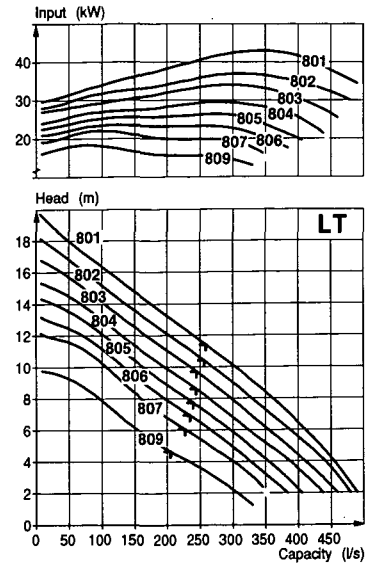
MT = medium-head version

HT = high-head version

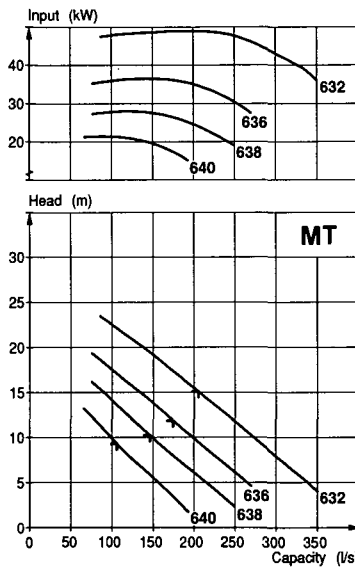
50 Hz, C 3300



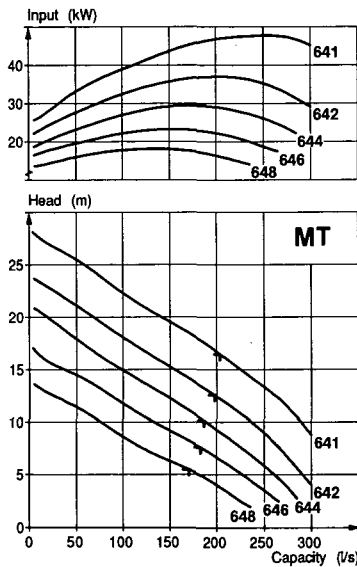
50 Hz, C 3300



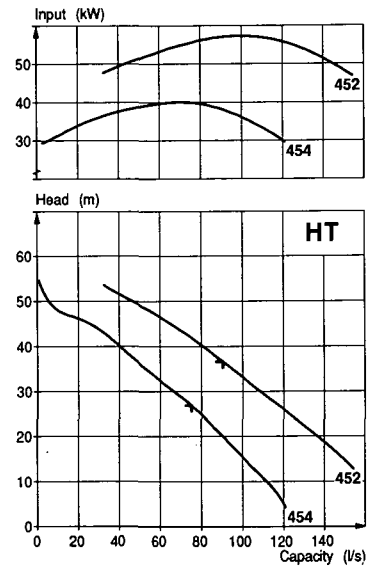
50 Hz, C 3300



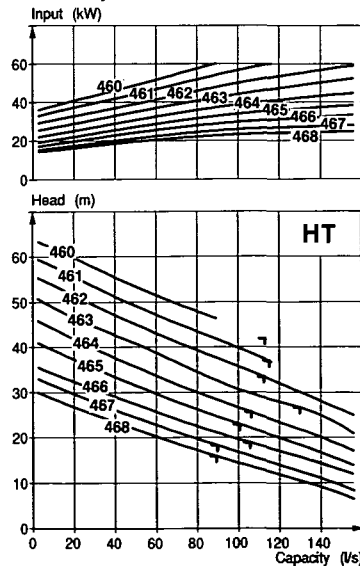
50 Hz, C 3300



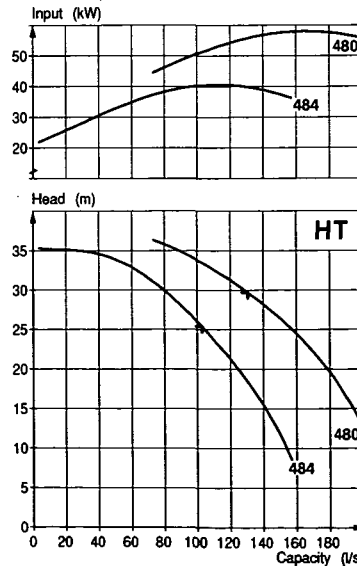
50 Hz, C 3300



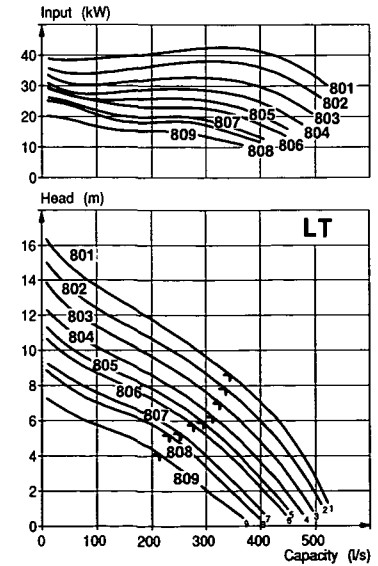
50 Hz, C 3300



50 Hz, R 3300



50 Hz, L 3300



## Performance curves

Each pump is tested in accordance with ISO 2548 class C standard.

8XX, 6XX, 4XX = curve numbers

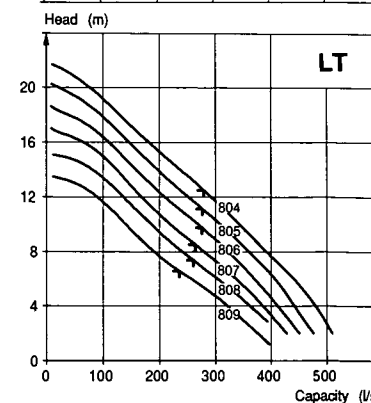
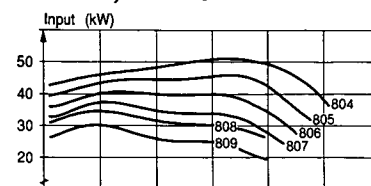
└ = best operating point

LT = low-head version

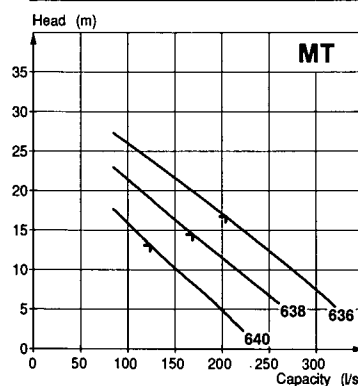
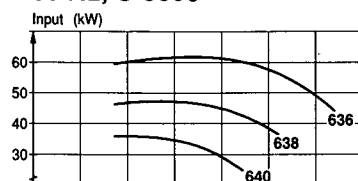
MT = medium-head version

HT = high-head version

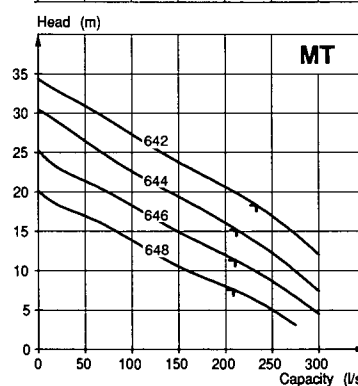
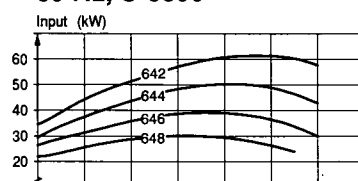
60 Hz, C 3300



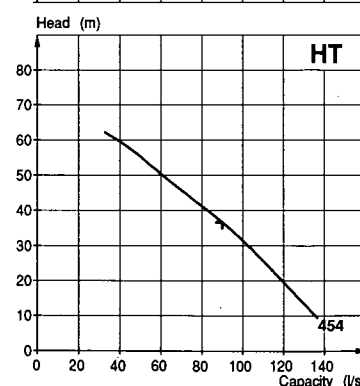
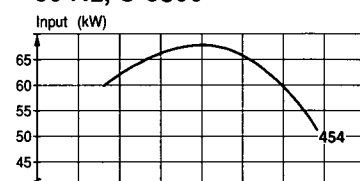
60 Hz, C 3300



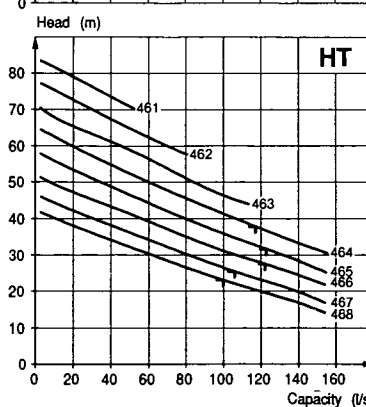
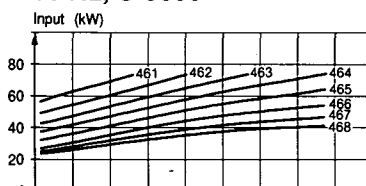
60 Hz, C 3300



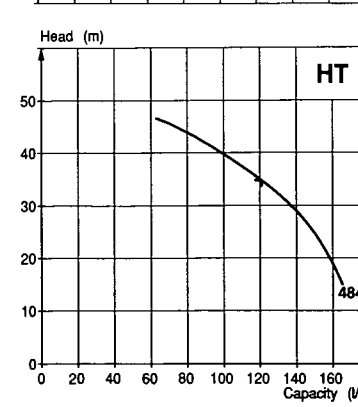
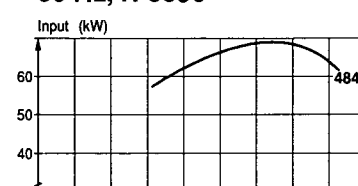
60 Hz, C 3300



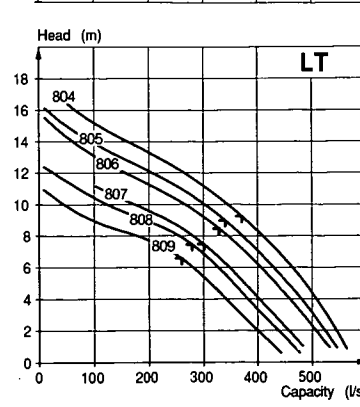
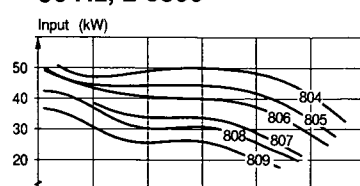
60 Hz, C 3300



60 Hz, R 3300



60 Hz, L 3300



## Design

### Motor

Squirrel-cage 3-phase induction motor for 50 Hz or 60 Hz.

The motor is started by means of direct on-line or star-delta start.

The motor can be run continuously or intermittently with a maximum of 15 evenly spaced starts per hour.

Flygt motors are tested in accordance with IEC 34-1.

The stator is insulated in accordance with class F (155°C, 310°F). The motor is designed to supply its rated output at  $\pm 5\%$  variation of the rated voltage. Without overheating the motor,  $\pm 10\%$  variation of the rated voltage can be accepted provided that the motor does not run continuously at full load. The motor is designed to operate with a voltage imbalance of up to 2 % between the phases.

### Bearings

The support bearing of the rotor consists of a single-row roller bearing.

The main bearing of the rotor consists of a two-row angular contact ball bearing.

### Cooling

The stator is cooled by the circulation of a portion of the pumped liquid in the space between the stator casing and the cooling jacket.

### Shaft seals

The pump has two mechanical seals.

Materials:

Inner seal: tungsten carbide — tungsten carbide.

Outer seal: tungsten carbide — tungsten carbide.

### Oil casing

The oil lubricates and cools the seals and acts as a buffer between the pump casing and the electric motor.

Pressure build-up within the oil casing is reduced by means of a built-in air volume.

### Shaft

The shaft is delivered with the rotor as an integral part.

Shaft material: carbon steel.

### Monitoring equipment

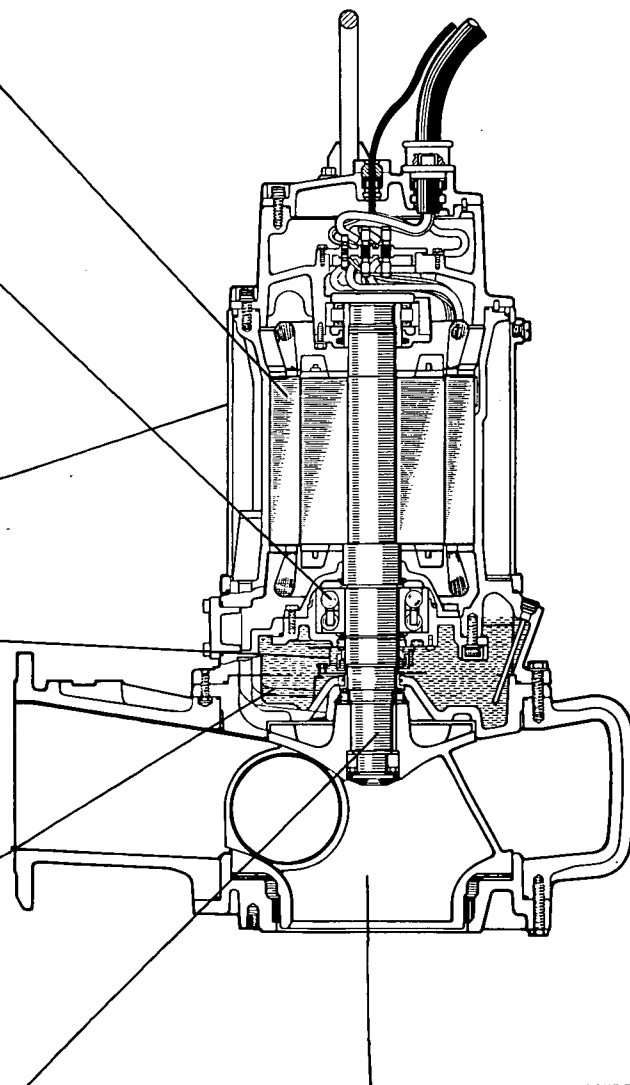
The stator incorporates three thermal switches connected in series that activate an alarm.

The thermal switches: open at 125°C (260°F).

The transducers shall be connected to Flygt's monitoring unit or equivalent unit.

The monitoring equipment shall be of a design that makes automatic restart impossible.

3300 is available with leakage sensors for sensing the presence of any water in the oil and/or stator housing.



### Impellers

The pump is available with the following types of impellers:

- single or two-vane impeller of cast iron (HT, MT)
- three-vane impeller of cast iron (LT)
- multi-vane impeller of cast iron (RP, RT)



## TRANSPORTATION AND STORAGE

The pump may be transported and stored in a vertical or horizontal position. Make sure that it cannot roll or fall over.

**Warning!**  
**Always lift the pump by its carrying handle or lifting eyes, never by the motor cable or the hose.**

The pump is frostproof as long as it is operating or is immersed in the liquid. If the pump is taken up when the temperature is below freezing, the impeller may freeze. The pump shall be operated for a short period after being taken up in order to expel all remaining water.

A frozen impeller can be thawed by allowing the pump to stand immersed in the liquid for a short period before it is started. Never use a naked flame to thaw the pump.

For longer periods of storage, the pump must be protected against moisture and heat. The impeller should be rotated by hand occasionally (for example every other month) to prevent the seals from sticking together. If the pump is stored for more than 6 months, this rotation is mandatory.

After a long period of storage, the pump should be inspected before it is put into operation. Pay special attention to the seals and the cable entry.

Follow the instructions under the heading "Before starting".

## INSTALLATION

### Safety precautions

In order to minimize the risk of accidents in connection with the service and installation work, the following rules should be followed:

1. Never work alone. Use a lifting harness (part No. 84 33 02), safety line (part No. 84 33 03) and a respirator (part No. 84 33 01), as required. Do not ignore the risk of drowning!
2. Make sure there are no poisonous gases within the work area.
3. Check the explosion risk before welding or using electric hand tools.
4. Do not ignore health hazards. Observe strict cleanliness.
5. Bear in mind the risk of electrical accidents.
6. Make sure that the lifting equipment is in good condition.
7. Provide a suitable barrier around the work area, for example a guard rail.
8. Make sure you have a clear path of retreat!
9. Use safety helmet, safety goggles and protective shoes.

10. All personnel who work with sewage systems shall be vaccinated against diseases that can occur.
11. A first-aid kit must be handy.

Follow all other health and safety rules and local codes and ordinances.

### Handling equipment

Lifting equipment is required for handling the pump.

The lifting equipment shall be able to hoist the pump straight up and down in the sump, preferably without necessitating resetting the lifting hook.

Oversize lifting equipment could cause damage if pump gets stuck when being lifted.

Make sure that the lifting equipment is securely anchored.

Two sets of lifting equipment are required to handle the pump for repair work.

**WARNING!** Keep out from under suspended loads.

## Installation alternatives

### CP and RP version

In the CP and RP version, the pump is installed on a stationary discharge connection and operates completely or partially submerged in the pumped liquid.

In addition to the pump, the following items are required:

#### Guide bars

**Guide bracket** for attaching the guide equipment to the access frame or to the upper part of the sump.

**Level sensors or other control equipment** for start, stop and alarm.

**Cable holder** for holding the cable and regulating the height of the level sensors.

**Access frame** (with covers) to which the upper guide bar bracket and cable holder can be attached.

**Discharge connection** for connecting the pump to the discharge line. The discharge connection has a flange which fits the pump casing flange and a bracket for attaching the guide equipment.

**Bushings** for vibration damping between the guide bars and the discharge connection.

See dimension page 10.

### CP and RP installation

All dimensions are in mm (in).

Provide a barrier around the pump pit, for example a guard rail.

Arrange for a cable between the sump and the electric control box. Make sure that the cables are not sharply bent or pinched.

**NOTE!** The end of the cable must not be submerged. Leads have to be above flood level, as water may penetrate through the cable into the junction box or the motor.

Place the access frame in position.

Align the frame so that it is horizontal and then grout it in place.

Grout the anchor bolts in place. Be careful when aligning and positioning the discharge connection in relation to the access frame.

See dimensional drawing.

Place the discharge connection in position and tighten it.

Secure the guide equipment in the brackets.

Check that the guide equipment is placed vertically by using a level or a plumb line.

Connect the discharge pipe to the discharge connection.

Bolt the cable holder to the access frame. Thread the level regulator cables through the holes in the cable holder and adjust the height of the sensors.

It is recommended that the level regulators be used with low voltage. The data sheet delivered with the regulators gives the permissible voltage. Local rules may specify otherwise.

Protect bolts and nuts with corrosion preventive compound.

Lower the pump along the guide rail or wire.

On reaching its bottom position, the pump will automatically connect to the discharge connection.

Fasten the lifting chain on the access frame and the cables on the cable holder. Make sure that the cables cannot be sucked into the inlet of the pump. Support straps are required for deep installations.

Run the cables up to the electric control box.

Clean out debris from the sump before starting up the station.

The pump can be hoisted up along the guide equipment for inspection without any connections having to be undone.

### CS version

In the CS version, the pump is transportable and intended to operate completely or partially submerged in the pumped liquid. The pump is equipped with a connection for hose or pipe, see "Parts list".

The pump stands on a base stand.

See dimension page 12.

### CS installation

Run the cables so that they have no sharp bends, are not pinched and cannot be sucked into the pump inlet. Connect the discharge line and the motor cable. See "Electrical connections".

Lower the pump into the sump.

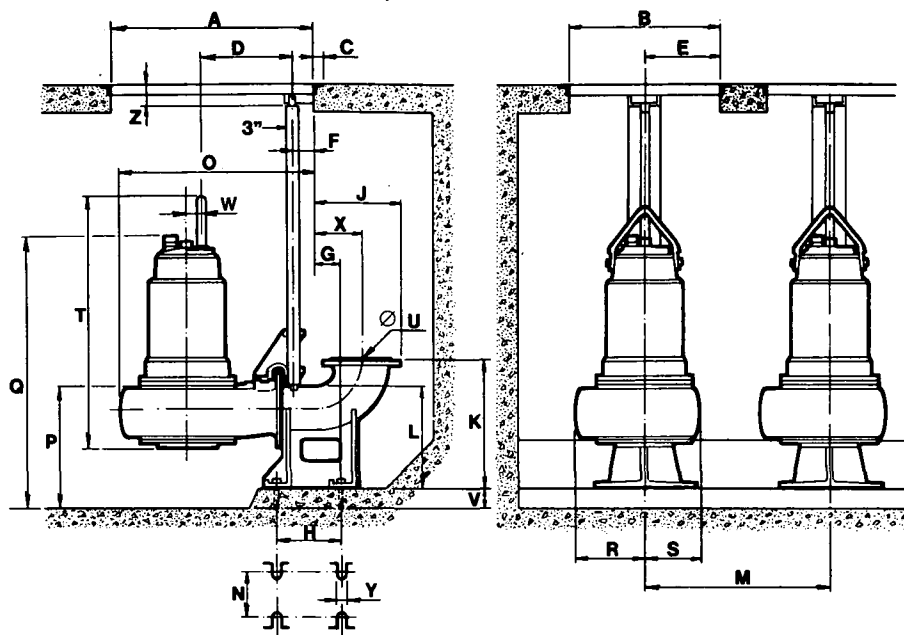
Place the pump on a base which prevents it from sinking into a soft sump bottom.

Alternatively, the pump can be suspended from above by its handle just above the bottom of the sump.

See dimension page 12.

**CP/RP installation**

All dimensions are in mm (in).



CP/RP version	A	B	C	D	E	F
CP LT	1455 (57.3)	1150 (45.3)	50 (2.0)	681 (26.8)	523 (20.6)	135 (5.3)
MT	1455 (57.3)	1150 (45.3)	50 (2.0)	681 (26.8)	523 (20.6)	135 (5.3)
HT	1455 (57.3)	1150 (45.3)	50 (2.0)	581 (22.9)	523 (20.6)	135 (5.3)
RP	1455 (57.3)	1150 (45.3)	50 (2.0)	581 (22.9)	523 (20.6)	135 (5.3)

CP/RP version	G	H	J	K	L	M Min. measu-rem.
CP LT	194 (7.6)	500 (19.7)	591 (23.2)	850 (33.4)	685 (27.0)	1400 (55.1)
MT	194 (7.6)	500 (19.7)	540 (21.3)	800 (31.5)	660 (26.0)	1400 (55.1)
HT	89 (3.5)	280 (11.0)	344 (13.5)	450 (17.7)	360 (14.2)	850 (33.5)
RP	89 (3.5)	280 (11.0)	344 (13.5)	450 (17.7)	346 (13.6)	900 (35.4)

CP/RP version	N	O	P Min. level	Q	R	S
CP LT	530 (20.9)	1233 (48.5)	756 (29.6)	1730 (68.1)	450 (17.7)	311 (12.2)
MT	530 (20.9)	1292 (50.9)	728 (28.6)	1705 (67.1)	501 (19.7)	378 (14.9)
HT	245 ( 9.6)	1070 (42.1)	523 (20.1)	1500 (59.0)	341 (13.4)	305 (12.0)
RP	245 ( 9.6)	1056 (41.6)	582 (22.9)	1457 (57.3)	320 (12.6)	305 (12.0)

CP/RP version	T	U diam.	V Min. measu-rem.	W	X	Y	Z
CP LT	1860 (73.2)	350* (13.8)	150 (5.9)	35 (1.4)	324 (12.7)	23 (0.9)	130 (5.1)
MT	1654 (65.1)	300* (11.8)	50 (2.0)	35 (1.4)	299 (11.8)	23 (0.9)	130 (5.1)
HT	1566 (61.6)	200** ( 7.9)	100 (3.9)	35 (1.4)	174 ( 6.8)	23 (0.9)	130 (5.1)
RP	1465 (57.7)	200** ( 7.9)	50 (2.0)	35 (1.4)	174 ( 6.8)	23 (0.9)	130 (5.1)

\* Flange as per SMS 342, DIN 2532 or BS 4622:1970 table 11.

\*\* Flange as per SMS 342, DIN 2533 or BS 4622:1970 table 11.

## CT and RT version

In the CT and RT version, the pump is installed in a stationary position in a dry well next to the wet sump.

The pump has a watertight motor and will therefore not be damaged in the event of flooding in the pump room.

The pump is liquid-cooled.

In certain cases, the CT and RT version can only be operated intermittently. Contact Flygt for exact information.

In addition to the pump, the following items are required:

**Base stand and anchor bolts** for setting up the pump.

**Inlet elbow** for connecting the suction line.

**Shut-off valves** to permit the pump to be removed for repair.

**Level sensors or other control equipment** for start, stop and alarm.

## CT and RT installation

The pump should be positioned low in the dry pit for effective drainage.

Bolt the base stand or plate to the concrete base by means of four grouted-in anchor bolts.

Bolt the pump to the stand/plate.

Check that the pump is vertical.

Connect the motor cable, suction line and discharge line.

Make sure that the weight of the pump does not bear on the system piping.

**NOTE! The risk of freezing is particularly great at certain CT and RT installations.**

## LL version

In the LL version, the pump is installed in a stationary discharge arrangement.

The pump operates completely under water and requires no extra connections.

In addition to the pump, the following items are required:

**Discharge pipe** with bottom plate in which the pump is installed.

**Cable holder** for holding the cable and regulating the height of the level sensors.

**Cleaning screen** at intake.

**Level sensors** or other control equipment for start, stop or alarm.

## LL installation

The pump is lowered into position in the finished station.

No additional anchoring of the pump is required.

Fasten the motor cables on the cable holder and run them to the electric control box.

**NOTE! The end of the cable must not be submerged.** Leads have to be above flood level, as water may penetrate through the cable into the junction box or the motor.

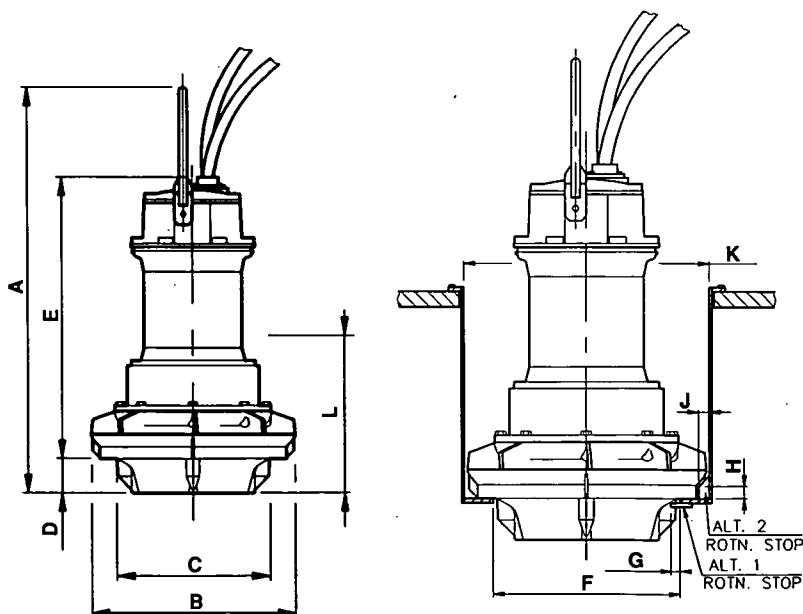
The pump can easily be hoisted for inspection without any connections having to be undone.

## LL

All dimensions are in mm (in).

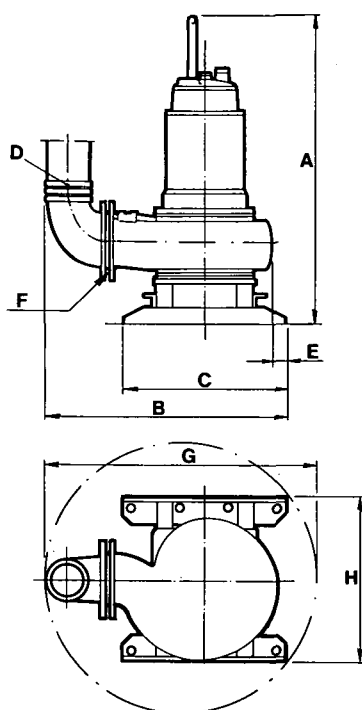
### LL version

A	1570 (62)
B (diam)	780 (30 3/4)
C (diam)	580 (22 9/16)
D	132 ( 5 1/16)
E	1097 (43 5/16)
F (diam)	610 (24)
G	30—40 (1 3/16—1 9/16)
H	40 (1 9/16)
J	35 (1 3/8)
K (diam)	800 (31 1/2)
L	600 (24) min. water level



**CS**

All dimensions are in mm (in).



	A	B	C
LT	1920 (75.6)	1440 (56.7)	1050 (41.3)
MT	1915 (75.4)	1410 (55.5)	1050 (41.3)
HT	1827 (71.9)	1289/1239 (50.7/48.8)	1050 (41.3)

	D <sub>(diam)</sub>	E	F* <sub>(diam)</sub>
LT	250 (10)	143 (5.6)	300 (12)
MT	200 ( 8)	84 (3.3)	250 (10)
HT	150 ( 6)	206 (8.1)	150** ( 6)

	G	H
LT	1675 (66.0)	1000 (39.4)
MT	1624 (64.0)	1000 (39.4)
HT	1494 (58.2)	1000 (39.4)

\* Flange as per SMS 342, DIN 2532 or BS 4622:1970 table 11.

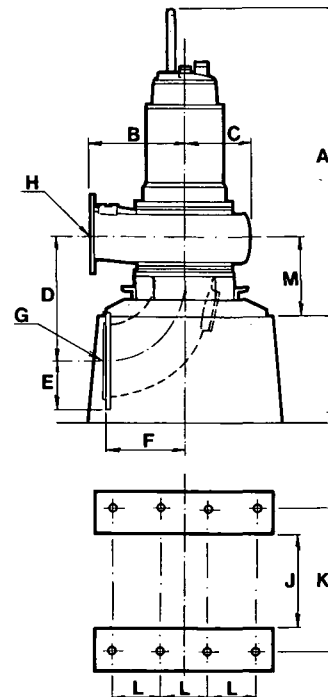
\*\* Flange as per SMS 342, DIN 2533 or BS 4622:1970 table 11.

**CT/RT**

All dimensions are in mm (in).

CT/RT version	A	B	C	D	E	F
CT LT	1920 (75.6)	600 (23.6)	380 (15.0)	790 (31.1)	298 (11.7)	525 (20.7)
MT						
Curve	1915 (75.4)	600 (23.6)	440 (17.3)	810 (31.9)	298 (11.7)	500 (19.7)
632-640						
Curve	1895 (74.6)	600 (23.6)	440 (17.3)	553 (21.8)	241 (9.5)	400 (15.7)
641-648						
HT	1825 (71.8)	500 (19.7)	320 (12.6)	485 (19.0)	175 (6.9)	450 (17.7)
RT	1790 (70.5)	500 (19.7)	305 (12.0)	675 (26.6)	200 (7.9)	350 (13.8)

CT/RT version	G <sub>diam*</sub>	H <sub>diam*</sub>	J	K	L	M
CT LT	400* (15.7)	300* (11.8)	680 (26.8)	900 (35.4)	300 (11.8)	510 (20.0)
MT						
Curve	400*	250*	680	900	300	530
632-640	(15.7)	(9.8)	(26.8)	(35.4)	(11.8)	(20.9)
Curve	300	250	680	900	300	507
641-648	(11.8)	(9.8)	(26.8)	(35.4)	(11.8)	(20.0)
HT	200** (7.9)	150** (5.9)	680 (26.8)	900 (35.4)	300 (11.8)	454 (17.9)
RT	250** (9.8)	150** (5.9)	680 (26.8)	900 (35.4)	300 (11.8)	439 (17.3)



\* Flange as per SMS 342 or DIN 2532 or BS 4622:1970 table 11.

\*\* Flange as per SMS 342 or DIN 2533 or BS 4622:1970 table 11.

## Electrical connections

All electrical work shall be carried out under the supervision of an authorized electrician.

Local codes and regulations shall be complied with.

### WARNING!

**All electrical equipment must be earthed. This applies to both pump equipment and any monitoring equipment.**

**Failure to heed this warning may cause a lethal accident. Make sure that the earth lead is correctly connected by testing it.**

Check that the mains voltage and frequency agree with the specifications on the pump data plate.

The motor can be connected for different voltages as shown on the data plate.

If intermittent operation is prescribed (see Data Plate), the pump shall be provided with a control equipment that provides such operation.

Under no circumstances may the starter equipment be installed in the pump pit.

Install the motor cable and the control cable as illustrated in the figure.

To avoid leakage into the pump, check:

- that the cable entry seal sleeve and washers conform to the outside diameter of the cable. Always measure the cable before installing it. See the parts list.
- that the outer jacket on the cable is not damaged. When refitting a cable which has been used before, always cut off a short piece of the cable so that the cable entry seal sleeve does not close around the cable at the same point again.

**NOTE!** For safety reasons, the earth lead should be approx. 100 mm (4") longer than the phase leads. If the motor cable is jerked loose by mistake, the earth lead should be the last lead to come loose from its terminal. This applies to both ends of the cable.

The motor is convertible between different voltages as stated on the data plate. This conversion is done on the terminal board or the contactor.

### Connection of stator and motor leads

Check on the data plate which connection, Y or  $\Delta$ , is valid for the voltage supply. Then, depending on voltage, arrange the connection on the terminal board in accordance with Y or  $\Delta$ , see figure.

Connect the motor cable to the terminal board connections U1, V1, W1 and earth.

If star-delta start is used, both motor cables are connected as shown in the figure. Links are not used with star-delta start.

Connect the leads from the motor control circuit to T1 and T2.

Make sure that the pump is correctly earthed (grounded).

Install the cover (38).

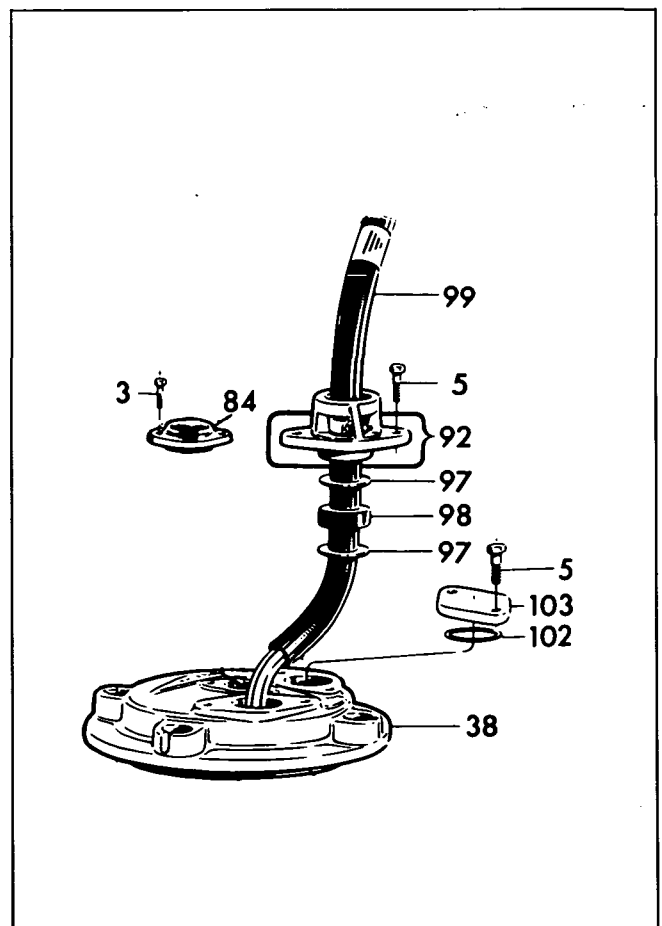
Tighten the screws and the gland nut so that the cable entry unit bottoms out.

Connect the motor cable and the control cable to the starter equipment. Check the direction of rotation, see "Before starting".

If the direction of rotation is wrong, transpose two of the phase leads.

Remember that the starting surge with the direct-on line start can be up to six times higher than the rated current. Make sure that the fuses or circuit breakers are of the proper amperage.

The overload protection (motor protection breaker) shall, for direct-on-line start be set to the motor's rated current as given on the data plate.



Electrical connections

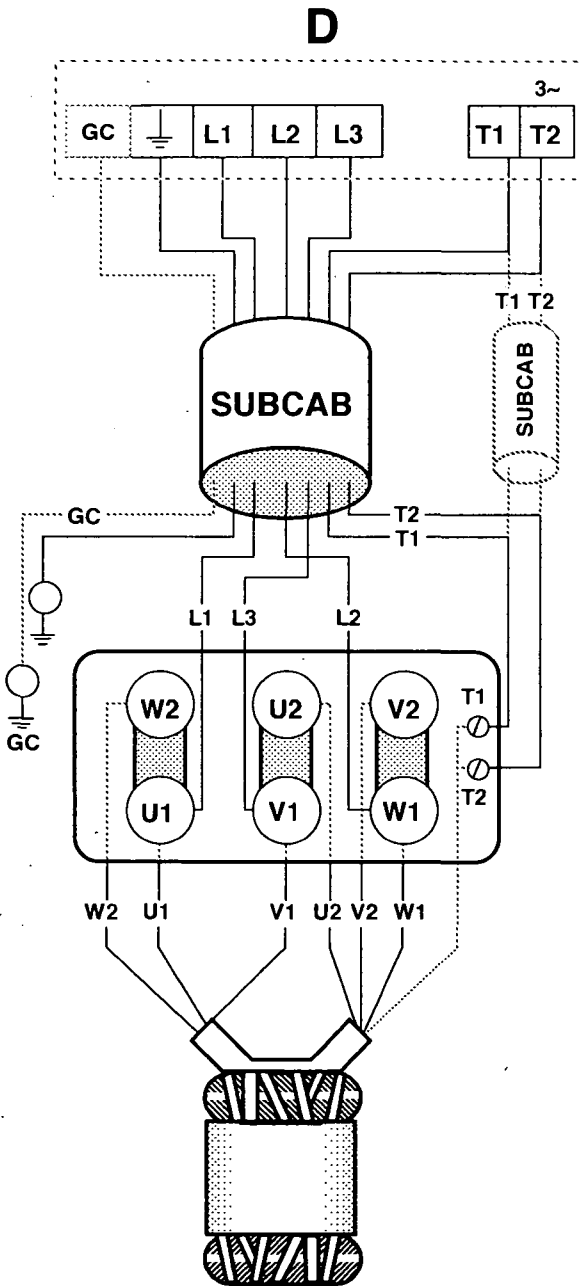
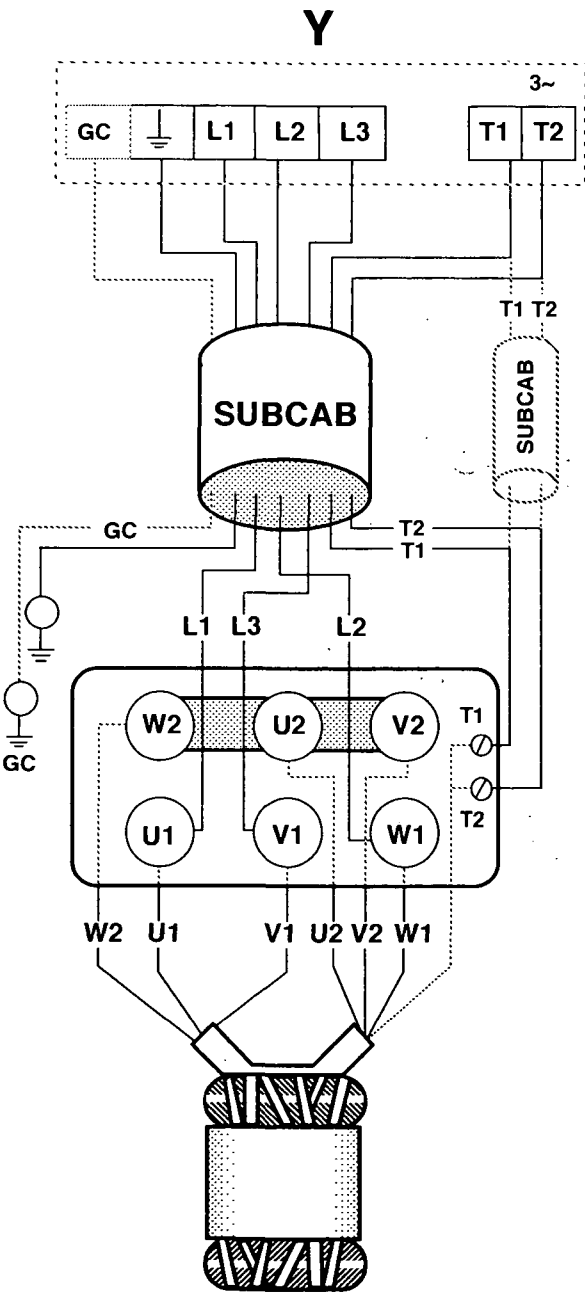
SUBCAB 4G/SUBCAB AWG\*:

Mains	Lead	Pump terminal board
L1	Brown (Red*)	U1
L2	Blue (White*)	W1
L3	Black (Black*)	V1
Earth	Yellow/green	⏏
Groundcheck	Yellow*	GC
T1	Black/orange*	T1
T2	Black/blue*	T2

The stator leads are connected to the terminal board as follows:

Stator lead	Connection on terminal board
U1, red	U1
V1, brown	V1
W1, yellow	W1
V2, blue	V2
W2, black	W2
U2, green	U2

Connect the control leads from the motor control circuit to T1 and T2.



## Electrical connections

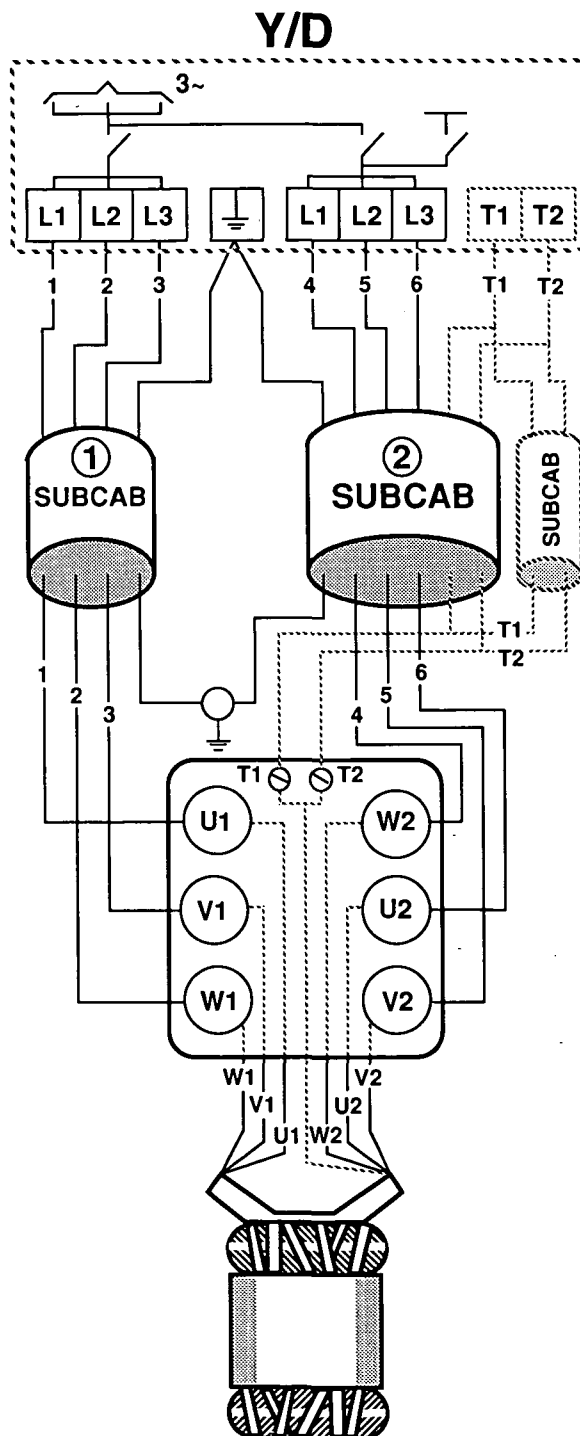
### SUBCAB 4

Mains	Lead	Pump terminal board
L1	Brown	U1/W2
L2	Blue	W1/V2
L3	Black	V1/U2
Earth	Yellow/green	↓
T1	Black T1	T1
T2	Black T2	T2

The stator leads are connected to the terminal board as follows:

Stator lead	Connection on terminal board
U1, red	U1
V1, brown	V1
W1, yellow	W1
V2, blue	V2
W2, black	W2
U2, green	U2

Connect the control leads from the motor control circuit to T1 and T2.





## Capacitive leakage sensor CLS-30 and leakage sensor FLS (built-in version)

The pump is available with leakage sensors for sensing water in the oil and/or the stator casing.

A plate in the junction box shows that the pump is equipped with sensors.

CLS-30 is a leakage sensor for sensing water in the oil casing and issues an alarm when the oil contains 30 % water. Oil change is recommended within 14 days of alarm. If the sensor issues an alarm shortly after the oil is changed, contact your nearest Flygt representative.

The CLS-30 sensor is installed in the bearing housing and goes down into the oil casing.

The FLS sensor consists of a small float switch for sensing water in the stator casing. Its design makes it suitable for pumps in vertical installations.

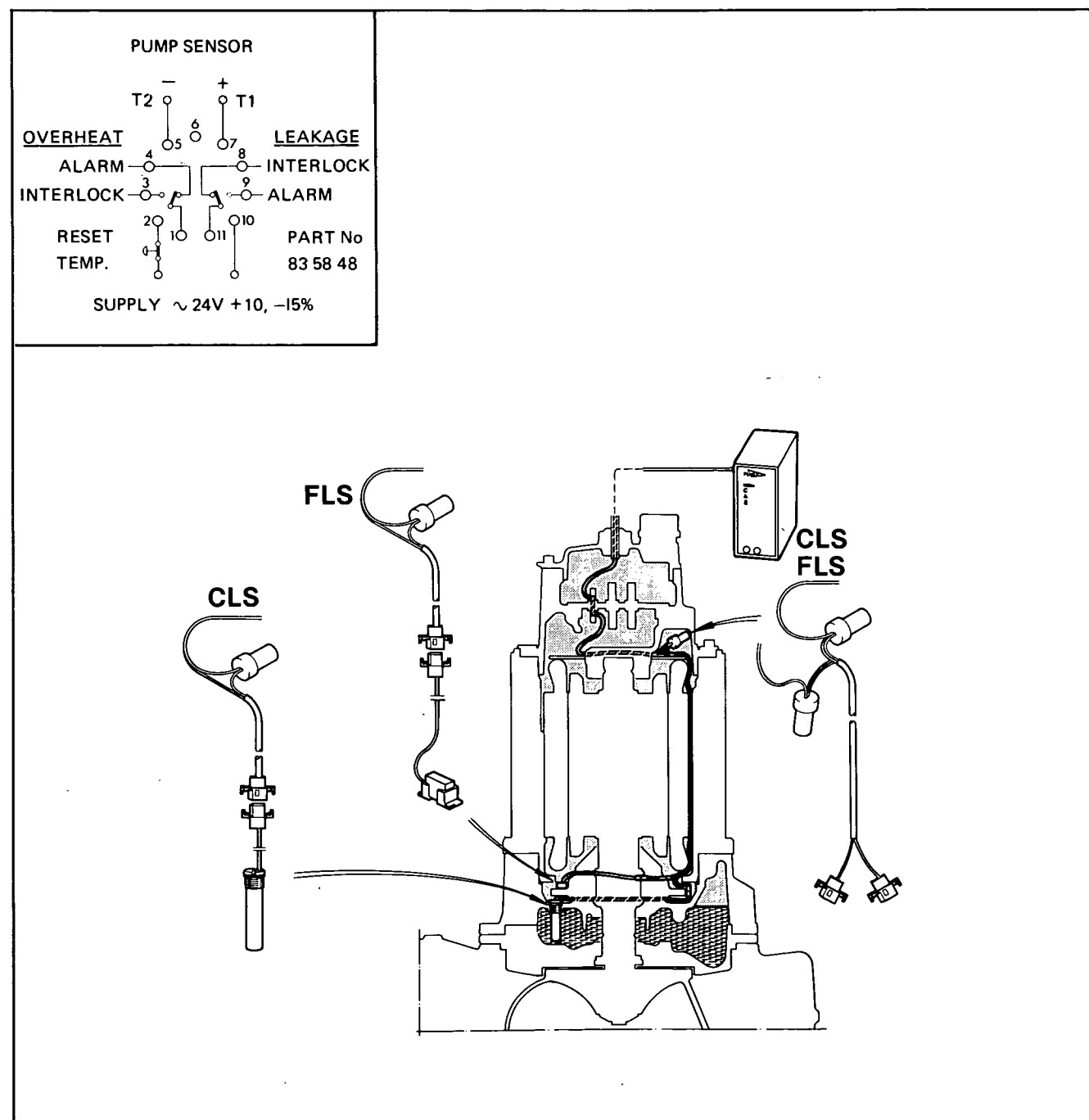
The FLS sensor is installed in the bottom of the stator casing.

The two sensors, CLS-30 and FLS, can be used in the same pump. They are connected in parallel.

The parallel-connected sensors are in turn connected in series with the stator's thermal switches. They are connected on installation to an alarm relay, type Mini CAS, in accordance with the following diagram.

**IMPORTANT!** Be careful when removing the pump's motor unit not to damage the leads. (Disconnect the leads before the rotor assembly and the stator casing are separated completely). Also be careful not to damage the sensors.

Make sure that the leads are not pinched during assembly.



## Before starting

Check the oil level in the oil casing.

Remove the fuses or open the circuit breaker and check that the impeller can be rotated by hand.

Check that the monitoring equipment (if any) works.

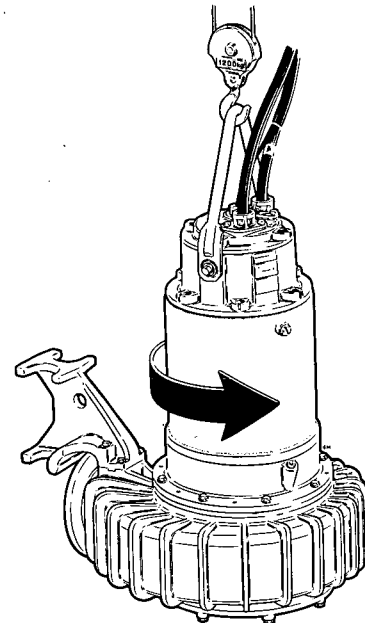
Check the direction of rotation. The impeller shall rotate clockwise, as viewed from above. When started, the pump will jerk in the opposite direction to the direction in which the impeller rotates. See the figure.

**WARNING! Watch out for the starting jerk, which can be powerful.**

In the case of CT and RT installation, the direction of rotation is checked through the inlet elbow access cover.

The above measures are described under "Inspection".

## Starting jerk



# CARE AND MAINTENANCE

The figures in parentheses are item numbers and refer to the cutaway figure. See page 27.

## Safety precautions

### WARNING!

**Before starting work on the pump, make sure that the pump is isolated from th power supply and cannot be energized.**

**NOTE!** This applies to the control circuit as well.

The power supply must be locked off and tagged with the supervisor's name.

The following points are important in connection with work on the pump:

- make sure that the pump has been thoroughly cleaned.
- observe good personal hygiene.
- beware the risk of infection.
- follow local safety regulations.

The pump is designed for use in liquids which can be hazardous to health. In order to prevent injury to the eyes and skin, observe the following points when working on the pump:

- Always wear goggles and rubber gloves.
- Rinse the pump thoroughly with clean water before starting work.
- Rinse the components in water after disassembly.
- Hold a rag over the oil casing screw (OIL) and the inspection screw (INSP) when removing them. Otherwise, pressure that may have built up in the pump due to the leakage of pumped liquid into the pump may cause splatter into the eyes or onto skin.

Proceed as follows if you get hazardous chemicals in your eyes:

- rinse immediately in running water for 15 minutes. Hold your eyelids apart with your fingers.
- contact an eye doctor.

on your skin:

- remove contaminated clothes.
- wash skin with soap and water.
- seek medical attention if required.

Inspection

Regular inspection and preventive maintenance ensure more reliable operation.

The pump should be inspected after 2000 hours of operation or at least once a year, except for the CS-version which should be inspected every sixth month, more frequently under severe operating conditions.

Under normal operating conditions, the pump should have a major overhaul in a service shop after 6000 hours of operation or at least every third year.

This requires special tools and should be done by an authorized service shop.

When the pump is new or when the seals have been replaced, inspection is recommended after one week of operation.

Service contract

Flygt or its agent offers service agreements in accordance with a preventive maintenance plan. For further information, please contact your Flygt representative.

Recommended inspections:

Inspection of	Action
Visible parts on pump and installation	<p>Replace or fix worn and damaged parts.</p> <p>Make sure that all screws, bolts and nuts are tight.</p> <p>Check the condition of carrying handle/lifting eyes, chains and wire ropes.</p> <p>Check that the guide bars are vertical.</p>
Pump casing and impeller	<p>Replace worn parts if they impair function.</p> <p>If the clearance between the impeller skirt and the pump casing exceeds 2 mm (0.1 in), see "Replacing the wear ring".</p> <p>Wear on the outlet flange on the pump casing usually causes corresponding wear on the discharge connection.</p>
Oil quantity	<p>WARNING. If the seal leaks, the oil casing may be under pressure. Hold a rag over the oil casing screw in order to prevent splatter. See "Safety precautions" for additional information.</p> <p>Check that the oil reaches up to the oil hole.</p>
Condition of the oil	<p>A check of the condition of the oil can show whether there has been an increased leakage. Note! Air/oil mixture can be confused with water/oil mixture.</p> <p>Insert a tube (or hose) into the oil hole. Cover the top end of the tube and take up a little oil from the bottom.</p> <p>Suck up a little oil from the bottom using oil drainage pump 83 95 42 or the equivalent.</p> <p>Change the oil if it contains too much water, i.e., is heavily emulsified (cream-like), or if the oil housing contains separated water. See "Changing the oil". Check again one week after changing the oil.</p> <p>If the oil contains too much water again, the fault may be:</p> <ul style="list-style-type: none"><li>— that an oil screw (OIL) is not sufficiently tight.</li><li>— that an O-ring (3) or its sealing surface is damaged.</li><li>— that the lower mechanical seal (7) is damaged.</li></ul> <p>Contact a Flygt service shop.</p>

Inspection of	Action
Liquid in the stator casing	<p>WARNING. If there has been leakage, the stator casing may be under pressure. Hold a rag over the inspection screw to prevent splatter. See "Safety precautions" for additional information.</p> <p>Remove the inspection screw/cover.</p> <p>If there is water in the stator casing, the cause may be:</p> <ul style="list-style-type: none"> <li>— that an O-ring is damaged.</li> <li>— that the cable entry is leaking.</li> </ul> <p>If there is oil in the stator casing, the cause may be:</p> <ul style="list-style-type: none"> <li>— that the inner mechanical seal is damaged. Contact a Flygt service shop.</li> <li>— that an O-ring is damaged.</li> </ul>
Cooling system	Rinse and clean if the flow through the system has been partly restricted.
Cable entry	<p>Make sure that the cable clamps are tight. If the cable entry leaks:</p> <ul style="list-style-type: none"> <li>— check that the entry is firmly tightened into its bottom-most position.</li> <li>— cut a piece of the cable off so that the seal sleeve (1) closes around a new position on the cable.</li> <li>— replace the seal sleeve (1).</li> <li>— check that the seal sleeve (1) and the washers (2) conform to the outside diameter of the cables.</li> </ul>
Cables	Replace the cable if the outer jacket is damaged. Make sure that the cables do not have any sharp bends and are not pinched.
Level sensors or other level equipment	<p>Check function. Clean, adjust, replace or repair damaged level sensing equipment. Follow the instructions for the level sensing equipment in question.</p> <p>NOTE! The level sensor contains a mercury switch. Damaged sensors should therefore be disposed of in a proper manner.</p>
Starter equipment	If faulty, contact an electrician.
Monitoring equipment (should be checked often)	<p>Follow the instructions for monitoring equipment.</p> <p>Check:</p> <ul style="list-style-type: none"> <li>— signals and tripping function.</li> <li>— that relays, lamps, fuses and connections are intact.</li> </ul> <p>Replace defective equipment.</p>
Rotation direction of pump (requires voltage)	Transpose two phase leads if the impeller does not rotate clockwise as viewed from above. Rotation in the wrong direction reduces the capacity of the pump and the motor may be overloaded. Check the direction of rotation, during <b>non-load</b> every time the pump is reconnected.
Pipes, valves and other peripheral equipment	Repair faults and notify supervisor of any faults or defects.
Insulation resistance in the stator	Use insulation tester. With a 1000 V-DC megger the insulation between the phases and between any phase and earth (ground) should be $> 1 \text{ M}\Omega$ .

## Changing the oil

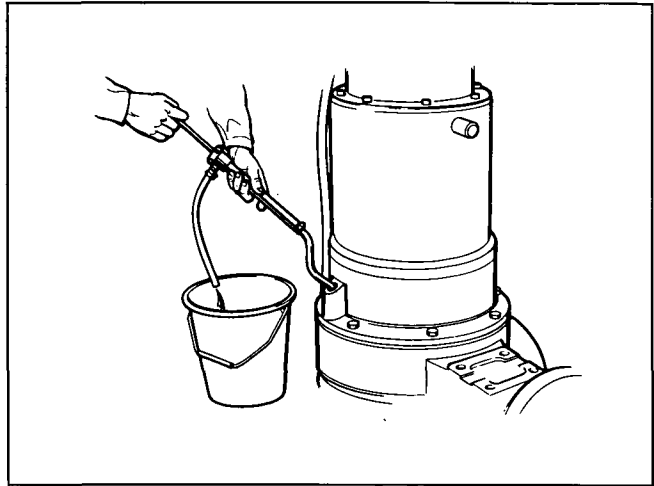
**WARNING.** If the seal leaks, the oil casing may be under pressure. Hold a rag over the oil plug to prevent splatter.

Unscrew the oil casing screws (OIL). Pump out the oil using oil drainage pump 83 95 42 or the equivalent. Make sure that the plastic tube goes all the way to the bottom of the oil casing.

Fill up with 13 litres (14 US quarts) of new oil. Use an ordinary SAE 10W-30 motor oil.

Always replace the O-rings of the oil hole screws. Put the screws back and tighten them. Tightening torque 80 Nm (60 ft lb).

A paraffin oil approved by authorities (e.g. Mobil Whiterex 309) is recommended for raw or clean water pumping.



## Replacing the impeller

### Removing the impeller

**WARNING!** Worn impellers often have very sharp edges.

Remove bolts/nuts (31) and lift the motor section off of the pump casing (79).

Lay the motor section on its side.

Remove the impeller screw (32), and the protective plug (51).

Loosen the screws on the locking assembly (50) evenly and in a diagonal pattern, a little at a time.

Replace the three light-coloured screws with three M10 screws. The auxiliary threads have only 3—5 load-bearing thread turns and are not designed to withstand high pulling force.

Carefully tap the dark screw heads.

Pull off the locking assembly.

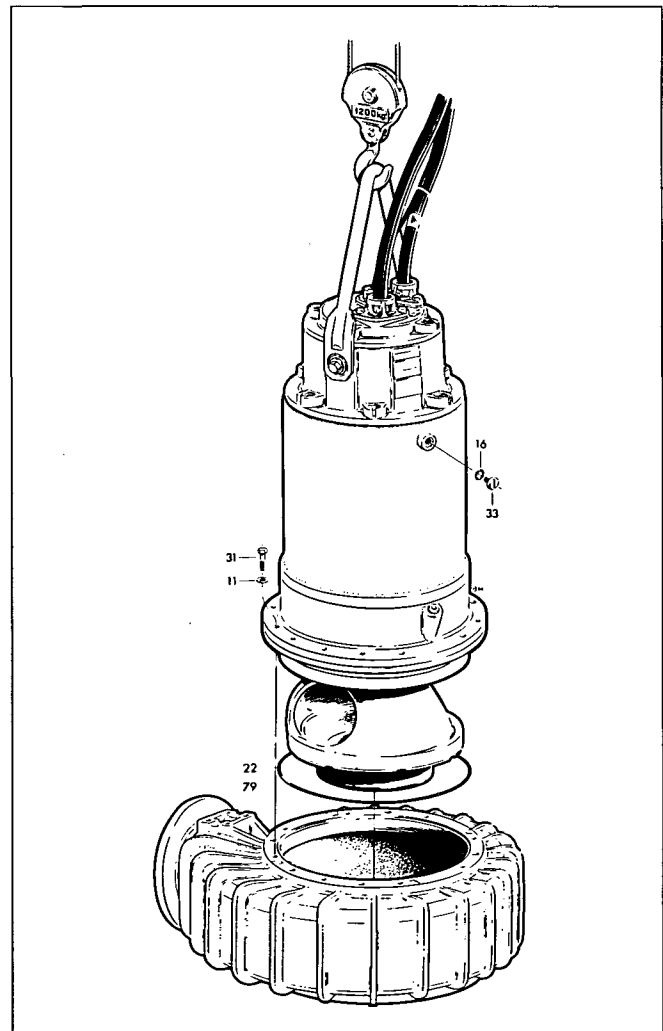
Pull off the impeller.

Use impeller puller, see "Tools", page 21.

Do **not** pry off the impeller, since it can easily be damaged.

### Removing the impeller (R)

In the R version, the locking assembly has been replaced with a hexagon head bolt. Undo this bolt and pull off the impeller.



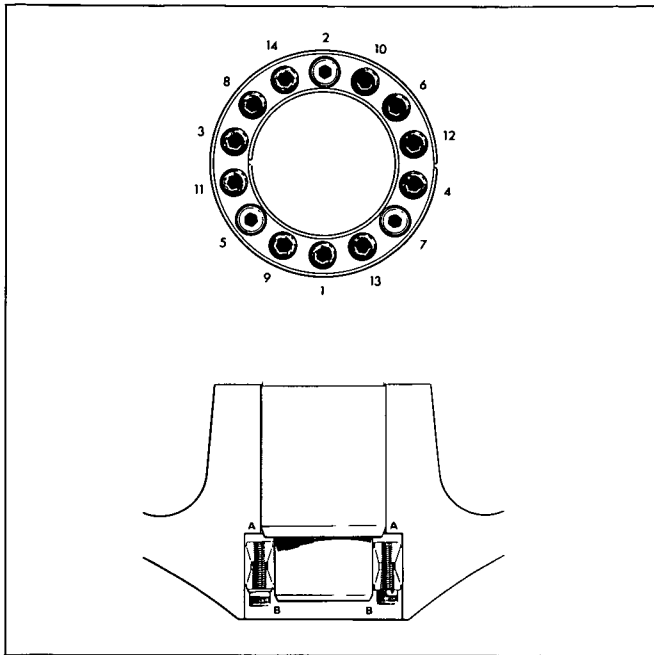
### Installing the impeller

Make sure that the end of the shaft is clean and free of burrs. Polish off any flaws with fine emery cloth.

Clean and oil all sealing surfaces and O-rings.

Molybdenum disulphide ( $\text{MoS}_2$ ) should not be used.

Press the impeller onto the shaft.



Apply a 3 mm ( $\frac{1}{8}$ ") thick layer of grease "A", see fig. Mount the locking assembly on the shaft.

Tighten the locking assembly screws evenly and in a diagonal pattern, first manually and then to 10 Nm (7 ft lb).

Then tighten the screws in sequence all around until they are tightened to a torque of 35 Nm (26 ft lb).

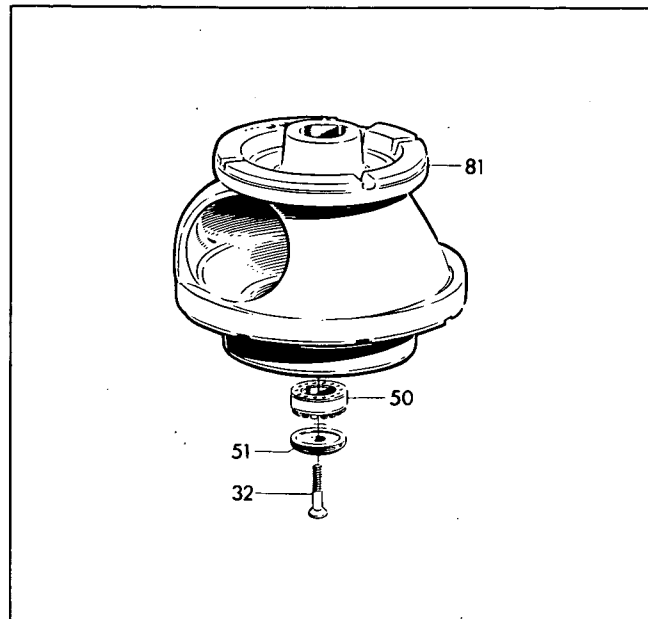
Fill the space "B" with grease.

Fit the protector (51) and the screw (32).

Check that the impeller is firmly seated.

Bend down the lock tabs on the impeller screws.

Check that the impeller can be rotated by hand.



Fit the motor section to the pump casing (79). Make sure that the pump casing has the right orientation.

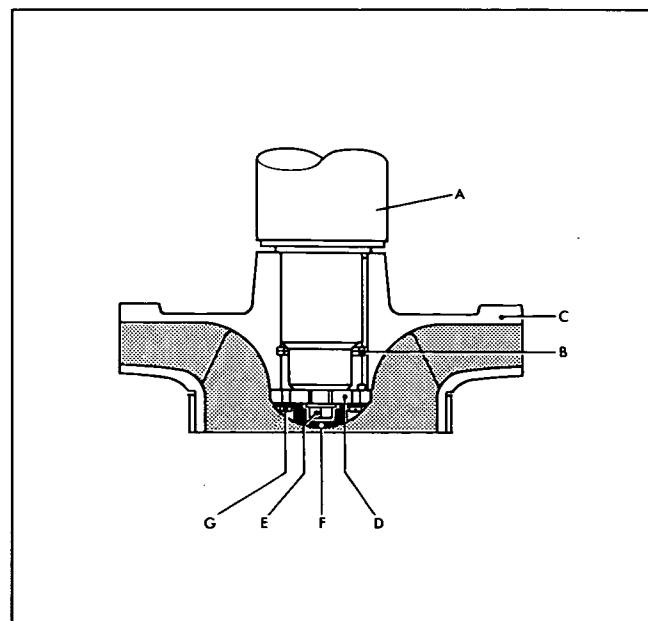
Don't forget the O-ring (22).

It is particularly important that the clearance between the lower diffuser and the impeller is kept to a minimum.

### Installing the impeller (R)

Check that the key is in its keyway on the shaft (A). Check that the circlip (B) is in place in the hub. Put the impeller (C) on the shaft. Fit the washer (D) and press on the impeller with a M16 screw. Tighten the impeller and the washer with the impeller screw (E). Secure the protective cap (F) with the slotted screw (G). Torque for impeller screw 150 Nm (110 ft lb).

More extensive repairs require special tools and should be carried out by an authorized service technician.



## Replacing the wear ring

When the clearance between the impeller skirt and the pump casing/wear ring exceeds 2 mm (0.1 in), one or more of the following replacements must be made.

### Replacing the wear ring in the suction cover (LT, MT, HT).

Disconnect the suction cover (4) from the pump casing.

Remove the wear ring.

Drive in the new wear ring. Use a rubber mallet or wooden block to prevent deformation.

The work will proceed more easily if the pump casing is first heated and/or the wear ring cooled.

### Replacing the impeller wear ring in the pump casing (R)/diffuser ring (LL).

Disconnect and lift off the motor section from the pump casing/diffuser ring.

Lay the motor section on its side.

Knock off the wear ring. If necessary, saw grooves in the wear ring using a hacksaw.

Heat the new wear ring and press it into the pump casing/diffuser ring.

### Replacing the impeller wear ring.

Disconnect and lift off the motor section from the pump casing.

Lay the motor section on its side.

Knock off the wear ring from the impeller. If necessary, saw grooves in the wear ring using a hacksaw.

Heat the new wear ring and press it onto the impeller.

### Assembly

Before assembling the pump, check the O-ring (22) and fit it in place.

## ACCESSORIES AND TOOLS

### Zinc anode set

In order to reduce corrosion on the pump, it can be fitted with zinc anodes.

Order No.

Pump casing (raw water): 443 26 27

Pump casing (LT, MT, HT): 443 26 28

Pump casing (LL)

### Level sensor

Flygt supplies level sensors suited for different liquid densities and with different cable lengths. See separate brochure.

### Start and control equipment

Flygt has suitable start and control equipment for the pump. Contact Flygt for further information.

### Tools

Besides ordinary standard tools, the following tools are required in order to perform the necessary care and maintenance of the pump:

Order No.	Description
83 95 42	Oil pump
84 13 04	Hexagon bit adaptor, n = 6
84 13 06	Hexagon bit adaptor, n = 10
84 17 10	Hexagon bit adaptor, n = 14
84 13 96	Hexagon bit adaptor, n = 24
84 15 51	Socket extension
84 15 66	Torque wrench (0—137 Nm)
400 53 00	Impeller heater
81 39 63	Screw See 491 74 00
84 20 49	Yoke Together with 479 23 00 extension and 479 25 00 Washer for LT-impellers.
344 48 00	Socket For R-impellers.
400 54 01	Bar For HT-452—454 impellers.
400 54 03	Bar For MT 641—648 impellers.
400 54 05	Bar For MT 632—640 impellers.
479 23 00	Extension See 84 20 49
479 25 00	Washer See 84 20 49
491 74 00	Yoke Together with 3 pcs 81 39 63 screw for HT 460—468 impellers.

For further information on tools, see Flygt's Tool Catalogue.

# FAULT TRACING (TROUBLESHOOTING)

A universal instrument (VOM), a test lamp (continuity tester) and a wiring diagram are required in order to carry out fault tracing on the electrical equipment.

Fault tracing shall be done with the power supply disconnected and locked off, except for those checks which cannot be performed without voltage.

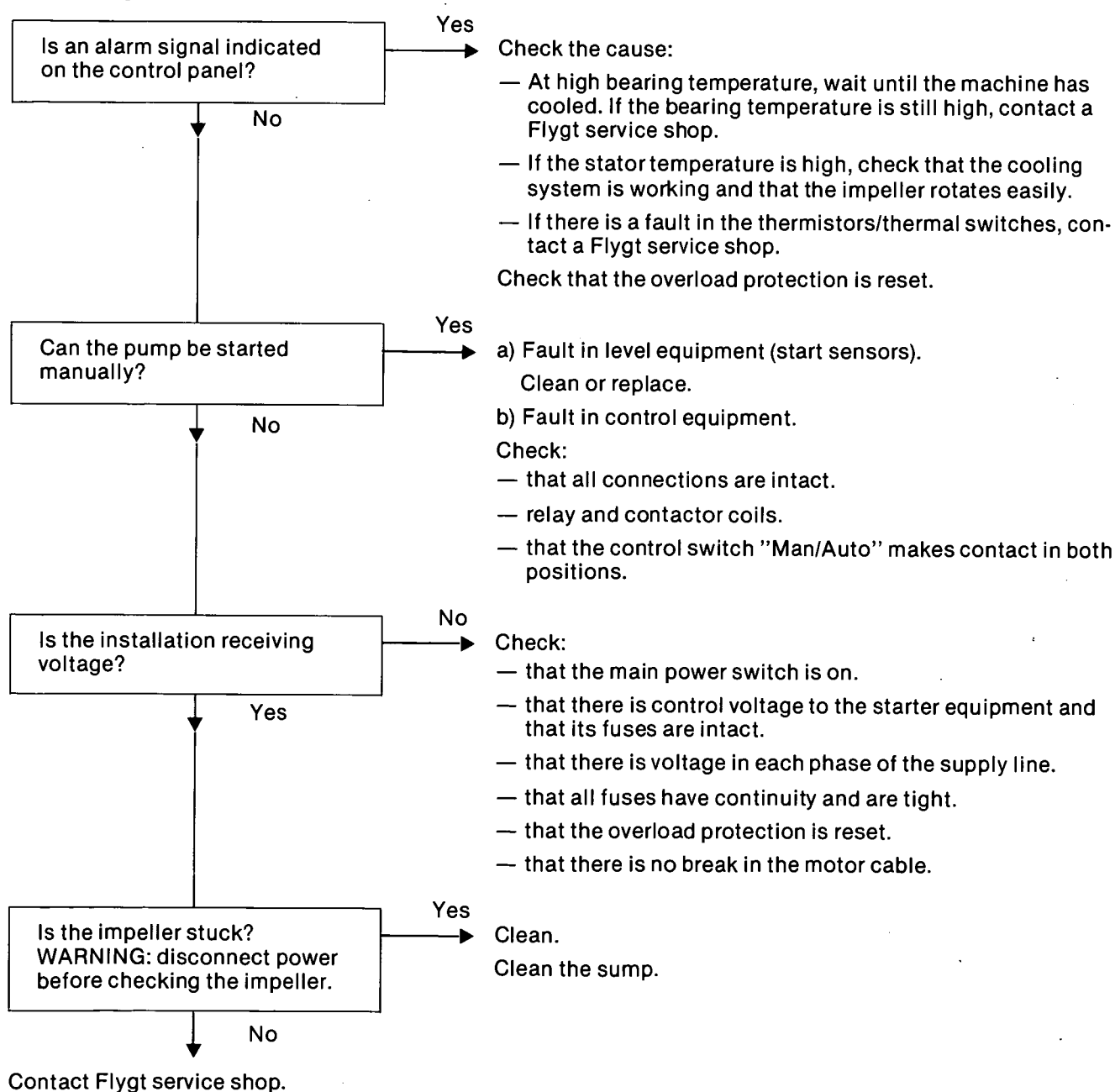
Always make sure that there is no one near the pump when the power supply is turned on.

Use the following checklist as an aid to fault tracing. It is assumed that the pump and installation have formerly functioned satisfactorily.

Electrical work shall be performed by an authorized electrician.

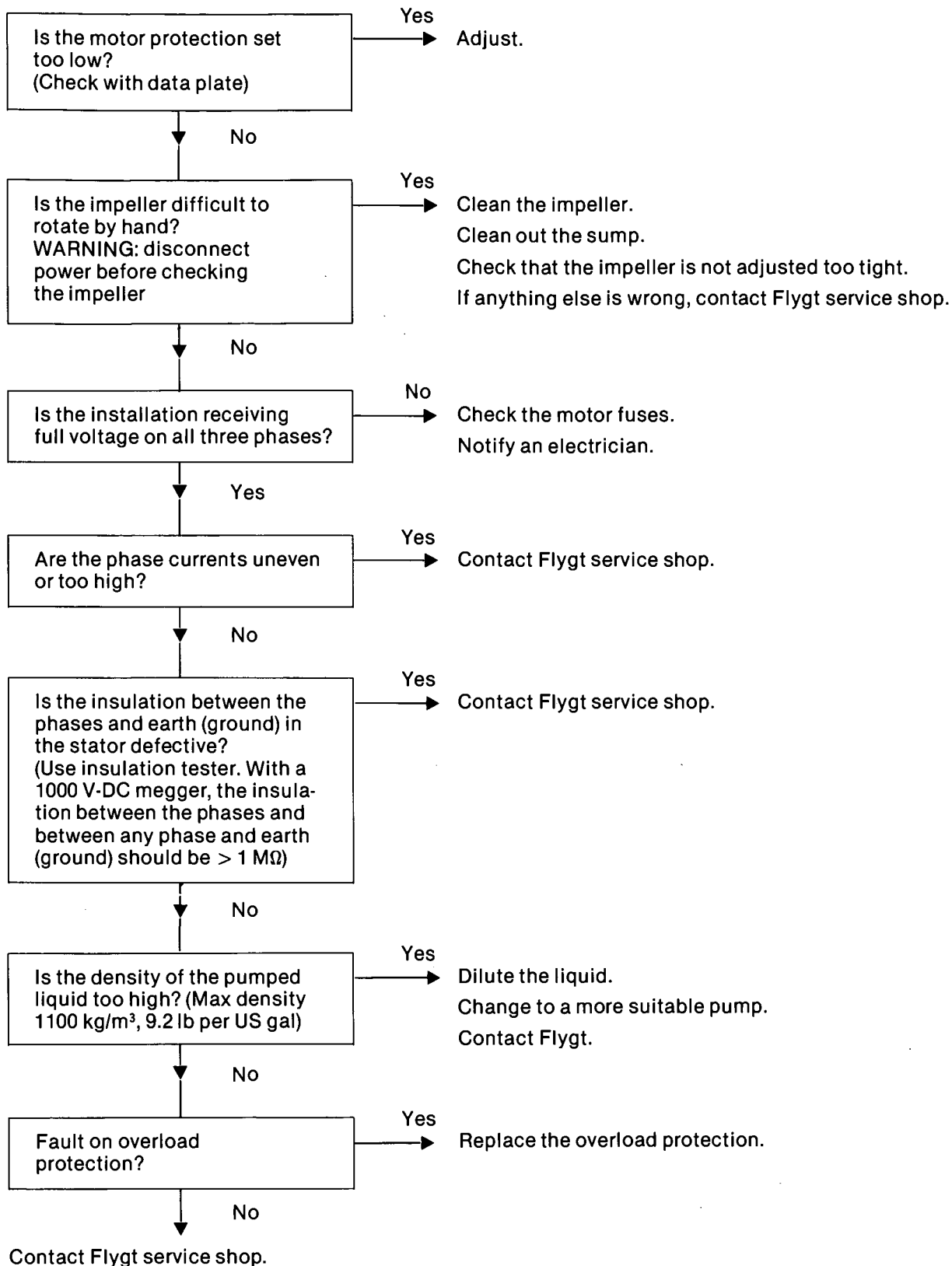
Follow local safety regulations and observe recommended safety precautions.

## 1. Pump fails to start

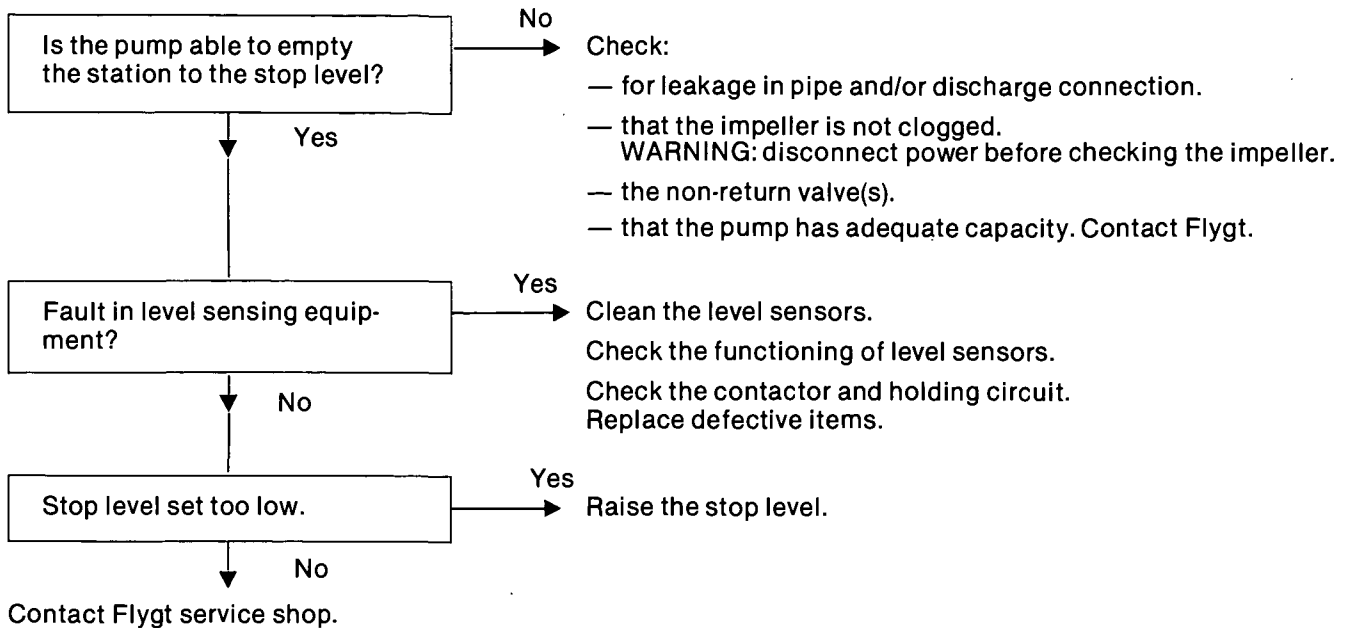




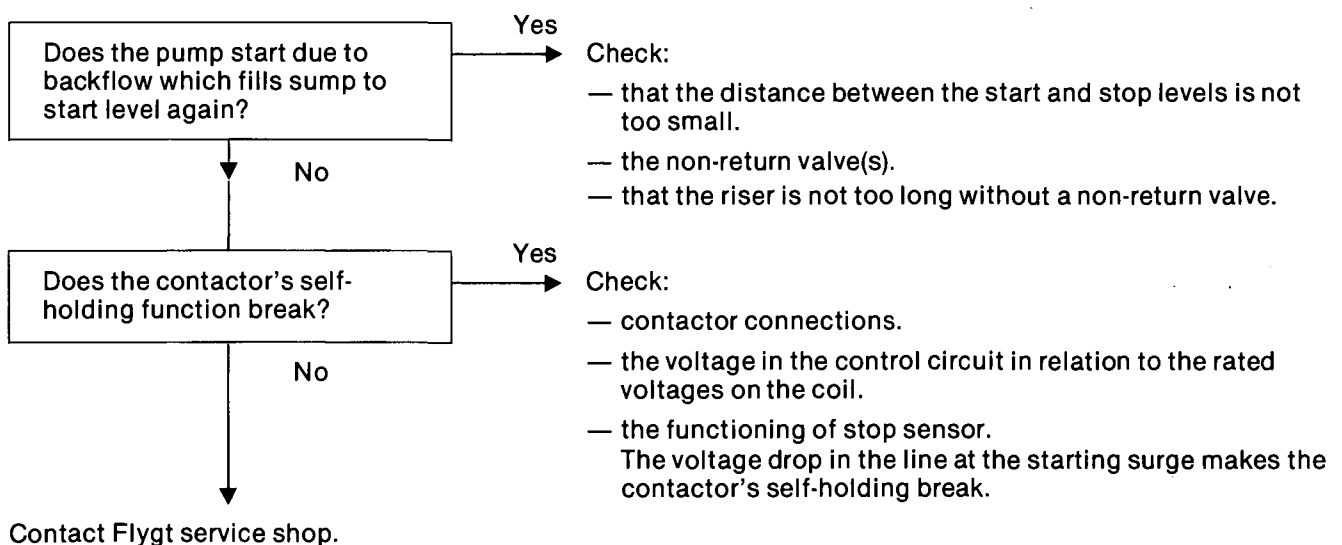
## 2. Pump starts but motor protection trips



### 3. The pump does not stop (when level control is used)



### 4. The pump starts-stops-starts in rapid sequence



### 5. Pump runs but delivers too little or no water

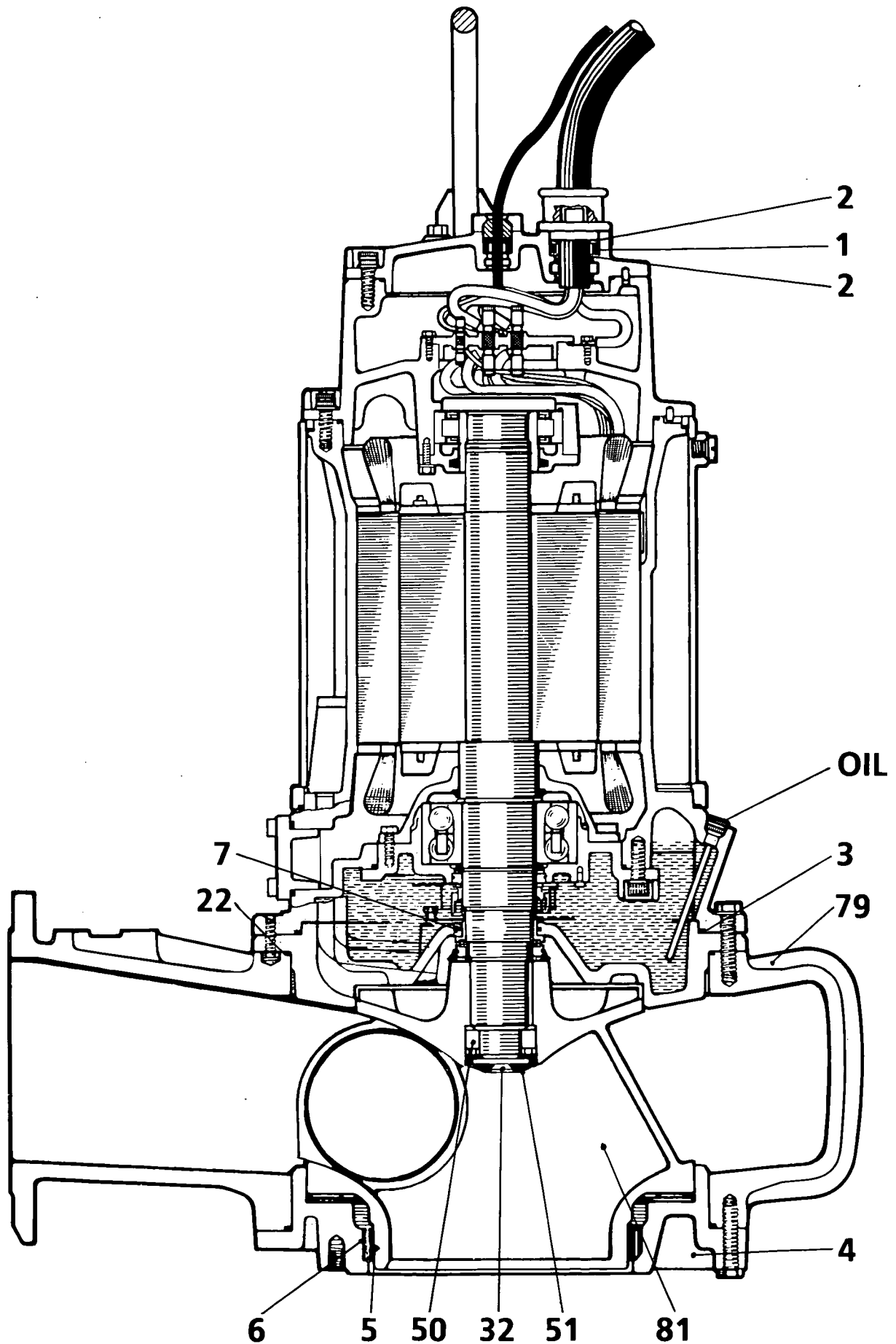
Check:

- direction of rotation of pump, see "Before starting".
- that valves are open and intact.
- that pipes, impeller and strainer are not clogged.
- that the impeller rotates easily.
- that the suction lift has not been altered.
- for leakage in the pump installation.
- for wear on wear ring, impeller, pump casing/flange, suction bottom, diffuser disc, diffuser.

See also under "Inspection".

**Do not override the motor protection repeatedly if it has tripped.**

Most recent service date	Pump No.	Hours of operation	Remarks	Sign.



30025



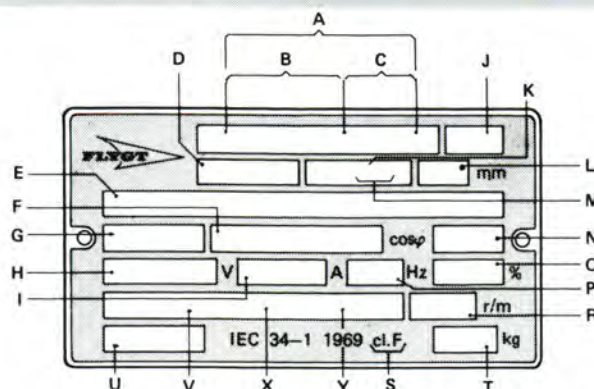


**PARTS LIST**  
**DETALJLISTA**  
**ERSATZTEILLISTE**  
**LISTE DES PIÈCES DE RECHANGE**



## How to read the data plate Das bedeuten die Angaben auf dem Datenschild

## Hur man läser dataskylten Comment lire la plaque signalétique



### Data plate interpretation:

- A Product No
- B Product code
- C Consecutive No
- D Serial No.
- E Special
- F Shaft power
- G Stator connection
- H Rated voltage
- I Rated current
- J Factory code
- K Number of poles
- L Impeller/propeller diam.
- M Curve No.
- N Power factor
- O Operating duty, cont./int.
- P Number of phases, type of current, frequency
- R Rotation speed
- S Insulation class
- T Weight
- U S-order No.
- V \*Rotation speed/blade angle propeller version
- X \*Gear ratio
- Y \*Direction of rotation L = left R = right

\*For mixers

### Datenschild, Beschriftung:

- A Produkt Nr.
- B Produktcode
- C Lfd. Nr.
- D Fabrikations-Nr.
- E Sonderbezeichnung
- F Leistungsabgabe
- G Statorschaltung
- H Nennspannung
- I Nennstrom
- J Fabrikskode
- K Polzahl
- L Laufrad/Propeller Durchmesser
- M Kurve Nr.
- N Leistungsfaktor
- O Betriebsart, kont./int.
- P Phasenzahl, Stromart, Frequenz
- R Drehzahl
- S Isolationsklasse
- T Gewicht
- U S-Auftragsnummer
- V \*Propellerdrehzahl/Winkel des Propeller flügels Propellerausführung
- X \*Übersetzungsverhältnis
- Y \*Drehrichtung L = links R = rechts

\*Für Rührwerke

### Dataskylt inskription:

- A Produktnummer
- B Produktkod
- C Löpnummer
- D Tillverkningsnummer
- E Special
- F Axeleffekt, motor
- G Statorkoppling
- H Märkspänning
- I Märkström
- J Fabrikskod
- K Poltal
- L Pumphjul/Propeller diam.
- M Kurvnummer
- N Effektfaktor
- O Driftart, kont./int.drift
- P Fastal, strömart, frekvens
- R Varvtal
- S Isolationsklass
- T Vikt
- U S-order nummer
- V \*Propellervarvtal/bladvinkel propellertyp
- X \*Utväxlingsförhållande
- Y \*Rotationsriktning L = vänster R = höger

\*For omrörare

### Légende de la plaque signalétique:

- A N° de produit
- B Code de produit
- C N° d'ordre
- D N° de série
- E Indications spéciales
- F Puissance sur l'arbre, moteur
- G Couplage du stator
- H Tension nominale
- I Intensité nominale
- J Code d'usine
- K Nombre de pôles
- L Roue/Hélice diamètre
- M N° de courbe
- N Facteur de puissance
- O Type de fonctionnement, continu/intermittent
- P Nombre de phases, type de courant, fréquence
- R Régime
- S Classe d'isolation
- T Poids
- U Numéro d'ordre S
- V \*Vitesse de rotation d'hélice/angle des pâles d'hélice version à hélice
- X \*Rapport de réduction
- Y \*Sens de rotation L = gauche R = droite

\*Pour les agitateurs



State product No. and serial No. of pump when ordering parts.

Do not use item Nos. when ordering spare parts or for stock records.

The provision of the manufacturer's guarantee applies only under the condition that genuine Flygt spare parts are used and that the repair and service work is carried out by a workshop authorized by Flygt.

The manufacturer reserves the right to alter specification and design.

The terms of the guarantee apply only providing the pump is used in accordance with the instructions and in applications for which it is intended.

Uppge pumpens produktnummer och tillverkningsnummer vid reservdelsbeställning.

Använd inte pos.nr utan detaljnr vid reservdelsbeställning och lagerhållning.

Tillverkarens garantibestämmelser gäller endast under förutsättning att Flygts originaldelar används samt att reparations- och servicearbetet utförs av en av Flygt auktoriserad verkstad.

Rätt till ändringar i utförande och specifikationer förbehålles.

Garantivillkoren förutsätter att pumpen används enligt instruktionen och i applikationer för vilka den är avsedd.

Bei Bestellung bitte die Produkt-Nr. und die Fabrikations-Nr. der Pumpe angeben.

Die Pos.-Nummern sind nicht für die Lagerorganisation vorgesehen.

Die Garantiebestimmungen des Herstellers gelten nur unter der Voraussetzung, daß Original Flygt-Ersatzteile verwendet werden, und daß Reparatur- und Wartungsarbeiten von einer von Flygt autorisierten Werkstatt durchgeführt werden.

Änderungen in bezug auf Ausführung und Spezifikationen vorbehalten.

Die Garantiebedingungen voraus, setzen daß die Pumpe laut der Instruktion und in Applikationen, zu welchen sie bestimmt ist, verwendet wird.

Pour toute commande de pièces de rechange, prière d'indiquer le N° de produit et le N° de série de la pompe à laquelle ces pièces sont destinées.

Ne pas utiliser les numéros de repérage lors de la commande de pièces de rechange, ou sur les fiches de stocks. Utiliser les numéros de pièces.

La garantie du constructeur n'est valable que dans la mesure où sont exclusivement utilisées des pièces de rechange Flygt d'origine et où les réparations et interventions sont assurées par un atelier agréé par Flygt.

Nous nous réservons le droit de modifier l'exécution et les spécifications de nos produits.

La garantie n'est valable que dans la mesure où la pompe est utilisée conformément aux directives du constructeur et uniquement affectée aux usages auxquels elle est destinée.

**LT** = Low-head version (Curve No. 801—820)  
Niederdruckausführung

**MT** = Medium-head version (Curve No. 632—648)  
Mitteldruckausführung

**HT** = High-head version (Curve No. 452—454, 460—468)  
Hochdruckausführung

**R** = Raw water pump (Curve No. 480—484)  
Rohwasserpumpe

**CP** = Stationary pump for coupling to a discharge connection.  
Stationäre Pumpe für Anschluß an-Kupplungsfuß.

**CS** = Transportable pump for hose connection.  
Transportable Pumpe mit Schlauchanschluss.

**CT** = Stationary pump, dry installation.  
Stationäre Pumpe, Trockenaufstellung.

**LL** = Lift pump version  
Hebemodell

Lågtrycksutförande  
Modèle basse pression

Medeltrycksutförande  
Modèle pression moyenne

Högtrycksutförande  
Modèle haute pression

Råvattenpump  
Pompe pour eau propre

Stationär pump för anslutning till kopplingsfot.  
Pompe stationnaire pour raccordement sur pied d'assise.

Transportabel pump med slanganslutning.  
Pompe transportable avec raccord pour tuyau souple.

Stationär pump, torrt installerad.  
Pompe stationnaire, installation au sec.

Lyftmodell  
Modèle pompe de levage



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Item No	Part No.	Denomination	Benämning	Quantity
Pos. nr.	Detail nr.	Bezeichnung	Designation	Antal
N° de repérage	N° de pièce			Anzahl
				Nombre

## Pump Types 3300.181 Pumpenaggregate 3300.181

## Pumpaggregat 3300.181 Pompes 3300.181

1	80 30 46	Cylindrical pin (8 × 16) Zylinderstift	Cylindrisk pinne Goupille	2
2	80 68 14	Key (20 × 12 × 70) Passfeder	Plattkil Clavette	1
		SCREW SCHRAUBE	SKRUV VIS	
3a	81 41 04	M8 × 20		4
3b	81 41 06	M8 × 25		6
4	81 41 34	M10 × 40		5
5	81 41 55	M12 × 30		10
6	81 73 86	M8 × 12		4
7	82 01 05	M16 × 40		14
8	81 73 42	M4 × 12		2
9	82 20 88	4 × 5		8
		WASHER SCHEIBE	BRICKA RONDELLE	
10	82 35 16	8.4 × 16		4
11	82 35 23	17 × 30		8
12	82 44 26	90 × 110 × 3.5		2
13	82 35 23	FBF 16.2 × 26.2 × 3.5		14
14	82 48 63	FBF 10.2 × 17.2 × 2.2		4
15	374 56 00	Retaining ring Nutring	Spårring Circlip	1
		O-RING O-RING	O-RING ANNEAU TORIQUE	
			LT MT HT R	
16	82 73 91	22.2 × 3	2 2 2 2	
17	82 73 90	19.2 × 3.0	3 3 3 3	
18	82 75 00	269.3 × 5.7	1 1 1 1	
19	82 75 02	289.3 × 5.7	1 1 1 1	
20	82 75 06	359.3 × 5.7	1 1 1 1	
21	82 75 10	439.3 × 5.7	1 1 1 1	
22	82 75 12	479.3 × 5.7	3 3 2 2	
23	82 74 82	144.5 × 3	1 1 1 1	
24	82 78 88	460 × 8	1 1 1 1	
25	81 41 32	Screw (M10 × 30) Schraube	Skruv Vis	4
26	84 53 75	Roller bearing (SKF NU 315) Rollenlager	Rullager Roulement à rouleaux	1
26a	82 59 21	Retaining ring Nutring	Spårring Circlip	1
27	83 37 03	Ball bearing (SKF 3318/C-3) Kugellager	Kullager Roulement à billes	
28	83 38 94	Conical washer Feder	Tallriksfjäder Ressort	2

Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre			
29	84 25 73	Seal ring Dichtungsring	Tättningsring Joint	1			
30	84 34 07	Screw (M16 x 60) Schraube	Skruv Vis	2			
31		SCREW SCHRAUBE	SKRUV VIS	LT	MT	HT	R
	84 34 11	M16 x 80		16	8-16	8-16	8
	84 34 07	M16 x 60	Curve 641—648	—	8	—	—
32		SCREW SCHRAUBE	SKRUV VIS	LT	MT	HT	R
	82 13 95	M16 x 70		—	1	1	—
	82 13 97	M16 x 100		1	—	—	—
	84 34 11	M16 x 80		—	—	—	1
33	283 13 00	Inspection screw Inspektionsschraube	Inspektionsskrv Vis d'inspection	2			
34	302 21 00	Compression spring Druckfeder	Tryckfjäder Ressort de compression	9			
35	303 09 00	Earthing plate Erdungsblech	Skyddsledarbricka Plaque de terre	2			
36	428 22 01	Inspection screw Inspektionsschraube	Inspektionsskrv Vis d'inspection	2			
37	306 73 00	Screw Schraube	6-kantskrv spec. Vis	9			
38	319 03 00	Junction box cover Anschlussdosendeckel	Införingslock Couvercle	1			
39	391 30 00	Bearing casing, upper Lagergehäuse, oberes	Lagerhus, övre Boîtier de roulement, sup.	1			
40	391 32 00	Cover Deckel	Lock Capot	1			
42	531 43 00	Stator casing Statorgehäuse	Stator hus Logement de stator	1			
43	319 12 01	Outer casing Mantel	Kåpa komplett Enveloppe extérieure	1			
44	503 34 00	Bearing cover Lagerdeckel	Lagerlock Cache-roulement	1			
45		BEARING HOUSING, LOWER LAGERGEHÄUSE, UNTERES	LAGERHUS, NEDRE BOITIER DE ROULEMENT, INF.	1			
	503 45 00	For, För, Für, Pour FLS					
	503 45 01	For, För, Für, Pour CLS					
46	319 19 00	Washer Scheibe	Bricka Rondelle	1			

Item No Pos. nr. Pos.-Nr. N° de répérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
47	319 20 00	Washer Scheibe	Bricka Rondelle	1
48	319 21 01	Oil casing Ölgehäuse	Oljehus Bac à huile	1
49	319 23 02	Inspection screw Inspektionsschraube	Inspektionsskruvenhet Vis d'inspection	
50	84 59 12	Locking assy. Spannsatz	Spännsats Douille de serrage	1
51	341 86 00	Washer Scheibe	Bricka Rondelle	1
52	440 44 00	Spacing sleeve, for LT Distanzhülse, für LT	Distanshylsa, för LT Manchon d'écartement pour LT	1
53	426 82 00	Terminal board assy. Schaltbretteinheit	Kopplingsplintenhet Plaque à bornes, compl.	1
54	279 76 01	Pipe Rohr	Rör Conduite	1
55	392 15 00	Gasket Packung	Packning Joint	1
56	374 57 00	Washer Scheibe	Bricka Rondelle	1
57	337 77 04	SEAL UNIT, INNER DICHTUNGSEINHEIT, INNERE	INRE PLANTÄTNINGSENHET JOINT MÉCANIQUE, INTÉRIEURE	
	*	Stat. seal ring unit Stat. Dichtungsringeinheit	Stat. tätningsringenhet Anneau fixe	(1)
58	82 74 75	O-ring (109.5 x 3) O-Ring	O-ring Anneau torique	(1)
59	*	Seal ring Dichtungsring	Släpring Anneau	(1)
	*	Rot. seal ring unit Rot. Dichtungsringeinheit	Rot. tätningsringenhet Anneau tournant	(1)
60	*	Seal ring Dichtungsring	Tätningsring Anneau d'étanchéité	(1)
61	335 82 20	O-ring O-Ring	O-ring Anneau torique	(1)
62	*	Washer Scheibe	Bricka Rondelle	(1)
63	*	Compression spring Druckfeder	Tryckfjäder Ressort de compression	(9)
64		Spring housing Federgehäuse	Fjäderhus Boîtier de ressort	(1)
65	301 19 20	Stop spring Hemmfeder	Dragfjäder Ressort d'arrêt	(1)

\* Not delivered separately  
Keine separate Lieferung

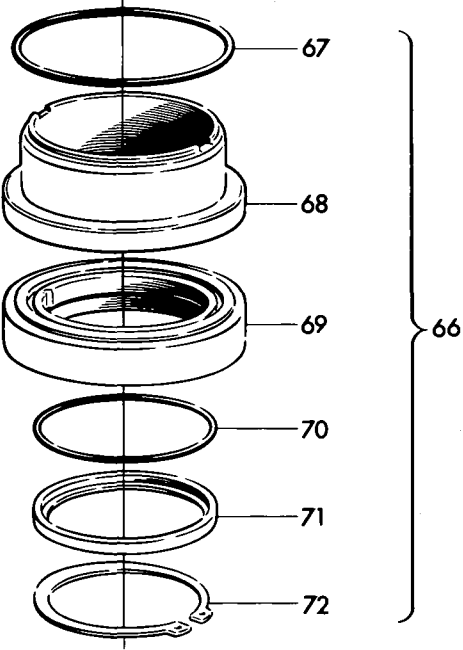
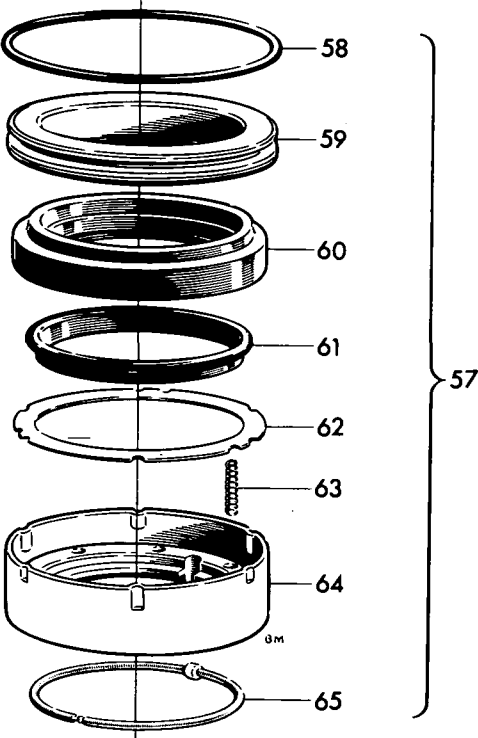
Levereras ej separat  
N'est pas livré séparément

Item No Pos. nr. Pos.-Nr. N° de reperage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
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(57)	337 77 04	SEAL UNIT, INNER SPECIAL (WC/WC) DICHTUNGSEINHEIT, INNERE, SONDERAUS- FÜHRUNG (WC/WC)	INRE PLANTÄTNINGSENHET, SPEC. (WC/WC) JOINT MÉCANIQUE, INTÉRIEURE SPÉCIAL (WC/WC)	1
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Seals  
Dichtungen

Tätningar  
Joints










Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
66	337 79 05	SEAL UNIT, OUTER DICHTUNGSEINHEIT, ÄUßERE	YTTRE PLANTÄTNINGSENHET JOINT MÉCANIQUE, EXTÉRIEURE	
67	82 81 55	O-ring (89.1 x 5.7) O-Ring	O-ring Anneau torique	(1)
68	*	Seal ring Dichtungsring	Tätningsring Joint	(1)
69	*	Seal ring Dichtungsring	Tätningsring Joint	(1)
70	82 74 68	O-ring (74.5 x 3) O-Ring	O-ring Anneau torique	(1)
71	*	Ring Ring	Ring Anneau	(1)
72	82 61 20	Retaining ring (SgA 70) Nutring	Spårring Circlip	(1)
73	374 81 03	Plate Platte	Platta Plaque	1
74	342 10 00	Lifting attachment Bügel	Bygel Poignée	1
75	342 20 00	Sleeve Hülse	Hylsa Tube	2
76	342 21 00	Washer Scheibe	Bricka Rondelle	2
77		SHAFT-ROTOR UNIT ROTOREINHEIT	AXEL-ROTORENHET ARBRE-ROTOR COMPL.	LT MT HT R
77a	80 30 07	Cylindrical pin (4x14) Zylinderstift	Cylindrisk pinne Goupille	
		50 Hz	60 Hz	
	542 54 00	4 pol 40 kW	40 kW (60 hp)	— — 1 —
	319 14 00	4 pol 54 kW	66 kW (88 hp)	— — 1 1
	319 14 01	6 pol 44 kW	57 kW (77 hp)	1 1 — —
	319 14 06	6 pol 34 kW	45 kW (60 hp)	1 1 — —
	319 14 01	8 pol 37 kW	45 kW (60 hp)	1 — — —
	319 14 06	8 pol 27 kW	34 kW (45 hp)	1 — — —
		Stainless steel shaft Rostfreier Welle	Rostfri axel Arbre-acier inoxydable	
	319 14 04	4 pol 54 kW	66 kW (88 hp)	— — 1 1
	319 14 05	6 pol 44 kW	57 kW (77 hp)	1 1 — —

\* Not delivered separately  
Keine separate Lieferung

Levereras ej separat  
N'est pas livré séparément

Item No	Part No.	Denomination	Benämning	Quantity
Pos nr.	Detail nr.			Antal
Pos.-Nr.	Bestell-Nr.	Bezeichnung	Designation	Anzahl
N° de repérage	N° de pièce			Nombre

78		WEAR RING, STATIONARY VERSCHLEISSRING, STATIONÄRER	SLITRING STATIONÄR ANNEAU D'USURE, FIXE	LT	MT	HT	R
		Rubber Gummi	Gummi Caoutchouc				
	379 71 01	Curve 801—820		1	—	—	—
	319 32 00	Curve 632—640		—	1	—	—
	379 71 00	Curve 641—648		—	1	—	—
	319 38 00	Curve 452—454, 460—468		—	—	1	—
		Brass Messing	Mässing Cuivre jaune				
	314 88 14	Curve 801—820		1	—	—	—
	314 88 10	Curve 632—640		—	1	—	—
	314 88 11	Curve 641—648		—	1	—	—
	314 88 05	Curve 452—454, 460—468		—	—	1	—
	271 31 02	Curve 480, 484		—	—	—	1

79		PUMP CASING PUMPENGHÄUSE	PUMPHUS VOLUTE
		LT DN 300 12"	
	319 34 00	 Flange undrilled Flansch, ungebohrt	Oborrad fläns Bride de refoulement, nonpercée
	319 34 22	 For flush valve Für Spülventil	För omrörarventil Pour vanne de brassage
	319 34 01	 SMS 342, DIN 2532	
	319 34 05	 ANSI 16.1:1967 Table 5 (USA)	
	319 34 07	 BS 4622:1970 Table 11	
		MT DN 250 10"	
	319 30 00	 Flange undrilled Flansch, ungebohrt	Oborrad fläns Bride de refoulement, nonpercée
	319 30 20	 For flush valve Für Spülventil	För omrörarventil Pour vanne de brassage

Item No Pos nr. Pos.-Nr. N° de répérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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319 30 01



SMS 342, DIN 2532

319 30 05



ANSI B16.1:1967 Table 5 (USA)

319 30 07



BS 4622:1970 Table 11

**HT DN 150 6"**

319 36 00

Flange undrilled  
Flansch, ungebohrtOborrad fläns  
Bride de refoulement, nonpercée

319 36 20

For flush valve  
Für SpülventilFör omrörarventil  
Pour vanne de brassage

319 36 06

SMS 342, DIN 2533  
BS 4622:1970 Table 11  
ANSI B16.1:1967 Table 5 (USA)**R DN 150 6"**

344 49 00

Flange undrilled  
Flansch, ungebohrtOborrad fläns  
Bride de refoulement, nonpercée

344 49 20

For flush valve  
Für SpülventilFör omrörarventil  
Pour vanne de brassage

344 49 06

SMS 342, DIN 2533  
BS 4622:1970 Table 11  
ANSI B16.1:1967 Table 5 (USA)**80****PUMP CASING BOTTOM  
PUMPENGEHÄUSEBODEN****SUGLOCK  
FOND DE VOLUTE****LT MT HT R**

437 82 02

Curve 801—820

1 — — —

319 31 00

Curve 632—640

— 1 — —

374 85 00

Curve 641—648

— 1 — —

319 37 00

Curve 452—454

— — 1 —

434 50 00

Curve 460—468

— — 1 —



Item No	Part No.	Denomination	Benämning	Quantity
Pos nr.	Detail nr			Antal
Pos.-Nr.	Bestell-Nr.	Bezeichnung	Designation	Anzahl
N° de reperage	N° de pièce			Nombre

**81** IMPELLER, CURVE NO  
LAUFRAD, KURVE NR

PUMPHJUL, KURVA NR  
ROUE, COURBE N°

LT MT HT R

435 14 68	50 Hz	801	1	—	—	—
435 14 71	50 Hz	802	1	—	—	—
435 14 74	50 Hz	803	1	—	—	—
435 14 77	50—60 Hz	804	1	—	—	—
435 14 80	50—60 Hz	805	1	—	—	—
435 14 83	50—60 Hz	806	1	—	—	—
435 14 87	50—60 Hz	807	1	—	—	—
531 57 07	50 Hz	620	1	—	—	—
319 40 00	50 Hz	632	—	1	—	—
408 55 00	50—60 Hz	636	—	1	—	—
408 56 00	50—60 Hz	638	—	1	—	—
408 57 00	50—60 Hz	640	—	1	—	—
434 62 00	50 Hz	641	—	1	—	—
434 62 01	50—60 Hz	642	—	1	—	—
434 62 02	50—60 Hz	644	—	1	—	—
434 62 03	50—60 Hz	646	—	1	—	—
434 62 04	50—60 Hz	648	—	1	—	—
393 81 00	50 Hz	452	—	—	1	—
393 84 00	50—60 Hz	454	—	—	1	—
481 72 01	50 Hz	460	—	—	1	—
481 72 04	50—60 Hz	461	—	—	1	—
481 72 07	50—60 Hz	462	—	—	1	—
481 72 10	50—60 Hz	463	—	—	1	—
481 72 13	50—60 Hz	464	—	—	1	—
481 72 16	50—60 Hz	465	—	—	1	—
481 72 19	50—60 Hz	466	—	—	1	—
481 72 22	50—60 Hz	467	—	—	1	—
481 72 25	50—60 Hz	468	—	—	1	—
344 51 00	50 Hz	480	—	—	—	1
344 50 00	50—60 Hz	484	—	—	—	1

Stainless steel  
Nichtrostenden Stahl

Rostfritt stål  
Acier inoxydable

434 62 80	50 Hz	641	—	1	—	—
434 62 81	50—60 Hz	642	—	1	—	—
434 62 82	50—60 Hz	644	—	1	—	—
434 62 83	50—60 Hz	646	—	1	—	—
434 62 84	50—60 Hz	648	—	1	—	—
434 62 90	50 Hz	641	—	1	—	—
434 62 91	50—60 Hz	642	—	1	—	—
434 62 92	50—60 Hz	644	—	1	—	—
434 62 93	50—60 Hz	646	—	1	—	—
434 62 94	50—60 Hz	648	—	1	—	—
479 99 01	50 Hz	460	—	—	1	—
479 99 04	50—60 Hz	461	—	—	1	—
479 99 07	50—60 Hz	462	—	—	1	—
479 99 10	50—60 Hz	463	—	—	1	—
479 99 13	50—60 Hz	464	—	—	1	—
479 99 16	50—60 Hz	465	—	—	1	—
479 99 19	50—60 Hz	466	—	—	1	—
479 99 22	50—60 Hz	467	—	—	1	—
479 99 25	50—60 Hz	468	—	—	1	—

**82**

438 37 00 Data plate  
Datenschild

Dataskylt  
Plaque signalétique

2

Item No Pos nr. Pos.-Nr. N° de reperage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benaming Designation	Quantity Antal Anzahl Nombre			
83		STATOR STATOR	STATOR STATOR	LT	MT	HT	R
		50 Hz	60 Hz				
		44 kW 970 r/min	57 kW (77 hp) 1150 r/min				
319 74 28	190—200V Δ	380V Y/220V Δ	1	1	—	—	
319 74 34	380—400V Y/220—230V Δ	—	1	1	—	—	
319 74 38	660V Y/380V Δ	440—460V Δ	1	1	—	—	
319 74 39	690V Y/400V Δ	—	1	1	—	—	
319 74 44	400—440V Δ	480V Δ	1	1	—	—	
319 74 52	500—550V Δ	575—600V Δ	1	1	—	—	
	34 kW 970 r/min	45 kW (60 hp) 1160 r/min					
427 39 28	190—200V Δ	380V Y/200V Δ	1	1	—	—	
427 39 34	380—400V Y/220—230V Δ	440—460V Y/260V Δ	1	1	—	—	
427 39 38	660—690V Y/380—400V Δ	440—460V Δ	1	1	—	—	
427 39 44	400—440V Δ	480V Δ	1	1	—	—	
427 39 52	500—550V Δ	575—600V Δ	1	1	—	—	
	37 kW 725 r/min	45 kW (60 hp) 875 r/min					
428 40 28	190—200V Δ	380V Y/200—220V Δ	1	—	—	—	
428 40 29	—	380/220—230V	1	—	—	—	
428 40 38	660—690V Y/380—400V Δ	440—460V Δ	1	—	—	—	
428 40 44	400—440V Δ	400V Δ	1	—	—	—	
428 40 52	500—550V Δ	575—600V Δ	1	—	—	—	
	40 kW 1475 r/min	45 kW (60 hp) 1780 r/min					
542 59 28	190—200 V Δ	200—220V Δ	—	—	1	—	
542 59 30	—	380V Δ	—	—	1	—	
542 59 34	380—400V Y/220—230V Δ	440—460V Y/260V Δ	—	—	1	—	
542 59 38	660V Y/380V Δ	440—460V Δ	—	—	1	—	
542 59 39	690V Y/400V Δ	460V Δ	—	—	1	—	
542 59 44	400—440V Δ	480V Δ	—	—	1	—	
542 59 52	500—550V Δ	575—600V Δ	—	—	1	—	
	54 kW 1470 r/min	65.5 kW (88 hp) 1770 r/min					
319 98 28	190—200V Δ	200—220V Δ	—	—	—	1	
319 98 30	—	380V Δ	—	—	—	1	
319 98 34	380—400V Y/220—230V Δ	440—460V Y/260V Δ	—	—	—	1	
319 98 38	660V Y/380V Δ	440—460V Δ	—	—	—	1	
319 98 39	690V Y—400V Δ	460V Δ	—	—	—	1	
319 98 44	400—440V Δ	400V Δ	—	—	—	1	
319 98 50	500V Δ	575V Δ	—	—	—	1	
319 98 52	500—550V Δ	575—600V Δ	—	—	—	1	
	27 kW 730 r/min	34 kW (45 hp) 880 r/min					
427 40 28	190—200V Δ	200—220V Δ					
427 40 30	—	380V Δ					
427 40 38	660—690V Y/380—400V Δ	440—460V Δ					
427 40 44	400—440V Δ	400V Δ					
427 40 52	500—550V Δ	575—600V Δ					
	Stator with thermistors Stator mit Thermistoren	Stator med termistorer Stator avec thermistors					
530 26 xx	37 kW 725 r/min	45 kW (60 hp) 875 r/min					
530 27 xx	34 kW 970 r/min	45 kW (60 hp) 1160 r/min					
530 28 xx	54 kW 1470 r/min	65 kW (88 hp) 1770 r/min					
530 52 xx	44 kW 975 r/min	56 kW (75 hp) 1170 r/min					
560 85 xx	27 kW 725 r/min	34 kW (45 hp) 875 r/min					
xxx xx 44	400—440 V Δ	480 V Δ					

Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
84	413 70 00	Cable entry flange Leitungseinführungsflansch	Införingsfläns Bride d'entrée	1
85		CLAMP KLAMMER	KLAMMA BRIDE	
	398 98 00 398 98 01	(10)—12 mm (0.39"—0.47") (12)—14 mm (0.47"—0.55")	White, Vit, Weiss, Blanc Yellow, Gul, Gelb, Jaune	
86		WASHER SCHEIBE	BRICKA RONDELLE	2
	82 41 08 82 40 84	(10)—12 mm (0.39"—0.47") (12)—14 mm (0.47"—0.55")		
87		SEAL SLEEVE DICHTUNGSHÜLSE	TÄTNINGSHYLSA MANCHON	1
	84 35 66 84 35 59	(10)—12 mm (0.39"—0.47") (12)—14 mm (0.47"—0.55")		
91	94 20 76	Control cable Steuerleitung SUBCAB, 2 × 1.5 mm <sup>2</sup> , Ø 11 mm (0.43")	Manöversladd Câble auxiliaire	1

When delivered for a pilot cable with diameter 12—14 mm (0.47"—0.55") (not delivered from factory) items No 84, 86, 87 and protection cover (433 47 02) should be assembled.

When delivered without the pilot cable (item 91) the cable entry unit (item 84) should be replaced by a cover (392 14 00) and an O-ring (82 79 24).

Bei Lieferung für Steuerleitung mit Durchmesser 12—14 mm (nicht werkseitig lieferbar) müssen Pos.Nr. 84, 86 und 87 sowie Schutzstopfen (433 47 02) angebaut sein.

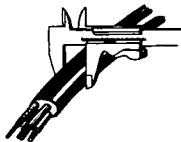
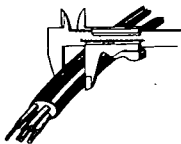
Bei Lieferung ohne Steuerleitung (Pos Nr. 91) ist die Leitungseinführungseinheit (Pos Nr. 84) durch den Deckel (392 14 00) und den O-Ring (82 79 24) zu ersetzen.

Vid leverans för manöversladd med diameter 12—14 (levereras ej från fabrik) skall pos.nr 84, 86 och 87 samt skyddspropp (433 47 02) vara monterade.

Vid leverans utan manöversladd (pos nr 91) skall införingsenheten (pos nr 84) ersättas med ett täcklock (392 14 00) och en O-ring (82 79 24).

Lors de la livraison pour câble auxiliaire de 12—14 mm de diamètre (N'est pas livré d'usine), les pièces correspondant aux numéros de repérage 84, 86 et 87 doivent être en place, ainsi que le bouchon de protection (433 47 02).

Lorsque la pompe est livrée sans câble auxiliaire (N° de repérage 91) l'entrée de câble (N° de repérage 84) doit être remplacée par un couvercle (392 14 00) avec anneau torique (82 79 24).

Item No Pos nr. Pos.-Nr. N° de reperage	Part No. Detail nr. Bestell-Nr. N° de piece	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
92		POWER CABLE ENTRY ASSY. MOTORLEITUNGEIN- FÜHRUNGSEINHEIT	INFÖRINGSENHET FÖR MOTORSLADD ENTRÉE DE CABLE COMPL.	
	394 77 16	(24)—30 mm (0.94"—1.18")		
	394 77 14	(30)—39 mm (1.18"—1.54")		
	394 77 15	(40)—47 mm (1.57"—1.85")		
93	*	Flange Flansch	Fläns Bride	(1)
94	82 23 55	Nut (M5) Mutter	Mutter Ecrou	(2)
95	81 73 63	Screw (M5 x 35) Schraube	Skruv Vis	(2)
96	*	Clamp Klammer	Klamma Bride	(2)
97		WASHER SCHEIBE	BRICKA RONDELLE	2—4
	82 41 27	(24)—26 mm (0.94"—1.02")		
	82 41 28	(26)—28 mm (1.02"—1.10")		
	82 41 29	(30)—32 mm (1.18"—1.26")		
	82 41 00	(32)—34 mm (1.26"—1.34")		
	82 41 01	(33)—35 mm (1.30"—1.38")		
	82 41 02	(35)—37 mm (1.38"—1.46")		
	82 41 03	(37)—39 mm (1.46"—1.54")		
	82 41 04	(40)—42 mm (1.57"—1.65")		
	82 40 74	(45)—47 mm (1.77"—1.85")		
				
98		SEAL SLEEVE DICHTUNGSHÜLSE	TÄTNINGSHYLSA MANCHON	1—2
	84 35 71	(24)—26 mm (0.94"—1.02")		
	84 35 73	(26)—28 mm (1.02"—1.10")		
	84 35 68	(30)—32 mm (1.18"—1.26")		
	84 35 60	(32)—34 mm (1.26"—1.34")		
	84 35 61	(33)—35 mm (1.30"—1.38")		
	84 35 62	(35)—37 mm (1.38"—1.46")		
	84 35 63	(37)—39 mm (1.46"—1.54")		
	84 35 64	(40)—42 mm (1.57"—1.65")		
	84 35 49	(45)—47 mm (1.77"—1.85")		
				
99		MOTOR CABLE MOTORLEITUNG	MOTORSLADD CÂBLE	1—2
	94 20 47	SUBCAB, 4 x 25 mm <sup>2</sup> , Ø33.5 mm (1.32")		
	94 20 48	SUBCAB, 4 x 35 mm <sup>2</sup> , Ø37.5 mm (1.47")		
	94 20 57	SUBCAB, 4G 10 + 2 x 1.5 mm <sup>2</sup> , Ø27 mm (1.06")		
	94 20 58	SUBCAB, 4G 16 + 2 x 1.5 mm <sup>2</sup> , Ø27 mm (1.06")		
	94 20 62	SUBCAB, 4G 25 + 2 x 1.5 mm <sup>2</sup> , Ø33.5 mm (1.32")		
	94 20 63	SUBCAB, 4G 35 + 2 x 1.5 mm <sup>2</sup> , Ø37.5 mm (1.47")		

\* Not delivered separately  
Keine separate Lieferung

Levereras ej separat  
N'est pas livré séparément

Item No Pos nr Pos.-Nr. N° de repérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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When the pump is delivered with cable entry but without motor cable, items No. 97 and 98 plus plugs 433 47 05 shall be fitted.

When the pump is delivered without cable entry, a transport retainer consisting of 1—2 hexagonal screws 81 41 56, hexagonal nut 82 23 59, sleeve 84 35 61 and 2—4 washers 82 40 84 shall be fitted.

Bei Lieferung mit angebaute Leitungseinführung, jedoch ohne Motorleitung, müssen Pos.Nr. 97 und 98 sowie Verschlußstopfen 433 47 05 angebaut sein.

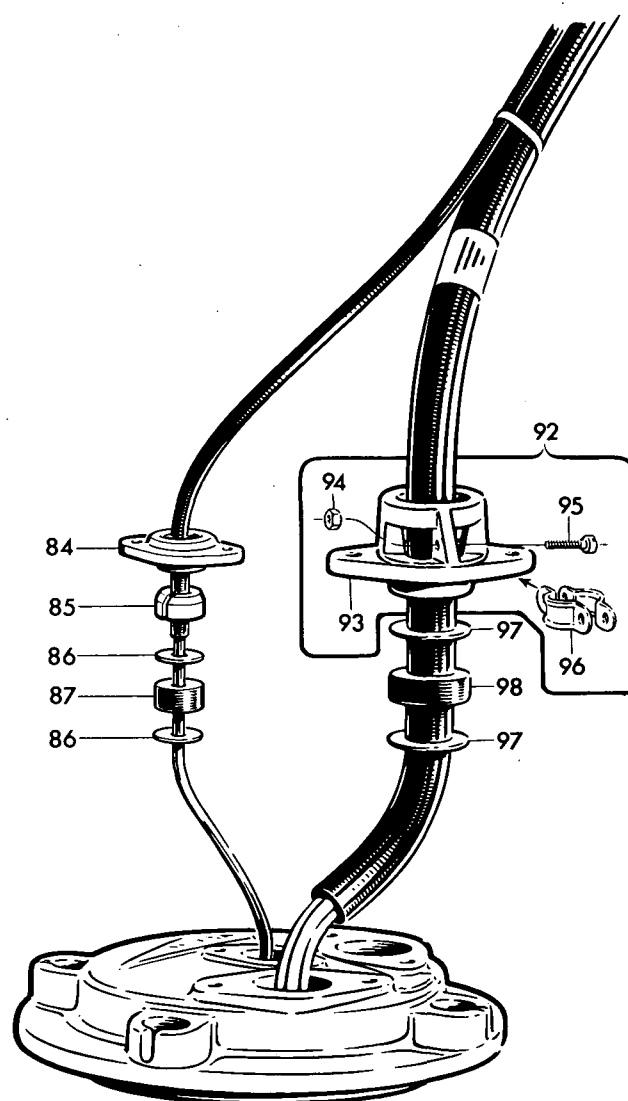
Bei Lieferung ohne Leitungseinführung muß eine Transportsicherung angebaut sein, bestehend aus 1—2 Sechskantschrauben 81 41 56, Sechskantmutter 82 23 59, Hülse 84 35 61 und 2—4 Scheiben 82 40 84.

Vid leverans med monterad kabelinföring men utan motorsladd skall pos nr 97 + 98 samt skyddspropp 433 47 05 vara monterade.

Vid leverans utan kabelinföring skall en transportsäkring monteras bestående av 1—2 st 6-kantskruvar 81 41 56, 6-kantmutter 82 23 59, hylsa 84 35 61 samt 2—4 st brickor 82 40 84.

Si la pompe est livrée avec entrée de câble montée, mais sans câble d'alimentation, les pièces correspondant aux N°s de repérage 97 et 98 ainsi également que le bouchon de protection 433 47 05 doivent être montés.

En cas de livraison sans entrée de câble, la pompe doit alors être munie d'une sécurité transport constituée de 1—2 vis 6 pans 81 41 56, 1 écrou 6 pans 82 23 59, 1 douille 84 35 61 et 2—4 rondelles 82 40 84.



Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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100

WEAR RING, ROTATING  
VERSCHLEISSRING,  
ROTIERENDERSLITRING, ROTERANDE  
ANNEAU D'USURE  
TOURNANT

LT MT HT R

345 25 09

1 — — —

345 25 00

Curve 632—640

— 1 — —

345 25 03

Curve 641—648

— 1 — —

345 25 02

— — 1 —

271 32 02

— — — 1

101

80 23 58

Cylindrical pin (8 x 50) HT, R  
Zylinderstift HT, RCylindrisk pinne HT, R  
Goupille HT, R

102

82 74 05

O-ring, 64.2 x 5.7  
(for direct start)  
O-Ring (für Direktstart)

O-ring, (för direktstart)

Anneau torique (pour démarrage  
direct)

1

103

319 22 00

Cover (for direct start)  
Deckel (für Direktstart)

Lock (för direktstart)

Couvercle (pour démarrage direct)

1

104

82 73 30

Felt strip  
Filzstreifen

Tättningslist

Bande d'étanchéité

1

105

391 31 00

Ring  
Ring

Ring

Anneau

1

106

391 33 00

Bearing cover, upper  
Lagerdeckel, oberer

Lagerlock, övre

Capot de roulement, sup.

1

107

393 03 00

Washer  
Scheibe

Bricka

Rondelle

1

108

379 95 00

Seal ring  
Dichtungsring

Tättningsring

Anneau d'étanchéité

109

PLATE  
PLATTESKIVA  
PLAQUE

1

441 41 00

For stator 427 39 28—58

110

INSULATING HOSE  
ISOLERSCHLAUCHISOLERSLANG  
GAINE ISOLANTE

94 05 15

1.6 m (5.3 ft) For stator

319 98 28—58, 427 39 28,  
427 39 32—34, 319 74 28,  
319 74 32—34, 319 79 28

0.8 m (2.6 ft) For stator

427 39 52—58, 319 74 58,  
319 79 30, 319 79 38—58

94 05 12

1.6 m (5.3 ft) For stator

427 39 30, 427 39 35,  
427 39 38—44, 319 74 30,  
319 74 35—52, 319 79 32

3.1 m (10.3 ft) For stator 427 39 37

Item No	Part No.	Denomination	Benämning	Quantity
Pos nr.	Detail nr.			Antal
Pos.-Nr.	Bestell-Nr.	Bezeichnung	Designation	Anzahl
N° de reptage	N° de pièce			Nombre

**Version with leakage sensor FLS,  
floating type and capacitive  
leakage sensor CLS-30, built-in type**

**Ausführung mit Leckagedetektor  
FLS und kapazitive Leakage-  
detektor CLS-30, eingebaut Modell**

**Utförande med läckagegivare FLS  
och läckagesensor CLS-30, inbyggd  
version**

**Modèle avec détecteur de fuites FLS  
et détecteur de fuites à condensateur  
CLS 30, du type intérieur**

300	83 58 48	Alarm relay unit Alarmeinheit	Larmreläenhet Unité d'alarme	1
301	83 44 24	End sleeve Aderendhülse	Ändhylsa Douille de boul	2
302		CABLE UNIT KABELEINHEIT	KABELENHET UNITÉ DE CÂBLE	

	504 78 04	CLS 30		1
	504 78 11	FLS		1
	543 83 00	CLS 30 + FLS		1

a	*	Receptacle Kontakthülse	Kontakthylsa Manchon d'accouplement	(2)
b	*	Terminals device Kontakt vorrichtung	Kopplingsdon Pince de raccordement	(1)
c	*	Cable Kabel	Ledning Câble	(1)
d	*	Cable Kabel	Ledning Câble	(1)
e	*	Insulating hose Isolierschlauch	Isolerslang Tuyau isolante	(1)

303	505 12 00	LEAKAGE SENSOR UNIT, CLS 30 LECKAGE DETEKTOR EINHEIT, CLS 30	LÄCKAGE SENSOR ENHET, CLS 30 UNITE DE DÉTECTEUR DE FUITES, CLS 30	
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f	*	Sensor Detektor	Detektor Détecteur	(1)
g	*	O-ring O-Ring	O-ring Anneau torique	(1)
h	*	Terminal device Kontakt vorrichtung	Kopplingsdon Pince de raccordement	(1)
i	*	Terminal Anschlusssteck	Kontaktstift Contact à fiches	(2)

\* Not delivered separately  
Keine separate Lieferung

Levereras ej separat  
N'est pas livré séparément

Item No Pos nr. Pos.-Nr. N° de répérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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304	518 89 01	LEAKAGE SENSOR UNIT, FLS LECKAGE DETEKTOR EINHEIT, FLS	LÄCKAGE SENSOR ENHET, FLS UNITÉ DE DÉTECTEUR DE FUITES, FLS	1
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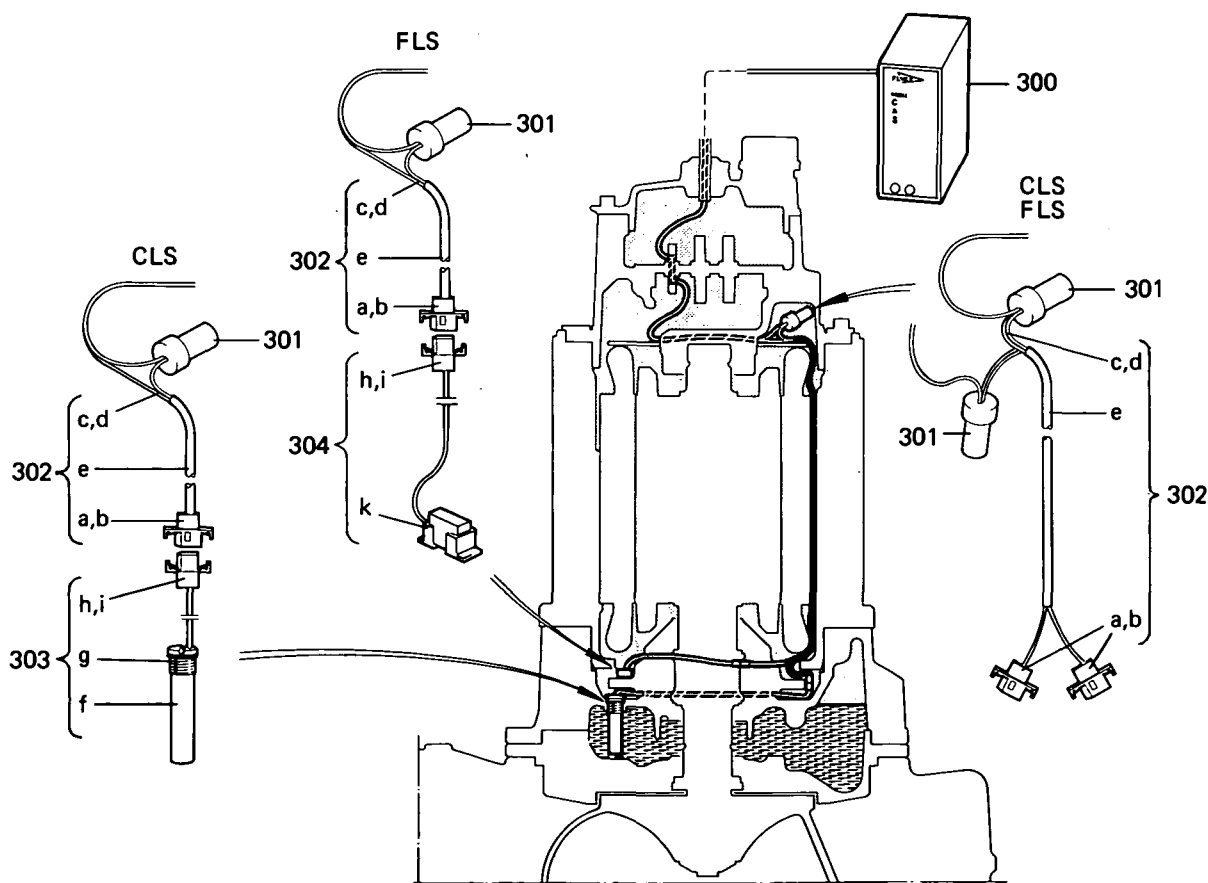
k	*	Level switch unit Pegelgeber-Einheit	Nivåvaktenhet Unité de regulateurs de niveau	(1)
h	*	Terminal device Kontakt vorrichtung	Kopplingsdon Pince de raccordement	(1)
i	*	Terminal Anschlusssteck	Kontaktstift Contact à fiches	(2)

\* Not delivered separately  
Keine separate Lieferung

Levereras ej separat  
N'est pas livré séparément

**Version with leakage sensor  
FLS, floating type and capacitive  
leakage sensor CLS-30, built-in type**  
**Ausführung mit Leckagedetektor  
FLS und kapazitive Leckagedetektor  
CLS-30, eingebaut Modell**

**Utförande med läckagegivare FLS  
och läckagesensor CLS-30  
inbyggd version**  
**Modèle avec détecteur de fuites  
FLS et détecteur de fuites à  
condensateur CLS 30, du type intérieur**





Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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**Sump components, CP 3300**  
**Schachteinbauteile, CP 3300**

**Pumpgropsdetaljer, CP 3300**  
**Equipement du puisard, CP 3300**

115	84 34 30	Screw (M20 x 60) Schraube	6-kantskruv Vis	2
116	84 34 37	Screw (M20 x 110) Schraube	6-kantskruv Vis	2
117	92 64 10	Guide bar Führungsrohr	Gejdrör Barre de guidage	2
118	305 79 00	Sliding bracket Gleitklaue	Styrklo Glissière	1
119	251 36 00	Cable holder Kabelhalter	Sladdhållare Fixe-câbles	1
120	255 47 01	Rubber tube Gummihülse	Mellanlägg Manchon	2
121	319 59 01	Guide bar holder Führungsrohrhalter	Gejdfäste Attache pour barres de guidage	1

For LT  
Für LT

För LT  
Pour LT

122	84 34 32	Screw Schraube	Skruv Vis	4
123	463 59 00	Bellmouth Einmündung	Inloppstratt Tuyau d'arrivée	1

Item No Pos nr. Pos.-Nr. N° de répérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
124	322 20 00	ACCESS FRAME UNIT EINSTIEGRAHMEN- EINHEIT	INMURNINGSRAMENHET CADRE DE TRAPPE D'ACCES COMPL.	1
125	81 41 29	Screw (M10 x 20) Schraube	Skruv Vis	(3)
126	82 35 18	Washer (10.5 x 22) Scheibe	Bricka Rondelle	(3)
127	82 35 23	Washer (17 x 30) Scheibe	Bricka Rondelle	(2)
128	*	Chain Kette	Kätting Chaîne	(4)
129	84 34 02	Screw (M16 x 35) Schraube	Skruv Vis	(2)
130	*	Locking pin Querstift	Sprint Goupille de blocage	(4)
131	*	Cover Deckel	Lucka Trappe	(1)
132	*	Cover Deckel	Lucka Trappe	(1)
133	*	Access frame Einstiegrahmen	Inmurningsram Cadre de trappe d'accès	(1)
134	82 56 27	Square washer (17.5 x □ 93) Vierkantscheibe	4-kantbricka Plaque carré	(2)
135	84 50 19	S-hook S-Haken	S-hake S-crochet	(8)

136	DISCHARGE CONNECTION ASSY KUPPLUNGSFUß	KOPPLINGSFOT PIED D'ASSISE
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## LT DN 350 14"

320 15 00



320 15 01



SMS 342, DIN 2537

320 15 05



ANSI B16.1:1967 Table 5 (USA)

320 15 07



BS 4504:1969 Table 16/11

\* Not delivered separately  
Keine separate Lieferung

Levereras ej separat  
N'est pas livré séparément

Item No Pos nr. Pos.-Nr. N° de répérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
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**MT DN 300 12"**

481 75 00



481 75 01



SMS 342, DIN 2532

481 75 05



ANSI B16.1:1967 Table 5 (USA)

481 75 07



BS 4622:1970 Table 11

**HT DN 200 8"**

444 71 00



444 71 06

SMS 342, DIN 2533  
BS 4622:1970 Table 11  
ANSI B16.1:1967 Table 5 (USA)

444 71 07



BS 4622:1970 Table 11

**R DN 200 8"**

444 71 00



444 71 06

SMS 342, DIN 2533  
BS 4622:1970 Table 11  
ANSI B16.1:1967 Table 5 (USA)

444 71 07



BS 4622:1970 Table 11

FOR DISCHARGE  
CONNECTION  
FÜR KUPPLUNGSFUßFÖR KOPPLINGSFOT  
POUR PIED D'ASSISE

82 23 62

Nut (M20)  
MutterMutter  
Ecrou

4

82 35 26

Washer (36 x 21 x 3)  
ScheibeBricka  
Rondelle

4

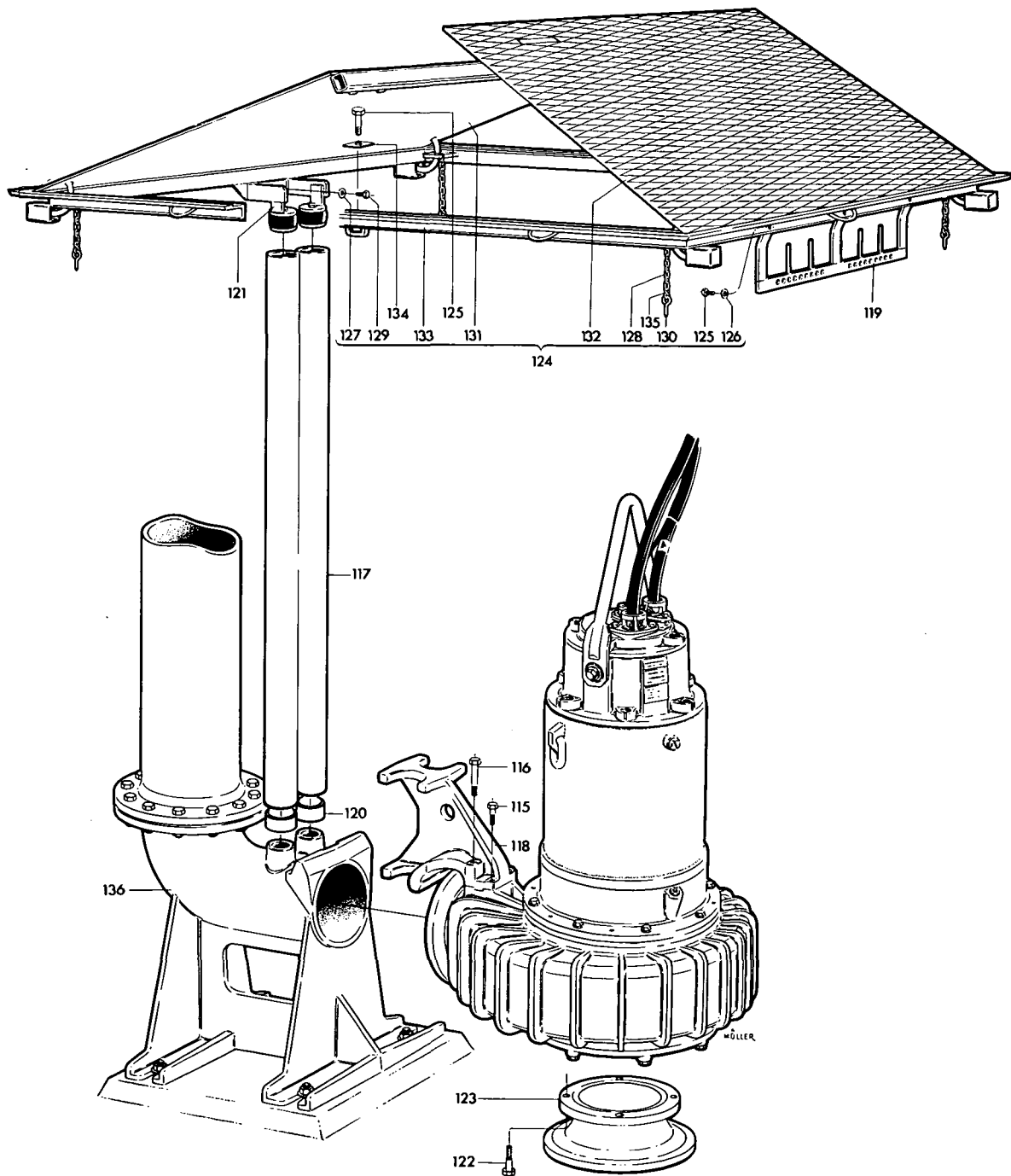
409 60 01

Anchor bolt  
(M20 x 200)  
SchraubeIngjutningsbult  
Vis

4

**Sump components, CP 3300**  
**Schachteinbauteile, CP 3300**

**Pumpgropsdetaljer, CP 3300**  
**Equipement du puisard, CP 3300**



Item No	Part No.	Denomination	Benämning	Quantity
Pos nr.	Detalj nr.	Bezeichnung	Beskrivning	Antal
N° de	Bestell-Nr.		Désignation	Anzahl
repérage	N° de pièce			Nombre

## Hose connection for CS 3300 Schlauchanschluß für CS 3300

## Stativ och anslutning för CS 3300 Raccord de tuyau pour pompe CS 3300

				LT	MT	HT
138	437 88 01	Stand Stativ	Stativ Bâti	1	1	1
139	82 35 26	Washer (21 x 36 x 3) Scheibe	Bricka Rondelle	4	12	8
140	82 23 62	Nut (M20) Mutter	6-kantmutter Ecrou	4	12	8
		SCREW SCHRAUBE	6-KANTSKRUV VIS			
141						
	84 34 11	(M16 x 80), Curve 641—648		8	8	—
	84 34 13	(M16 x 100)		8	8	8
142						
	84 34 32	(M20 x 70)		—	—	8
	84 34 34	(M20 x 80)		4	12	—
143		GASKET PACKUNG	PACKNING JOINT			
	84 65 82			—	1	—
	295 64 00			—	—	1
	380 25 01			1	—	—
144		HOSE CONNECTION SCHLAUCHANSCHLUß	TRYCKANSLOTNING RACCORD DE TUYAU			
	295 57 00	6"		—	—	1
	309 80 00	8"		—	—	1
	379 32 00	8"		—	1	—
	457 68 00	10"		1	—	—
146		HOSE CLAMP SCHLAUCHSCHELLE	SLANGKLÄMMA COLLIER DE SERRAGE POUR TUYAU	LT	MT	HT
	82 31 38	6"		—	—	2
	82 31 40	8"		—	3	3
	82 32 71	10"		3	—	—



Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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**Pump components CT 3300**  
**Pumpenraum-Zubehör für CT 3300**

**Pumplokalsdetaljer CT 3300**  
**Équipement complémentaire pour CT 3300**

150

SUCTION PIPE ASSY.  
SAUGROHREINHEIT

SUGRÖRSENHET  
COUDE D'ASPIRATION

**LT DN 400 16"**

437 89 00



437 89 01



SMS 342, DIN 2532

437 89 05



ANSI B16.1:1967 Table 5

437 89 07



BS 4504:1969 Table 16/11

**MT DN 400 16" curve 632, 636—640**

320 06 00



320 06 01



SMS 342, DIN 2532

320 06 05



ANSI B16.1:1967 Table 5

320 06 07



BS 4504:1969 Table 16/11

**MT DN 300 curve 641—648**

384 74 00



384 74 01



SMS 342, DIN 2532

384 74 05



ANSI B16.1:1975 Table 5




384 74 07



BS 4622:1970 Table 11

Item No Pos nr Pos.-Nr. N° de répérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
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## HT DN 200 8"

	272 82 00						
	272 82 06		SMS 342, DIN 2532, ANSI B16.1:1975 Table 5				
	272 82 07		BS 4622:1970 Table 11				
151		Screw Schraube	Skruv Vis	LT	MT	HT	
	81 41 55	M12 x 30		(6)	(6)	—	
	81 41 56	M12 x 35, Curve 641—648		—	(4)	—	
	81 52 49	3/4 UNC x 32		—	—	(4)	
152	82 71 78	Plug Propf	Propp Bouchon	(1)	(1)**	—	
153		Gasket Packung	Packning Joint				
	274 48 00	MT curve 641—648		—	(1)	(1)	
	320 07 00			(1)	(1)	—	
154	*	Suction pipe Saugrohr	Sugrör Coude d'aspiration				
155		Cleaning door Reinigungsdeckel	Renslucka Regard de nettoyage				
	274 45 00			—	—	(1)	
	274 45 01	Curve 641—648		—	(1)	—	
	320 19 00			(1)	(1)	—	
156		SCREW SCHRAUBE	6-KANTSKRUV VIS	LT	MT	HT	R
	84 34 05	M16 x 50		—	—	—	8
	84 34 11	M16 x 80, Curve 641—648		—	8	—	—
	84 34 13	M16 x 100		8	8	8	—
157		SCREW SCHRAUBE	6-KANTSKRUV VIS	LT	MT	HT	
	84 34 30	M20 x 60	—	—	8		
	84 34 30	M20 x 60	—	12	—		
	84 34 34	M20 x 80	16	—	—		

\*\* Not for curve 641—648  
Nicht für Kurve 641—648

Ej kurva 641—648  
Pas pour courbe 641—648

\* Not delivered separately  
Keine separate Lieferung

Levereras ej separat  
N'est pas livré séparément

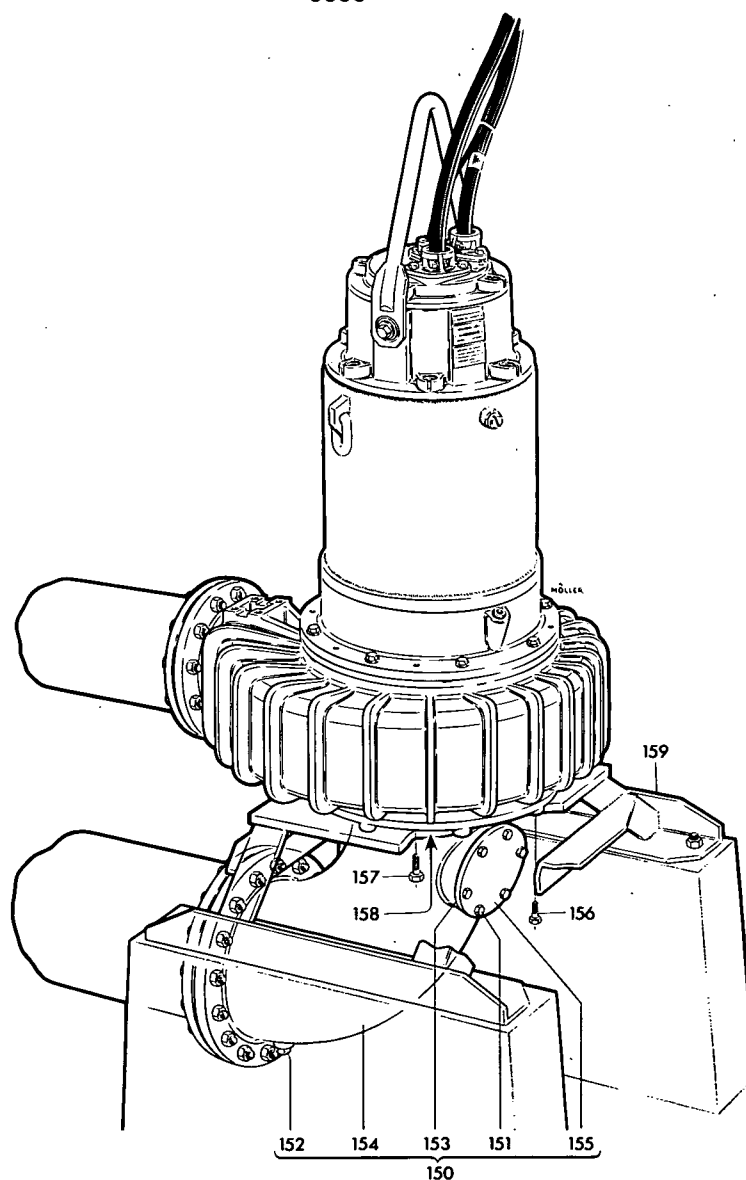


Item No Pos nr. Pos.-Nr. N° de reperage	Part No. Detail nr. Bestell.-Nr. N° de piece	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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158		GASKET PACKUNG	PACKING JOINT	LT	MT	HT
	84 65 80	Curve 632, 636—640		—	1	—
	84 65 81			1	—	—
	84 65 82	Curve 641—648		—	1	—
	274 76 00			—	—	1
159	437 88 01	Stand Stativ	Stativ Bâti	1	1	1

Sump components, CT 3300  
Pumpenraum-Zubehör für CT 3300

Pumplokalsdetaljer, CT 3300  
Équipement complémentaire pour pompe CT 3300



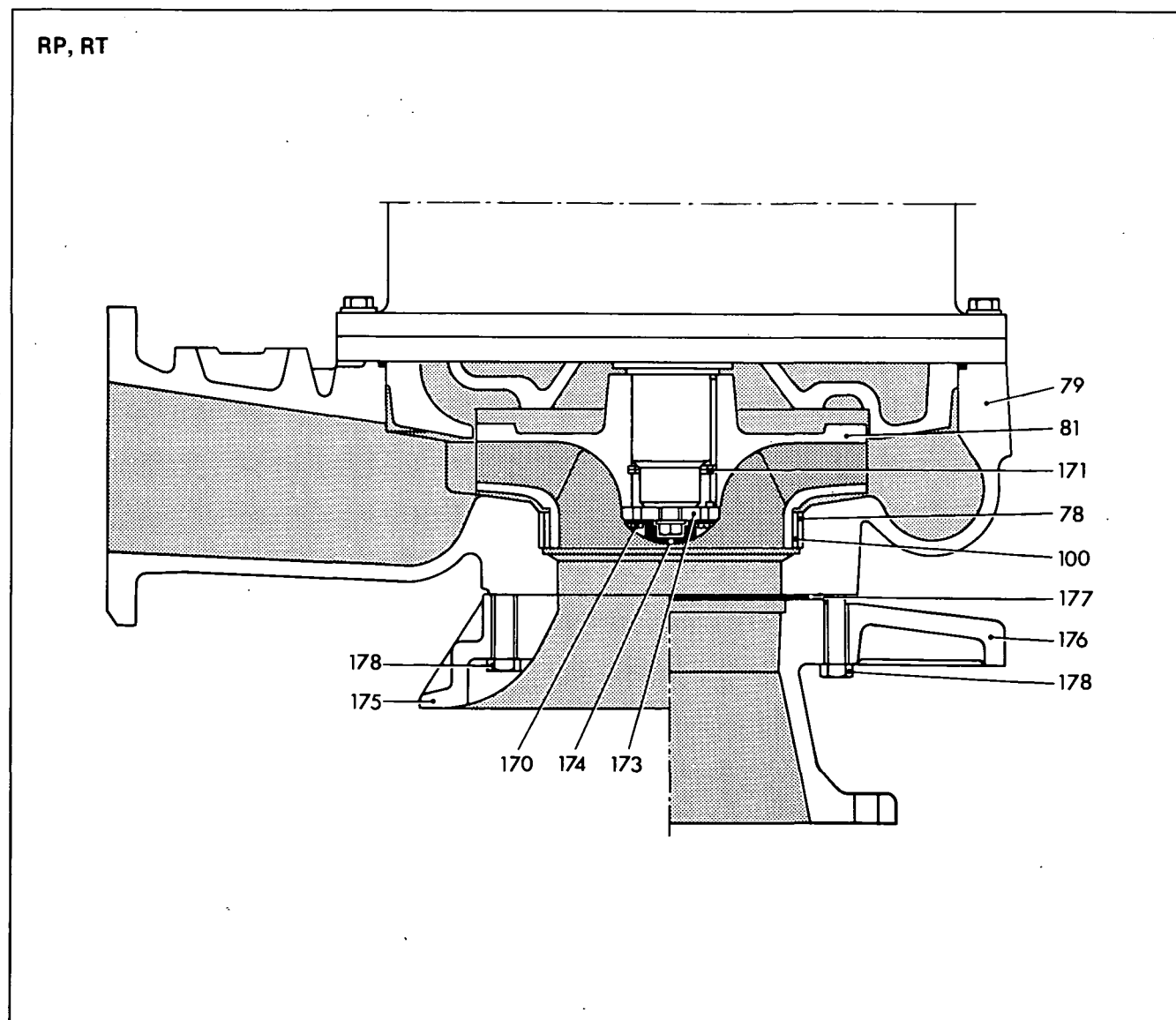
Item No Pos. nr. Pos.-Nr. N° de repérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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## Version RP and RT

### Ausführung RP und RT

## Utförande RP och RT

<b>170</b>	81 73 86	Slotted screw (M8 x 10) Schlitzschraube	Spårskruv Vis	2	2
<b>171</b>	82 62 17	Retaining ring (SgH 72) Nutring	Spårring Circlip	1	1
<b>173</b>	319 25 00	Washer Scheibe	Bricka Rondelle	1	1
<b>174</b>	319 27 00	Protection Schutz	Skydd Protection	1	1
<b>175</b>	344 52 00	Inlet bellmouth Zulauftrichter	Inloppstratt Cône d'entrée	1	—



Item No. Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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176

INLET BELLMOUTH  
ZULAUFTRICHTERINLOPPSTRATT  
CONE D'ENTRÉE

— 1

344 53 00



344 53 01



SMS 342, DIN 2532

344 53 05



ANSI B16.1:1967 Table 5 (USA)

344 53 07



BS 4622:1970 Table 11

177

345 44 00

Gasket  
PackungPackning  
Joint

— 1

178

84 34 34

Screw (M20 x 80)  
Schraube6-kantskruv  
Vis

4 8

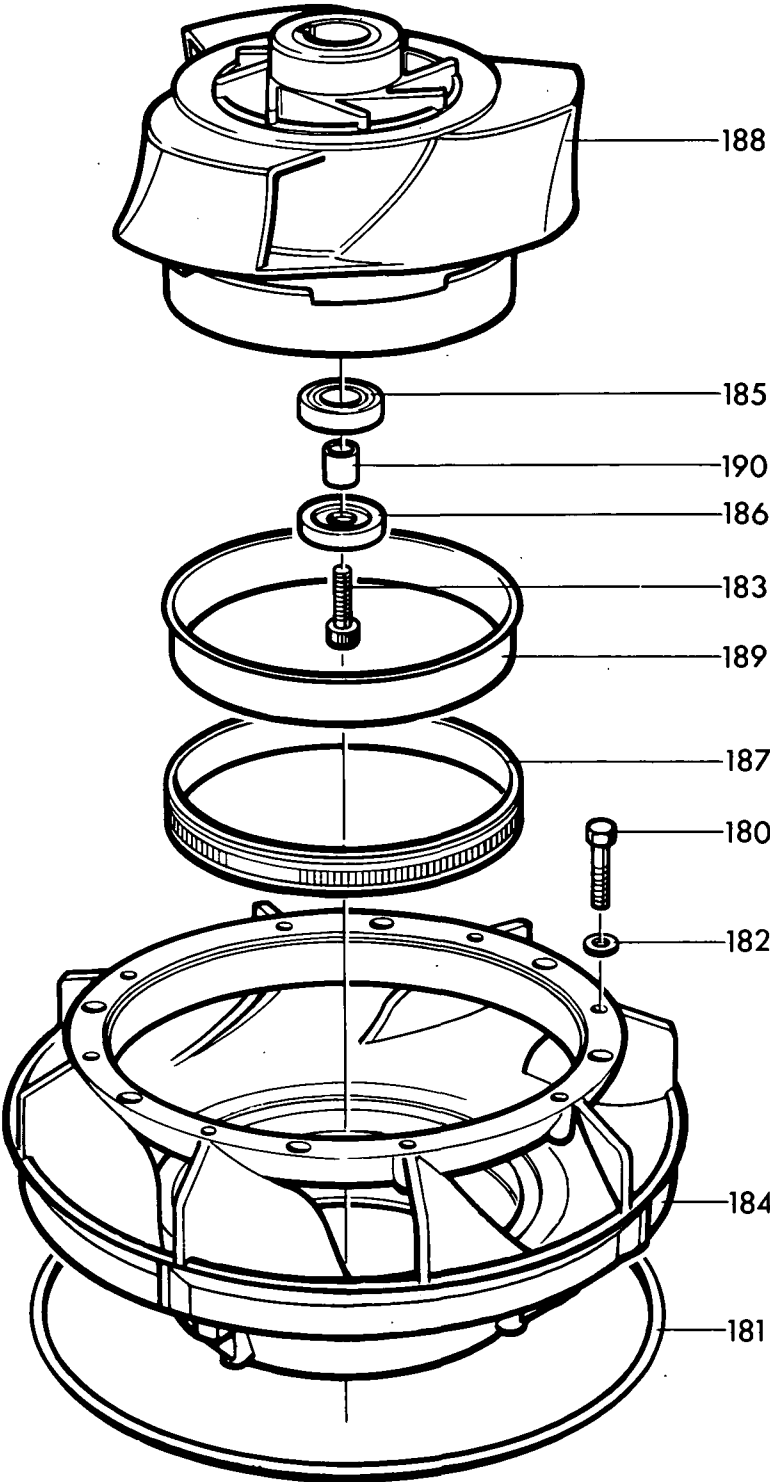
Item No Pos nr. Pos.-Nr. N° de reperage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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**LL-version**  
**LL-Ausführung**

**LL-utförande**  
**Modèle LL**

180	82 35 23	Washer (17 × 30 × 3) Scheibe	Bricka Rondelle	4
181	82 83 43	G-ring G-Ring	G-ring Anneau G	1
182	84 34 11	Screw (M16 × 80) Schraube	6-kantskruv Vis	4
183	82 13 97	Allen screw (M16 × 70) Innensechskantschraube	Insexskruv Vis Allen	1
184	547 88 00	Diffusor ring Diffusorring	Ledskenedel Anneau diffuseur	1
185	84 59 12	Locking assy. Spannsatz	Spännsats Douille de serrage	1
186	341 86 00	Washer Scheibe	Bricka Rondelle	1
187	314 88 14	Wear ring, stationary Verschleissring, stat.	Tättningsring, stationär Anneau d'usure, fixe	1
188		IMPELLER, CURVE NO LAUFRAD, KURVE NR	PUMPHJUL, KURVA NR ROUE, COURBE N°	1
	435 14 68	x01	50 Hz	
	435 14 71	x02	50 Hz	
	435 14 74	x03	50 Hz	
	435 14 77	x04	50—60 Hz	
	435 14 80	x05	50—60 Hz	
	435 14 83	x06	50—60 Hz	
	435 14 87	x07	50—60 Hz	
189	345 25 09	Wear ring, rotating Verschleissring, rot.	Slitring, roterande Anneau d'usure tournant	1
190	440 44 00	Spacing sleeve Distanzhülse	Distanshylsa Manchon d'écartement	

LL



30116

Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr. Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Désignation	Quantity Antal Anzahl Nombre
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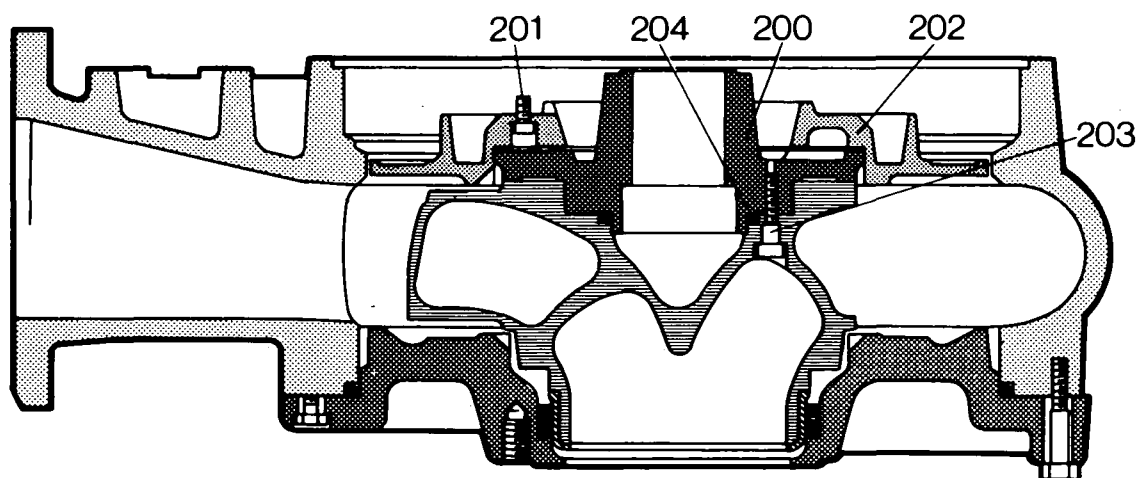
## HT Curve No 460—468

THE FOLLOWING PARTS  
ARE ADDED  
DIE FOLGENDE TEILE  
KOMMEN HINZU

FÖLJANDE DETALJER  
TILLKOMMER  
LES PIÈCES SUIVANTES  
SONT AJOUTÉES

200	434 49 03	Hub Nabe	Nav Moyeu	1
201	82 00 49	Screw (M10 x 20) Schraube	Skruv Vis	2
202	434 48 00	Ring Ring	Ring Anneau	1
203	82 00 71	Screw (M12 x 40) Schraube	Skruv Vis	2
204	82 74 12	O-ring (110.5 x 5.7) O-Ring	O-ring Anneau torique	1

## HT Curve No 460—468

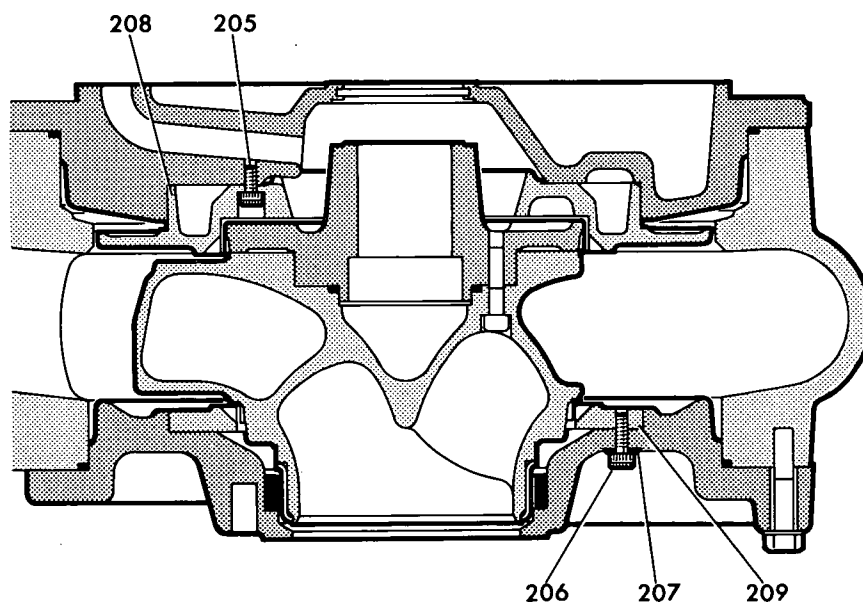


Item No Pos nr. Pos.-Nr. N° de repérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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434 92 00	CONVERSION SET TO HT FOR TWO VANE DESIGN UNBAUSATZ ZU HT FÜR 2-KANALLAUFRÄDER	OMBYGGNADSSATS TILL HT FÖR 2 KANALSHJUL ENSEMBLE DE CONVERSION À HT POUR ROUES À 2 CANAUX
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205	82 00 49	Screw (M10 x 20) Schraube	Skruv Vis	1
206	82 00 52	Screw (M10 x 30) Schraube	Skruv Vis	4
207	82 35 18	Washer Scheibe	Bricka Rondelle	4
208	434 48 00	Ring Ring	Ring Anneau	1
209	434 58 00	Ring Ring	Ring Anneau	1

HT Curve No 460—468



Item No Pos.nr. Pos.-Nr. N° de repérage	Part No. Detail nr Bestell-Nr. N° de pièce	Denomination Bezeichnung	Benämning Designation	Quantity Antal Anzahl Nombre
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## Accessories Zubehör

## Tillbehör Accessoires

	ZINC ANODES ZINK ANODENSATZ	ZINKANODSATS ANODES EN ZINC	
	For motor unit Für Motoreinheit	För motorenhet Pour unité motrice	1
443 26 26			
	For pump casing Für Pumpengehäuse	För pumphus Pour volute	1
	For rawwater Für Rohwasser	För råvatten Pour l'eau brute	
443 26 27 443 26 36	With bellmouth Mit Zulauftrichter	Med inloppstratt Avec cône d'entrée	
443 26 28	LT, MT, HT		
	SEAL TOOL DICHTUNGSWERK- ZEUG	TÄTNINGSVERKTYG OUTIL POUR GARNITURE MÉCANIQUE	
398 39 00 398 40 00 399 47 01 400 56 00			



Item No	Part No.	Denomination	Benämning	Quantity
Pos. nr.	Detalj nr.			Antal
Pos.-Nr.	Bestell-Nr.	Bezeichnung	Beskrivning	Anzahl
N° de repérage	N° de pièce		Désignation	Nombre

**Capacitive leakage sensor CLS-30,  
external version**  
**Kapazitive Leckagedetektor CLS-30,  
äussere Modell**

**Kapacitiv läckagesensor CLS-30,  
extern version**  
**Détecteur de fuites á condensateur  
CLS-30, du type extérieur**

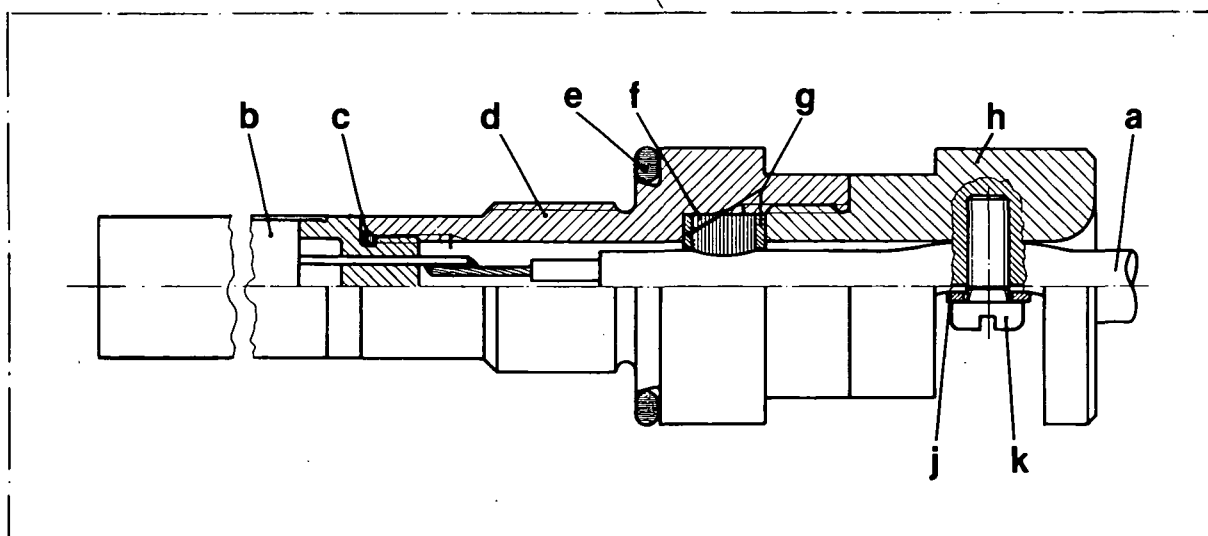
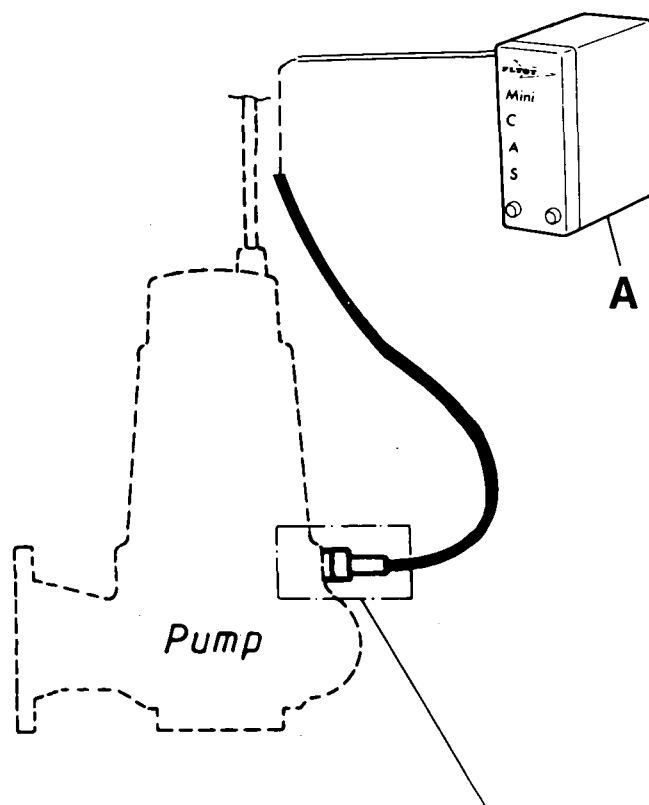
	510 17 00	LEAKAGE SENSOR SET LECKAGE DETEKTOR SATZ	LÄCKAGESENSOR SATS JEU DE DETECTEUR DE FUITES	1
<b>A</b>	83 58 48	Alarm unit Alarmeinheit	Larmcentral Unité d'alarme	1
	509 43 00	LEAKAGE SENSOR UNIT LECKAGE DETEKTOR EINHEIT	LÄCKAGESENSOR ENHET UNITÉ DE DETECTEUR DE FUITES	1
<b>a</b>	94 17 08	Cable 23 m Kabel	Sladd Câble	(1)
<b>b</b>	*	Sensor Detektor	Sensor Détecteur	(1)
<b>c</b>	*	O-ring O-Ring	O-ring Anneau torique	(1)
<b>d</b>	*	Nipple Nippel	Nippel Raccord	(1)
<b>e</b>	82 72 95	O-ring O-Ring	O-ring Anneau torique	(1)
<b>f</b>	509 38 00	Sleeve Hülse	Hylsa Manchon	(1)
<b>g</b>	509 39 00	Washer Scheibe	Bricka Rondelle	(2)
<b>h</b>	*	Gland screw Hülsenschraube	Hylsskruv Vis à douille	(1)
<b>j</b>	509 40 00	Plate Platte	Platta Plaque	(1)
<b>k</b>	81 73 41	Screw Schraube	Skruv Vis	(2)

\* Not delivered separately  
Keine separate Lieferung

Levereras ej separat  
N'est pas livré séparément

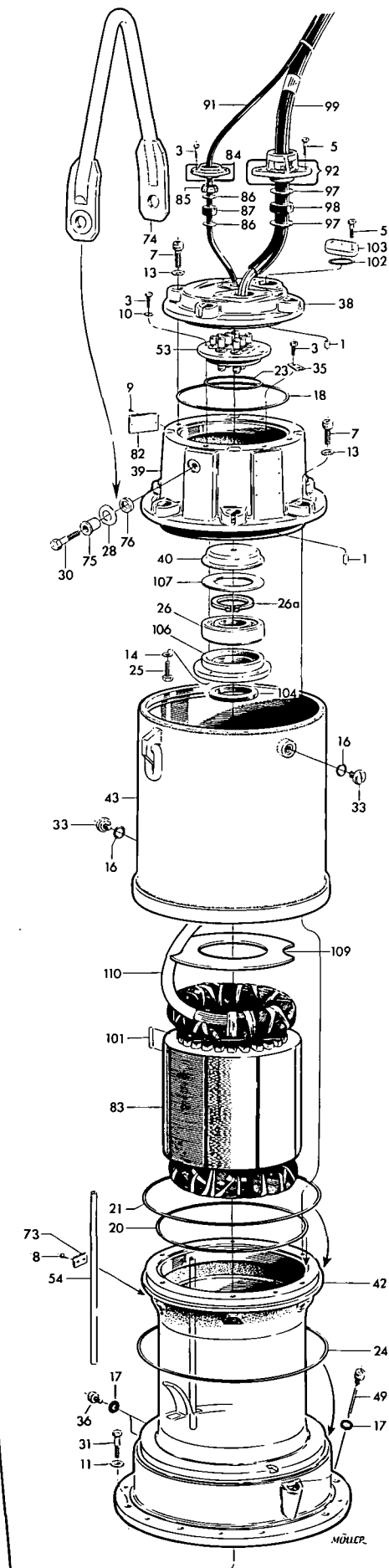
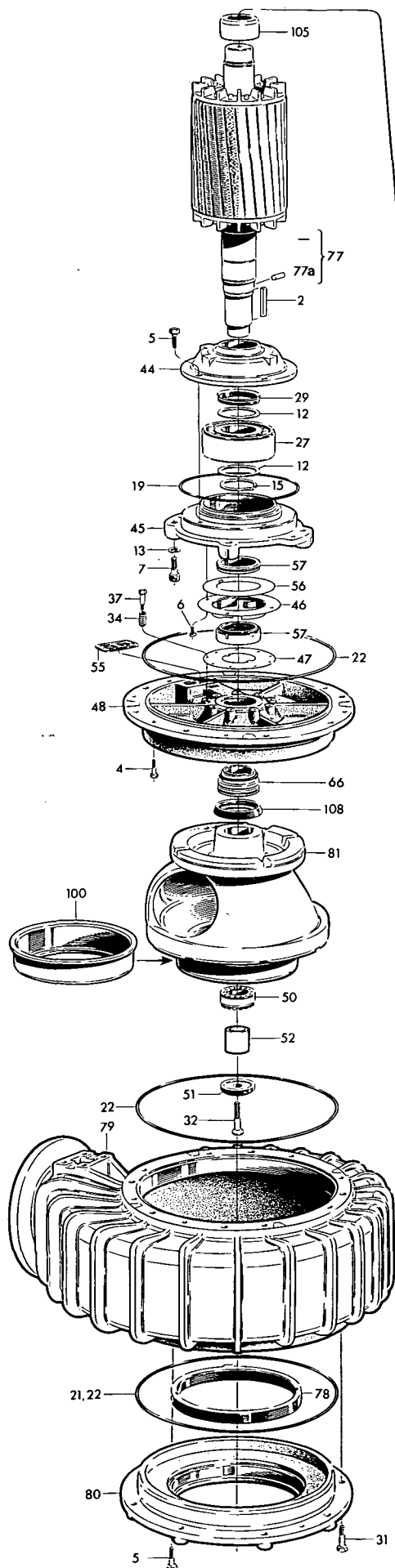
**Leakage sensor external version**  
**Leckagedetektor, äussere Modell**

**Läckagesensor, extern version**  
**Détecteur de fuites, du type extérieur**



**NOTES**

3300

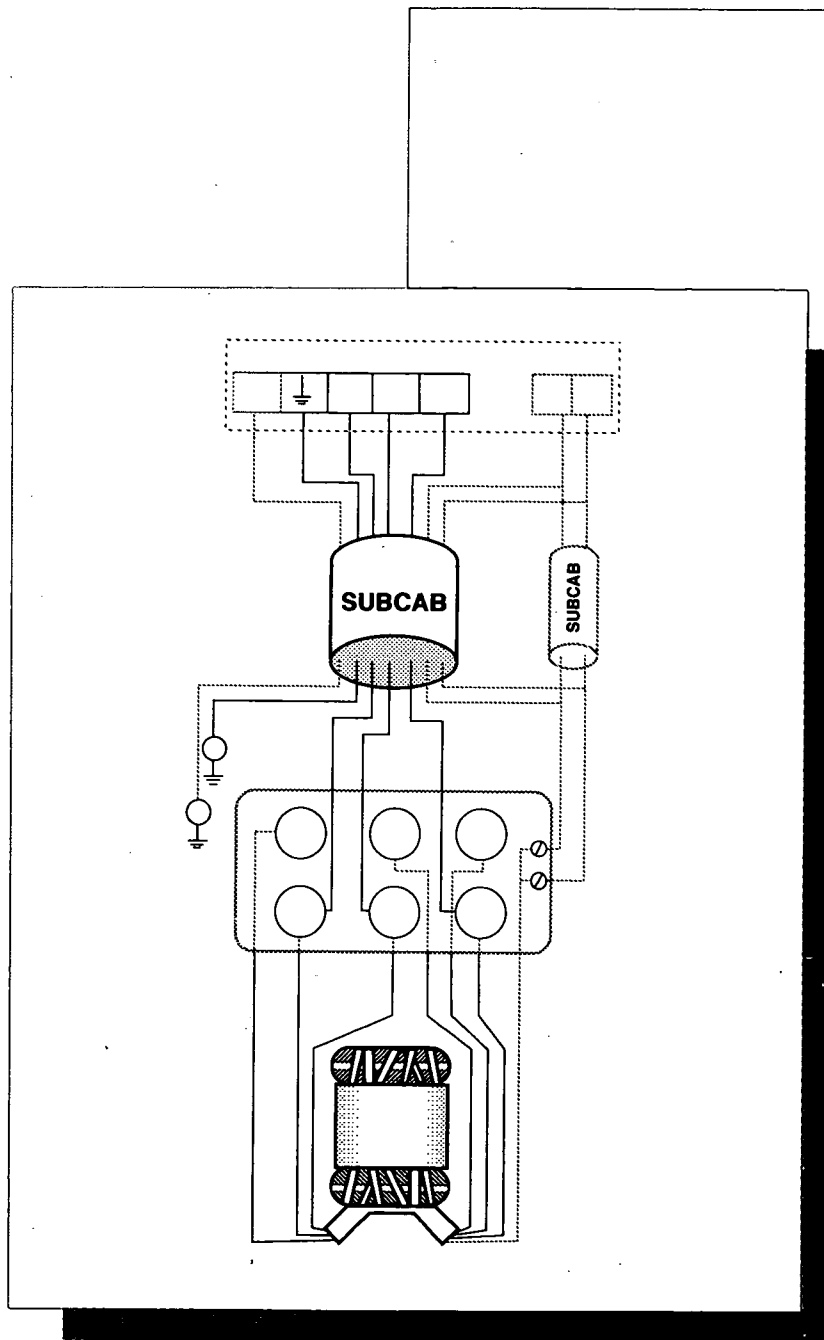






2000  
3000  
4000  
5000

SUBCAB®, POWER CABLE CONNECTIONS  
SUBCAB®, KABELANSCHLÜSSE  
SUBCAB®, KABELANSLUTNINGAR  
SUBCAB®, BRANCHEMENT DES CÂBLES



**IMPORTANT INFORMATION!**  
**WICHTIGE INFORMATION!**  
**VIKTIG INFORMATION!**  
**INFORMATION IMPORTANT!**

## **SUBCAB POWER CABLE CONNECTION** **SUBCAB KABELANSCHLUB**

The electrical connections for the Flygt SUBCAB power cables will be changed according to the new standard (404)A3216.001. The new connections will be implemented in production from serial no. 9310000. In the tables you can find the connection (or connections) that are valid for your particular pump or mixer.

The electrical connections shown in this brochure are the most common ones. If your product is to be connected in a special way not covered by this brochure, please check in the ordinary "Installation, Care and Maintenance" manual. There you will also find general information about electrical connections.

More information about the new standard connections can be found in the brochure "SUBCAB POWER CABLE CONNECTION".

Die elektrische Anschlüsse der Kabel für Flygt SUBCAB werden gemäß der neuen Norm (404) A3216.001 geändert. Die neuen Anschlüsse werden ab Fabrikationsnummer 9310000 in der Produktion eingeführt. Den entsprechenden Anschluß (Anschlüsse) Ihrer Pumpe oder Ihres Rührwerkes entnehmen Sie den Tabellen.

Diese Broschüre enthält die üblichen Anschlußvarianten. Falls Ihr Produkt auf eine Weise anzuschließen ist, die nicht in dieser Broschüre abgedruckt ist, können Sie die erforderliche Information der entsprechenden Betriebsanleitung entnehmen. Dort finden Sie zudem auch allgemeine Informationen zu den elektrischen Anschlüssen.

Für weitere Informationen über die neuen Normanschlüsse, siehe Broschüre "SUBCAB POWER CABLE CONNECTION".

## **SUBCAB KRAFTKABELANSLUTNING** **SUBCAB, BRANCHEMENT DE CÂBLE**

De elektriska anslutningarna för Flygt SUBCAB kablar kommer att ändras i enlighet med den nya standarden (404)A3216.001. De nya inkopplingarna införs fr.o.m. tillverkningsnummer 9310000. I tabellerna kan ni hitta den koppling (eller kopplingar) som gäller för just er pump eller mixer.

Denna broschyr omfattar de vanligast förekommande inkopplingsvarianterna. Om er produkt skall kopplas in på ett sätt som inte visas i denna broschyr, kan ni istället finna information i den ordinarie bruksanvisningen "Installation och Skötsel". Där finns även generell information om elektriska inkopplingar.

Mer information om de nya standardinkopplingarna finns i broschyren "SUBCAB POWER CABLE CONNECTION".

Le branchement électrique des câbles Flygt SUBCAB va être modifié conformément à la nouvelle norme (404)A3216.001. Cette modification entrera en vigueur à la production à partir du N° de série 9310000. Vous trouverez dans les tableaux l'indication du branchement applicable à votre pompe ou agitateur.

Cette brochure regroupe les variantes de branchement les plus courantes. Si votre matériel doit être branché d'une manière ne figurant pas dans la brochure, vous pouvez alors vous reporter à la notice "Installation et Entretien" concernant normalement ce matériel. Celle-ci contient également des directives générales en matière de branchement électrique.

Vous trouverez d'autre part, dans la brochure "SUBCAB POWER CABLE CONNECTION", un complément d'information sur les nouveaux branchement normalisés.

**2000**

Product Produkt Produkt Produite	Figure/Figur/Figur/Figure		
	Y+D	Y/D	1~
2050	A1		D1*
2051	A1		D1*
2060	A1		D1
2066	A1		D1
2071	A1		D3
2075	A1	B1	
2084	A1	B1	
2102	A1	B1	D3
2125	A1	B1/C1	
2135	A1		
2140	A1	B1	
2151	A1	B1/C1	
2201	A1	C1	
2250	A1	C1	
2400	A1	C1	
2540	A2	C2	

**4000**

Product Produkt Produkt Produite	Figure/Figur/Figur/Figure		
	Y+D	Y/D	1~
4351	A1	B1	D1*
4352	A2	B2	D2
4400	A2	B2	D4
4410	A2	B2	D4
4430	A2	B2	D4
4440	A2	B2	
4451	A1	B1	D3
4501	A1	B1	D3
4630	A1		
4640	A1		
4650	A1		
4660	A1		
4670	A1		
4680	A1		

**3000**

Product Produkt Produkt Produite	Figure/Figur/Figur/Figure		
	Y+D	Y/D	1~
3041	A1	B1	D1*
3060	A1		D1
3067	A2	B2	D2
3080	A1	B1	
3085	A2	B2	D2/D4
3102	A2	B2	D2/D4
3126	A1	B1	D3
3127	A2	B2	D2/D4
3140	A1	B1	
3152	A1	B1/C1	D3
3170	A1	B1/C1	
3201	A1	B1/C1	
3300	A1	C1	

**5000**

Product Produkt Produkt Produite	Figure/Figur/Figur/Figure		
	Y+D	Y/D	1~
5510	A2	B2	
5520	A2	B2	
5530	A2	B2	
5540	A1	B1/C1	
5550	A1	B1/C1	
5560	A1	B1/C1	
5630	A1	B1	
5640	A2	B2/C2	
5650	A2	B2/C2	
5660	A2	B2/C2	
5670	A2	C2	

\*8 lead stator. See "Installation, care and maintenance.

\*Stator mit 8 Litzen. Siehe "Betriebsanleitung".

\*8-ledarstator. Se "Installation och skötsel".

\*Stator à 8 conducteurs. Voir "Installation et entretien".



#### SUBCAB/SUBCAB AWG\*

1	Brown (Red*)
2	Blue (White*)
3	Black (Black*)
Earth	Yellow/green
Ground-check	Yellow*
T1	Black T1/orange*
T2	Black T2/blue*

#### Stator leads

U1	Red
V1	Brown
W1	Yellow
V2	Blue
W2	Black
U2	Green

#### SUBCAB/SUBCAB AWG\*

1	Braun (Rot*)
2	Blau (Weiss*)
3	Schwarz (Schwarz*)
Erd	Gelb/grün
"Ground-check"	Yellow*
T1	Schwarz T1/orange*
T2	Schwarz T2/blau*

#### Statorlitzen

U1	Rot
V1	Braun
W1	Gelb
V2	Blau
W2	Schwarz
U2	Grün

#### SUBCAB/SUBCAB AWG\*

1	Brun (Röd*)
2	Blå (Vit*)
3	Svart (Svart*)
Jord	Gul/grön
"Ground-check"	Gul*
T1	Svart T1/orange*
T2	Svart T2/blå*

#### Statorledare

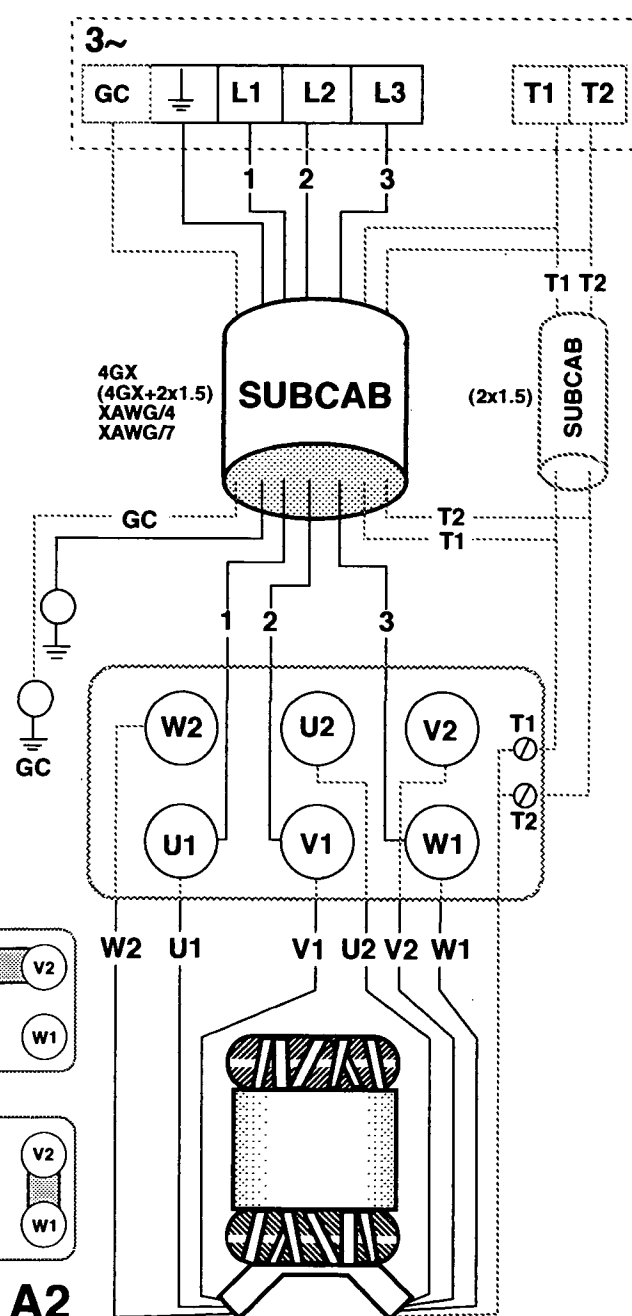
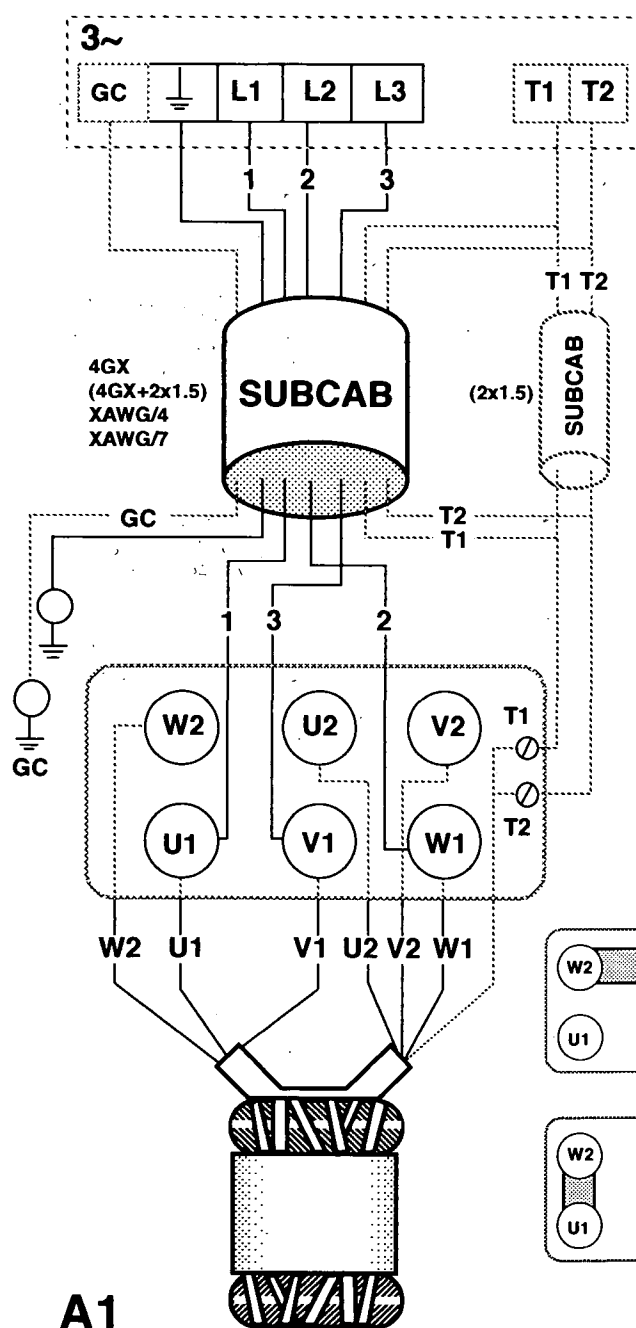
U1	Röd
V1	Brun
W1	Gul
V2	Blå
W2	Svart
U2	Grön

#### SUBCAB/SUBCAB AWG\*

1	Brun (Rouge*)
2	Bleu (Blanc*)
3	Noir (Noir*)
Terre	Jaune/vert
"Ground-check"	Jaune*
T1	Noir T1/orange*
T2	Noir T1/bleu*

#### Conducteurs du stator

U1	Rouge
V1	Brun
W1	Jaune
V2	Bleu
W2	Noir
U2	Vert



#### SUBCAB

1	Black 1
2	Black 2
3	Black 3
4	Black 4
5	Black 5
6	Black 6
Earth	Yellow/green
T1	Black T1
T2	Black T2

#### Stator leads

U1	Red
V1	Brown
W1	Yellow
V2	Blue
W2	Black
U2	Green

#### SUBCAB

1	Schwarz 1
2	Schwarz 2
3	Schwarz 3
4	Schwarz 4
5	Schwarz 5
6	Schwarz 6
Erd	Gelb/grün
T1	Schwarz T1
T2	Schwarz T2

#### Statorlitzen

U1	Rot
V1	Braun
W1	Gelb
V2	Blau
W2	Schwarz
U2	Grün

#### SUBCAB

1	Svart 1
2	Svart 2
3	Svart 3
4	Svart 4
5	Svart 5
6	Svart 6
Jord	Gul/grön
T1	Svart T1
T2	Svart T2

#### Statorledare

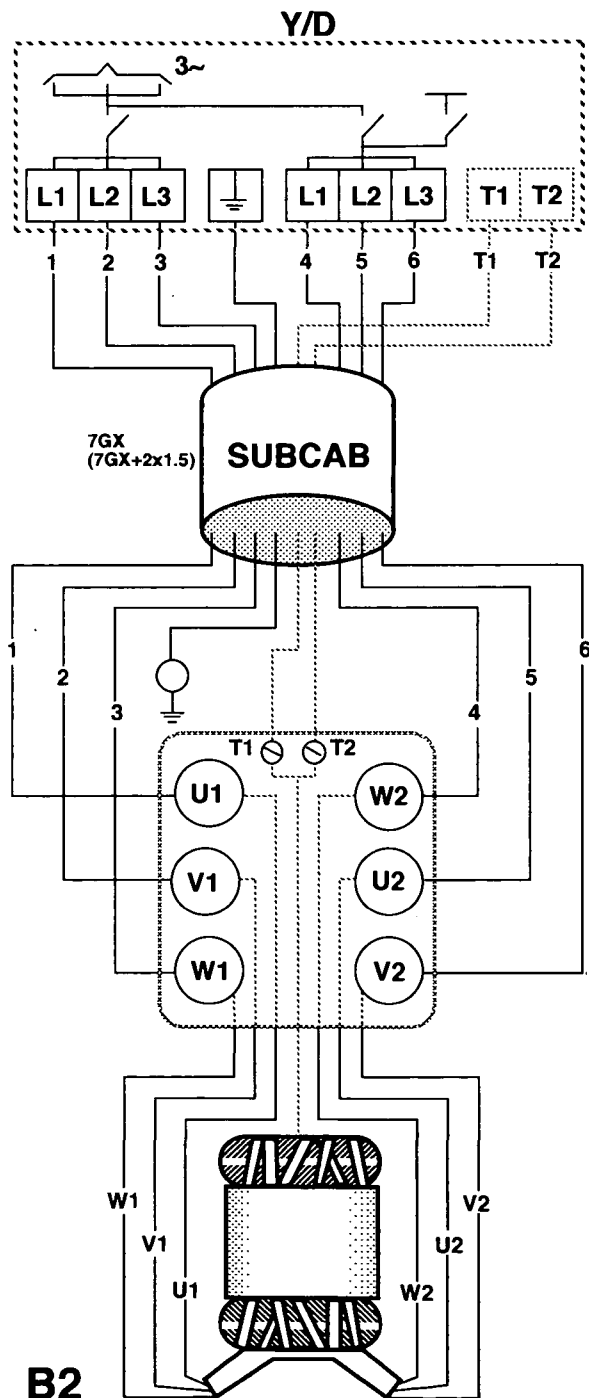
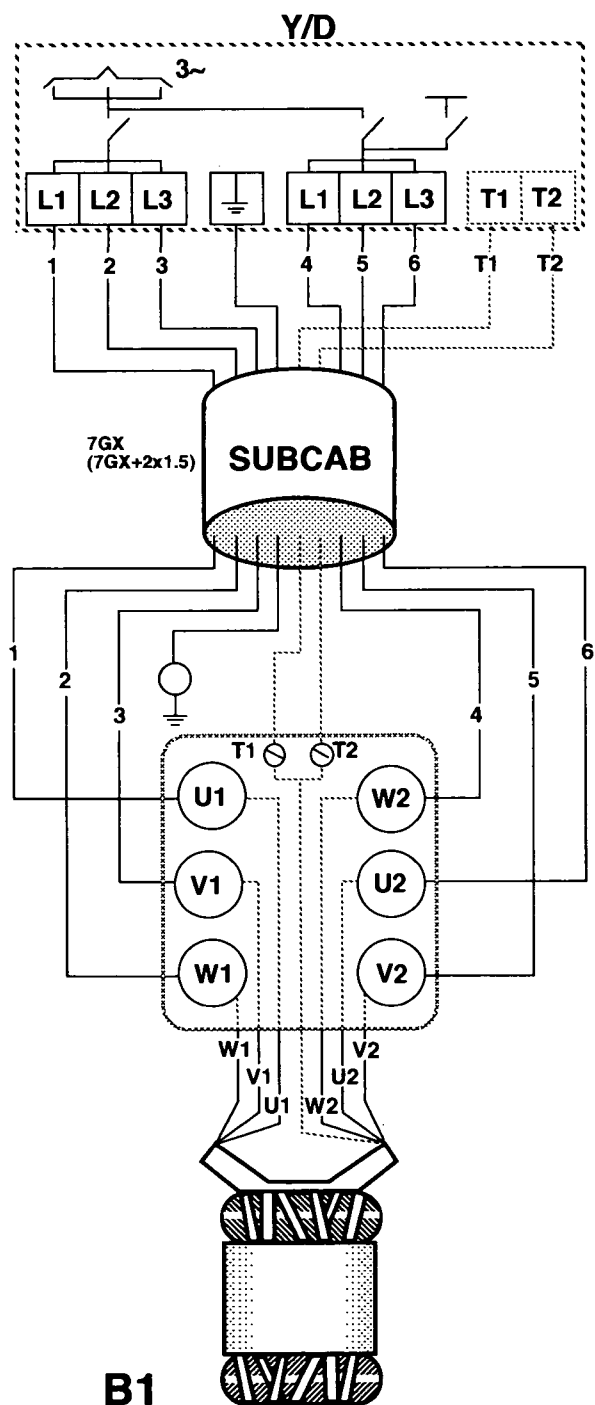
U1	Röd
V1	Brun
W1	Gul
V2	Blå
W2	Svart
U2	Grön

#### SUBCAB

1	Noir 1
2	Noir 2
3	Noir 3
4	Noir 4
5	Noir 5
6	Noir 6
Terre	Jaune/vert
T1	Noir T1
T2	Noir T2

#### Conducteurs du stator

U1	Rouge
V1	Brun
W1	Jaune
V2	Bleu
W2	Noir
U2	Vert



#### SUBCAB 1+2

1/4	Brown
2/5	Blue
3/6	Black
Earth	Yellow/green
T1	Black T1
T2	Black T2

#### Stator leads

U1	Red
V1	Brown
W1	Yellow
V2	Blue
W2	Black
U2	Green

#### SUBCAB 1+2

1/4	Braun
2/5	Blau
3/6	Schwarz
Erd	Gelb/grün
T1	Schwarz T1
T2	Schwarz T2

#### Statorlitzen

U1	Rot
V1	Braun
W1	Gelb
V2	Blau
W2	Schwarz
U2	Grün

#### SUBCAB 1+2

1/4	Brun
2/5	Blå
3/6	Svart
Jord	Gul/grön
T1	Svart T1
T2	Svart T2

#### Statorledare

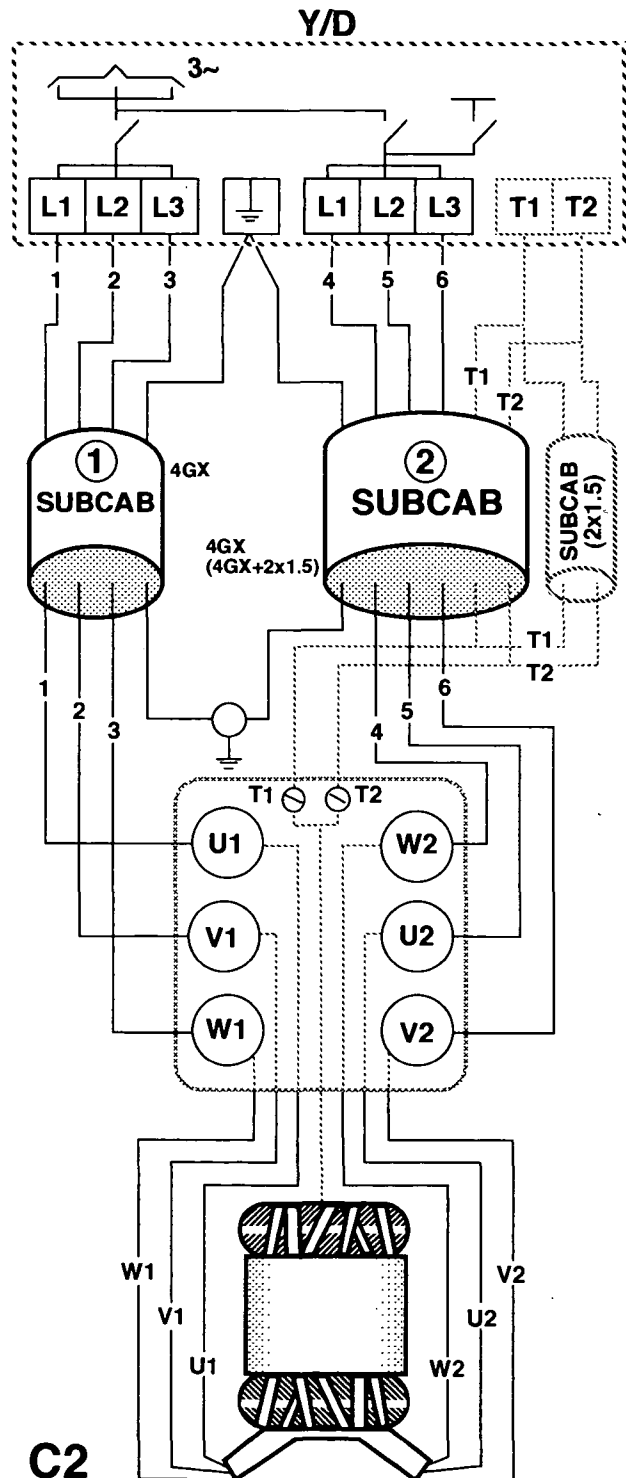
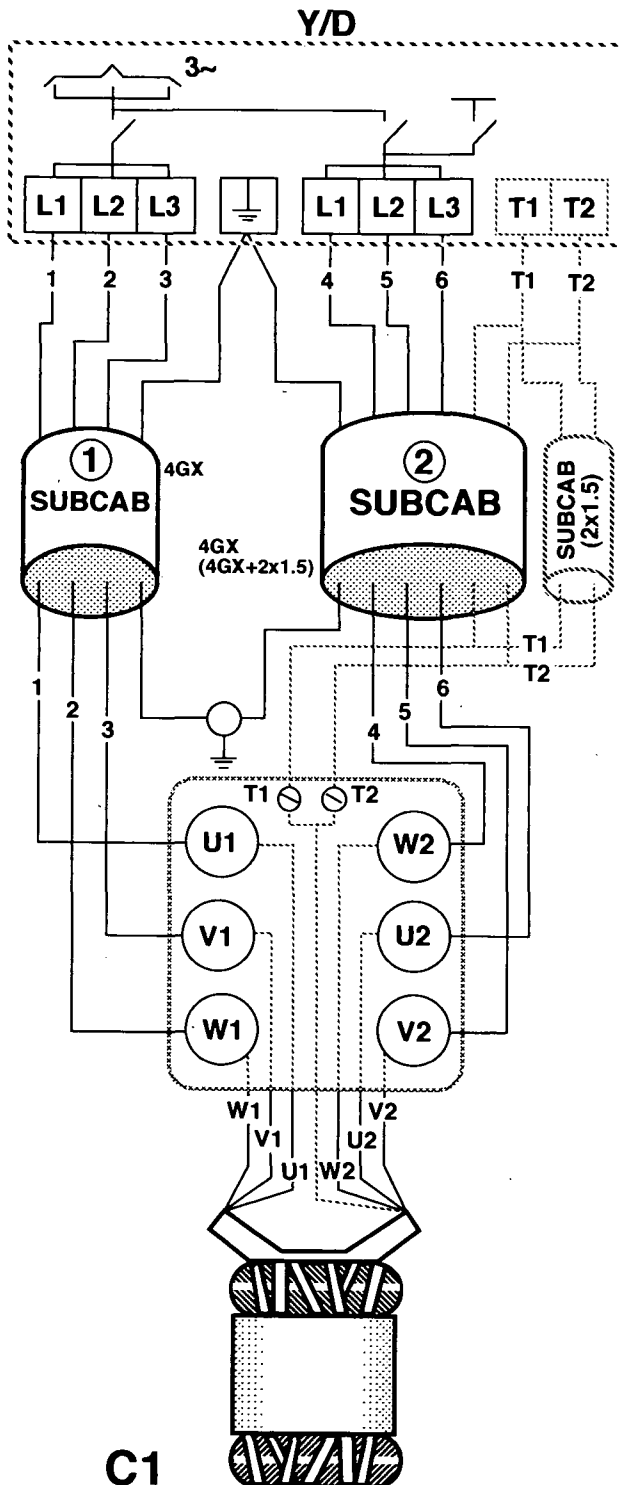
U1	Röd
V1	Brun
W1	Gul
V2	Blå
W2	Svart
U2	Grön

#### SUBCAB 1+2

1/4	Brun
2/5	Bleu
3/6	Noir
Terre	Jaune/vert
T1	Noir T1
T2	Noir T2

#### Conducteurs du stator

U1	Rouge
V1	Brun
W1	Jaune
V2	Bleu
W2	Noir
U2	Vert



Il existe également des stators à 8 conducteurs. Voir "Installation et entretien".

#### SUBCAB/SUBCAB AWG\*

1	Brown (Red*)
2	Black (Black*)
3	Blue (White*)
Earth	Yellow/green
Ground-check	Yellow*
T1	Black T1/orange*
T2	Black T2/blue*

#### Stator leads

U1**	Red	U5	Red
V1	Brown	V5	Brown
W1	Yellow	W5	Yellow
U2	Green	U6**	Green
V2	Blue	V6	Blue
W2	Black	W6	Black

\*\*Stator leads that change rotation direction.

#### SUBCAB/SUBCAB AWG\*

1	Braun (Rot*)
2	Schwarz (Schwarz*)
3	Blau (Weiß*)
Erd	Gelb/grün
"Ground-check"	Gelb*
T1	Schwarz T1/orange*
T2	Schwarz T2/blau*

#### Statorlitzten

U1**	Rot	U5	Rot
V1	Braun	V5	Braun
W1	Gelb	W5	Gelb
U2	Grün	U6**	Grün
V2	Blau	V6	Blau
W2	Schwarz	W6	Schwarz

\*\*Statorlitzten für die Umkehrung der Drehrichtung.

#### SUBCAB/SUBCAB AWG\*

1	Brun (Röd*)
2	Svart (Svart*)
3	Blå (Vit*)
Jord	Gul/grön
"Ground-check"	Gul*
T1	Svart T1/orange*
T2	Svart T2/blå*

#### Statorledare

U1**	Röd	U5	Röd
V1	Brun	V5	Brun
W1	Gul	W5	Gul
U2	Grön	U6**	Grön
V2	Blå	V6	Blå
W2	Svart	W6	Svart

\*\*Statorledare som ändrar rotationsriktningen.

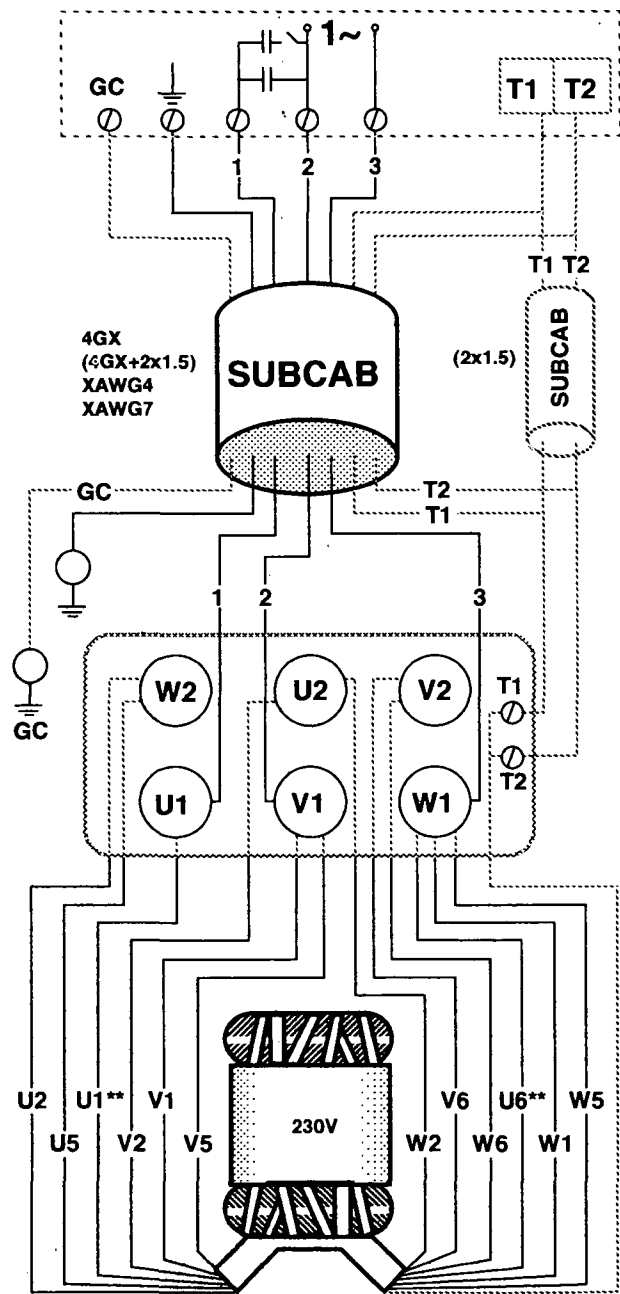
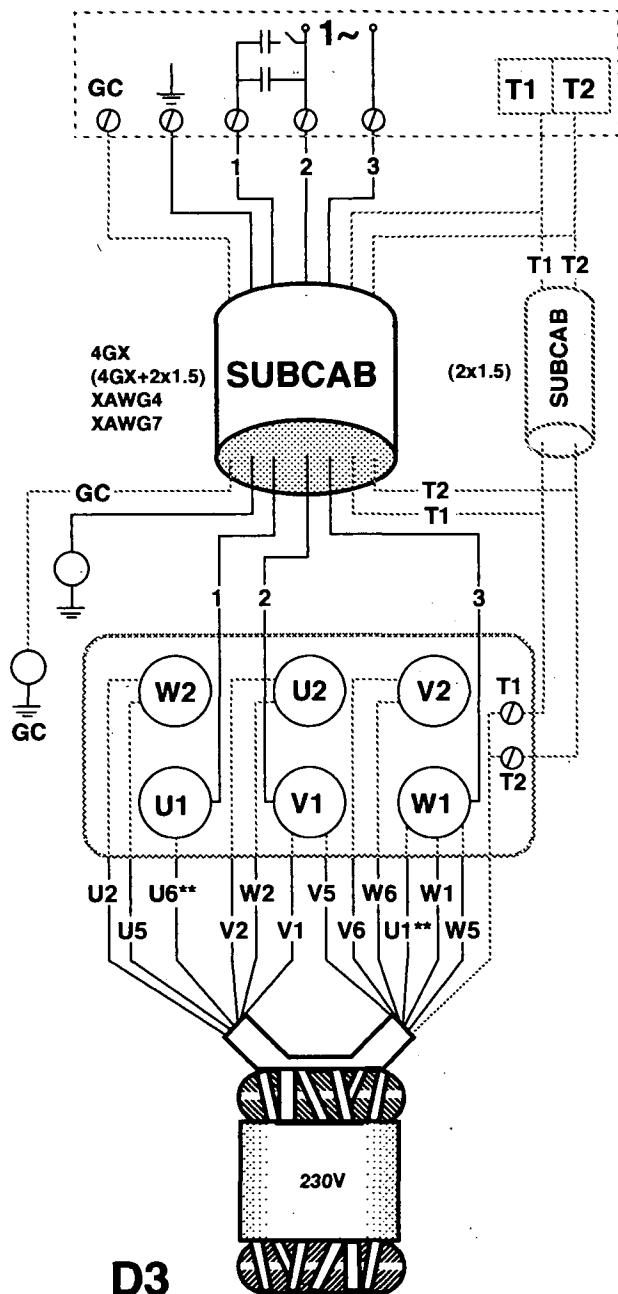
#### SUBCAB/SUBCAB AWG\*

1	Brun (Rouge*)
2	Noir (Noir*)
3	Bleu (Blanc*)
Terre	Jaune/vert
"Ground-check"	Jaune*
T1	Noir T1/orange*
T2	Noir T2/bleu*

#### Conducteurs du stator

U1**	Rouge	U5	Rouge
V1	Brun	V5	Brun
W1	Jaune	W5	Jaune
U2	Vert	U6**	Vert
V2	Bleu	V6	Bleu
W2	Noir	W6	Noir

\*\*Ce conducteur inverse le sens de rotation.



#### SUBCAB/SUBCAB AWG\*

1	Brown (Red*)
2	Black (Black*)
3	Blue (White*)
Earth	Yellow/green
Ground-check	Yellow*
T1	Black T1/orange*
T2	Black T2/blue*

#### Stator leads

U1	Red	Z1**	Blue
U2	Brown	Z2**	Black
U5	Yellow	Z5**	Red
U6	Green	Z6**	Brown

\*\*Stator leads that change rotation direction.

#### SUBCAB/SUBCAB AWG\*

1	Braun (Rot*)
2	Schwarz (Schwarz*)
3	Blau (Weiß*)
Erd	Gelb/grün
"Ground-check"	Gelb*
T1	Schwarz T1/orange*
T2	Schwarz T2/blau*

#### Statorlitzen

U1	Rot	Z1**	Blau
V1	Braun	Z2**	Schwarz
W1	Gelb	Z5**	Rot
U2	Grün	Z6**	Braun

\*\*Statorlitzen für die Umkehrung der Drehrichtung.

#### SUBCAB/SUBCAB AWG\*

1	Brun (Röd*)
2	Svart (Svart*)
3	Blå (Vit*)
Jord	Gul/grön
"Ground-check"	Gul*
T1	Svart T1/orange*
T2	Svart T2/blå*

#### Statorledare

U1	Röd	Z1**	Blå
V1	Brun	Z2**	Svart
W1	Gul	Z5**	Röd
U2	Grön	Z6**	Brun

\*\*Statorledare som ändrar rotationsriktningen.

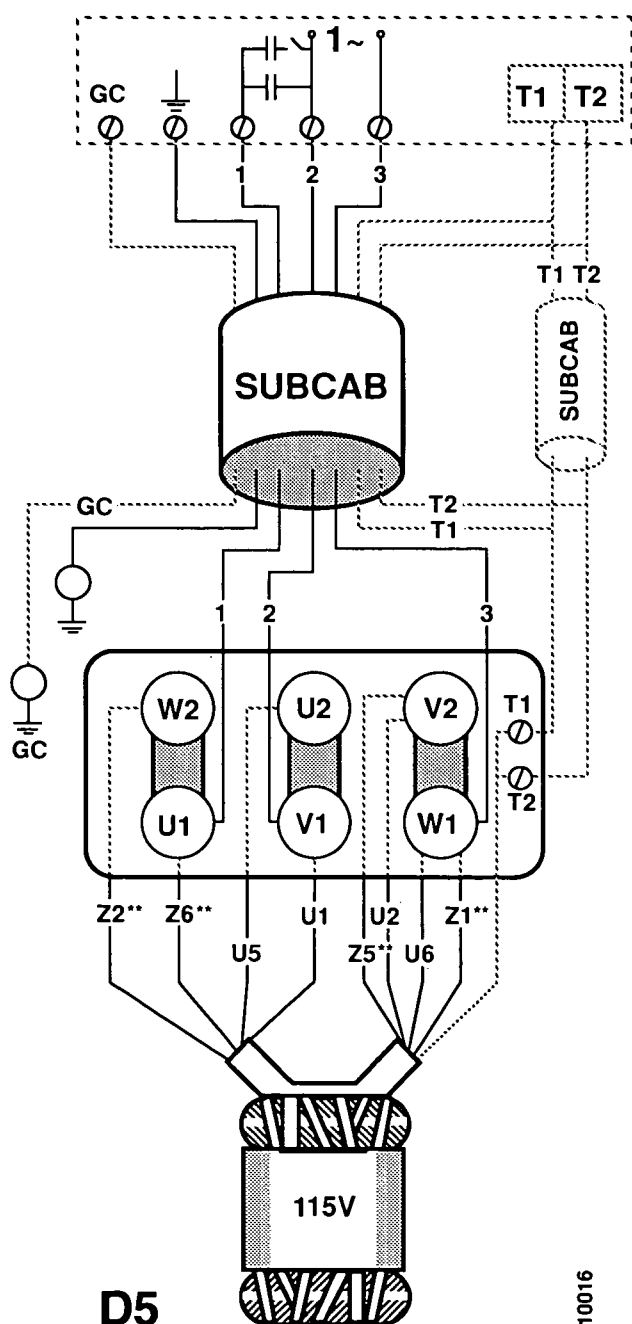
#### SUBCAB/SUBCAB AWG\*

1	Brun (Rouge*)
2	Noir (Noir*)
3	Bleu (Blanc*)
Terre	Jaune/vert
"Ground-check"	Jaune*
T1	Noir T1/orange*
T2	Noir T2/bleu*

#### Conducteurs du stator

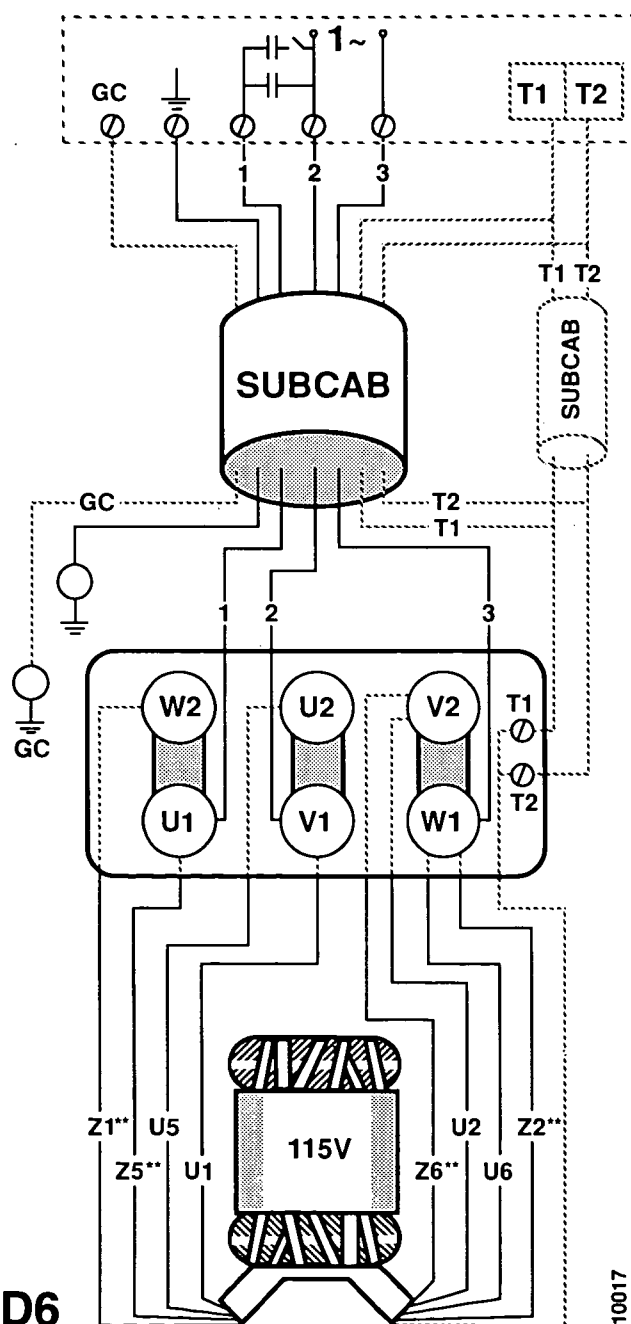
U1	Rouge	Z1**	Bleu
V1	Brun	Z2**	Noir
W1	Jaune	Z5**	Rouge
U2	Vert	Z6**	Brun

\*\*Ce conducteur inverse le sens de rotation.



D5

10016



D6

10017

SUBCAB/SUBCAB AWG\*

1	Brown (Red*)
2	Black (Black*)
3	Blue (White*)
Earth	Yellow/green
Ground-check	Yellow*
T1	Black T1/orange*
T2	Black T2/blue*

Stator leads

U1**/U5	Red
V1/V5	Brown
W1/W5	Yellow
U2/U6**	Green
V2/V6	Blue
W2/W6	Black

\*\*Stator leads that change rotation direction.

SUBCAB/SUBCAB AWG\*

1	Braun (Rot*)
2	Schwarz (Schwarz*)
3	Blau (Weiß*)
Erd	Gelb/grün
"Ground-check"	Gelb*
T1	Schwarz T1/orange*
T2	Schwarz T2/blau*

Statorlitzen

U1**/U5	Rot
V1/V5	Braun
W1/W5	Gelb
U2/U6**	Grün
V2/V6	Blau
W2/W6	Schwarz

\*\*Statorlitzen für die Umkehrung der Drehrichtung.

SUBCAB/SUBCAB AWG\*

1	Brun (Röd*)
2	Svart (Svart*)
3	Blå (Vit*)
Jord	Gul/grön
"Ground-check"	Gul*
T1	Svart T1/orange*
T2	Svart T2/blå*

Statorledare

U1**/U5	Röd
V1/V5	Brun
W1/W5	Gul
U2/U6**	Grön
V2/V6	Blå
W2/W6	Svart

\*\*Statorledare som ändrar rotationsriktningen.

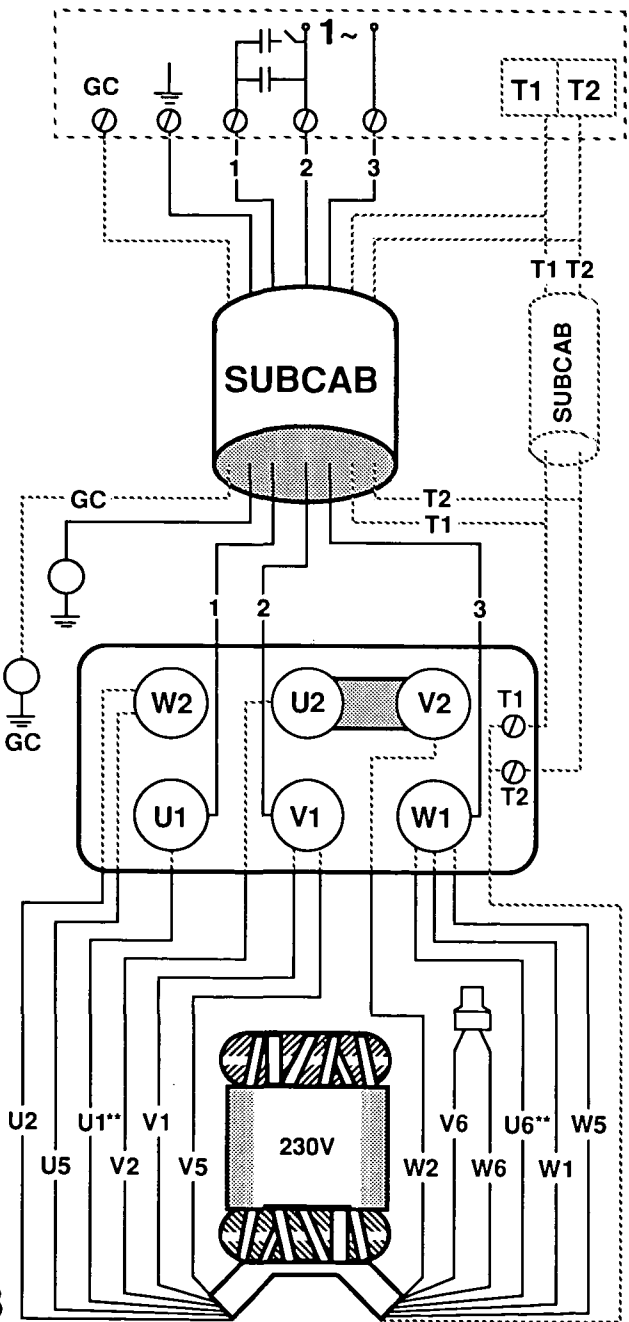
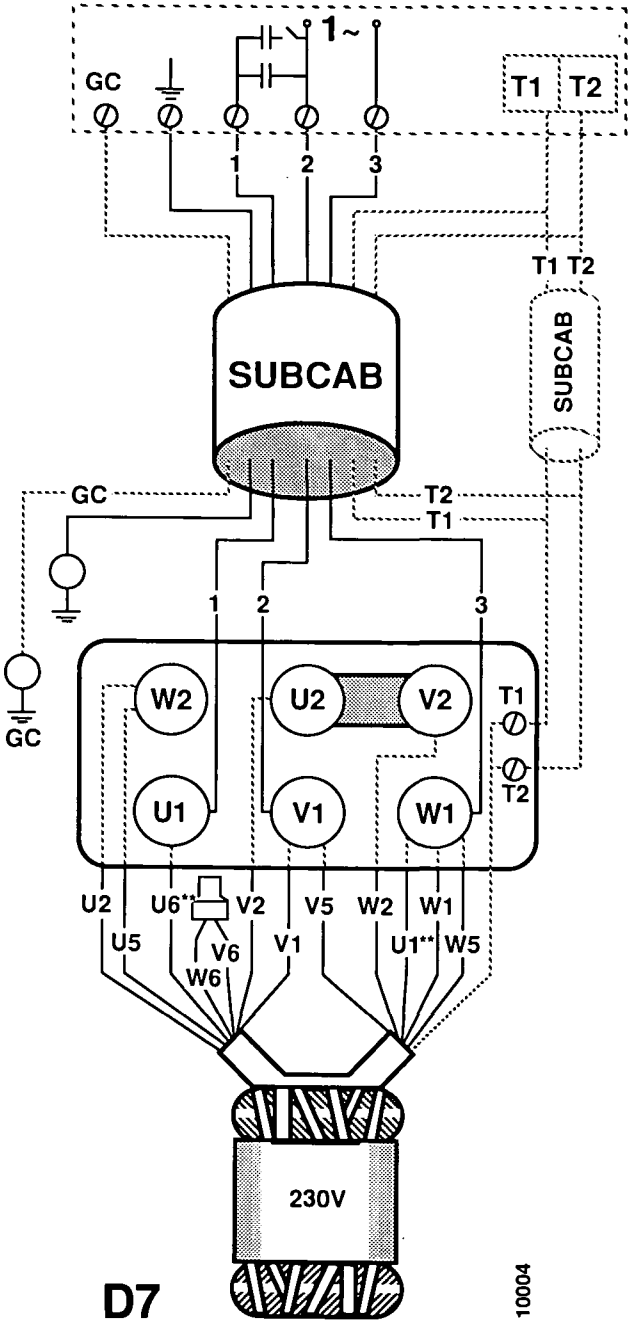
SUBCAB/SUBCAB AWG\*

1	Brun (Rouge*)
2	Noir (Noir*)
3	Bleu (Blanc*)
Terre	Jaune/vert
"Ground-check"	Jaune*
T1	Noir T1/orange*
T2	Noir T2/bleu*

Conducteurs du stator

U1**/U5	Rouge
V1/V5	Brun
W1/W5	Jaune
U2/U6**	Vert
V2/V6	Bleu
W2/W6	Noir

\*\*Ce conducteur inverse le sens de rotation.







2697L/LB

VALVES

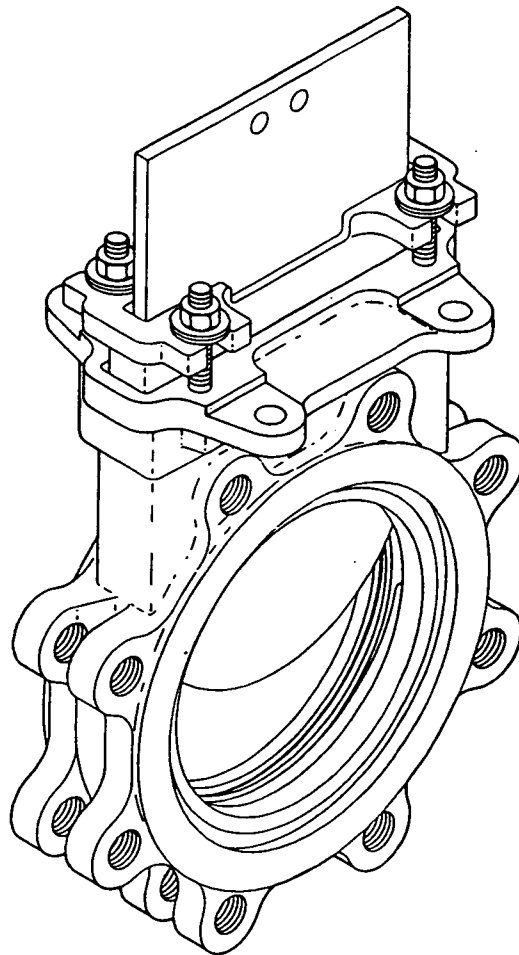
SUPPLIER: VALVEFLO ENGINEERING P/L  
22 Jeays Street  
BOWEN HILLS QLD 4006  
PH: (07) 3252 8866  
FAX: (07) 3252 4874

MODEL: Ø 450 KNIFE GATE VALVE  
Ø 150 ECCENTRIC VALVE  
Ø 1" BSP SWING CHECK VALVE (TOP OF RISER  
PIPES)

SUPPLIER: GOYEN CONTROLS  
1/9 Virginia Street  
VIRGINIA QLD 4014  
  
PH: 3865 1644  
FAX: 3865 1454

MODEL: 1 1/2" BSP BW2 SOLENOID VALVE  
(AT BACK FLOW PREVENTOR)

# INSTRUCTIONS FOR DeZURIK® KGS, C SERIES, AND 2" THRU 6" L SERIES KNIFE GATE VALVES



## USE OF THESE INSTRUCTIONS

This document should be made available to personnel responsible for installation, operation, and maintenance of the following DeZURIK Knife Gate Valves: KGS, C Series, and 2" thru 6" L Series. Refer to the data plate attached to the valve, and also to the applicable product bulletin for information regarding materials of construction and product limitations.

Instructions for this equipment consist of a separate document for each of the following system components:

- The basic valve, without the actuator
- The valve actuator
- Accessories if any, such as positioners, pilot valves, and limit switches

Each of the above components also has an Assembly drawing which is referenced on the Installation drawing.

## SAFETY MESSAGES

Safety messages in these Instructions and on label(s) on the valve are flagged with one of the words **Caution**, **Warning**, or **Danger**. The messages must be carefully read and followed to avoid personal injury and/or equipment damage.

After installation, if a safety label on the valve becomes difficult to see or read, or if a label has been removed, please contact DeZURIK for replacement label(s). Include the 7-digit part number from the data plate on the valve, the quantity of valves, and an appropriate name and mailing address.

## INSPECTION

This equipment has been properly packaged and protected for shipment. However, the possibility exists for damage in transit, due to improper handling. Upon arrival at the final destination, the equipment should be carefully inspected for damage. If damage exists, a damage claim should be filed immediately with the carrier.

## STORAGE

Units should be stored in a clean, cool and dry location, and should be protected from dirt, chips, dust, and other contaminants. For long term storage, the seating and packing gland areas should be protected from direct sunlight.

If outdoor storage is necessary, the equipment should be wrapped in plastic and stored high enough so that it will not be immersed in water or buried in snow. The temporary plastic plugs in electrical and pneumatic openings should be replaced with metal pipe plugs.

## REPLACEMENT PARTS

Recommended spare parts are listed on the Assembly drawings. It is recommended that one set of parts be inventoried for each valve size and type.

Replacement parts may be ordered from the local DeZURIK sales representative, or directly from DeZURIK, as listed on the back cover.

When ordering parts, include the valve size and the 7-digit part number from the valve data plate. Also include the Assembly drawing number, the name of the part, and the balloon number and quantity shown on the Assembly drawing.

## DEZURIK SERVICE

DeZURIK service personnel are available for start-up and repair of DeZURIK products. Also, DeZURIK provides customized training programs for customers. Contact a DeZURIK sales representative for further information.

## DeZURIK

### KGS, C SERIES, and 2" thru 6" L SERIES KNIFE GATE VALVES

- DESCRIPTION** The DeZURIK KGS, C Series, and 2" thru 6" Knife Gate Valves are bonnetless valves with a stainless steel body and gate, and an all-metal or resilient-faced seat. A choice of several actuators and accessories is available.
- INSTALLATION** Install the valve between ANSI Class 125 or Class 150 pipeline flanges. Flange gaskets are required. Before installation, remove foreign material such as weld spatter, oil, grease, and dirt from the valve and pipeline.
- Install the valve so that the side marked "seat" is on the lower pressure side of the valve when the valve is closed; the pipeline pressure will then assist sealing the valve in the closed position.
- Observe the following points to prevent distortion of the valve body and gate when the flange bolts are tightened:
- Align the mating pipeline flanges.
  - Select the length of the flange bolts so that the bolts used in the blind holes near the chest area of the valve do not bottom out when tightened.
  - Tighten the flange bolts evenly, in a crisscross pattern.
- OPERATION** The gate in the valve is positioned by the valve actuator. The actuator moves the gate over the valve seat in the closed position, and withdraws the gate from the seat in the throttling and open positions. Refer to the Actuator Instructions for adjustment and maintenance requirements for the actuator.
- LUBRICATION** The valve does not require lubrication. Refer to the Actuator Instructions for lubrication requirements for the actuator.
- PACKING ADJUSTMENT** The gate packing is contained and compressed by the packing gland. If packing leakage occurs, tighten the adjustment nuts on top of the packing gland. Tighten the nuts evenly and gently — just enough to stop the leakage. Overtightening will cause excessive operating forces, and will decrease the life of the packing.
- PACKING REPLACEMENT** Refer to Figure 1 for component identification.
1. Relieve the pressure in the pipeline.

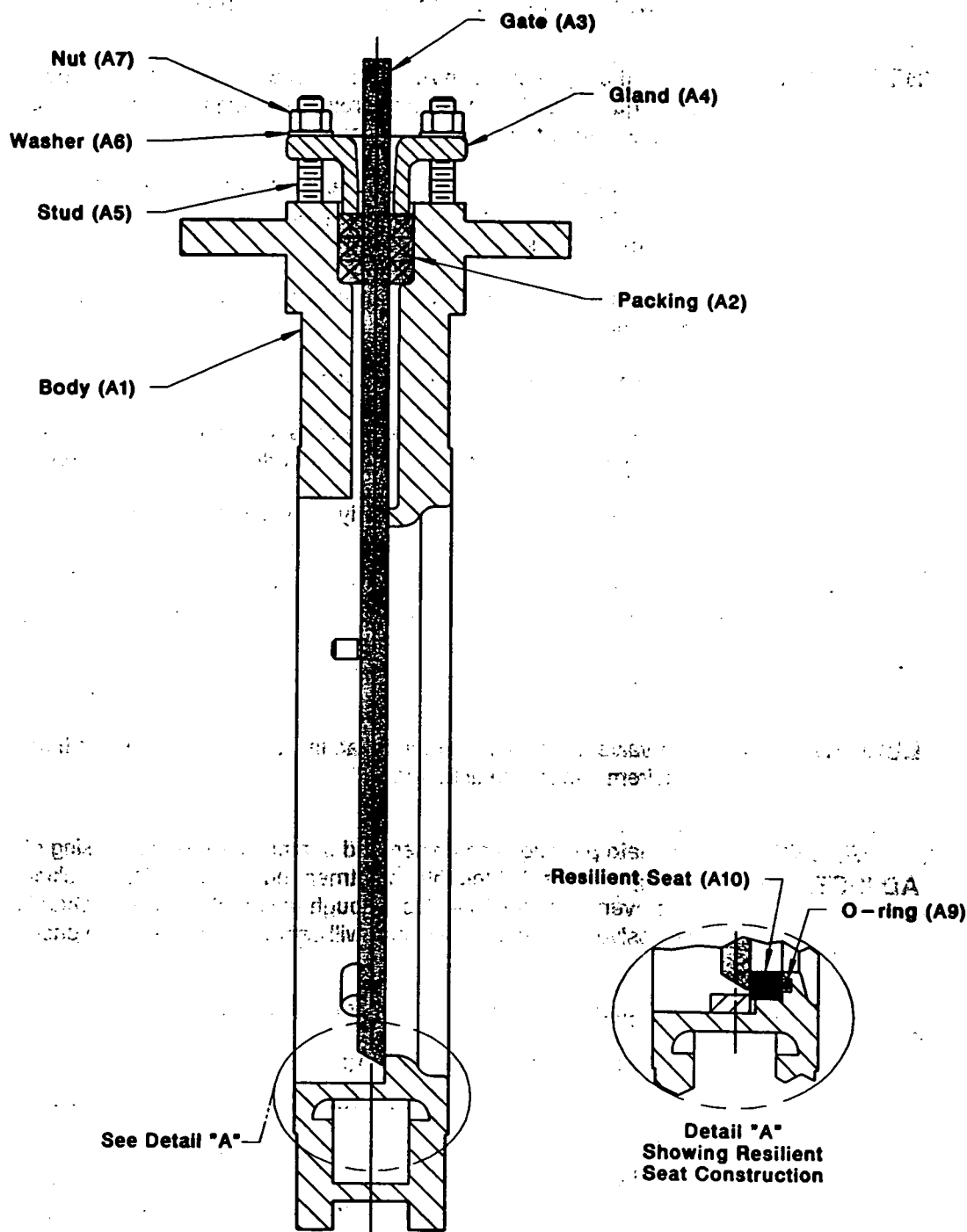


#### WARNING

Pipeline pressure can propel the loose gate and packing gland, and can cause personal injury or equipment damage. Relieve pipeline pressure before removing gate stem and packing gland nuts.

2. Close the valve.
3. Remove the two screws and nuts near the top of the gate and disengage the stem from the gate by stroking the actuator (not the valve) to the open position.

**DeZURIK**  
**KGS, C SERIES, and 2" thru 6" L SERIES KNIFE GATE VALVES**



**Component Identification**  
**Figure 1**

DeZURIK

**KGS, C SERIES, and 2" thru 6" L SERIES KNIFE GATE VALVES****PACKING  
REPLACEMENT**  
(continued)**WARNING**

**Moving parts from accidental operation of powered actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

4. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.
5. Remove the gland nuts (A7), washers (A6), and packing gland (A4).
6. Remove the used packing (A2) from the packing chamber.
7. With the gate closed, center the gate in the body opening below the packing chamber.
8. Cut new packing rings to the length and quantity shown in Table A. With type C and type D packing, all rings are the same material; with type CW packing, the first (bottom) ring is a wire braid scraper, and the other rings are type C; with type DW packing, the first (bottom) ring is a wire braid scraper, and the other rings are type D; with type ZJ packing, the second ring (from the bottom) is zip joint, and the other rings are type C.
9. Assemble and pack the rings one at a time, with the ends together, but not overlapped. Stagger the joints, on the long sides of the packing chamber. A square-end wood or plastic tool, driven by a hammer or mallet, is recommended for packing the rings. The inside and outside edges of each ring are to be packed against the gate and packing chamber, so that each ring is compressed flat and evenly.
10. Replace the packing gland (A4), washers (A6), and nuts (A7). Tighten the nuts evenly and finger tight, plus ½ turn.
11. Reconnect the stem to the gate with the two screws and nuts.

**Table A**  
**Packing Rings**  
**Size, Length, and Quantity**

Valve Size	Size (inches, square)	Length (inches)	Quantity
2	3/8	7	2
3	3/8	8 ¾	3
4	3/8	11	3
6	3/8	15 ½	3
8	3/8	19 ¼	3
10	1/2	22 ¾	3
12	1/2	27 ½	3
14	1/2	30	3
16	1/2	35	3
18	5/8	39 ½	3
20	5/8	44	4
24	5/8	52	4

**DeZURIK**  
**KGS, C SERIES, and 2" thru 6" L SERIES KNIFE GATE VALVES**

**PACKING  
REPLACEMENT  
(continued)**

12. If the actuator is a powered actuator, reconnect power to the actuator.
13. The pipeline may now be pressurized. If packing leakage occurs, tighten the adjustment nuts on top of the packing gland. Tighten the nuts evenly and slowly, just enough to stop the leakage. Overtightening will cause excessive operating forces, and will decrease the life of the packing.

**SEAT REPLACEMENT  
Resilient Seated Valves**

Refer to Figure 1 for component identification.

1. Relieve the pressure in the pipeline.



**WARNING**

Pipeline pressure can propel the loose flange bolts and flanges, and can cause personal injury or equipment damage. Relieve pipeline pressure before removing flange bolts and flanges.

2. Close the valve.
3. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



**WARNING**

Moving parts from accidental operation of powered actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.

4. Remove the pipeline flange bolts and flange from the side of the valve body opposite the word "seat". As an alternative, remove both flanges, and remove the valve from the pipeline.
5. Remove the two screws and nuts near the top of the gate and disengage the stem from the gate.
6. Remove the actuator yoke and actuator from the valve.
7. Remove the gland nuts (A7), washers (A6), and packing gland (A4).
8. Remove the gate (A3) from the body.
9. Remove the packing (A2) from the packing chamber.
10. For 2" and 5" sizes, and 14" thru 24" sizes:

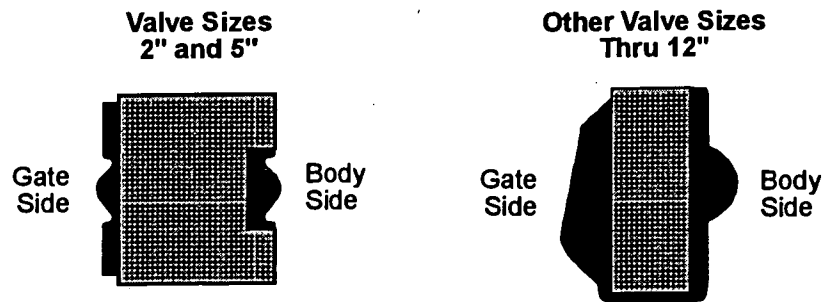
Push the top of the resilient seat (A10) toward the center of the valve, and remove the seat through the packing chamber.

For 3" thru 12" sizes, except 5":

Push the top of the resilient seat (A10) toward the center of the valve, and remove the seat through the valve port.

## DeZURIK

### KGS, C SERIES, and 2" thru 6" L SERIES KNIFE GATE VALVES



**Resilient Seat Configurations  
Figure 1**

#### 11. For 2" thru 12" sizes:

Note the gate side and body side of the seat as shown in Figure 1. Insert the new seat (A10) through the packing chamber (2" and 5" sizes) or valve port (other sizes). Place the seat behind the lug at the 6 o'clock position in the body. Then push the top of the seat into position.

#### For 14" thru 24" sizes:

Inspect the O-ring in the body groove. If worn or damaged, remove and replace the O-ring and sealant. Seal the new O-ring to the groove with a paint-like thickness of silicone sealant. Insert the new seat (A10) through the packing chamber so that the resilient seal will be towards the gate. Place the seat behind the lug at the 6 o'clock position in the body, and push the top of the seat into position.

12. Replace the gate (A3) in the body, with the beveled age facing away from the resilient seat. Place the gate in the fully closed position.
13. Replace the packing, as described in steps 7 through 9 in the **PACKING REPLACEMENT** section.
14. Replace the packing gland (A4), washers (A6), and nuts (A7). Tighten the nuts evenly and finger tight, plus ½ turn.
15. Replace the yoke and actuator on the valve.
16. Reconnect the stem to the gate with the two screws and locknuts.
17. Replace the pipeline flange and flange bolts, or replace the valve in the pipeline if the valve was removed. Refer to the requirements in the **INSTALLATION** section.
18. If the actuator is a powered actuator, reconnect power to the actuator.
19. The pipeline may now be pressurized. If packing leakage occurs, tighten the adjustment nuts (A7) on top of the packing gland. Tighten the nuts evenly and slowly, just enough to stop the leakage. Overtightening will cause excessive operating forces, and will decrease the life of the packing.



**DeZURIK**  
**KGS, C SERIES, and 2" thru 6" L SERIES KNIFE GATE VALVES**

**GATE REPLACEMENT**

Refer to Figure 1 for component identification.

1. Relieve the pressure in the pipeline.



**WARNING**

**Pipeline pressure can propel the loose flange bolts and flanges, and can cause personal injury or equipment damage. Relieve pipeline pressure before removing flange bolts and flanges.**

2. Close the valve.
3. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



**WARNING**

**Moving parts from accidental operation of powered actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

4. Remove the pipeline flange bolts, and remove the valve from the pipeline.
5. Remove the actuator, actuator yoke, packing gland (A4), and packing (A2) from the valve.
6. Remove and inspect the gate (A3). If the gate appears to be scratched or galled due to too-long flange bolts in the chest area of the body, check for body damage in the tapped flange holes and within the chest cavity. Repair or replace the body, as appropriate.
7. Remove and inspect the seat components. Replace or reinstall the seat components as described in step 11 in the SEAT REPLACEMENT section.
8. Place the new gate (A3) in the body, in the fully closed position.
9. Replace the packing (A2) as described in steps 7 thru 9 in the PACKING REPLACEMENT section. Use new packing.
10. Replace the yoke and actuator on the valve.
11. Adjust the actuator, yoke, and packing gland so that the valve actuates smoothly full stroke in both directions, and so that there is no evidence of binding or scratching on the gate when the gate is visible in the fully open position.
12. Replace the valve in the pipe line as described in the INSTALLATION section.
13. If the actuator is a powered actuator, reconnect power to the actuator.
14. The pipeline may now be pressurized. If packing leakage occurs, tighten the adjustment nuts (A7) on top of the packing gland. Tighten the nuts evenly and slowly, just enough to stop the leakage. Overtightening will cause excessive operating forces, and will decrease the life of the packing.

**DeZURIK**

**KGS, C SERIES, and 2" thru 6" L SERIES KNIFE GATE VALVES**

**TROUBLESHOOTING**

Condition	Possible Cause	Corrective Action
Packing leaks, with no evidence of galling on gate.	Packing is loose.	Adjust packing gland. See PACKING ADJUSTMENT section.
	Packing is worn or torn.	Replace packing. See PACKING REPLACEMENT section.
Packing leaks, and gate is galled.	Packing is worn or torn.	Replace packing and gate. See PACKING REPLACEMENT and GATE REPLACEMENT sections.
Valve leaks when fully closed, with no evidence of galling on gate	Seats are worn or torn.	Replace seats. See SEAT REPLACEMENT section.
Valve leaks when fully closed, and gate is galled.	Seats are worn or torn.	Replace seats and gate. See SEAT REPLACEMENT and GATE REPLACEMENT sections.

Printed in the USA

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## CYLINDER ACTUATOR FOR DeZURIK® KNIFE GATE VALVE

### DESCRIPTION

The cylinder used with DeZURIK Knife Gate Valves is a pneumatic double acting cylinder that requires a supply pressure between 50 and 100 psi.



#### WARNING

**This cylinder is a pressure vessel. Release the pressure from both ends of the cylinder before attempting any disassembly or repair.**

### SAFETY MESSAGES

Safety messages in these instructions and on label(s) on the valve are flagged with one of the words **Caution**, **Warning** or **Danger**. The messages must be carefully read and followed to avoid personal injury and/or equipment damage.

After installation, if a safety label on the valve becomes difficult to see or read, or if a label has been removed, please contact DeZURIK for replacement label(s). Include the 7-digit part number from the data plate on the valve, the quantity of valves, and an appropriate name and mailing address.

### LUBRICATION

Cylinder lubrication is required only when the cylinder is disassembled. At reassembly, lubricate the piston seal, O-rings, piston grooves, and cylinder wall with Dow Corning No. 44.

### ADJUSTMENTS

#### Cylinder Alignment

The piston rod and the gate must be aligned. Check alignment in the open and closed position and adjust the cylinder position, if necessary. Oversized mounting holes in both the cylinder and the yoke allow for movement.

#### Valve Opening

The set screw in the end of the cylinder acts as an open position stop. This screw must be adjusted so the actuator does not pull the gate off the seat ring when the valve opens. To adjust the stop, close the valve, then turn the set screw in all the way. Apply pressure to the cylinder port to open the valve, then back out the set screw until the stroke length is the same as in Table A.

### PISTON ROD PACKING ADJUSTMENT

To stop packing leakage, tighten the gland nuts uniformly only until the leak stops. **IMPORTANT:** Once leak has stopped, do not continue tightening the gland nuts. Over-tightening the gland nuts will result in premature packing failure.

### CYLINDER SUPPORT

The unit may be mounted in any position around the pipeline, however it is best to mount the valve with the cylinder in a vertical position. If the valve is installed with the cylinder in a position other than vertical, the customer must provide additional support on size 10 inch and larger valves. This support should be at the cylinder end of the yoke, and not on the cylinder. See Installation Drawing for dimension location of cylinder support.

## CYLINDER ACTUATOR FOR DeZURIK® KNIFE GATE VALVE

### DISASSEMBLY



#### WARNING

**This cylinder is a pressure vessel. Release pressure from both ends of cylinder before attempting any disassembly or repair.**

2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



#### WARNING

**Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

3. Disconnect the cylinder tubing.

**Table A**  
**Length of Allowable Stroke**

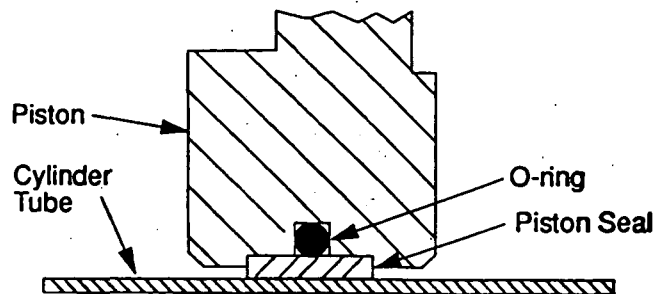
Valve Size	Stroke Length			
	Metal Seat		Resilient Seat	
	inches	mm	inches	mm
2	2.2	55	1.8	45
3	3.2	80	2.8	75
4	4.2	105	3.8	95
6	6.2	155	5.7	145
8	8.2	205	7.7	195
10	9.6	240	9.1	225
12	11.6	290	11.1	280
14	13.2	335	12.7	320
16	15.2	385	14.6	370
18	17.2	435	16.6	420
20	19.2	485	18.6	470
24	23.2	590	22.5	570
30	28.5	725	27.8	700

**NOTE:** When flexible tubing is used, only one swivel connector is installed for each piece of tubing. The swivel connector is on the cylinder port end of the tubing.

4. Remove nuts and washers from tie rods.
5. Remove cylinder cap.
6. Remove O-ring from cylinder cap.
7. Remove cylinder tube. Rotate cylinder tube while pulling it off the piston.
8. Remove the piston seal and O-ring. Clean the parts and the grooves in the piston. Figure 1 shows piston seal construction.

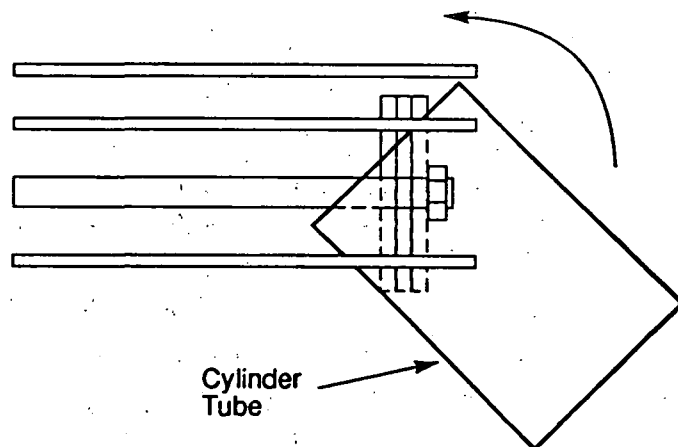
## CYLINDER ACTUATOR FOR DeZURIK® KNIFE GATE VALVE

### REASSEMBLY



**Figure 1**  
**Piston Seal and O-Ring Arrangement**

1. Using Dow Corning No. 44, thoroughly lubricate the groove, O-ring, piston seal and inside of cylinder tube.
2. Place lubricated O-ring and seal on piston.
3. Carefully slide the lubricated cylinder tube over the piston seal. Start with the tube at a 45 degree angle to the piston and rotate the tube onto the piston. On 6 inch and larger cylinders, remove tie rods as needed to allow positioning the tube at the 45 degree angle. See Figure 2.



**Figure 2**  
**Cylinder Tube Installation**

4. Lubricate the cylinder cap O-ring with Dow Corning No. 44 and place it in the cylinder cap.
5. Place the cylinder cap on the cylinder tube, and place the washers and nuts on the tie rods. Tighten the nuts to the torque listed in Table B.
6. Reconnect the cylinder tubing.
7. If the actuator is a powered actuator, reconnect power to the actuator.

## CYLINDER ACTUATOR FOR DeZURIK® KNIFE GATE VALVE

### REASSEMBLY (continued)

**Table B**  
**Torque Specifications for**  
**Tie Rod Nuts**

Cylinder Size	Torque	
	Ft. lbs.	Nm
C4	12	16
C6-C8	16	22
C10-C12	20	27

### PISTON ROD PACKING REPLACEMENT



1. Close the valve and release the cylinder pressure.
2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.

#### **WARNING**

**This cylinder is a pressure vessel. Release the pressure from both ends of the cylinder before attempting any disassembly or repair.**



#### **WARNING**

**Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

3. Remove the two gland nuts and remove the gland from the studs.
4. Remove the old packing.
5. Cut the new packing in lengths that fit around the piston rod. Install one piece at a time, making sure the ends of each piece meet but do not overlap. Install each layer so the joints are staggered.
6. Install the packing gland, washers and gland nuts.
7. Tighten the gland nuts finger tight plus 1/2 turn.
8. If packing leaks after the cylinder is pressurized, tighten the gland nuts uniformly only until the leak stops.

**IMPORTANT:** Once leak has stopped, do not continue tightening the gland nuts. Overtightening the gland nuts will result in premature packing failure.

9. If the actuator is a powered actuator, reconnect power to the actuator.

Printed in the U.S.A.

# INSTRUCTIONS FOR DeZURIK® 4" THRU 20" ECCENTRIC VALVES

## **USE OF THESE INSTRUCTIONS**

These instructions provide installation, operation, and maintenance information for DeZURIK 4 inch through 20 inch Eccentric Valves. They include procedures which, when carefully followed, help to assure satisfactory performance of these valves. All warnings and cautions included in these instructions must be followed to avoid personal injury and equipment damage. These instructions are intended for use by personnel who are responsible for installation, operation or maintenance of DeZURIK 4 inch through 20 inch Eccentric Valves.

Refer to the Data Plate attached to the valve, and also to the Product Bulletin for information regarding materials of construction and product limitations.

## **SAFETY MESSAGES**

Safety messages in these instructions and on label(s) on the valve are flagged with one of the words Caution, Warning or Danger. The messages must be carefully read and followed to avoid personal injury and/or equipment damage.

After installation, if a safety label on the valve becomes difficult to see or read, or if a label has been removed, please contact DeZURIK for replacement label(s). Include the 7-digit part number from the data plate on the valve, the quantity of valves, and an appropriate name and mailing address.

## **INSPECTION**

This unit has been packaged to provide ample protection during shipment. However, if the unit is mishandled in transit, it could sustain damage. Upon arrival at its final destination, the unit should be carefully inspected for damage. If damage exists, a damage claim should be filed immediately with the carrier.

## **STORAGE**

Units should be stored in a clean, cool and dry location, and should be protected from dirt, paper stock, dust, and other contaminants. If outdoor storage is necessary, the unit should be wrapped in plastic and stored high enough so that it will not be immersed in water or buried in snow.

## **REPLACEMENT PARTS**

Recommended spare parts are listed on the valve Assembly Drawing. These parts should be stocked to minimize downtime. If four or more valves are in use, it is advisable to stock one complete valve as a spare.

Replacement parts may be ordered from the local DeZURIK sales representative, or directly from DeZURIK, as listed on the back cover. When ordering parts, include the 7-digit part number from the valve Data Plate. Also include the Assembly Drawing number, the name of the part, and the balloon number and quantity shown on the Assembly Drawing.

## **DeZURIK SERVICE**

DeZURIK service personnel are available for start-up and repair of DeZURIK products. DeZURIK also offers customized training programs and consultation services for customers. Contact a DeZURIK sales representative for further information.



**4" THRU 20"**  
**DeZURIK® ECCENTRIC VALVES**

**DESCRIPTION**

The DeZurik Eccentric valves offer welded nickel seats that provide excellent resistance to corrosion and damage and also prolong the life of resilient plug facing. The valve rotates 90 degrees from full open to full close. Clockwise rotation of the valve stem will close the valve. If an actuator other than DeZurik is to be mounted, the actuator must be capable of maintaining the valve plug position with flow in the pipeline.

**WARNING**

**This valve is a pressure vessel. Pressure must be completely released before disassembly. The bonnet will blow off the actuator if the bonnet bolts are removed with pressure in the valve.**

**INSTALLATION**

If the valve is installed in a service such as liquids or gases, the end of the valve marked "SEAT" should be downstream.

If the valve is installed in suspended solid service such as mining slurries, raw sewage or paper stock of 2% or more consistency, the end of the valve marked "SEAT" should be upstream.

The valve plug should be horizontal and should rotate upward as the valve opens.

**TOOLS REQUIRED**

This valve is assembled using only SAE fasteners. To service this valve, you should have a full set of combination wrenches, Allen wrenches, a large flat tipped screwdriver, a flat pry bar, a pin punch and a dead blow hammer. You may want to machine a shaft to aid you in removing the lower bearing from the body. See the DISASSEMBLY section for details.

**LUBRICATION**

This valve does not require routine maintenance lubrication. If the valve is disassembled, lubricate the packing and the plug journals as follows:

**Packing**

Packing lubrication requirements are dependent upon the packing material.

PTFE Packing - Requires no lubrication.

All Packing Other than PTFE - Apply a light coat of Keystone Nevastane HT-2 to the inside and outside diameters of the packing rings.

**Plug Journals  
And Bearings**

Plug journal lubrication is dependent upon the materials used in construction of the valve.

Cast Iron, Ni-Resist, Bronze and Acid Bronze Valves - Lubricate the journals on the plug with Keystone Nevastane HT-2.

All Valves except Cast Iron, Ni-Resist, Bronze and Acid Bronze Valves - Spray the journals on the plug with a light coat of Molykote G Rapid Spray, then lubricate with a mixture of powdered graphite and Standard Oil #140 Gear Lube.

**PACKING  
ADJUSTMENT**  
**Nut Actuators and  
Lever Actuators**

The stem seal tightening procedure is dependent upon the type of actuator on the valve. If a packing leak should occur, tighten the packing as follows

4" thru 8" valves - Loosen the nuts under the packing gland, then, while actuating the valve with a torque wrench, tighten the nuts on top of the packing gland until the torque required to actuate the valve matches the torque shown in Table A. Once the torque is matched, tighten the nuts under the packing gland. If the packing leaks following this adjustment, replace the packing.

## 4" THRU 20" DeZURIK® ECCENTRIC VALVES

### Nut Actuators and Lever Actuators (continued)

**Table A**  
**Actuating Torque**

Valve Size	Actuating Torque (ft lbs)	
	Standard Packing	Low Friction Packing
4	28	14
5 & 6	60	30
8	104	52

10" and 12" valves--Tighten the nut on top of the housing until the spring is approximately 3/4 compressed. If packing leakage occurs when the spring is compressed, replace the packing.

### All Other Actuators

Tighten the gland nuts evenly only until the leak stops. Do not continue tightening after leakage stops. If packing leakage cannot be stopped by tightening the gland nuts, the packing must be replaced.

### CLOSED POSITION

Because of the eccentric action of this valve, the closed position of the valve is dependent upon the pressure drop expected when the valve is closed. To adjust the valve closed position, follow these steps:

1. Relieve pipeline pressure.
2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



#### WARNING

**Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

3. Back off the actuator closed position stop as described in the Actuator Instructions.
4. Close the valve with the torque specified in the Actuator Instructions. This torque is the amount required to seat the plug for a given pressure drop across the valve. To avoid excessive plug and seat wear caused by overtorquing, use the actual pressure drop across the valve when determining correct closing torque.
5. After the valve has been closed using the correct amount of torque, set the actuator closed position stop to limit actuator travel at this position.

### PACKING REPLACEMENT

When DeZurik Eccentric valves are mounted in a vertical pipeline, or mounted in a horizontal pipeline with the plug stem horizontal, there is a chance that gravity will cause the plug to swing to a lower position in the valve body when the actuator is removed. To avoid this hazard, place the plug in the lowest position before removing the actuator.

Follow these steps to replace the packing:

1. Discontinue pipeline flow and relieve pipeline pressure.
2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.

**4" THRU 20"**  
**DeZURIK® ECCENTRIC VALVES**

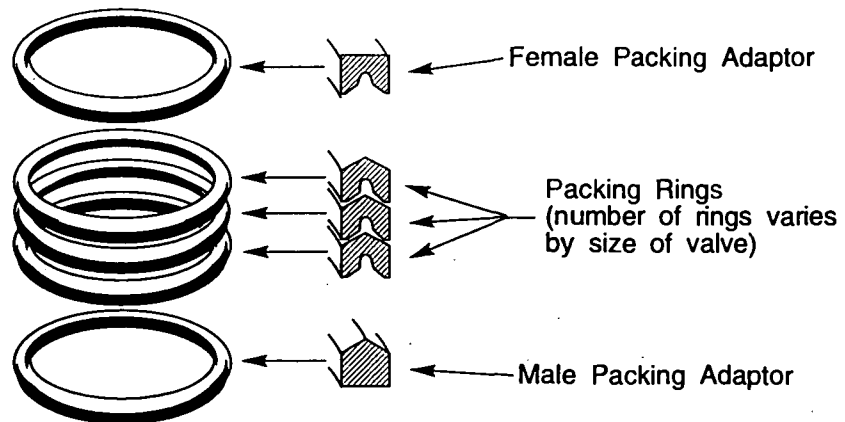
**PACKING  
REPLACEMENT  
(continued)**



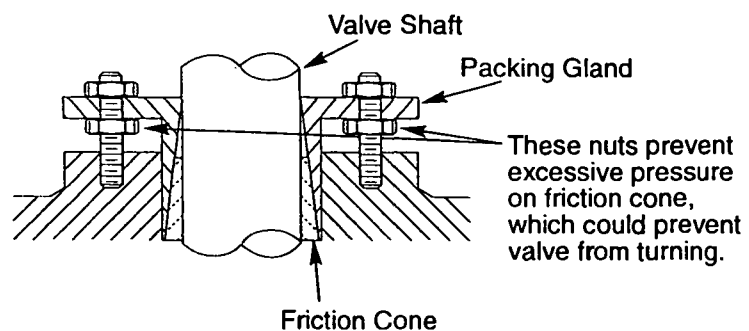
**WARNING**

**Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

3. Scribe the actuator and valve bonnet for alignment when reassembling.
4. Remove the actuator from the valve as described under ACTUATOR REMOVAL in the Actuator Instructions.
5. Remove the actuator adaptor (when used) from the valve.
6. Remove the packing gland nuts, then slide the packing gland off the valve shaft.
7. Pull the packing out of the bonnet.
8. For valves with low friction packing, lubricate the new packing, then install it one ring at a time in the sequence shown in Figure 1.  
A friction cone is used on 4 to 8 inch valves with a wrenching nut or hand lever actuator, and standard packing. Before installing the gland, set the cone on top of the packing. Do not lubricate the outside of the cone or the inside of the gland.
9. Slide the packing gland down the valve shaft and over the studs. If the valve has a friction cone, bring the gland nuts under the gland up finger tight.



**Figure 1**  
**Correct Packing Installation Sequence**



**Figure 2**  
**Friction Cone Adjustment**

## 4" THRU 20"

### DeZURIK® ECCENTRIC VALVES

#### PACKING REPLACEMENT (continued)

10. Packing Gland Nuts: Preliminary adjustment now; final after valve is pressurized.
  - a. 4 thru 8 inch Lever and Nut Operated Valves Only - Turn packing gland nuts onto the studs until they touch the bonnet.
  - b. All Remaining Valves Except 10 and 12 Inch Lever Operated - Turn the packing gland nuts onto the studs until they touch the packing gland, then one more turn.
11. Do final tightening of packing gland nuts after valve is pressurized. See PACKING ADJUSTMENT section of these instructions.
12. Fasten the adaptor (when used) to the valve, lining up the scribe marks made during disassembly.
13. Install the actuator as described in the ACTUATOR INSTALLATION section of the Actuator Instructions.
14. If the actuator is a powered actuator, reconnect power to the actuator.
15. The valve is now ready to control flow.

#### DISASSEMBLY



#### WARNING

**This valve is a pressure vessel. Pressure must be completely released before disassembly. The bonnet will blow off the actuator if the bonnet bolts are removed with pressure in the valve.**

1. Relieve pipeline pressure.
2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



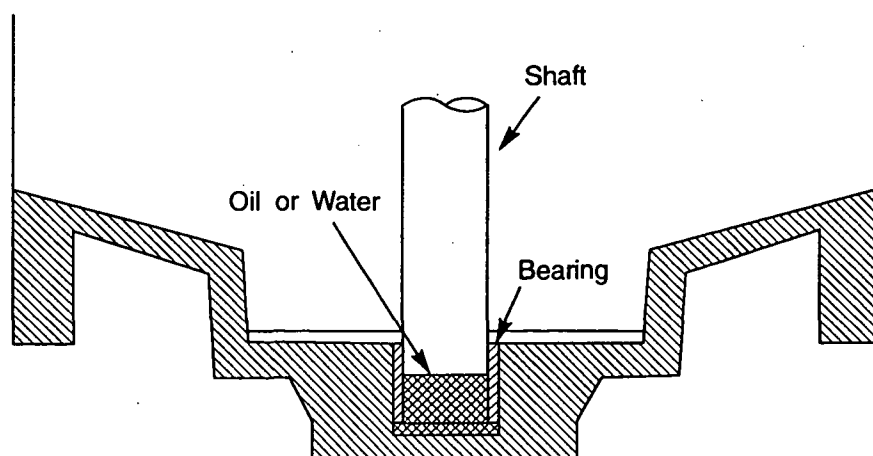
#### WARNING

**Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

3. Close the valve.
4. Remove the valve from the pipeline (if desired). It is not necessary to remove the valve from the pipeline to disassemble the valve.
5. Remove the actuator from the valve as described in the ACTUATOR REMOVAL section of the Actuator Instructions.
6. Scribe a line on the body, bonnet and plug stem to ensure component alignment during reassembly.
7. Remove the bolts holding the bonnet in place, then pry the bonnet loose from the valve body.
8. Remove the plug from the valve body.
9. Remove the gland nuts and gland from the bonnet.
10. Remove the packing from the bonnet.
11. Reaching through the packing chamber in the bonnet, drive the upper bearing out of the bonnet using a hammer and pin punch.
12. Remove the lower bearing from the valve body. The bearing can be chiseled out; or, it can be hydraulically forced out by filling the bearing half full of oil or water, then pounding a close fitting shaft into the bearing. This creates a hydraulic force under the bearing that forces it out. See Figure 2.

**4" THRU 20"**  
**DeZURIK® ECCENTRIC VALVES**

**DISASSEMBLY**  
**(continued)**



**Figure 3**  
**Hydraulically Removing the Lower Bearing**

**REASSEMBLY**

1. Push a new lower bearing into the valve body, then lubricate the bearing as described in the LUBRICATION section of these Instructions.
2. Place the plug into the valve body so the lower journal slides into the bearing. Turn the plug so it is nearly closed.
3. Set a new gasket in the body.
4. Push a new bearing into the bonnet, then lubricate the bearing as described in the LUBRICATION section of these instructions.
5. Place bonnet on valve, align scribe marks, then fasten bonnet in place.
6. Turn the plug to the closed position as described in the CLOSED POSITION section of these Instructions.
7. For valves with low friction packing, lubricate the new packing, then install it one ring at a time in the sequence shown in Figure 1.  
A friction cone is used on 4 to 8 inch valves with a wrenching nut or hand lever actuator, and standard packing. Before installing the gland, set the cone on top of the packing. Do not lubricate the outside of the cone or the inside of the gland.
8. Slide the packing gland down the valve shaft and over the studs. If the valve has a friction cone, bring the gland nuts under the gland up finger tight.
9. Packing Gland Nuts: Preliminary adjustment now; final after valve is pressurized.
  - a. 4" thru 8" Lever and Nut Operated Valves Only - Turn packing gland nuts onto the studs until they contact the bonnet. It will be necessary to adjust the packing gland nuts after the valve is pressurized; see the PACKING ADJUSTMENT section of these Instructions.
  - b. All Valves except 10" and 12" Lever Operated - Turn the packing gland nuts onto the studs until they contact the packing gland, then one additional turn. It will be necessary to adjust the packing gland nuts after the valve is pressurized; see the PACKING ADJUSTMENT section of these Instructions.
10. Install the actuator as described in ACTUATOR INSTALLATION in the Actuator Instructions.
11. If the actuator is a powered actuator, reconnect power to the actuator.
12. The valve is now ready to control flow.

## 4" THRU 20" DeZURIK® ECCENTRIC VALVES

### REMOVING VALVE FROM PIPELINE



#### WARNING

**This valve is a pressure vessel. Pressure must be completely released before disassembly. The bonnet will blow off the actuator if the bonnet bolts are removed with pressure in the valve.**

To remove the entire valve assembly from the pipeline, follow these steps.

1. Relieve pipeline pressure and drain portion of system where valve is located.
2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



#### WARNING

**Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

2. Close the valve.
3. Turn off the supply air and/or electricity if the valve has a powered actuator, then disconnect the piping and/or wiring from the valve assembly.
4. Support the valve assembly, then remove the flange bolts.
5. Remove the valve from the pipeline.

### FIELD TEST

Stroke the valve between the fully open and fully closed positions to verify that the valve and actuator are functioning properly.

### EMERGENCY OPERATION

Operate the valve as under normal conditions, taking care to bring the plug to the position required by the particular emergency condition.

### PREDICTED LIFE OF PARTS SUBJECT TO WEAR

Length of service for parts subject to wear is dependent on service conditions.

### TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Packing leaks	Packing is loose	Adjust packing as described in Maintenance section
	Packing is worn	Replace packing as shown in Packing Replacement section
Valve does not close	Object is wedged between plug and seat	Open valve to allow flow to flush object from valve. If this doesn't work, remove valve from pipeline and remove object from valve.
	Actuator closed position stop is out of adjustment	Adjust the closed position stop as described in Adjustments section of the Actuator Instructions
Valve leaks when closed	Plug is worn or damaged	Replace plug as shown in Disassembly and Reassembly sections
	Rubber on plug is torn	

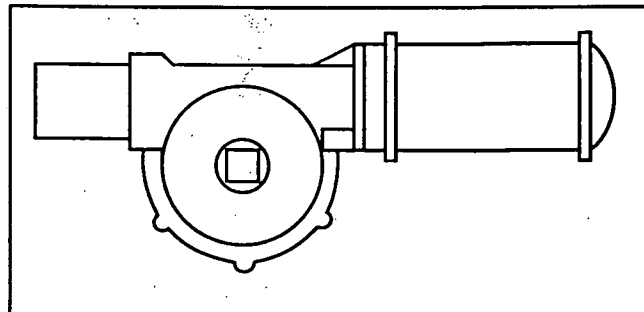


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## CYLINDER OPERATED G-SERIES ACTUATOR ON DeZURIK® ECCENTRIC VALVES

### DESCRIPTION

The G-Series cylinder actuator is a totally enclosed actuator that provides operation for DeZURIK Eccentric valves. A 2" square nut is provided on top of the actuator for manual operation. The actuator is available in four sizes: 4, 6, 12 and 16. It is also supplied with a single cylinder, or with single or double booster cylinders when valve size and application require them.



Several sections of these instructions require that you know the size of your actuator, and whether the pipeline pressure on the valve is "Direct" or "Reverse"; see Figure 1 to identify the different sized actuators offered, and Figure 2 for a definition of pressure direction.

### SAFETY MESSAGES

Safety messages in these instructions and on label(s) on the valve are flagged with one of the words Caution, Warning or Danger. The messages must be carefully read and followed to avoid personal injury and/or equipment damage.

After installation, if a safety label on the valve becomes difficult to see or read, or if a label has been removed, please contact DeZURIK for replacement label(s). Include the 7-digit part number from the data plate on the valve, the quantity of valves, and an appropriate name and mailing address.

### AIR SUPPLY

The supply pressure to the cylinder should be between 50 and 100 psi.

### TOOLS REQUIRED

This actuator is assembled using only standard SAE fasteners. To service this unit, you should have a full set of combination wrenches, hex wrenches, flat bladed screwdrivers, a pin punch and a dead blow hammer.

### LUBRICATION

The G-Series Actuator has been lubricated at the factory and requires no routine maintenance lubrication.

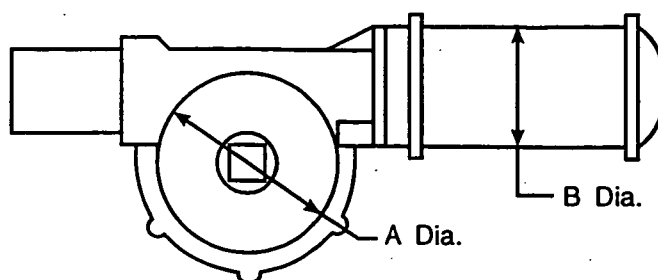
If the actuator is disassembled, lubricate the rack, rack guide, gear sector and bearings with a medium aluminum complex based grease such as Keystone Zeniplex-1.

If the cylinder is disassembled, it must be lubricated as described in the cylinder instructions.

### STOPS

Valves equipped with cylinder operated G-Series actuators have stops to limit valve travel in both the open and closed positions. These stops have been adjusted at the factory and do not require adjustment unless the actuator orientation is changed, or unless the actuator has been disassembled. See the STOP ADJUSTMENTS section of these instructions for details on adjusting the stops.

# CYLINDER OPERATED G-SERIES ACTUATOR ON DeZURIK® ECCENTRIC VALVES



A DIA.	ACT.	B DIA.	CYL.
7-1/8	G4	3-1/2	C3
8-1/8	G6	4-1/2	C4
15-1/4	G12	6-1/2	C6
19-1/8	G16	8-1/2	C8
		10-1/2	C10
		12-1/2	C12

**Figure 1**

## Actuator and Cylinder Identification

### STOP ADJUSTMENTS

#### Open Position Stop Adjustment

This actuator has a stop at each end of its cylinder that limits valve travel at both open and closed positions.

The open position stop on valves without booster cylinders, is an adjustable screw that is located in the end of the extension cap opposite the cylinder, and on valves with booster cylinders, the stop is located in the end of the power cylinder.

#### Closed Position Stop Adjustment

The closed position stop on valves without booster cylinders, is an adjustable screw that is located in the end of the cylinder, and on valves with booster cylinders, the stop is located in the end of the booster cylinder.

This adjustment must be made with the cylinder mounted on the actuator and with no pressure in the valve.

1. Discontinue flow and relieve pipeline pressure.
2. Open the valve.
3. Back out the set screw about 1-1/2 ". On units without booster cylinders, the set screw is in the end of the cylinder. On units with booster cylinders, the set screw is in the booster cylinder.
4. Close the valve with the cylinder pressure specified in Table B. Maintain this pressure for 5 minutes to allow the plug to seat, then screw the backed out set screw in until it contacts the piston rod.

If the pipeline pressure on the valve is: (See figure 2)

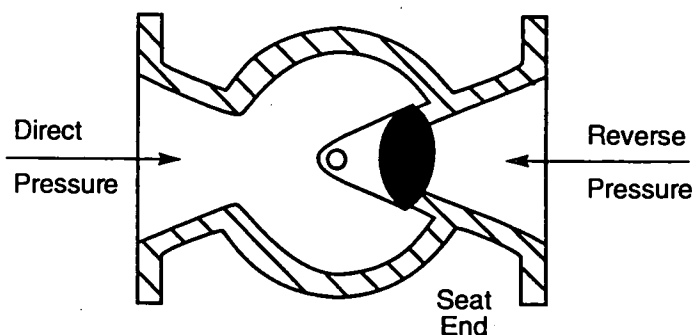
- a. Direct Pressure (higher pressure is at end opposite the seat), use the cylinder pressure specified in Table B for 25# Reverse Pressure Drop.
- b. Reverse Pressure (higher pressure is at seat end of valve), use the cylinder pressure specified in Table B for the amount of Reverse Pressure drop in your pipeline.



## CYLINDER OPERATED G-SERIES ACTUATOR ON DeZURIK® ECCENTRIC VALVES

### Closed Position Stop Adjustment (continued)

**NOTE:** The pressure specified in Table B will provide tight shut off or minimum leakage (depending on pressure drop) with maximum plug life. If the reverse pressure drop in the pipeline is unknown; use the figures for maximum pressure drop, but note that this will shorten the life of the plug. Actual pressure drop should be determined and the closing force set accordingly as soon as possible.



**Figure 2**  
**Direct and Reverse Pressure On Seat**

5. Make sure the thread seal is positioned properly, and lock the set screw in place with the jam nut.

### Open Position Adjustment

The cylinder must be mounted on the actuator while the open position adjustment is being made.

1. Open the valve.
2. Adjust the set screw in the end of the extension cap to set the plug in the proper position. On units with booster cylinders, adjust the set screw in the end of the booster cylinder.
3. Lock the set screw in place with the jam nut.

### ACTUATOR REMOVAL

When Eccentric valves are mounted in a vertical pipeline, or mounted in a horizontal pipeline with the plug stem horizontal, there is a chance that gravity will cause the plug to swing to a lower position in the valve body when the actuator is removed. To avoid this hazard, place the plug in the lowest position before removing the actuator.

1. Discontinue flow and relieve pipeline pressure.



#### WARNING

The valve is a pressure vessel. Pressure must be completely released before removing the bonnet bolts on the 4, 5 and 6 inch valves, as the bonnet bolts also hold the actuator in place.

2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.

## CYLINDER OPERATED G-SERIES ACTUATOR ON DeZURIK® ECCENTRIC VALVES

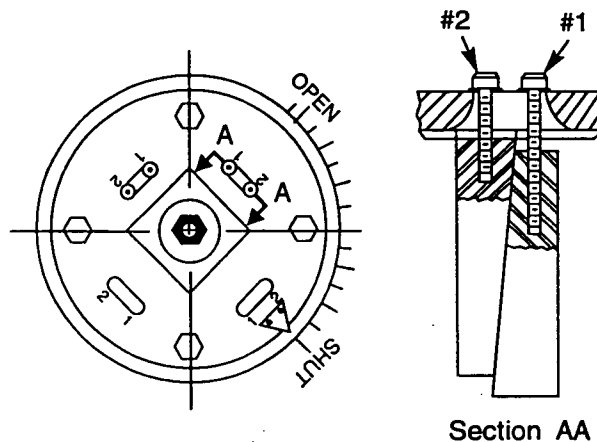
### ACTUATOR REMOVAL (continued)



### WARNING

**Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

3. Scribe corresponding lines on the valve and actuator to be used for alignment during actuator installation.
4. If the valve is a size 4" thru 20", remove the lock nut, spring washers, wrenching nut and pointer from the plug stud, then go to step 4.  
If the valve is a size 24" thru 36", follow steps a, b and c, then go to step 4.
  - a. Loosen the #1 lockscrews about 6 to 8 turns. Loosen the #2 lockscrews about 3 turns. See Figure 3.



**Figure 3**

### 2050 Key and Lockscrew Arrangement

- b. Using a soft hammer, tap the heads of the #1 lockscrews to loosen the keys.
- c. Remove the four screws holding the wrenching nut to the gear sector, then remove the stud locknut, spring washers and the wrenching nut with the keys attached.
5. Remove the screws fastening the adaptor to the valve. On the 4, 5, 6 and 10 inch valves, these screws also hold the bonnet to the valve body.
6. Lift the actuator and adaptor off the valve.

### ACTUATOR INSTALLATION

1. Place the valve in the position it was in when the actuator was removed. Normally this will be so the plug is in the lowest position in the valve body.
2. Line up the scribe marks on the valve and actuator made during actuator removal, then set the actuator on the valve so the valve shaft slides into the actuator gear sector.
3. Fasten the actuator adaptor to the valve.

## CYLINDER OPERATED G-SERIES ACTUATOR ON DeZURIK® ECCENTRIC VALVES

### ACTUATOR INSTALLATION (continued)

4. Slide the pointer and wrenching nut down the plug stud so it rests on top of the gear sector; the pointer should point to indicate the correct valve position. If the valve is a size 24 thru 36 inch, hold the keys in position when you slide the wrenching nut over the plug stud and guide the keys into the gear sector and stem slots. Then install the four screws fastening the wrenching nut to the gear sector.
5. Place the spring washers on the plug stud as shown in Figure 4.
6. Screw the lock nut down the plug stud until the spring washers are completely compressed, then back the nut off until the washers return to their normal unstressed shape.
7. If the valve is a size 24 thru 36 inch, go to step 8.  
If the valve is a size 24 thru 36 inch, tighten the #2 lockscrews and then the #1 lockscrews to hold the keys in place.
8. Pipeline flow may now be restored.

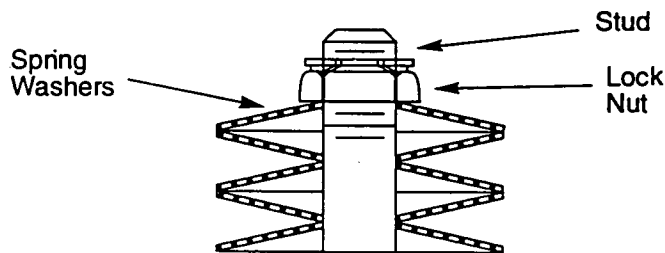


Figure 4  
Spring Washer Stackup

### CYLINDER REMOVAL FROM ACTUATOR

Follow these steps to remove the cylinder from the actuator. These steps can be performed with the actuator installed on the valve or removed.

1. Discontinue pipeline flow.
2. Apply air pressure to the port in the cylinder cap (the end farthest from the actuator housing) until the valve has moved to the end of its stroke.
3. Turn off the supply pressure to the cylinder, then disconnect the tubing from both cylinder ports.
4. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



#### WARNING

**Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

5. Remove the extension cap from the actuator housing. On units with booster cylinders, carefully remove the booster cylinder or cylinders.
6. Remove the nuts and spring washers from the end of the rack rod.
7. Remove the screws or nuts fastening the cylinder assembly to the housing, and carefully remove the cylinder assembly by sliding it away from the actuator until the rack rod clears the actuator housing.
8. The Cylinder Instructions has complete details on how to rebuild the cylinder.

## CYLINDER OPERATED G-SERIES ACTUATOR ON DeZURIK® ECCENTRIC VALVES

### CYLINDER INSTALLATION ON ACTUATOR

Follow these steps to install the cylinder on the actuator.

1. Scrape the old gasket material from the actuator housing and cylinder head, then place a new gasket on the cylinder head.
2. Install the cylinder/rack rod assembly by sliding the rack rod thru the rack then fasten the cylinder to the housing.

**NOTE:** If the rack rod is not attached to the cylinder, clean the threads of both the rack rod and the cylinder shaft, then apply Loctite to the cylinder shaft threads, and screw the rack rod onto the cylinder shaft.

3. Slide the spacer, spring washers and nuts onto the rack rod. See Table A for arrangement of spring washers.
4. Screw one nut onto the rack rod. Tighten the nut until the spring washers are completely compressed, then loosen the nut until the washers just return to their normal unstressed shape.
5. Screw the other nut onto the rack rod and tighten the two nuts against each other.
6. Replace the extension cap. On units with booster cylinders, replace the booster cylinder or cylinders.
7. If the actuator is a powered actuator, reconnect power to the actuator.
8. Adjust the open and closed position stops as described in the Stop Adjustments section of these instructions.

### DISASSEMBLY

When an eccentric valve is mounted with the plug stem horizontal, there is a chance that gravity will cause the plug to swing down to a lower position in the valve body when the actuator is removed. If this happened, it would be difficult to align the actuator correctly during reassembly. To avoid this hazard, rotate the actuator and valve together to place the plug in the lowest position before removing the actuator. After the cover has been removed from the actuator, make scribe marks on the mating gear teeth in line with the marked hex on the valve plug. Also make a scribe mark on the driving surface of the actuator in line with the marked hex. See steps 10 and 11 below and Figure 5.

1. Discontinue flow and relieve pipeline pressure.
2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



#### WARNING

**Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

3. Remove the extension cap from the actuator housing. On units with booster cylinders, carefully remove the booster cylinder or cylinders.
4. Place the actuator in the open position, then shut off cylinder supply pressure and disconnect the tubing.
5. Remove the nuts and washers from the end of the rack rod.
6. Remove the screws or nuts fastening the cylinder assembly to the housing and carefully remove the cylinder assembly by sliding it away from the actuator until the rack rod clears the actuator housing.

## CYLINDER OPERATED G-SERIES ACTUATOR ON DeZURIK® ECCENTRIC VALVES

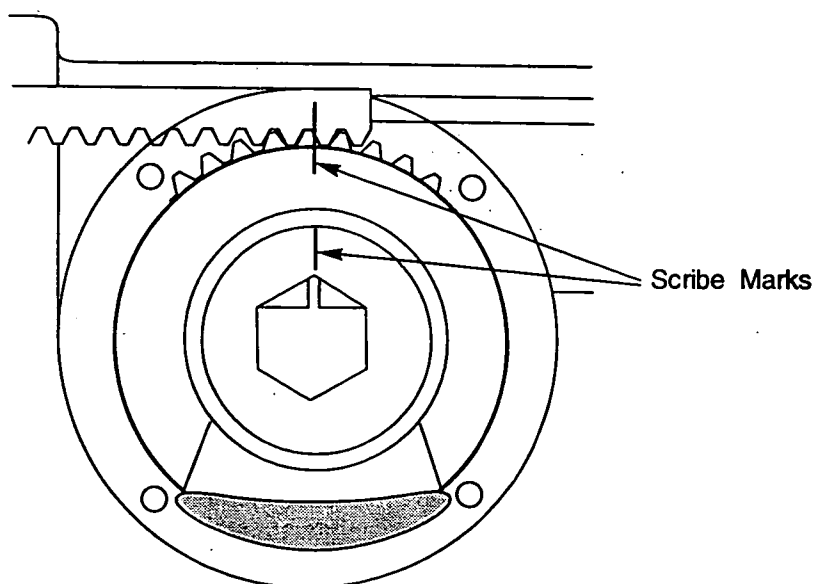
### DISASSEMBLY (continued)

7. Two valve size ranges:
  - a. If the valve is a size 4 thru 20 inch, remove the lock nut, spring washers, wrenching nut and pointer from the plug stud, then go to step 10.
  - b. If the valve is a size 24 thru 36 inch, go to step 7.
8. Loosen lockscrews #1 about 6 to 8 turns. Loosen lockscrews #2 about 3 turns. See figure 3.
9. Using a soft hammer, tap the heads of the #1 lockscrews to loosen the keys.
10. Remove the four screws holding the wrenching nut to the gear sector, then remove the stud locknut, spring washers and the wrenching nut with the keys attached.
11. Scribe corresponding lines on the actuator cover and housing, then remove the cover screws and cover from the top of the actuator. See Figure 5.
12. Mark which teeth of the rack and gear are engaged and lift the gear sector out of the actuator.
13. Remove the rack from the housing.
14. Remove the rack bearing.
15. Scribe corresponding lines on the valve and adaptor to be used for alignment during actuator reassembly. See Figure 5.



### WARNING

The valve is a pressure vessel. Pressure must be completely released before removing the bonnet bolts. On 4, 5, 6 and 10 inch valves, the bonnet bolts also hold the actuator in place. Do not loosen or remove them until pressure has been completely released.



**Figure 5**  
**Scribe Marks to Make to Aid Reassembly**

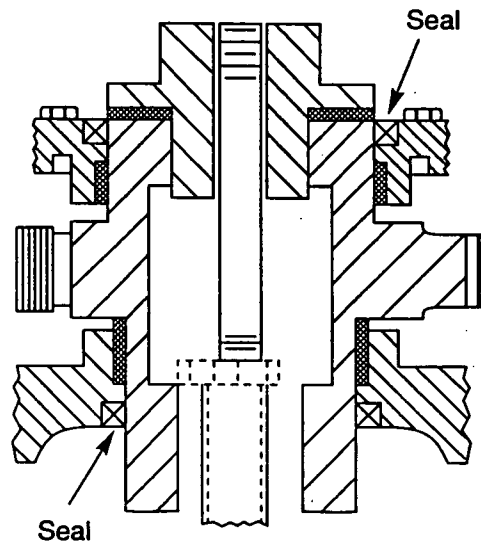
## CYLINDER OPERATED G-SERIES ACTUATOR ON DeZURIK® ECCENTRIC VALVES

### DISASSEMBLY (continued)

16. Remove the screws fastening the adaptor to the valve. On the 4, 5, 6 and 10 inch valves, these screws also hold the bonnet to the valve body.
17. Lift the rest of the actuator and the adaptor off the valve.
18. Remove the screws fastening the adaptor to the actuator housing, and separate the two parts.
19. Scrape any of the old gasket material from the parts.

### REASSEMBLY

1. Install new bearings and seals in the adaptor and cover if necessary. See Figure 6 for proper placement.



**Figure 6**  
**Location of Actuator Seals**

2. Place a new gasket on the adaptor then fasten the adaptor to the actuator housing with the screws.
3. Line up the scribe marks on the valve and adaptor made during actuator removal, then set the adaptor and housing on the valve.
4. Fasten the adaptor to the valve.
5. Install the rack bearing in the housing.
6. Apply a liberal amount of grease to the rack teeth and the back of the rack which will contact the rack bearing, then install the rack in the housing.
7. Apply a liberal amount of grease to the gear sector teeth and journals, then place the gear sector in the housing and carefully align the teeth with the rack as marked during disassembly. It may be necessary to loosen the screws mounting the adaptor to the valve and shift the housing slightly for better gear sector alignment. Be sure to tighten these screws after alignment is achieved.
8. Install the cylinder/rack rod assembly by sliding the rack rod through the rack then fasten the cylinder to the housing.

**Note:** If the rack rod is not attached to the cylinder, clean the threads of both the rack rod and the cylinder shaft then apply Loctite to the cylinder shaft threads and screw the rack rod onto the cylinder shaft.

## CYLINDER OPERATED G-SERIES ACTUATOR ON DeZURIK® ECCENTRIC VALVES

### REASSEMBLY (continued)

9. Slide the spacer, spring washers and nuts onto the rack rod. See Table A for spring washer placement.
10. Screw one nut onto the rack rod. Tighten the nut until the spring washers are completely compressed, then loosen the nut just until the washers return to their normal unstressed shape.
11. Screw the other nut onto the rack rod and tighten the two nuts against each other.
12. Set a new cover gasket on the housing, then install and fasten the top cover on the housing; make sure the scribe marks line up.
13. Slide the pointer and wrenching nut down the plug stud so it rests on top of the gear sector; the pointer should point to indicate the correct valve position. If the valve size is 24 thru 36 inches, hold the keys in position when you slide the wrenching nut over the plug stud, and guide the keys into the gear sector and stem slots. Then install the four screws fastening the wrenching nut to the gear sector.
15. Place the spring washers on the plug stud as shown in Figure 4.  
NOTE: Step 15 is for 24 thru 36 inch size valves only.
16. If the valve size is 24 thru 36 inches, tighten the #2 lockscrews and then the #1 lockscrews to hold the keys in place. Skip this step if the valve size is 4 thru 20 inches.
17. Replace the extension cap. On units with booster cylinders, replace the booster cylinder or cylinders.
18. Adjust the open and closed position stops as described in the Stop Adjustments section of these instructions.

### CHANGING ACTUATOR MOUNTING POSITIONS

On 4 thru 20 inch size valves the actuator can be mounted in 30 degree increments around the valve shaft. On 24 thru 36 inch size valves the actuator can be mounted in 45 degree increments around the valve shaft.

**FOR 60 DEGREE INCREMENT MOUNTING ON 4 THRU 20 INCH VALVES**

**AND FOR 90 DEGREE INCREMENT MOUNTING ON 24 THRU 36 INCH VALVES:**

To move the actuator mounting position in 60 degree increments from its present position on 4 thru 20 inch valves, and in 90 degree increments on 24 thru 36 inch valves, follow these steps.

1. Remove the actuator from the valve as described in the Actuator Removal section of these instructions.
2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



#### WARNING

**Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

3. Rotate the actuator to the desired position.
4. Install the actuator on the valve according to the Installation section of these instructions.

## CYLINDER OPERATED G-SERIES ACTUATOR ON DeZURIK® ECCENTRIC VALVES

### CHANGING ACTUATOR MOUNTING POSITIONS (continued)

#### FOR 30 DEGREE INCREMENT MOUNTING ON 4" THRU 20" VALVES ONLY:

The connection between the valve plug and the actuator gear sector is a hex, therefore, 60 degree increment mounting positions are possible without changing the timing of the gear sector and the rack. When a 30 degree position change is required, the timing between the gear sector and the rack must be changed. Follow these steps to change the position of the actuator by 30 degrees.

When Eccentric valves are mounted in a vertical pipeline, or mounted in a horizontal pipeline with the plug stem horizontal, there is a chance that gravity will cause the plug to swing to a lower position in the valve body when the actuator is removed. To avoid this hazard, place the plug in the lowest position before removing the actuator.

1. Discontinue flow and relieve pipeline pressure.
2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



#### WARNING

**Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

3. Remove the lock nut, spring washers, wrenching nut and pointer from the plug stud.
4. Scribe corresponding lines on the actuator cover and housing, then remove the cover screws and cover from the top of the actuator.



#### WARNING

**The valve is a pressure vessel. Pressure must be completely released before removing the bonnet bolts. On 4, 5, 6 and 10 inch valves, the bonnet bolts also hold the actuator in place. Do not loosen or remove them until pressure has been completely released.**

5. Mark which teeth of the rack and gear are engaged and lift the gear sector out of the actuator.
6. Remove the screws fastening the adaptor to the valve. On the 4, 5, 6 and 10 inch valves, these screws also hold the bonnet to the valve body.
7. Take out the screws fastening the actuator housing to the adaptor.
8. Rotate the adaptor on the valve, and the actuator on the adaptor until the holes line up and the actuator is in the desired position. Replace all of the screws.
9. Find the tooth that was marked on the gear sector and count over clockwise four teeth on the size 4 and 6 actuators, and five teeth on the size 12 and 16 actuators. This is the tooth that will engage with the marked tooth on the rack. Install the gear sector using the new tooth engagement, and be sure the gear sector fits on the plug stem properly.
10. Set a new cover gasket on the housing, then install and fasten the top cover on the housing; make sure the scribe marks line up.
11. Slide the pointer and wrenching nut down the plug stud so it rests on top of the gear sector; the pointer should point to indicate the correct valve position.



## CYLINDER OPERATED G-SERIES ACTUATOR ON DeZURIK® ECCENTRIC VALVES

### CHANGING ACTUATOR MOUNTING POSITIONS (continued)

12. Place the spring washers on the plug stud as shown in Figure 4.
13. Screw the lock nut down the plug stud until the spring washers are completely compressed, then back the nut off until the washers return to their normal unstressed shape.
14. Adjust the open and closed position stops as described in the Stop Adjustments section of these instructions.

#### FOR 45 DEGREE INCREMENT MOUNTING ON 24 THRU 36 INCH VALVES ONLY:

The connection between the valve plug and the actuator gear sector is a double key, therefore, 90 degree position changes are possible without changing actuator gear timing. However, when a 45 degree change is needed, gear sector and the rack timing must be changed. Follow these steps to change actuator position by 45 degrees.

When Eccentric valves are mounted in a vertical pipeline, or mounted in a horizontal pipeline with the plug stem horizontal, gravity might cause the plug to swing to a lower position in the valve body when the actuator is removed. To avoid this hazard, place the plug in the lowest position before removing the actuator.

1. Discontinue flow and relieve pipeline pressure.
2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



#### WARNING

**Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

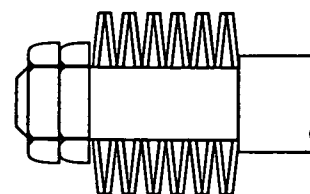
3. Loosen lockscrews #1 about 6 to 8 turns. Loosen lockscrews #2 about 3 turns. See Figure 3.
4. Using a soft hammer, tap the heads of the #1 lockscrews to loosen the keys.
5. Remove the four screws that hold the wrenching nut to the gear sector, then remove the stud locknut, spring washers and the wrenching nut with the keys attached.
6. Scribe corresponding lines on the actuator cover and housing, then remove the cover screws and cover from the top of the actuator.
7. Mark which teeth of the rack and gear are engaged, and lift the gear sector out of the actuator.
8. Remove the screws fastening the adaptor to the valve.
9. Remove the screws fastening the actuator housing to the adaptor.
10. Rotate the adaptor on the valve and the actuator on the adaptor until the holes line up and the actuator is in the desired position. Replace all of the screws.
11. Note the tooth that was marked on the gear sector and count over clockwise five teeth on the size 16 actuator. This is the tooth that will engage with the marked tooth on the rack. Install the gear sector using the new tooth engagement, and be sure the keyways in the gear sector match the keyways in the plug stem.
12. Set a new cover gasket on the housing, then install and fasten the top cover on the housing, making sure the scribe marks line up.

# CYLINDER OPERATED G-SERIES ACTUATOR ON DeZURIK® ECCENTRIC VALVES

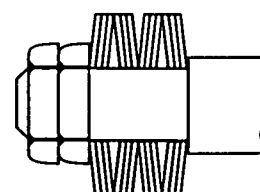
13. Hold the keys in position, then slide the wrenching nut over the plug stud and guide the keys into the gear sector and stem slots. Then install the four screws fastening the wrenching nut to the gear sector.
14. Place the spring washers on the plug stud as shown in Figure 4.
15. Screw the lock nut down the plug stud until the spring washers are completely compressed, then back the nut off until the washers return to their normal unstressed shape.
16. Tighten the #2 lockscrews, and then the #1 lockscrews to hold the keys in place.
17. Adjust the open and closed position stops as described in the Stop Adjustments section of these instructions.

**Table A**  
**Rack Rod Spring Washer Arrangements**

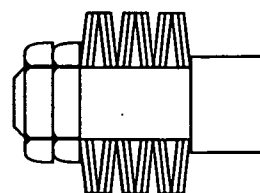
Valve Size	Actuator Size	Direct Pressure	Reverse Pressure
4	ALL	A	A
5	ALL	B	B
6	ALL	B	B
8	G4	B	B
8	G6	B	B
8	G12	A	A
10	G6	B	B
10	G12	A	B
12	G6	B	B
12	G12	B	B
12	G16	A	A
14	G12	B	B
14	G16	A	A
16	ALL	B	B
18	ALL	B	B
20	ALL	B	B
24	G16-C8	B	C
24	G16-C10	B	B
24	G16-C12	B	C
24	G16-C10B10	B	B
24	G16-C10B12	B	-
24	G16-C12B12	-	C
24	G16-C12B10B10	B	-
24	G16-C12B12B12	B	-
30	G16-C8	C	C
30	G16-C10	B	B
30	G16-C12	B	C
30	G16-C10B10	-	C
30	G16-C10B12	B	-
30	G16-C12B12	C	C
30	G16-C12B10B10	B	C
30	G16-C12B12B12	B	C
36	G16-C10B12	C	-
36	G16-C12B12	-	C
36	G16-C12B10B10	C	-
36	G16-C12B12B12	C	C



**Arrangement A**



**Arrangement B**



**Arrangement C**

# **CYLINDER OPERATED G-SERIES ACTUATOR ON DeZURIK® ECCENTRIC VALVES**

**Table B**  
**Cylinder Pressure Used To Adjust Seating Pressure (PSI)**

Valve Size	Actuator & Cylinder (See Fig.3)	*Reverse Pressure Drop (For Direct Pressure Drop Use Same as 25# Reverse)					Valve Size	Actuator & Cylinder (See Fig. 3)	*Reverse Pressure Drop (For Direct Pressure Drop Use Same As 25# Reverse)			
		25#	50#	75#	100#	125#			25#	50#	75#	100#
4"	G4-C3	25	27	29	31	33	18"	G12-C6	37			
	G4-C4	14	15	16	17	18		G12-C8	21	29		
	G4-C6	7	7	8	9	9		G12-C10	14	19		
6"	G4-C3	48						G16-C8	16	22	28	33
	G4-C4	27	31	35				G16-C10	10	14	18	21
	G4-C6	12	14	16				G16-C12	7	10	12	15
	G6-C4	21	24	27	31	32		G16-C10B10	11	15	19	22
	G6-C6	10	11	12	13	14		G16-C10B12	8	11	13	16
								G16-C12B12	8	11	13	16
8"	G4-C4	57						G16-C12B10B10	12	16	20	23
	G4-C6	25					20"	G12-C8	24	34		
	G6-C6	20	22	25	28			G12-C10	15	22		
	G6-C8	11	13	15	16			G16-C8	18	25	32	39
	G12-C6	10	11	13	14	15		G16-C10	12	16	21	25
	G12-C8	6	7	8	8	9		G16-C12	8	12	15	18
10"	G6-C6	30	36					G16-C10B10	13	17	22	26
	G6-C8	17	20					G16-C10B12	9	13	16	19
	G12-C6	15	18	21	24	26		G16-C12B12	9	13	16	19
	G12-C8	9	10	12	14	15		G16-C12B10B10	14	18	23	27
	G12-C10	6	7	8	9	10	24"	G16-C8	22	38		
								G16-C10	14	21	28	34
12"	G6-C6	41						G16-C12	10	15	19	24
	G6-C8	23						G16-C10B10	15	22	29	35
	G12-C6	21	26	30	35			G16-C10B12	11	16	20	25
	G12-C8	12	15	17	20	22		G16-C12B12	11	16	20	25
	G12-C10	8	10	11	13	14		G16-C12B10B10	16	23	30	36
	G16-C8	9	11	13	15	17		G16-C12B12B12	12	17	21	26
	G16-C10	6	7	8	10	11	30"	G16-C8	28			
	G16-C12	4	5	6	7	8		G16-C10	18	29		
								G16-C12	13	20	27	34
14"	G12-C6	26	34					G16-C10B10	19	30	40	50
	G12-C8	15	19	24	28			G16-C10B12	14	21	28	35
	G12-C10	10	13	15	18			G16-C12B12	14	21	28	35
	G16-C8	11	15	18	21			G16-C12B10B10	20	31	41	51
	G16-C10	7	10	12	14			G16-C12B12B12	15	22	29	36
	G16-C12	5	7	8	10		36"	G16-C10B12	56			
	G16-C10B10	8	11	13	15			G16-C12B12	39	50		
								G16-C12B10B10	39	50		
16"	G12-C6	32						G16-C12B12B12	39	50		
	G12-C8	18	24									
	G12-C10	12	16	19								
	G16-C8	14	18	22	26							
	G16-C10	9	12	15	17							
	G16-C12	6	8	10	12							
	G16-C10B10	10	13	16	18							
	G16-C10B12	7	10	12	14							

\*Reverse pressure drop: The pressures specified for reverse pressure drop will provide tight shutoff or minimum leakage (depending on pressure drop) with maximum plug life. If dead tight shutoff is required with reverse pressure, contact the factory for limitations and recommendations.

Printed in the USA

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A UNIT OF GENERAL SIGNAL  
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## DeZURIK® DOUBLE-ACTING HYDRAULIC CYLINDER FOR USE WITH RACK AND GEAR ACTUATOR

### DESCRIPTION

This instruction covers the DeZURIK double-acting hydraulic cylinder used on rack and gear actuators. This cylinder can be used with DeZURIK Pumpcheck accessories.



### CAUTION

**This cylinder is a pressure-containing vessel. Release the pressure from both ends of the cylinder before attempting any disassembly or repairs.**

### SAFETY MESSAGES

Safety messages in these instructions and on label(s) on the valve are flagged with one of the words Caution, Warning or Danger. The messages must be carefully read and followed to avoid personal injury and/or equipment damage.

After installation, if a safety label on the valve becomes difficult to see or read, or if a label has been removed, please contact DeZURIK for replacement label(s). Include the 7-digit part number from the data plate on the valve, the quantity of valves, and an appropriate name and mailing address.

### SUPPLY

Supply medium is clean water. Minimum supply pressure is 50 psi. Maximum supply pressure is 100 psi.

### LUBRICATION

When the cylinder is disassembled, lubricate the grooves in the piston, the piston seal, the O-rings, and the cylinder wall with Dow Corning No. 44 grease or equivalent.

### CLOSED POSITION ADJUSTMENT

1. Turn the set screw in the end of the cylinder counterclockwise approximately 5 revolutions.
2. Close the valve. See the valve instruction sheet to determine closed position.
3. Turn the set screw clockwise until resistance is felt as it contacts the piston rod.
4. Lock in place with the nut, being sure the thread seal is positioned properly.

### DISASSEMBLY

1. Shut off the cylinder supply pressure and relieve the pressure in the cylinder.
2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



### WARNING

**Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.**

3. Disconnect the cylinder tubing.
4. Remove the nuts and washers from the cylinder cap end of the tie rods and remove the cylinder cap.
5. Remove the cylinder tube. Rotate it while pulling it off the piston.
6. Remove the nut fastening the piston to the piston rod and remove the piston.
7. Remove the nuts from the cylinder head end of the tie rods and remove the cylinder head.

## DeZURIK® DOUBLE-ACTING HYDRAULIC CYLINDER FOR USE WITH RACK AND GEAR ACTUATOR

8. Remove the gland and packing from the cylinder head.
9. Remove the two scrapers. One scraper is found in the cylinder head, the other is in the gland. Figure 1 shows their location.

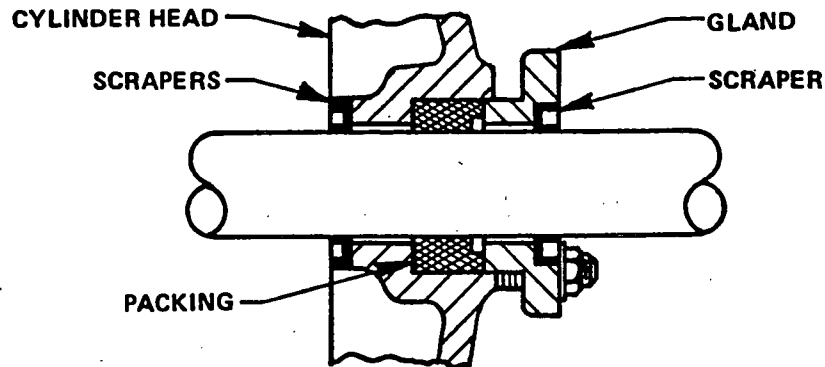
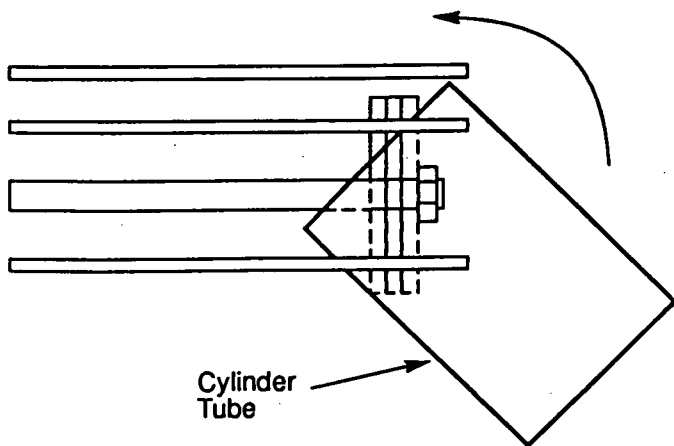


Figure 1  
Scrapper Locations

### REASSEMBLY

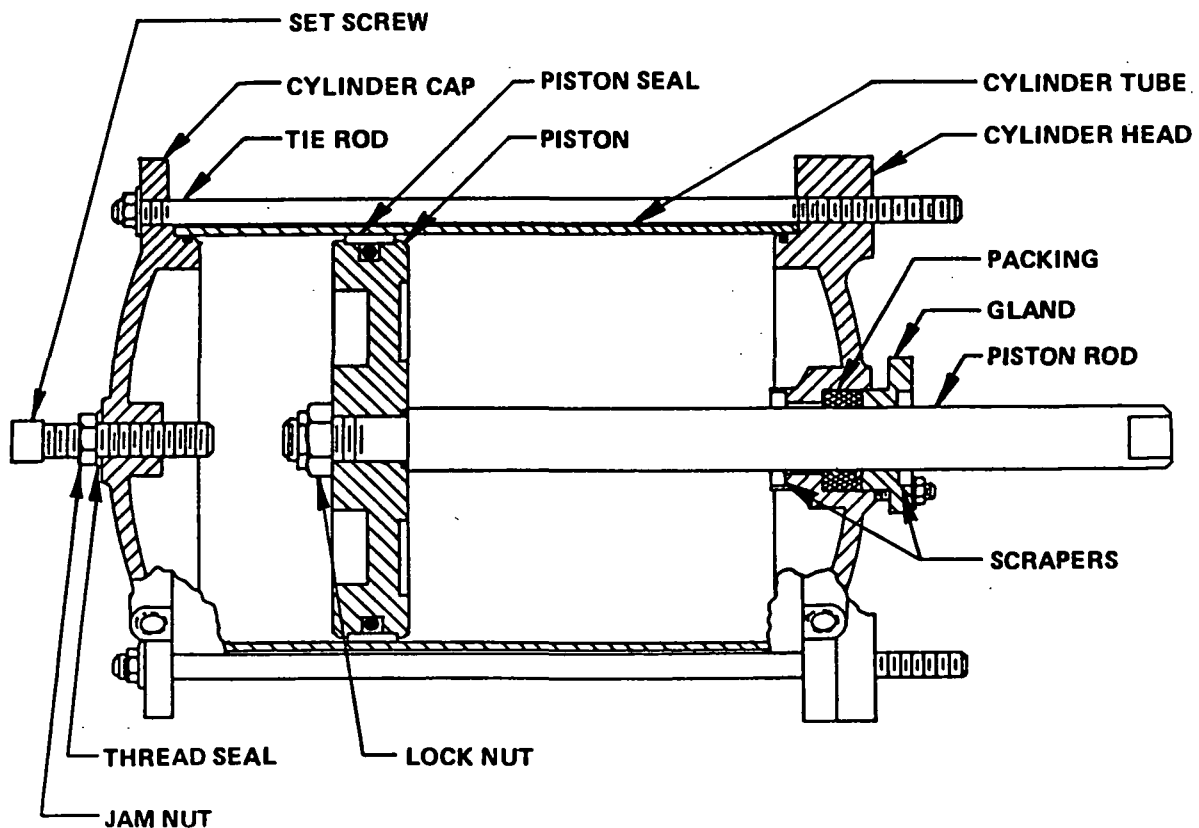
1. Clean and examine the rod scrapers. If they are damaged, use new scrapers. Install the scrapers in the cylinder head and the gland.
2. Clean the packing chamber and the O-ring groove in the cylinder head. Then assemble the gland and the cylinder head on the piston rod.
3. Install the packing. It is recommended that new packing be used.
4. Place the O-ring in the cylinder head, lubricating it with Dow Corning No. 44 grease.
5. Remove the O-ring from the center of the piston and clean the O-ring groove. Inspect the O-ring, replacing it if damaged, and install the O-ring, lubricating it with Dow Corning No. 44 grease.
6. Slide the piston onto the piston rod, and install and tighten the nut.
7. Remove the piston seal and its O-ring and clean the O-ring, seal and the groove in the piston. Inspect the O-ring and seals, replacing them if damaged. Then install the O-ring and seal, lubricating them with Dow Corning No. 44 grease.
8. Lubricate the inside of the cylinder tube and slide the cylinder over the piston. On cylinders with 6" and larger diameter, start the cylinder at a 45° angle to the piston as shown in Figure 2. (It will be necessary to remove several cylinder tie rods to provide clearance.)
9. Clean the O-ring groove in the cylinder cap and install the O-ring, lubricating it with Dow Corning No. 44 grease.
10. Install the cylinder cap, lock washers and nuts. Tighten the nuts on the tie rods with the torques specified in Table 1.
11. Reconnect the tubing to the cylinder ports.
12. If the actuator is a powered actuator, reconnect power to the actuator.
13. Actuate the cylinder, checking the closed position adjustment.

# DeZURIK® DOUBLE-ACTING HYDRAULIC CYLINDER FOR USE WITH RACK AND GEAR ACTUATOR



**Figure 2**  
**Cylinder Tube Installation**

Table A Tie Rod Nut Torque			
Cylinder Size	Torque		
	ft. lbs	cm./kg.	N-M
C3 - C4	12	165	16
C6 & C8	16	220	22
C10 & C12	20	275	27



**DeZURIK Double Acting Hydraulic Cylinder**

Rev A - Gen revs. 24.1.95 R.J.

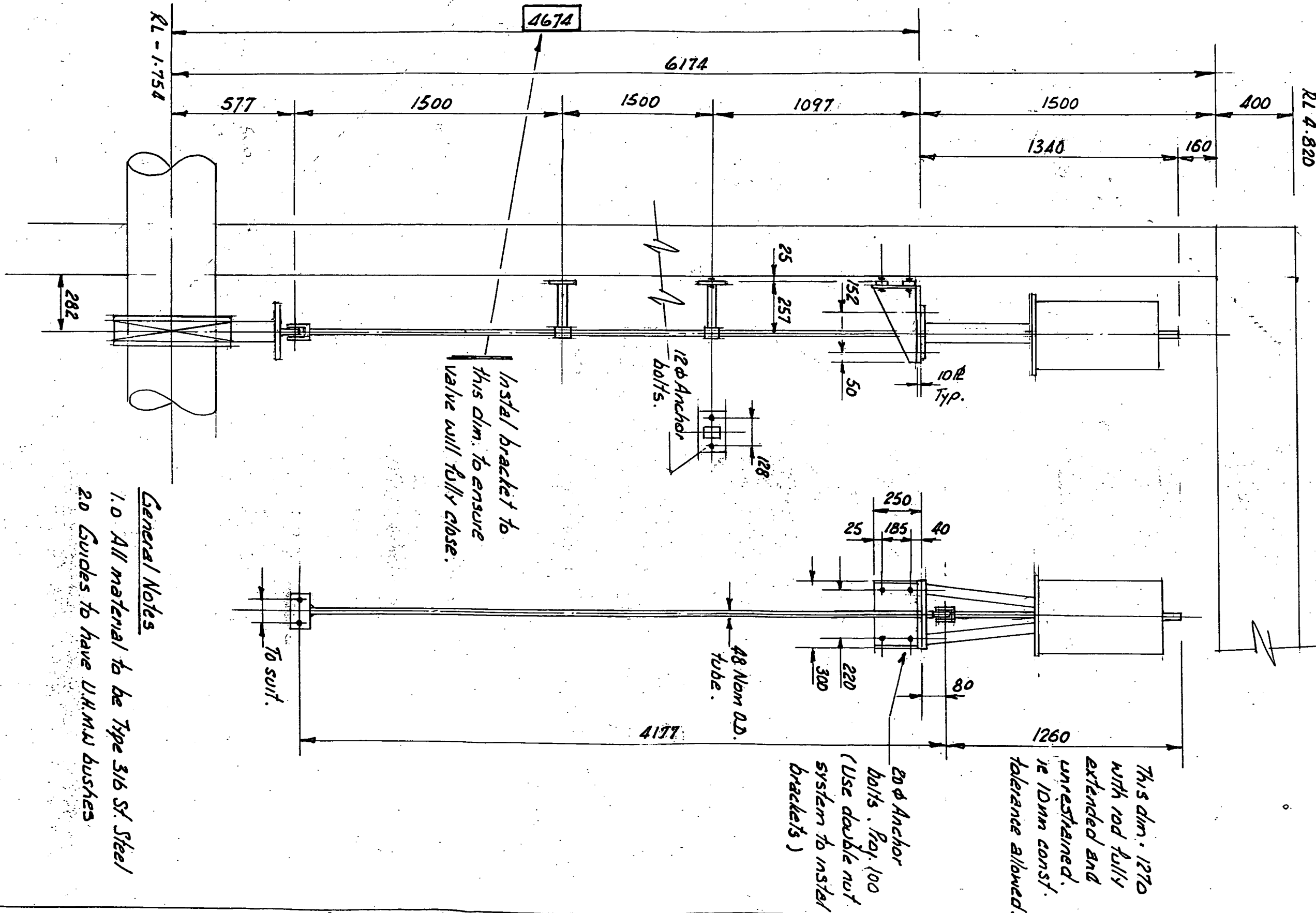
VALVEFLO HOUSE, 22 JEAYS ST., BOWEN HILLS, BRISBANE, QUEENSLAND, 4008  
PHONE (07) 252 8866 FAX (07) 252 4874  
TELEX AAM2129



SOUTHBANK DEVELOPMENT - SEWERAGE PEAK  
FLOW BY-PASS PUMP STATION.  
450 DIA KNIFF GATE VALVE WITH EXTN. STEM  
AND CYLINDER ACTUATOR.

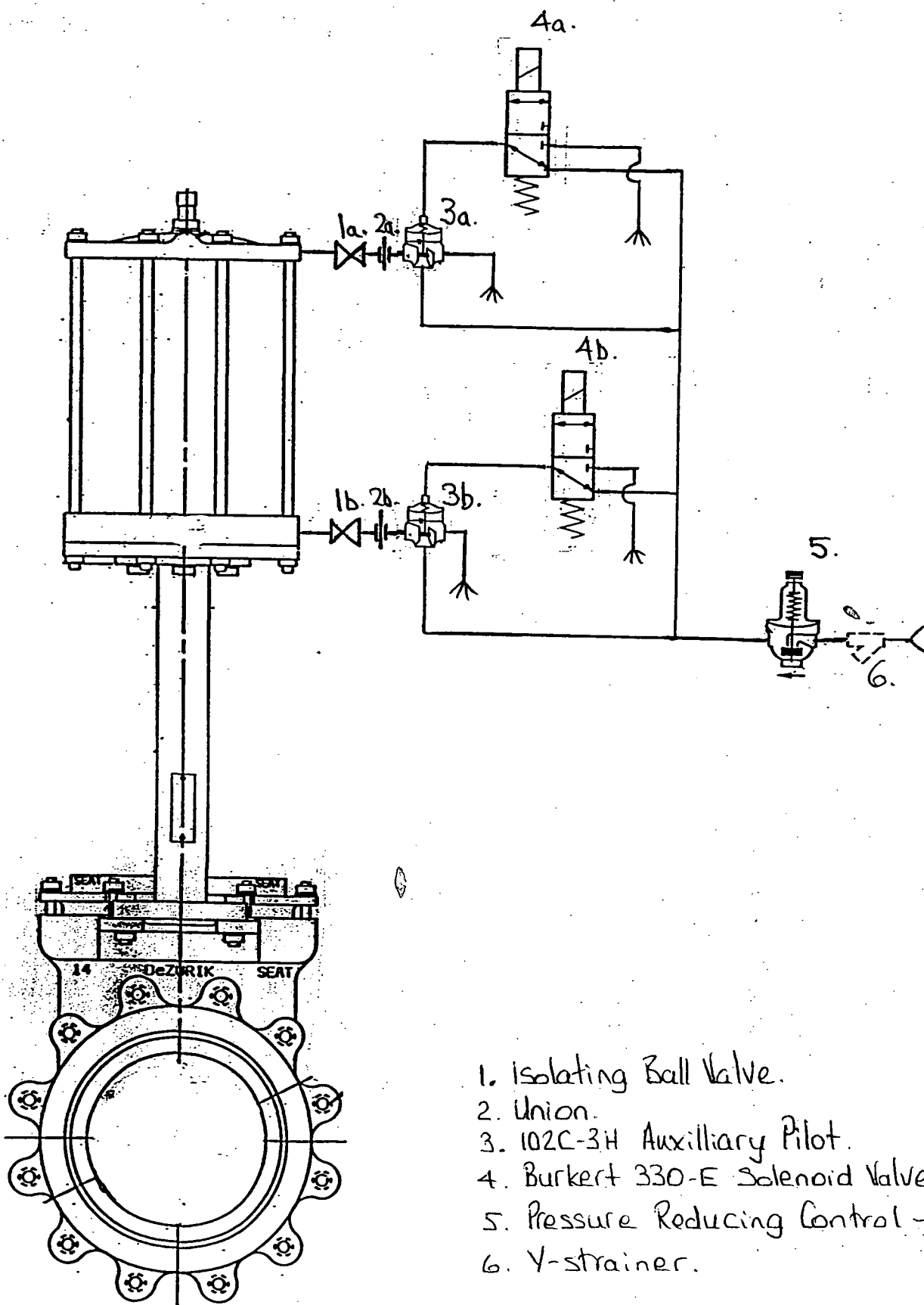
DRAWN R.J.  
DATE 13.1.95  
DRAWING NO. VO. 253  
REV A

Job No BQ 942844 J & P Richardson.



# General Notes

- 1.0 All material to be Type 316 St. Steel
- 2.0 Guides to have U.H.M.W bushes



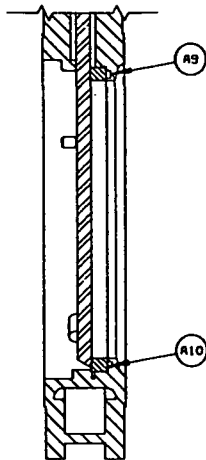
HYDRAULIC SCHEMATIC  
 450mm Knife Gate Valve



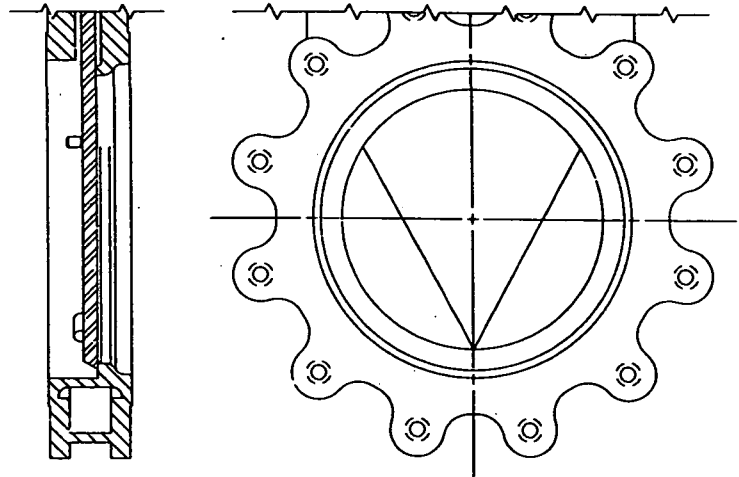
NOTE:

1. WHEN ORDERING PARTS, SPECIFY VALVE SIZE AND MODEL NUMBER FROM DATA PLATE. ALSO GIVE DRAWING NUMBER WITH PART NAME, ITEM NUMBER AND QUANTITY.
2. RECOMMENDED SPARE PARTS ARE ITEMS NO. A2 AND A10.

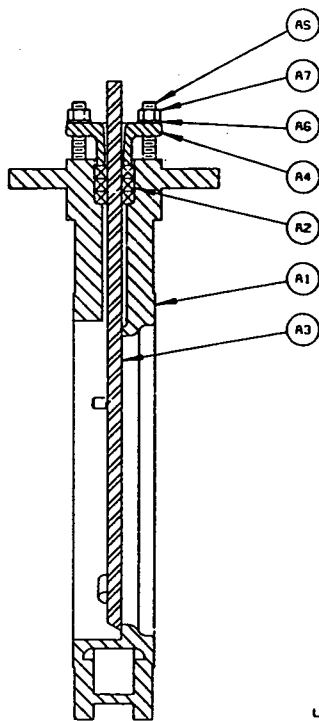
NO.	PART NAME	QTY.
A1	BODY	1
A2	PACKING	-
A3	GATE	1
A4	CLAND	1
A5	STUD	6
A6	WASHER	12
A7	NUT	6
A8		
A9	O RING (1 1/4" - 2 1/4" VALVES)	1
A10	FACED SEAL	1



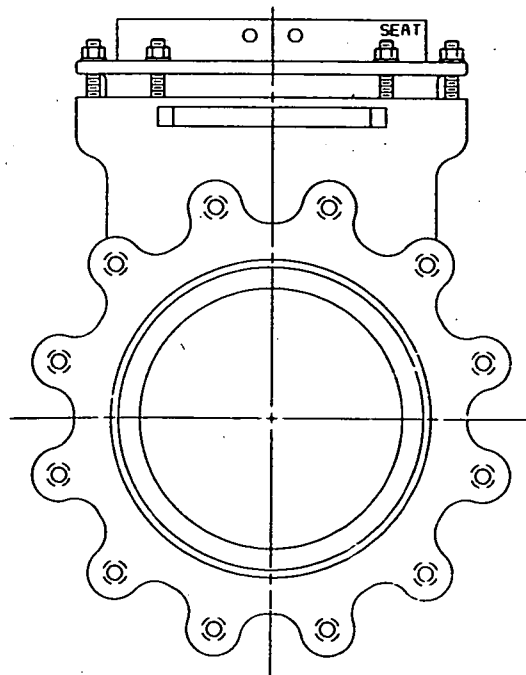
ALTERNATE SECTION SHOWING  
RESILIENT SEAT CONSTRUCTION



V-ORIFICE VALVE



LUGGED VALVE



10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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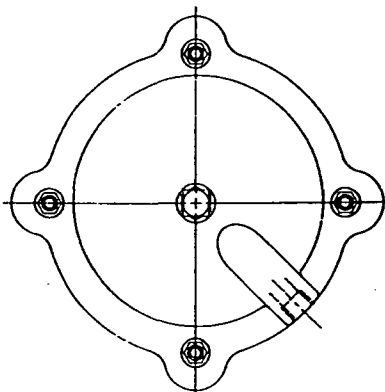
**GOZURIK**  
A UNIT OF GENERAL SIGNAL  
SARTELL, MINNESOTA, U.S.A. 56371  
CAMBRIDGE, ONTARIO, CANADA  
SUNBURY, VICTORIA, AUSTRALIA  
CRAWLEY, ENGLAND

VALVE ASSEMBLY	
10 - 24 CAST STAINLESS STEEL LUGGED KNIFE GATE VALVE	
DCT. CODE	APPROVED RJP
C1	CHECKED RJP
DATE	7-29-86
A-28428	

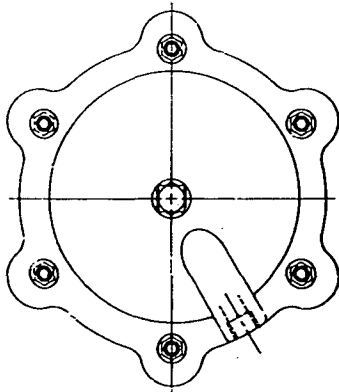
# NOTE:

1. WHEN ORDERING PARTS, SPECIFY VALVE SIZE AND MODEL NUMBER FROM DATA PLATE. ALSO GIVE DRAWING NUMBER WITH PART NAME, ITEM NUMBER AND QUANTITY.
2. RECOMMENDED SPARE PARTS ARE ITEMS NO. C3, C8, C11, C12, C15 & C20.

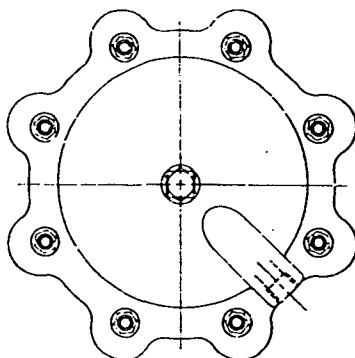
NO.	PART NAME	QTY.
C1	SET SCREW	1
C2	JAM NUT	1
C3	THREAD SEAL (CYLINDER CAP)	1
C4	TIE ROD (4 & 6 CYLINDER)	4
C4	TIE ROD (8 CYLINDER)	6
C4	TIE ROD (10 & 12 CYLINDER)	8
C5	NUT (4 & 6 CYLINDER)	4
C5	NUT (8 CYLINDER)	6
C5	NUT (10 & 12 CYLINDER)	8
C8	LOCK WASHER (4 & 6 CYLINDER)	4
C8	LOCK WASHER (8 CYLINDER)	6
C8	LOCK WASHER (10 & 12 CYLINDER)	8
C7	CYLINDER CAP	1
C8	O-RING (CYLINDER TUBE)	2
C9	LOCK NUT	1
C10	PISTON	1
C11	PISTON SEAL	1
C12	O-RING (PISTON)	1
C13	CYLINDER TUBE	1
C14	PISTON ROD	1
C15	PACKING	1
C16	CYLINDER HEAD	1
C17	GLAND	1
C18	STUD	2
C19	JAM NUT	2
C20	O-RING (PISTON ROD)	1
C21	WASHER	2



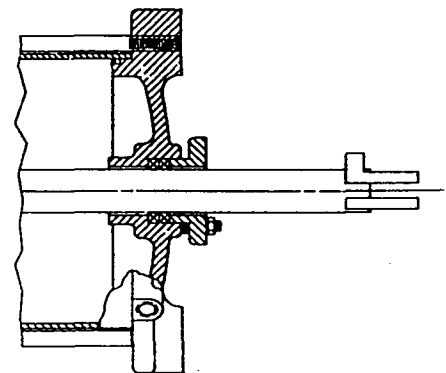
4 & 6 CYLINDERS



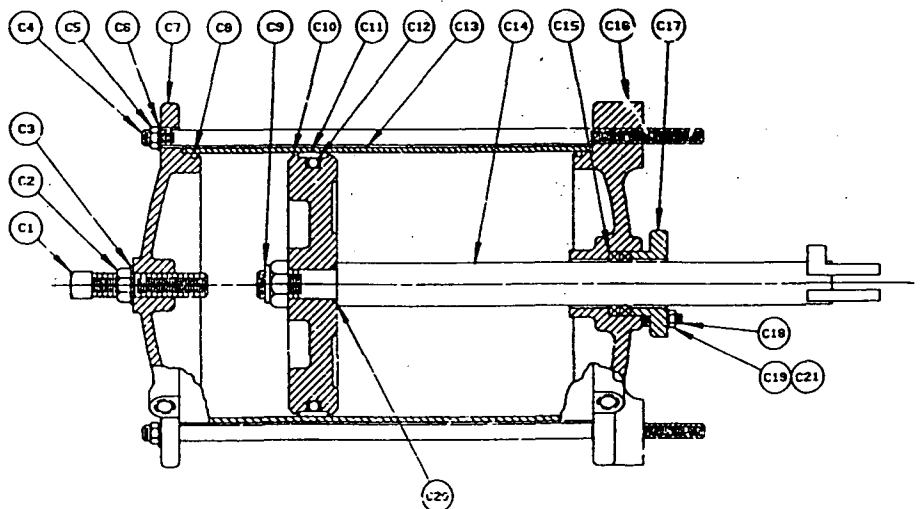
8 CYLINDER



10 & 12 CYLINDERS



SIZE 8 CYLINDER ONLY



**DeZURIK**  
SARTELL, MINNESOTA, U.S.A. 55377  
CAMBRIDGE, ONTARIO, CANADA  
SUNBURY, VICTORIA, AUSTRALIA  
CRAMINGTON, ENGLAND

C4, C6, C8, C10 & C12 CYLINDER ASSEMBLY  
FOR USE WITH KNIFE GATE VALVES

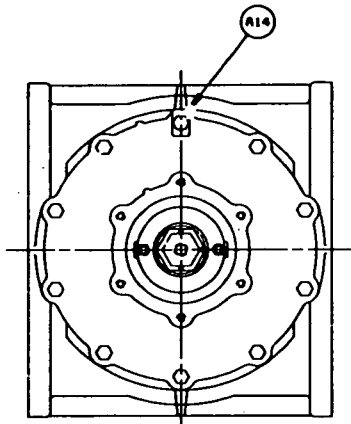
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APPROVED LJC  
DATE 5-27-83

A-22779

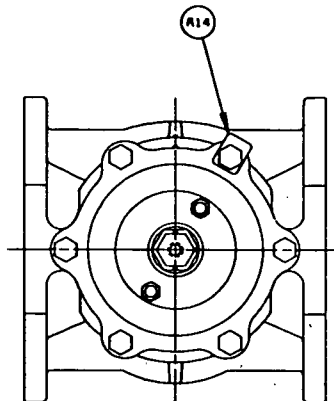
NOTES:

1. RECOMMENDED SPARE PARTS ARE ITEMS NUMBER A3, PLUG (IF RUBBER FACED), A4, A5 AND A9.
2. WHEN ORDERING PARTS REFER TO VALVE SIZE AND MODEL NUMBER ON DATA PLATE. ALSO GIVE DRAWING NUMBER WITH PART NAME, ITEM NUMBER AND QUANTITY.
3. CLOCKWISE ROTATION OF PLUG STEM CLOSES VALVE.

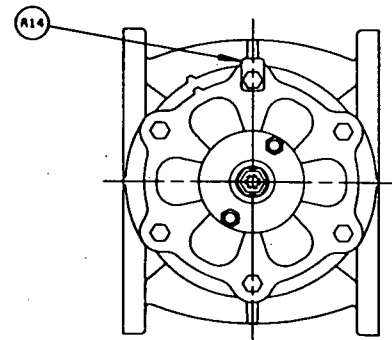
NO	PART NAME	QTY
A1	BODY	1
A2	BEARING (0350 - 0800 VALVES)	1
A2	BEARING (0850 - 1800 VALVES)	2
A2	BEARING (1850 & 2000 VALVES)	1
A3	PLUG	1
A4	THRUST BEARING	1
A5	CASKET (BODY)	1
A6	BONNET	1
A7	BEARING	1
A8	SCREW (0350 - 1800 VALVES)	6
A8	SCREW (1850 & 2000 VALVES)	10
A9	PACKING	-
A10	CONE, 0350 - 0800 ANG (EXCEPT LOW FRICTION CAT CHAR NO 10)	1
A11	CLAND	1
A12	STUD (0350 - 2000 A.G.H. & A.G.H.)	2
A12	STUD (0350 - 2000 A.G.C.)	2
A12	STUD (0850 - 1200 A.G.S26)	NOT REQUIRED
A12	STUD (0850 - 1200 A.G.C)	NOT REQUIRED
A12	STUD (0350 - 2000 ANG)	2
A12	STUD (0350 - 0800 ANG)	2
A12		
A13	NUT (0350 - 2000 A.G.H. & A.G.H.)	2
A13	NUT (0350 - 2000 A.G.C.)	2
A13	NUT (0850 - 1200 A.G.S26)	NOT REQUIRED
A13	NUT (0850 - 1200 A.G.C)	NOT REQUIRED
A13	NUT (0350 - 2000 ANG)	2
A13	NUT (0350 - 0800 ANG)	4
A13		
A14	CAUTION TAG	1
A15	PIPE PLUG (FIG 638 ONLY)	-



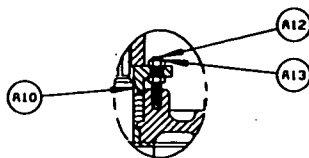
1850 & 2000 VALVES



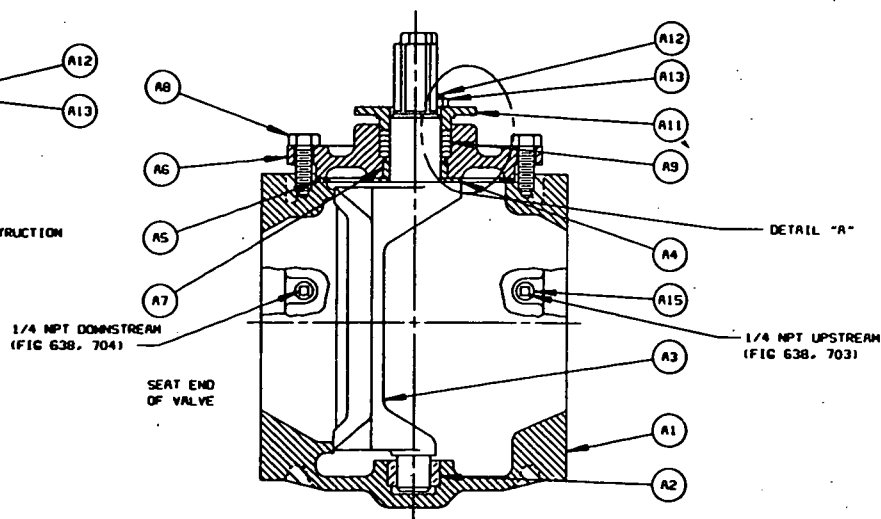
0350 - 0600 VALVES



0650 - 1800 VALVES



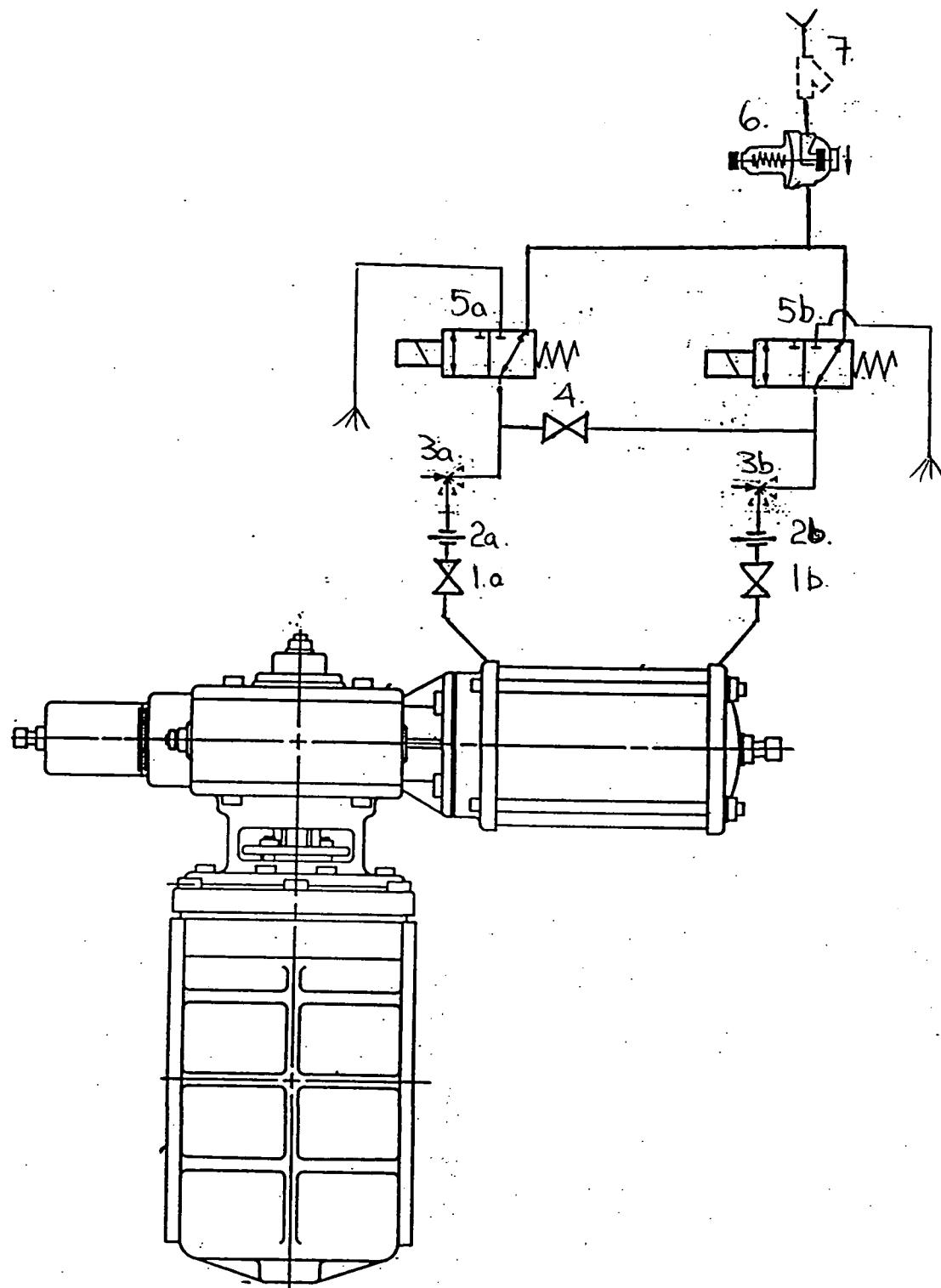
DETAIL "A"  
0350 - 0800 ANG CONSTRUCTION



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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**Goss-Zurik**  
A UNIT OF GENERAL SIGNAL  
SARTELL, MINNESOTA, U.S.A. 55377  
CAMBRIDGE, ONTARIO, CANADA  
SUNBURY, VICTORIA, AUSTRALIA  
CARLINGTON, ENGLAND

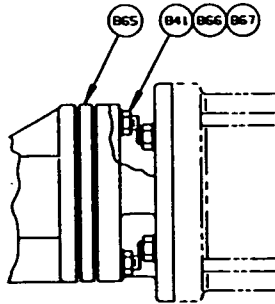
VALVE ASSEMBLY 0350 - 2000 ECCENTRIC VALVES, FLANGED, ALL EXCEPT FIG 198				
DOCT. CODE	DRAWN BENNY	APPROVED RJP	A-20730	
C1	CHECKED THO	DATE 12-03		



1. Isolating Ball Valve.
2. Union.
3. Speed Control - SCU type.
4. Manual Equalizing Valve
5. Burkert 330-E Solenoid Valve.
6. Pressure Reducing Control - CRD.
7. Y-strainer.

HYDRAULIC SCHEMATIC

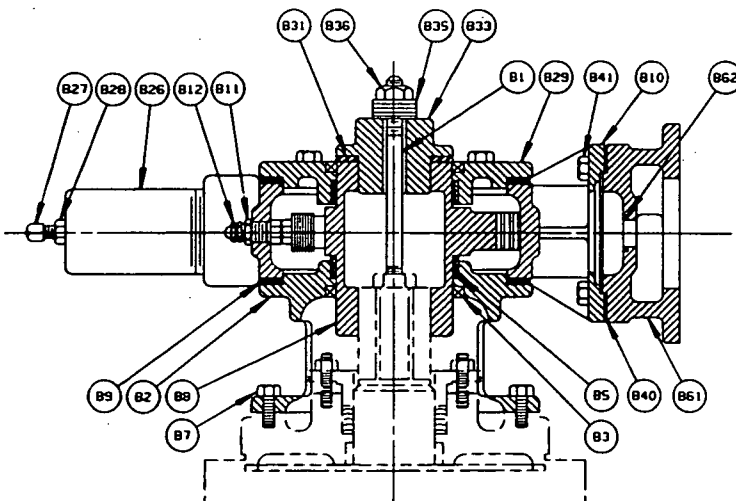
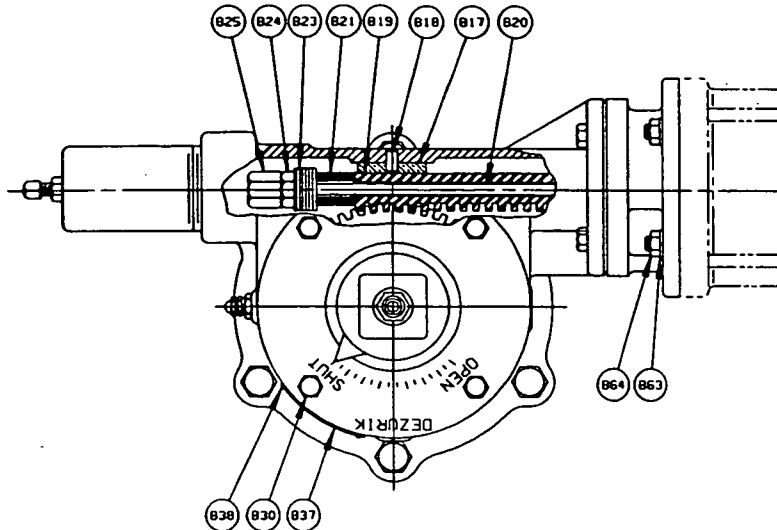
150mm ECCENTRIC VALVE



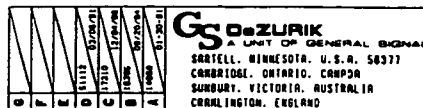
G4 ACTUATOR

NOTES:

1. RECOMMENDED SPARE PARTS ARE ITEMS NUMBER B3, B9, B40 & B62.
2. WHEN ORDERING PARTS, SPECIFY VALVE SIZE AND MODEL NUMBER FROM DATA PLATE. ALSO GIVE DRAWING NUMBER WITH PART NAME, ITEM NUMBER AND QUANTITY.
3. ITEM NUMBER B7 IS NOT REQUIRED ON THE 0350, 0400, 0450, 0500, 0600, 0850 & 1000 VALVES. USE BONNET SCREWS ON BODY ASSEMBLY TO MOUNT ACTUATOR TO VALVE.



NO.	PART NAME	QTY.
B1	STUD	1
B2	ADAPTER	1
B3	SEAL (GEAR SECTOR)	2
B4		
B5	BEARING	2
B6		
B7	SCREW { 0350, 0400, 0450 0500, 0600, 0850 & 1000 VALVES SEE NOTE 3 }	NOT REQD
B7	SCREW { 0650, 0800, 1050 & 1200 VALVES }	6
B8	GEAR SECTOR	1
B9	CASKET (HOUSING)	2
B10	HOUSING	1
B11	BUSHING	1
B12	VENT PLUG	1
B13		
B14		
B15		
B16		
B17	RACK BEARING	1
B18	PIN	1
B19	RACK	1
B20	RACK ROD	1
B21	SPACER	1
B22		
B23	SPRING WASHER	12
B24	JAM NUT	1
B25	CAP NUT	1
B26	EXTENSION CAP	1
B27	SET SCREW	1
B28	JAM NUT	1
B29	COVER	1
B30	SCREW (G4 FIG 391)	6
B30	SCREW (G6 FIG 391)	5
B31	POINTER	1
B32		
B33	WRENCHING SQUARE	1
B34		
B35	SPRING WASHER	5
B36	LOCKNUT	1
B37	DATA PLATE	1
B38	DRIVE SCREW	2
B39		
B40	GASKET (G4)	2
B40	GASKET (G6)	1
B41	SCREW (EXCEPT G4)	4
B41	STUD (G4)	4
B42		
B43		
B44		
B45		
B46		
B47		
B48		
B49		
B50		
B61	ADAPTOR	1
B62	SCRAPER	1
B63	LOCKWASHER (4 & 6 CYLINDERS)	4
B63	LOCKWASHER (8 CYLINDER)	6
B63		
B64	NUT (4 & 6 CYLINDERS)	4
B64	NUT (8 CYLINDER)	6
B64		
B65	SPACER (G4)	1
B66	NUT (G4)	4
B67	LOCKWASHER (G4)	4



G4 & G6 GEAR UNIT FOR USE WITH 0350 - 1200 VALVES  
HYDRAULIC CYLINDER

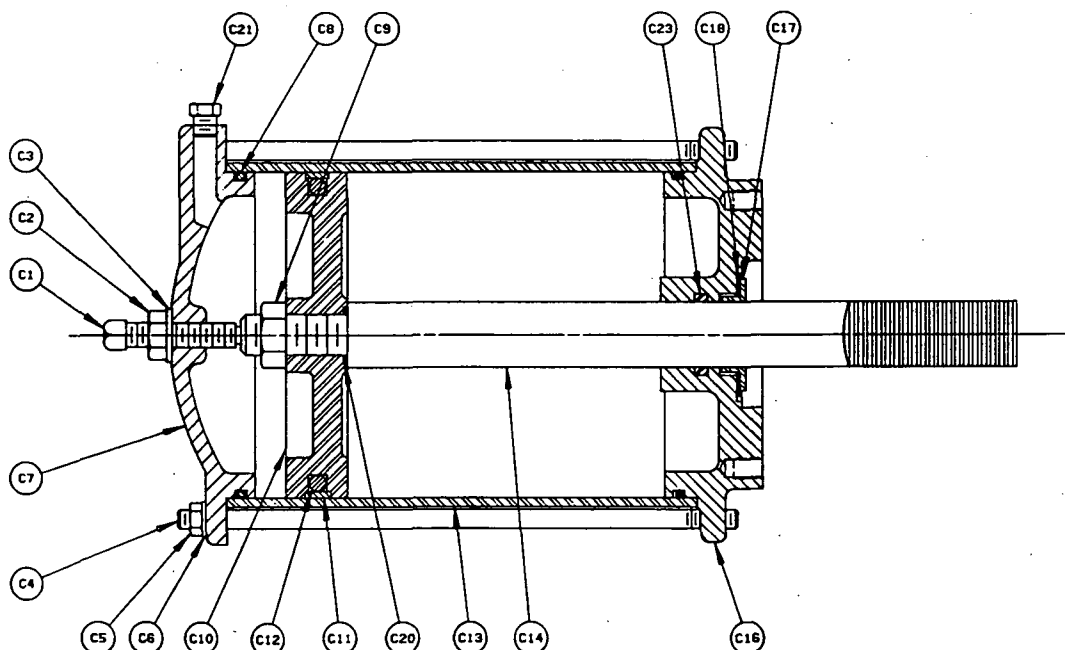
DOCT. CODE C1  
DRAWN NC  
CHECKED TMB  
APPROVED NAJ  
DATE 11-2-78

A-20743

NO.	PART NAME	QTY.
C1	SET SCREW	1
C2	JAW NUT	1
C3	THREAD SEAL (CYLINDER CAP)	-
C4	TIE ROD	4
C5	NUT	4
C6	LOCKWASHER	4
C7	CYLINDER CAP	1
C8	O-RING (CYLINDER TUBE)	2
C9	LOCK NUT	1
C10	PISTON	1
C11	PISTON SEAL	1
C12	O-RING (PISTON)	1
C13	CYLINDER TUBE	1
C14	RACK	1
C15		
C16	CYLINDER HEAD	1
C17	ROD SEAL	1
C18	SPRING WASHER	1
C19		
C20	O-RING (PISTON)	1
C21	BUSHING (3" & 6" CYLINDER)	1
C22		
C23	ROD SEAL	1

NOTE:

1. RECOMMENDED SPARE PARTS ARE ITEMS NUMBER C3, C8, C11, C12, C17, C20 AND C23.
2. WHEN ORDERING PARTS, SPECIFY VALVE SIZE AND MODEL NUMBER FROM DATA PLATE. ALSO GIVE DRAWING NUMBER WITH PART NAME, ITEM NUMBER AND QUANTITY.



**DeZURIK**

SARTELL, MINNESOTA, U.S.A. 55377  
CAMBRIDGE, ONTARIO, CANADA  
SUNBURY, VICTORIA, AUSTRALIA  
CRAMINGTON, ENGLAND

C3, C4 AND C6 HYDRAULIC CYLINDER ASSEMBLY

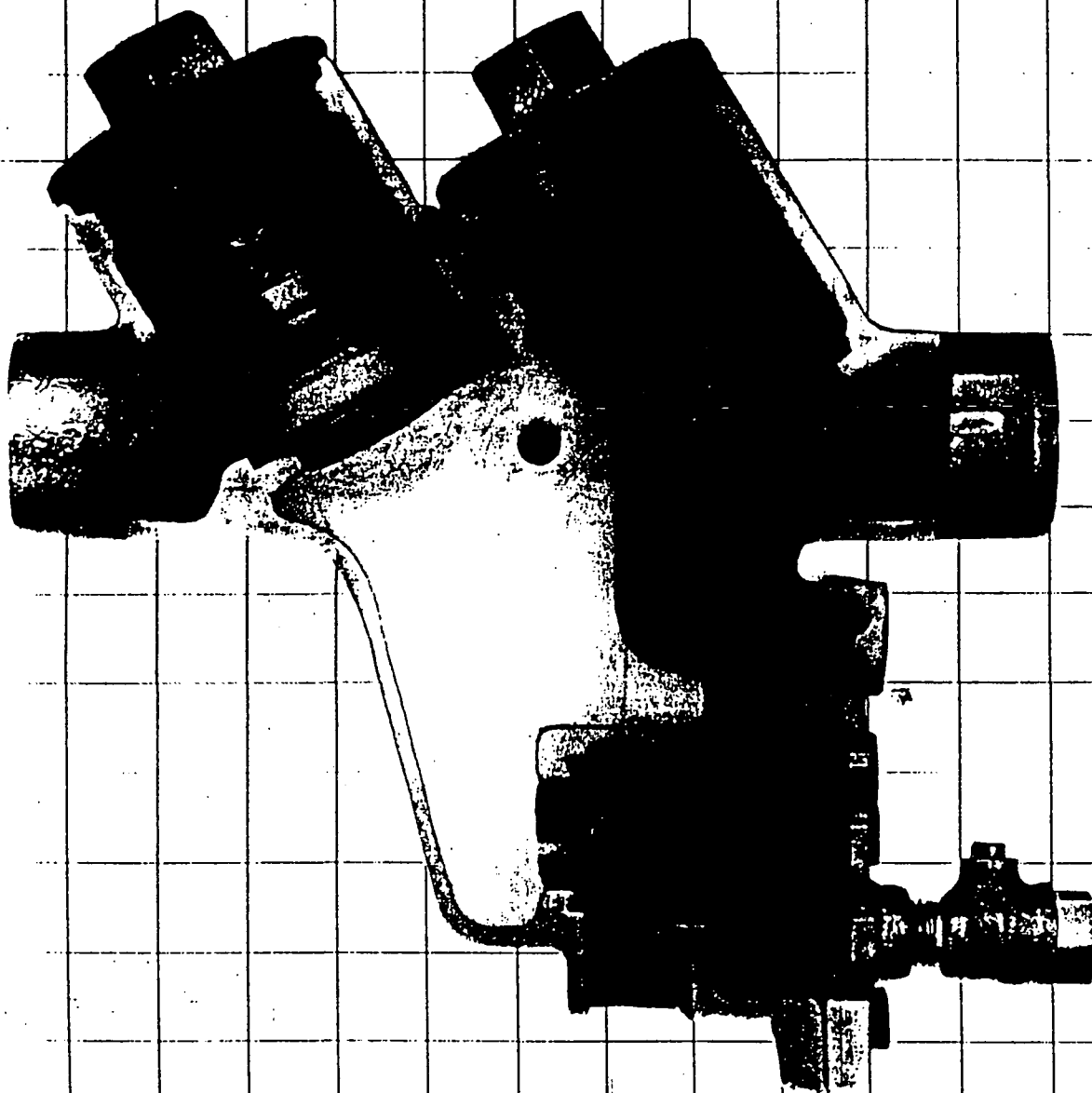
DOCT. CODE	DRAWN	TC	APPROVED
C1	CHECKED	DATE	DATE
	TWD	5-12-83	

A-28141

**Conbraco**  
Industries, Inc.

**MAINTENANCE  
MANUAL**

3-93



**1/4''-2'' REDUCED PRESSURE PRINCIPLE  
AND  
3/4''-2'' DOUBLE CHECK VALVE  
BACKFLOW PREVENTERS**

Conbraco Industries, Inc. P.O. Box 247  
Matthews, North Carolina 28106  
Fax 704-841-6021

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## Double Check Valve ¾"-2"

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# Reduced Pressure Principle Backflow Preventer

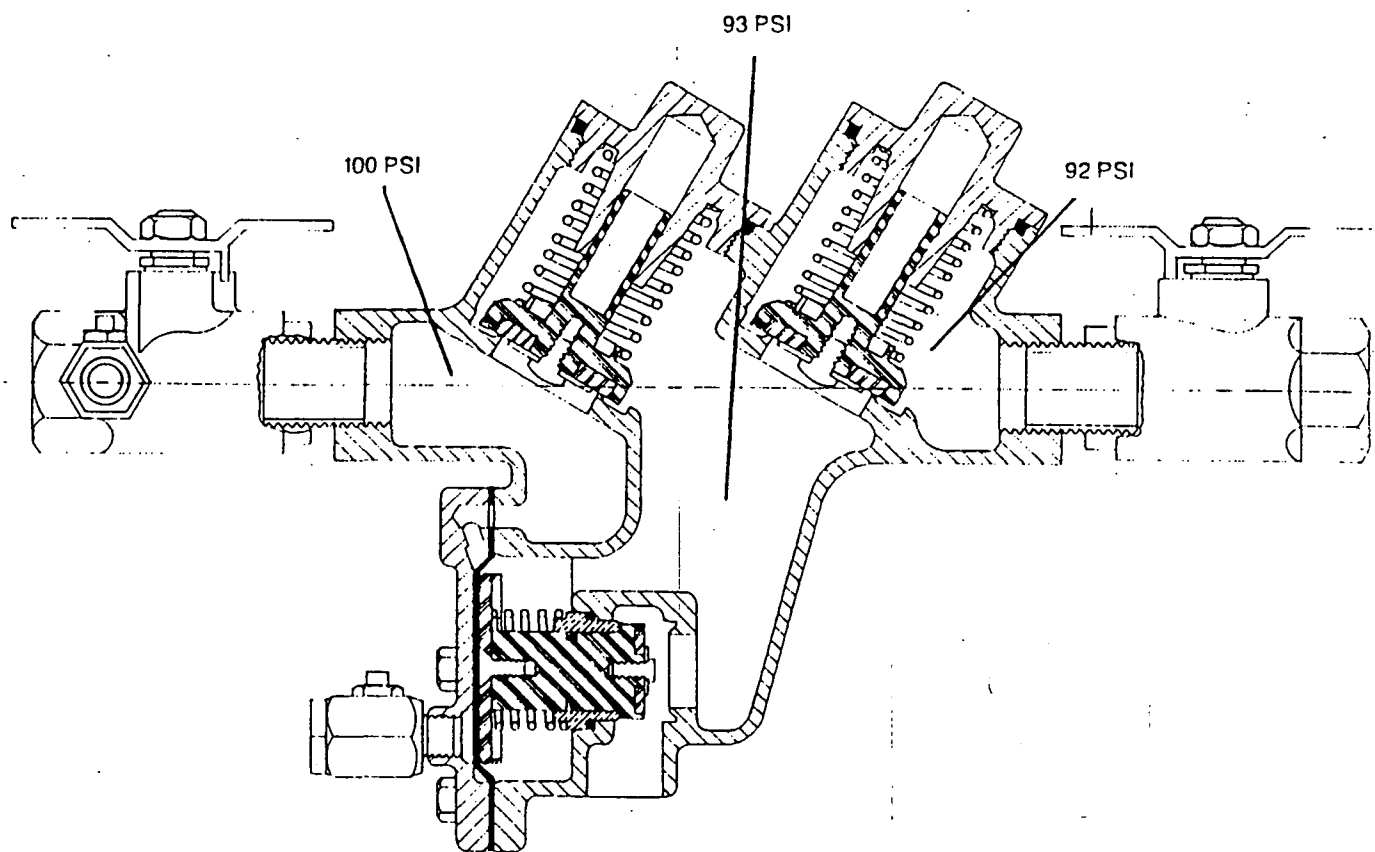
## I DESCRIPTION AND OPERATION

The RPZ device consists of two independently acting, spring loaded, poppet type check valves, together with a hydraulically dependent, mechanically independent pressure differential relief valve, located in the zone between the check valves. Two resilient seated shut-off valves and four test cocks complete the assembly.

During normal operation, the pressure drop across the first check valve into the "zone" area is

approximately 7 PSI. The second check valve is lightly spring loaded to provide a minimum pressure drop of 1 PSI across it. (See Fig. 1)

The relief valve operates on a differential pressure. Supply pressure on the upstream side of the first check valve acts against the diaphragm to close the relief valve during normal operation. In the event of back-pressure, the relief valve will open to maintain the pressure in the "zone" 3 PSI less than the inlet pressure.



(No Flow Condition)

FIGURE 1

## II INSTALLATION

a) The RPZ device must be installed in an accessible location to facilitate periodic field testing and maintenance.

b) The location selected should have adequate drainage for relief valve discharge. Drainage may be piped away, providing an approved air gap device is used (see Fig. 2). The device should never be placed where it may become submerged in standing water.

c) Flush all upstream piping thoroughly to remove foreign matter prior to installing the device.

d) Install the device in a horizontal position with adequate clearance from walls and/or obstructions, for testing and maintenance. A 12" to 30" clearance between the lower most portion of the device and flood grade or floor should be provided.

e) When shut-off valves are supplied separately, they should be installed with a test cock on the up-

stream side of the inlet shut-off valve.

(f) A "Y" strainer can be installed just upstream of the RPZ assembly to eliminate any debris from entering the device and fouling the check and/or relief valve.

(g) When installing the assembly, use pipe sealant on external threads only.

(h) Use wrench grips provided when installing.

(i) After installing the assembly and with downstream or #2 shut-off valve closed, pressurize the RPZ device and bleed air through test cock #4. Then open #2 shut-off valve.

### NOTE:

If water continues to drain from the relief valve, check the Trouble Shooting section for probable causes and solutions.

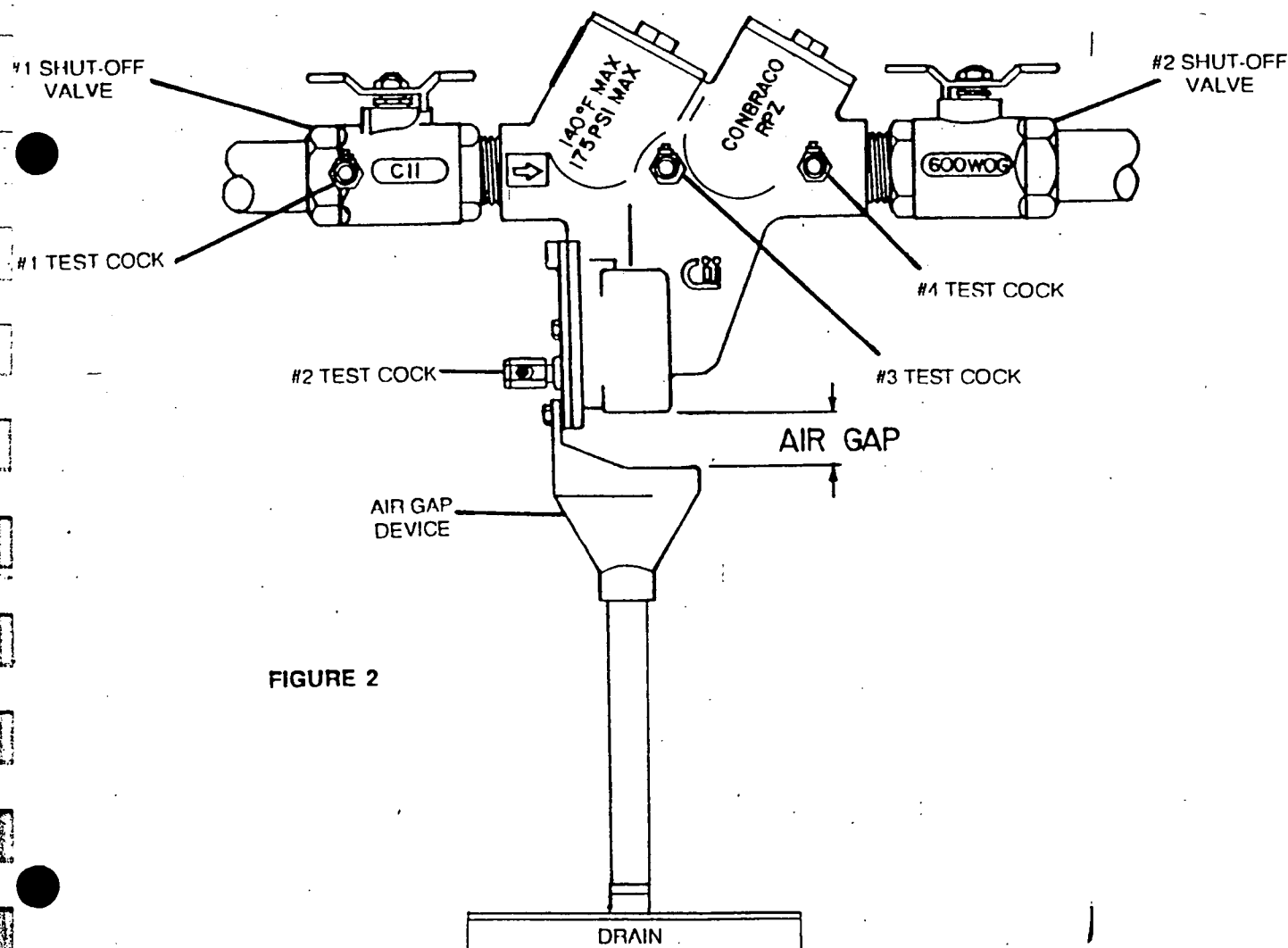


FIGURE 2

### III TROUBLE SHOOTING GUIDE

SYMPTOM	CAUSE	CORRECTIVE ACTION
1. Relief valve continuously discharges during no-flow condition.	a. #1 check valve fouled with debris.  b. #2 check valve fouled with debris coupled with a backpressure condition.  c. #1 check poppet stem not moving freely in guide (or #2 check poppet during a back-pressure condition.	a. Inspect and clean seat disc and seat.  b. Inspect and clean seat disc and seat.  c. Inspect for debris or deposit on poppet stem or guide.
2. Relief valve discharges continuously during flow and no-flow conditions.	a. Relief valve fouled with debris.  b. Damaged diaphragm (allows water to pass through from inlet to zone).  c. Sensing passage to inlet side of diaphragm plugged.  d. #1 check poppet stem not moving freely in poppet guide.	a. Inspect and clean relief valve seat disc and seat.  b. Replace diaphragm.  c. Inspect and clean passage in cover and body.  d. Inspect for debris or deposits on poppet stem or guide.
3. Relief valve discharges intermittently in a "spitting" action during no-flow condition.	a. Pressure fluctuations (water hammer) from supply.	a. Eliminate or reduce pressure fluctuations.

## II TROUBLE SHOOTING GUIDE

SYMPTOM	CAUSE	CORRECTIVE ACTION
4. Relief valve does not open during field test No. 1.	<ul style="list-style-type: none"> <li>a. #2 shut-off valve not closed completely.</li> <li>b. Test equipment improperly installed.</li> </ul>	<ul style="list-style-type: none"> <li>a. Close #2 shut-off valve or inspect for possible through leakage.</li> <li>b. Recheck test procedure</li> </ul>
5. #2 check valve fails to hold backpressure.	<ul style="list-style-type: none"> <li>a. #2 shut-off valve not closed completely.</li> <li>b. #2 check valve fouled with debris.</li> <li>c. #2 check poppet stem not moving freely in guide.</li> </ul>	<ul style="list-style-type: none"> <li>a. Close #2 shut-off valve or inspect for possible through leakage.</li> <li>b. Inspect and clean seat disc and seal.</li> <li>c. Inspect for debris or deposits on poppet stem or guide.</li> </ul>
6. Pressure differential across #1 check valve is low during field test No. 3 (does not meet 3 PSID minimum).	<ul style="list-style-type: none"> <li>a. #1 check valve fouled with debris.</li> <li>b. Upstream pressure fluctuations causing inaccurate gauge reading.</li> <li>c. #1 check poppet stem not moving freely in guide.</li> </ul>	<ul style="list-style-type: none"> <li>a. Inspect and clean seat disc and seal.</li> <li>b. Eliminate pressure fluctuations.</li> <li>c. Inspect for debris or deposits on poppet stem or guide.</li> </ul>

## IV MAINTENANCE INSTRUCTIONS

### A. Disassembly — Check Valves

1. Close #2 shut off valve, then close #1 shut off valve.
2. Bleed pressure from the assembly by opening #2, #3, and #4 test cock.

#### CAUTION:

**Caps are spring loaded and should be removed carefully to avoid personal injury.**

3. Unscrew cap using hex head provided.
4. Remove spring and poppet assembly from the body.

### B. Disassembly — Check Valve Poppet

#### CAUTION:

**Do not use pliers or other tools which may damage or scratch the plastic stem.**

1. Holding the poppet assembly in one hand, remove screw and retaining washer.
2. Remove the seat disc.
3. All parts should be carefully inspected for any damage or excessive wear and thoroughly rinsed in clean water prior to reassembly. Replace worn parts as necessary.

### C. Assembly — Check Valve Poppet

1. Install new disc in poppet, secure disc with retaining washer and screw.

#### NOTE:

**Due to symmetry of the disc, the old disc may be turned over to obtain an effective seal.**

### D. Assembly — Check Valve

1. Install the poppet assembly into the body.
2. Install the spring (heavy spring, larger diameter wire, goes into #1 check valve) onto the poppet.
3. Apply a thin coat of silicone based lubricant on cap o-ring.
4. Guide cap over spring and poppet stem and tighten cap.

### E. Relief Valve Disassembly

1. Remove cover bolts, cover and diaphragm.
2. Grasp the diaphragm plate and pull the assembly straight out of the body.
3. Holding the relief valve assembly in one hand, remove the screw and retaining washer.
4. Remove the seat disc.
5. Turn the assembly over, keeping the spring compressed by holding down on the diaphragm plate, remove the screw.
6. Remove the diaphragm plate, spring and bushing from the mainstem.
7. Remove the o-ring from the mainstem.
8. All parts should be carefully inspected for damage or excessive wear and thoroughly rinsed in clean water prior to reassembly. Replace worn parts as necessary.

### F. Assembly — Relief Valve

1. Apply a thin coat of silicone base lubricant on o-rings before installing.
2. Install o-ring onto mainstem.
3. Slide bushing over mainstem and position spring onto bushing.
4. Position diaphragm plate and compress spring, install screw into mainstem.
5. Turn the assembly over and install seat disc, retaining washer and screw.
6. Install o-ring onto bushing.
7. Slide complete assembly into the body.
8. Position diaphragm over flange, install cover and tighten bolts evenly.
9. Open #1 shut-off valve & bleed air out of unit through #2, #3 and #4 test cocks; then open #2 shut-off valve.
10. Test complete assembly to ensure proper operation.

**TESTING PROCEDURES**

IS IMPORTANT THAT THE RPZ BE TESTED PERIODICALLY IN COMPLIANCE WITH LOCAL DES, BUT AT LEAST ONCE A YEAR OR MORE, SERVICE CONDITIONS WARRANT.

**NOTE:** Test set-up is illustrated in Figure 3.

**EQUIPMENT REQUIRED**

Conbraco reduced pressure backflow preventer test kit.

**TEST NO. 1:****Purpose:**

To test operation of the pressure differential relief valve.

**Requirement:**

The pressure differential relief valve must operate to maintain the "zone" between the two check valves at a minimum of 2 PSI less than the supply pressure.

**PROCEDURE:**

Bleed water through all four test cocks to flush any foreign material.

**NOTE:** Open test cock #2 very slowly to avoid accidental dumping of the relief valve.

Connect the "high" side hose to test cock #2. Connect the "low" side hose to test cock #3.

Open valves #1, #2, and #3.

Slowly open test cock #3 and bleed all air from gauge and hoses through the "vent" hose. With test cock #3 maintained in the open position, slowly open test cock #2 and bleed all air again through the "vent" hose. Close valve #3. Then close valve #2.

Close #2 shut-off valve.

Slowly open valve #3 until the differential gauge needle starts to drop.

**Note:** It is important that the differential gauge needle drops slowly. Maintain valve #3 at this position and observe the differential pressure reading at the moment the first discharge is noted from the relief valve.

Record this reading as the opening differential pressure of the relief valve and close valve #3.

**TEST NO. 2:****Purpose:**

To test check valve #2 for tightness against reverse flow.

**Requirement:**

The check valve shall permit no through leakage in a direction reverse to normal flow under all conditions of a pressure differential.

**PROCEDURE:**

1. Maintain the #2 shut-off valve in the closed position (from Test No. 1)
2. Loosely attach the "vent" hose to test cock #4
3. Bleed all air from the "vent" hose by opening valve #2.
4. Close valve #2 and tighten hose connection to test cock #4. Then open test cock #4.
5. Loosen the "low" side hose at test cock #3 slightly and re-establish the normal reduced pressure within the zone. Then retighten hose.
6. Open valve #2. If the differential pressure remains steady then check valve #2 is reported as "OK." If the differential pressure falls until the relief valve opens then check valve #2 is recorded as "leaking" and Test No. 3 cannot be completed.

**TEST NO. 3:****Purpose:**

To test the static differential pressure across check valve #1.

**Requirement:**

The static differential pressure across check valve #1 must be a minimum of 3 PSI more than the opening differential pressure of the relief valve as recorded in Test No. 1.

**PROCEDURE:**

1. With the testing equipment installed as stated in Test No. 2, the static differential pressure across check valve #1 will be indicated on the gauge and should be recorded as such.

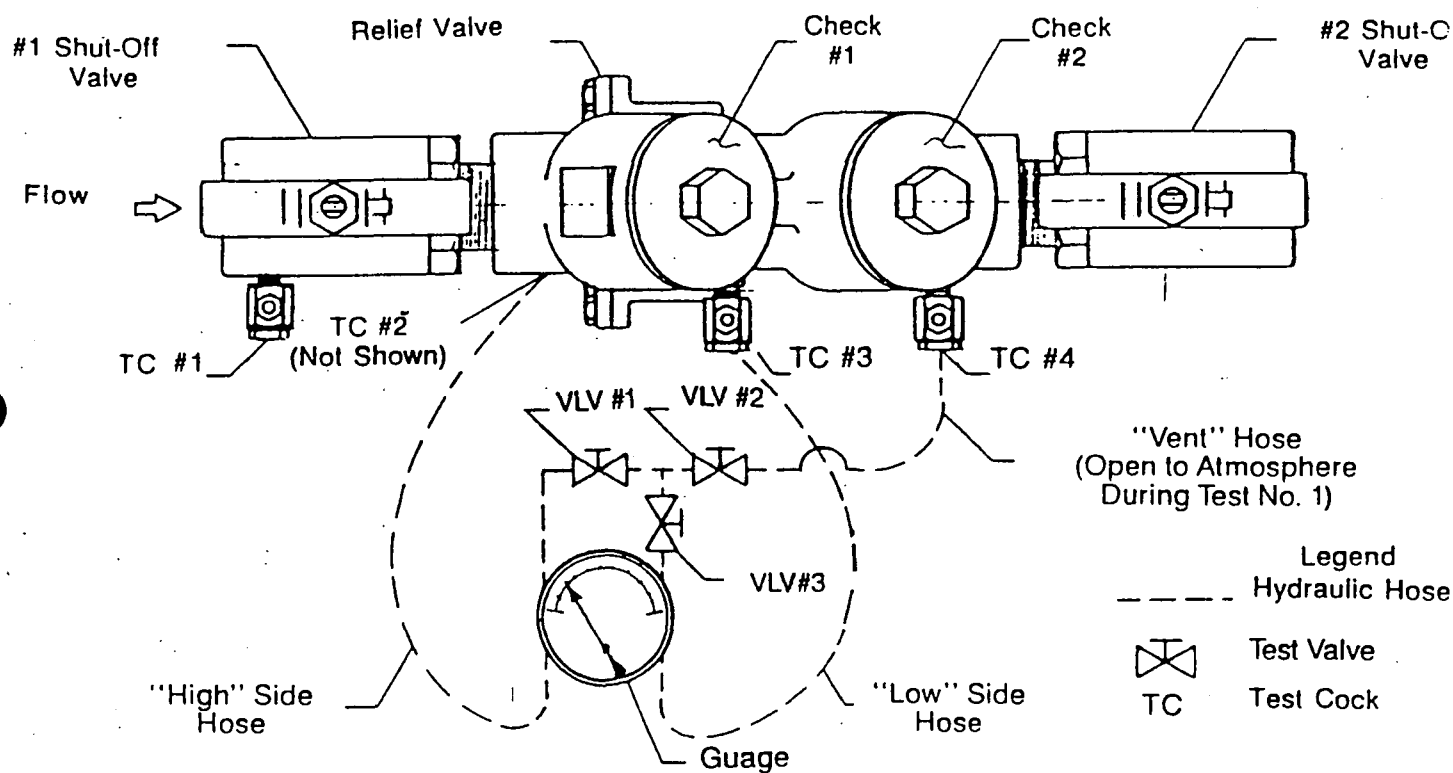
**Note:** Gauge needle should be steady and not falling.

**RESTORE OPERATION:**

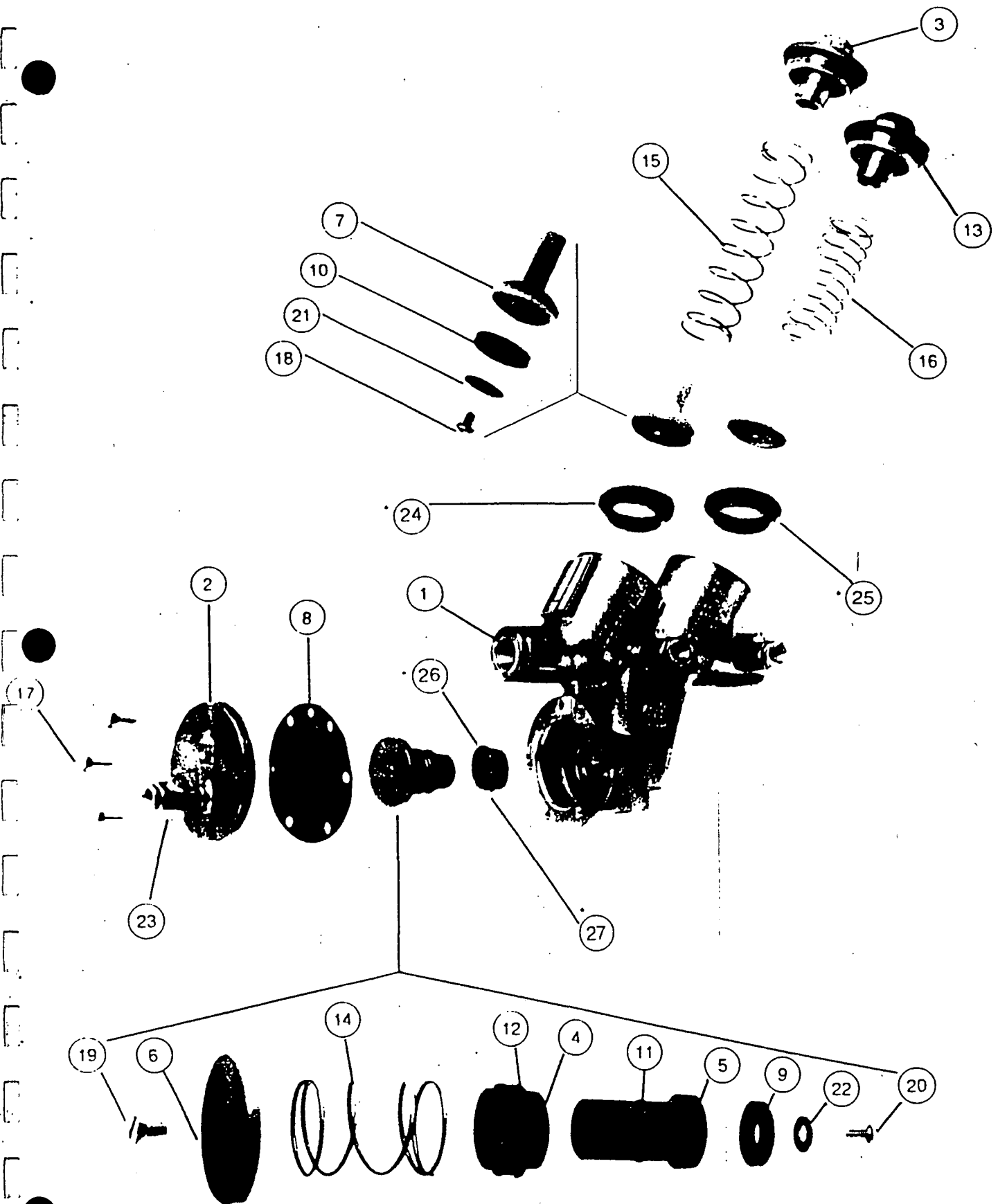
Close all test cocks, open all needle-valves, open #2 shut-off valve and carefully remove all test equipment.

**NOTE:** Refer to Troubleshooting Guide in section II, to resolve any problems incurred during field testing.

**CONBRACO REDUCED PRESSURE  
BACKFLOW PREVENTER  
"XL" SERIES  
(TOP VIEW SHOWN)**



**FIGURE 3**



\*Required On Replaceable Seat Models Only



# "XL" Series 40-200

## Reduced Pressure Principle Backflow Preventer

ITEM NO.	DESCRIPTION	QUANTITY	1/4", 3/8", 1/2"	3/4" & 1"	1 1/4", 1 1/2", 2"
1	Body	1	Consult Factory	Consult Factory	Consult Factory
2	R.V. Cover	1	F-3017	F-2982	F-2985
3	Cap	2	F-3016	F-2981	F-2984
4	R.V. Bushing	1	I-4507	I-4240	I-4257
5	R.V. Stem	1	G-3296	G-3212	G-3213
6	Diaphragm Plate	1	E-2222	D-2506	D-2516
7	Poppet	2	K-3409	K-3362	K3367
8	R.V. Diaphragm	1	D-2632	D-2505	D-2515
9	R.V. Seat Disc	1	D-2631	D-2504	D-2514
10	Check Seat Disc	2	D-2630	D-2503	D-2508
11	Stem O-Ring	1	D-2628	D-2502	D-2513
12	Bushing O-Ring	1	D-2629	D-2501	D-2512
13	Check Cap O-Ring	2	D-2046	D-2500	D-2510
14	R.V. Spring	1	A-1795	A-1698	A-1702
15	1st Check Spring	1	A-1797	A-1699	A-1703
16	2nd Check Spring	1	A-1794	A-1700	A-1701
17	Hex Head Bolt	6 (4) (2)	B-1793	B-1751	B-1754
18	Screw	2	B-1837	B-1750	B-1750
19	Screw	1	B-1749	B-1749	B1753
20	Screw	1	B-1837	B-1748	B-1753
21	Retaining Washer	2	E-2223	D-2499	D-2509
22	Retaining Washer	1	E-2224	D-2498	D-2499
23	Test Cock	3	78-257-01	78-257-01	78-258-01
24	Check Seat	2	L-5152	L-4864	L-4866
25	Check O-Ring	2	D-3086	D-2274	D-2832
26	R.V. Seat	1	L-5153	L-4863	L-4867
27	R.V. O-Ring	1	D-3087	D-2168	D-2274

### Repair Kits

#### Major Repair Kit

(4, 5, 6, 7 (2), 8, 9, 10 (2), 11, 12,  
13 (2), 14, 18 (2), 19, 20, 21 (2), 22)

40-003-01

40-004-01

40-007-01

For Replaceable Seat Add

40-003-A1

40-004-A1

40-007-A1

(24 (2), 25 (2), 26, 27)

#### Check Valve Repair Kit

(7, 10, 13, 18, 21)

40-003-02

40-004-02

40-007-02

For Replaceable Seat Add

(24, 25)

40-003-A2

40-004-A2

40-007-A2

#### Relief Valve Repair Kit

(4, 5, 6, 8, 9, 11, 12, 14, 19, 20, 22)

40-003-03

40-004-03

40-007-03

For Replaceable Seat Add

(26, 27)

40-003-A3

40-004-A3

40-007-A3

#### Rubber Repair Kit

(8, 9, 10 (2), 11, 12, 13 (2))

40-003-04

40-004-04

40-007-04

For Replaceable Seat Add

(25 (2), 27)

40-003-A4

40-004-A4

40-007-A4

### Accessories

Air Gap Drain

40-200-XA

40-200-X1

40-200-X1

Reduced Pressure Backflow Preventer Test Kit

40-200-TK (ALL SIZES)

\*1/4", 3/8" & 1/2" SIZES ONLY

\*\*1-1/4", 1-1/2" & 2" SIZES ONLY

# Double Check Backflow Preventer

## I DESCRIPTION AND OPERATION

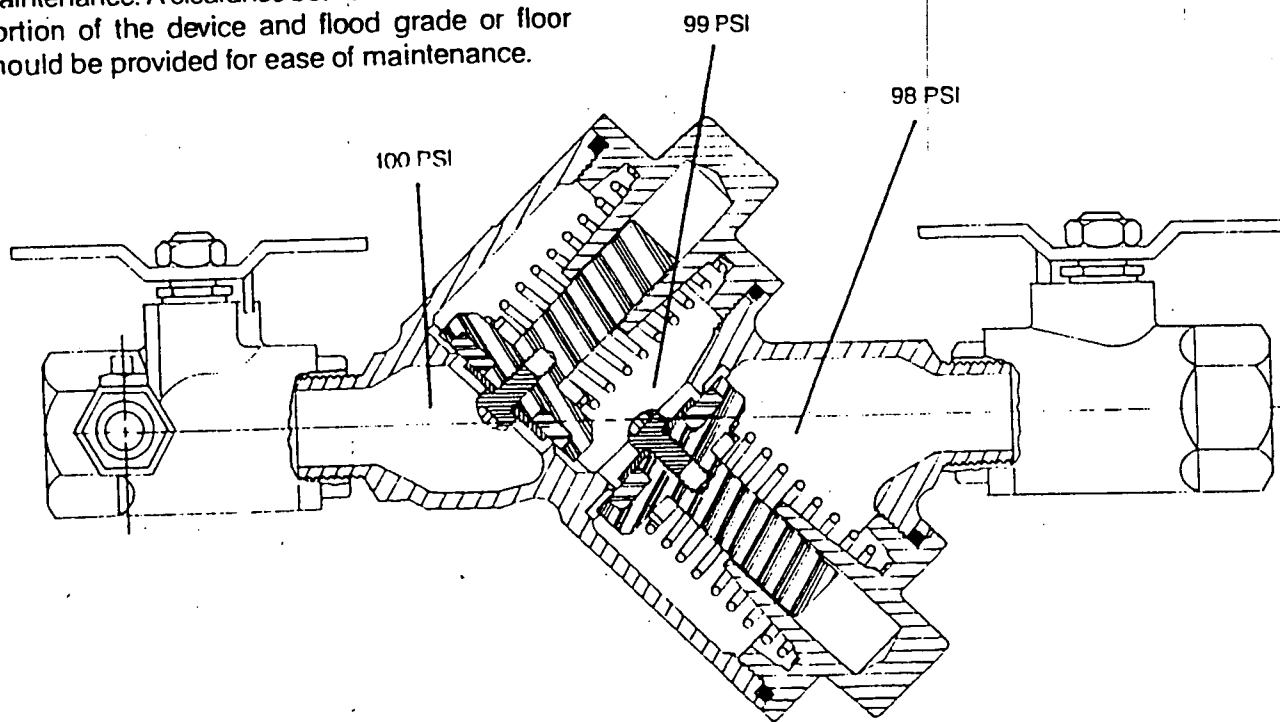
The Double Check Valve (DCV) device consists of two independently acting, spring loaded, poppet type check valves. Two resilient seated shut-off valves and four test cocks complete the assembly.

Each check valve is designed to maintain a minimum of 1 PSI across the valve during normal operation. If at any time the pressure downstream of the device increases above the supply pressure, both check valves will close to prevent any backflow from occurring. (See figure 4)

## II INSTALLATION

- The DCV must be installed in an accessible location to facilitate periodic field testing and maintenance.
- Flush all upstream piping thoroughly to remove foreign matter prior to installing the device.
- The device may be installed either vertical (for upward flow) or horizontal. It is recommended that the horizontal be chosen for the ease of testing and maintenance. A clearance between the lower most portion of the device and flood grade or floor should be provided for ease of maintenance.

- When shut-off valves are supplied separately, they should be installed with a test cock on the upstream side of the inlet shut-off valve.
- A "Y" strainer can be installed just upstream of the RPZ assembly to eliminate any debris from entering the device and fouling the check valves.
- When installing the assembly, use pipe sealant on external threads only.
- Use wrench grips provided when installing.
- After installing the assembly and with downstream or #2 shut-off valve closed, pressurize the device and bleed air through test cock #4. Then open #2 shut-off valve.



(No Flow Condition)

FIGURE 4

### III TROUBLE SHOOTING GUIDE

SYMPTOM	CAUSE	CORRECTIVE ACTION
Check valve fails to hold 1 PSID	<p>a. Shut-off valve not closed completely.</p> <p>b. Check valve fouled with debris.</p> <p>c. Check poppet stem not moving freely in guide.</p>	<p>a. Close #2 shut-off valve or inspect for possible through leakage.</p> <p>b. Inspect and clean seat disc and seat.</p> <p>c. Inspect for debris or deposits on poppet stem or guide.</p>

### IV MAINTENANCE INSTRUCTIONS

#### A. Disassembly — Check Valves

1. Close #2 shut-off valve, then close #1 shut-off valve.
2. Bleed pressure from the assembly by opening #2, #3, and #4 test cock.

#### CAUTION:

Caps are spring loaded and should be removed carefully to avoid personal injury.

3. Unscrew cap using hex head provided.
4. Remove spring and poppet assembly from the body.

#### B. Disassembly — Check Valve Poppet

#### CAUTION:

Do not use pliers or other tools which may damage or scratch the plastic stem.

1. Holding the poppet assembly in one hand, remove screw and retaining washer.
2. Remove the seat disc.

3. All parts should be carefully inspected for any damage or excessive wear and thoroughly rinsed in clean water prior to reassembly. Replace worn parts as necessary.

#### C. Assembly — Check Valve Poppet

1. Install new disc in poppet, secure disc with retaining washer and screw.

#### NOTE:

Due to symmetry of the disc, the old disc may be turned over to obtain an effective seal.

#### D. Assembly — Check Valve

1. Install the poppet assembly into the body.
2. Install the spring onto the poppet.
3. Apply a thin coat of silicone based lubricant on cap o-ring.
4. Guide cap over spring and poppet stem and tighten cap.

## TESTING PROCEDURE

**NOTE: IT IS IMPORTANT THAT THE DCV DEVICE BE TESTED PERIODICALLY IN COMPLIANCE WITH LOCAL CODES, BUT AT LEAST ONCE A YEAR OR MORE, AS SERVICE CONDITIONS WARRANT. TEST SET UP IS ILLUSTRATED IN FIGURE 5**

### EQUIPMENT REQUIRED

- 1. A duplex gauge or a pair of bourdon tube gauges.
- 2. Two by-pass valves.
- 3. Three lengths of 1/4 inch high pressure hose (approximately 5 feet each) with screw type couplings.
- 4. Fittings, and connectors as required to facilitate connection of the testing equipment as indicated in the diagram.

**NOTE: All connections must be free from leaks in order to receive accurate readings during testing.**

#### TEST NO. 1:

##### Purpose:

To test check valve #1 for tightness against reverse flow.

##### Requirement:

The valve shall permit no through leakage in a direction reverse to normal flow under all conditions of pressure differential.

##### PROCEDURE:

1. Bleed water through all four test cocks to flush any foreign material.
2. Connect the "high" side hose to test cock #2. Connect the "low" side hose to test cock #3.
3. Open test cocks #2 and #3. Bleed both hoses, making sure to bleed the low side last.
4. Close #2 shut-off valve; then close #1 shut-off valve.
5. Slowly open by-pass valve #1 and lower the pressure at test cock #2 approximately 2 psi below the pressure at test cock #3. **Note:** Due to check valve disc compression, both "high" and "low" side gauges may drop at the same rate approximately 10-15 psi or more. After the check valve disc compresses fully the required "high" side pressure of 2 psi below the "low" side should be obtainable. If this pressure differential can be maintained then check valve #1 is reported as "tight" or "okay." Proceed to test no. 2. However, if this pressure differential cannot be maintained proceed to step no. 6.

6. Open #1 shut off valve to repressurize the device.
7. Loosely attach the vent hose to test cock #1. Bleed all air from the gauge and vent hose by opening by-pass valve #2. Close by-pass valve #2, tighten vent hose. Open test cock #1.
8. Close #1 shut-off valve.
9. Loosen the "low" side hose at test cock #3 and lower the pressure in the assembly approximately 10 psi. Retighten hose.
10. Simultaneously open by-pass valves #1 and #2 **very slowly**. If the check valve is holding tight, the "high" side gauge will begin to drop while the "low" side gauge will rise. Close both by-pass valves. If a small (no more than 5 psi) pressure differential is created and held, then the check valve is reported as "tight" or "okay." If a pressure differential cannot be maintained, the check valve is reported as leaking.

#### TEST NO. 2:

##### Purpose:

To test check valve #2 for tightness against reverse flow.

##### Requirement:

The valve shall permit no through leakage in a direction reverse to normal flow under all conditions of a pressure differential.

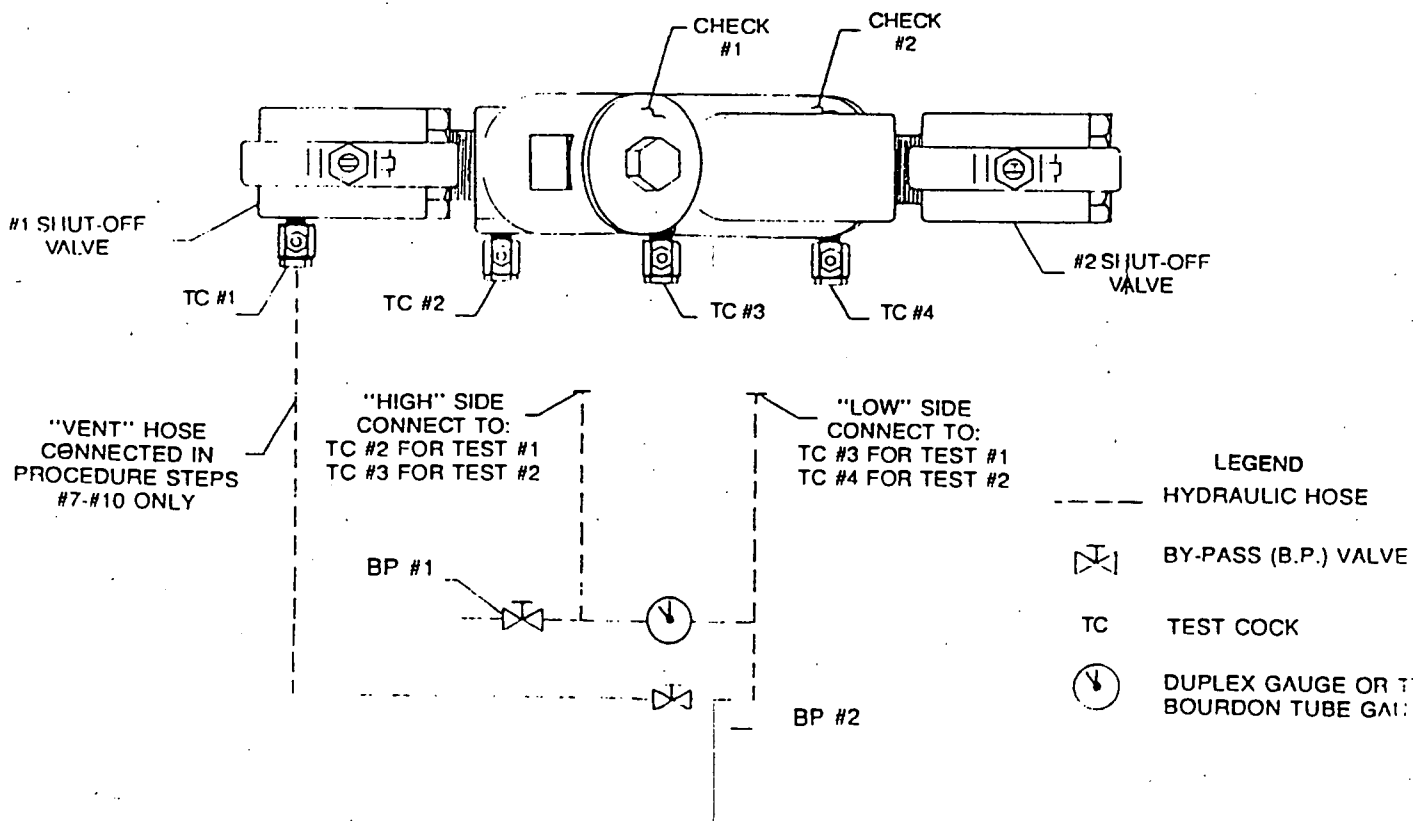
##### PROCEDURE:

Same as test #1 except the "high" side hose is connected to test cock #3 and the "low" side is connected to test cock #4.

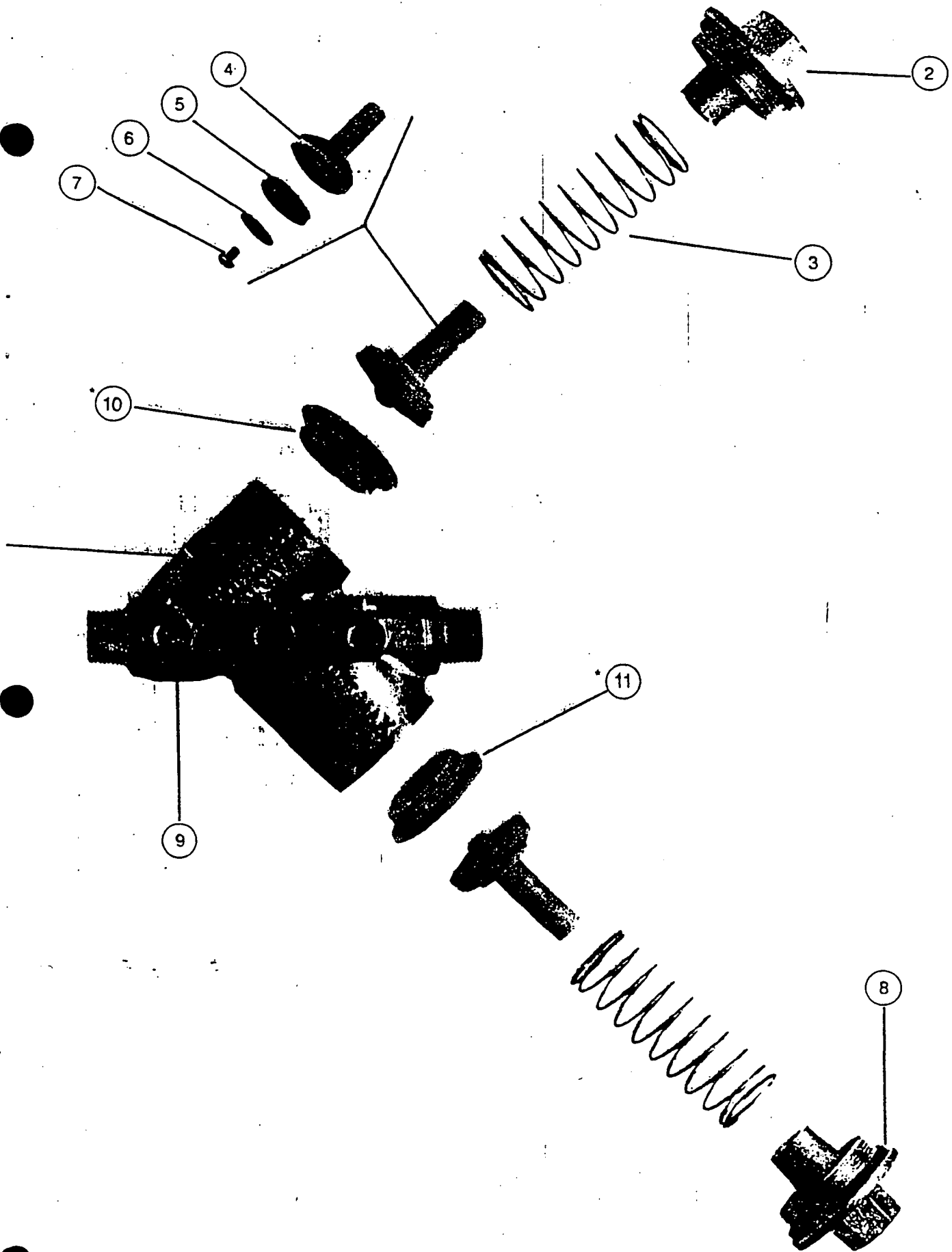
#### RESTORE OPERATION:

Close all test cocks. Remove testing equipment. Open shut-off valves #1 and #2.

**CONBRACO  
DOUBLE CHECK VALVE  
40-100 SERIES  
(TOP VIEW SHOWN)**



**FIGURE 5**



Required On Replaceable Seat Models Only

## “XL” Series 40-100

### Double Check Backflow Preventer

ITEM NO.	DESCRIPTION	QUANTITY	PART NO.	
			3/4" & 1"	1 1/4", 1 1/2", 2"
1	Body	1	Consult	Consult
			Factory	Factory
2	Cap	2	F-2981	F-2984
3	Spring	2	A-1700	A-1701
4	Poppet	2	K-3362	K3367
5	Seat Disc	2	D-2503	D-2508
6	Seat Retainer	2	D-2499	D-2509
7	Screw	2	B-1750	B-1750
8	Cap O-Ring	2	D-2500	D-2510
9	Test Cock	3	78-257-01	78-258-01
10	Check Seat	2	L-4864	L-4866
11	Check O-Ring	2	D-2274	D-2832

#### Repair Kits

##### Major Repair Kit

(4 (2), 5 (2), 6 (2), 7 (2), 8 (2))

For Replaceable Seat Add

(10 (2), 11 (2))

40-004-05 40-007-05

##### Check Valve Repair Kit

(4, 5, 6, 7, 8)

For Replaceable Seat Add

(10, 11)

40-004-02 40-007-02

40-004-A2 40-007-A2

##### Rubber Repair Kit

(5 (2), 8 (2))

For Replaceable Seat Add

(11 (2))

40-004-06 40-007-06

40-004-A6 40-007-A6

##### Replaceable Seat Kit

(10 (2), 11 (2))

40-004-A8 40-007-A8

#### Accessories

Double Check Valve Test Kit

40-100-TK (All Sizes)



# HYDROSTATIC TEST REPORT

ITT Flygt Limited

A C N 808 837 002

JOB NO: 664621  
 ITP NO: -  
 PIT SCHED: -  
 PRODUCT: CP3085-121MT 432  
 SERIAL NO: 9470936

CONT. NO: -GREY ST SPS  
 PROJECT: SOUTHERN DEAN DOWN PUMP  
 CLIENT: RICHARDSON J O P.

TEST NO: 3271  
 REVISION: A  
 DATE: 16-1-95  
 SHEET NO: -

## PROCEDURE:

- 1) The Pump casing is removed from the pump/motor unit
- 2) All openings in the casing are sealed with O-ring sealed steel plates
- 3) The casing is filled with water ensuring all air pockets are removed
- 4) A pressure of 1.350 kPa is applied to the water using a hand pump for a minimum of 10 minutes
- 5) The casing is tapped with a hammer to reveal any cracks which may be propagating in the pump casing
- 6) This certificate is only issued when a pump casing is subjected to the preceding steps without any leakage occurring through the pump casing casting

I HEREBY CERTIFY THE PUMP CASING REMOVED FROM THE FLYGT PRODUCT OF THE SERIAL NUMBER AS SHOWN ABOVE, WAS SUBJECTED TO THE ABOVE PROCEDURE AND THAT ALL INFORMATION ON THIS DOCUMENT IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE

TESTING OFFICER: Craig Horne SIGNATURE: [Signature]



An Affiliate of ITT Fluid Technology Corporation



JAN-95 TUE 10:54 ITT FLYGT SPARES

FLYGT

# TEST REPORT

TEST No 52712

REVISION A

## PRODUCT

Serial No. 3085.181	9470936	Performance curve No. 53-432-00-0030	Motor module/type 153	Voltage (V) 415
Base module 030	Impeller No. 461 78 00	Gear type	Gear ratio	Imp.diam/Blade angle
				Water temp °C 17

## TEST RESULTS

Pump total head H (m)	Volume rate of flow Q (l/s)	Motor input power P (kW)	Voltage U (V)	Current I (A)	Overall efficiency η (%)
11.18	0.0	1.33	421	2.7	0.00
10.50	2.2	1.34	421	2.7	16.92
9.41	5.9	1.61	422	3.0	33.88
8.53	9.1	1.71	421	3.1	44.65
7.53	13.4	1.97	420	3.4	50.08
5.50	21.4	2.36	420	3.8	48.87
1.38	36.2	2.46	421	3.9	19.91

GREY ST SPS SOUTHBANK  
DRAIN DOWN PUMP.

Accepted after ISO2548C	Test facility FAUS Australia	Test date 1 95-01-16	Time 10:43	Chief tester CH <i>Chadwick</i>
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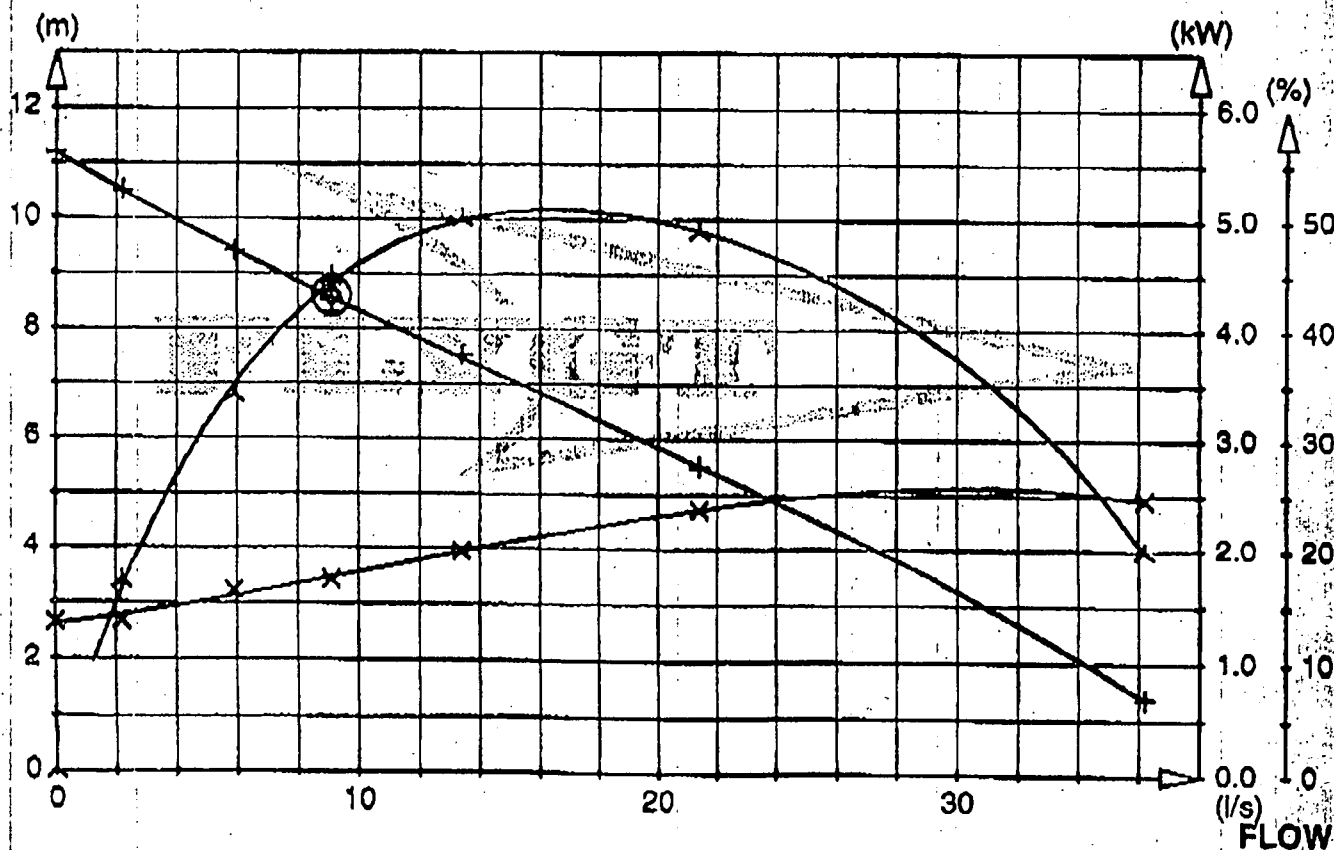
## SOUTHBANK DRAIN DOWN PUMP

## PLOTTED TEST RESULTS

Measured point: + = Q/H  
X = Q/P  
Duty point: ◇ = Q/H  
□ = Q/P  
△ = Q/ETA overall  
Calculated point: 人 = Q/ETA overall 3

### TOTAL HEAD

### INPUT POWER



JAN-95 TUE 10:55 ITT FLYGT SPARES

17.01.95 10:56  
P.03

# ITT

## ITT Flygt Limited

A.O.N. 000 832 922  
Unit 31 Slough Estate  
Holker Street Silverwater 2141  
P.O. Box 97, Ermington 2118  
Phone (02) 647 1855  
Fax (02) 648 4701

### ADDITIONAL TEST REPORT

PUMP TYPE: CP 3025-121 MT 432	DATE: 16-1-95	CUSTOMER: RICHARDSON J & P.
CONTRACT No.: —	PROJECT: GREY ST SPS SOUTHBANK DRAIN DOWN	ORDER No.: P0907
TESTING OFFICER: <i>[Signature]</i>	WITNESS 1: —	WITNESS 2: —
PUMP 1 SERIAL No.: 9470936	TEST No.: 3271	REVISION: A.
INSULATION: > 1000 MV @ 1000V	WATER IN OIL: O.K.	RESISTANCE TEST: 8.7 Ω
PUMP 2 SERIAL No.:	TEST No.:	REVISION:
INSULATION:	WATER IN OIL:	RESISTANCE TEST:
PUMP 3 SERIAL No.:	TEST No.:	REVISION:
INSULATION:	WATER IN OIL:	RESISTANCE TEST:
PUMP 4 SERIAL No.:	TEST No.:	REVISION:
INSULATION:	WATER IN OIL:	RESISTANCE TEST:
PUMP 5 SERIAL No.:	TEST No.:	REVISION:
INSULATION:	WATER IN OIL:	RESISTANCE TEST:

FLYGT

Branches in Adelaide, Brisbane, Melbourne, Mackay, Mt Isa and Perth.



AN-95 TUE 10:56 ITT FLYGT SPARES

17.01.95 10:58

FLYGT

# TEST REPORT

TEST No. 3272  
Revision A

## PRODUCT

Serial No. 3300.181	9440093	Performance curve No. 53-462-00-2060	Motor module/type 120	Voltage (V) 415
Base module 060	Impeller No. 481 72 07	Gear type	Gear ratio	Imp. diam/Blade angle
				Water temp °C 18

## TEST RESULTS

Pump total head H (m)	Volume rate of flow Q (l/s)	Motor input power P (kW)	Voltage U (V)	Current I (A)	Overall efficiency η (%)
56.31	0.0	29.53	424	52.5	0.00
47.57	38.0	37.68	423	63.3	47.11
42.95	61.5	42.24	422	69.4	61.35
38.70	95.5	49.73	423	80.9	69.18
32.98	118.1	54.21	423	88.7	70.44
29.59	136.0	58.09	422	92.0	67.92
23.51	167.9	62.50	422	98.9	61.96

GREY ST SPS SOUTH BANK  
MAIN PUMP STATION

Accepted after ISO2548C	Test facility PAUS Australia	Test date 1	Time 95-01-17 11:10	Chief tester CH <i>Calder</i>
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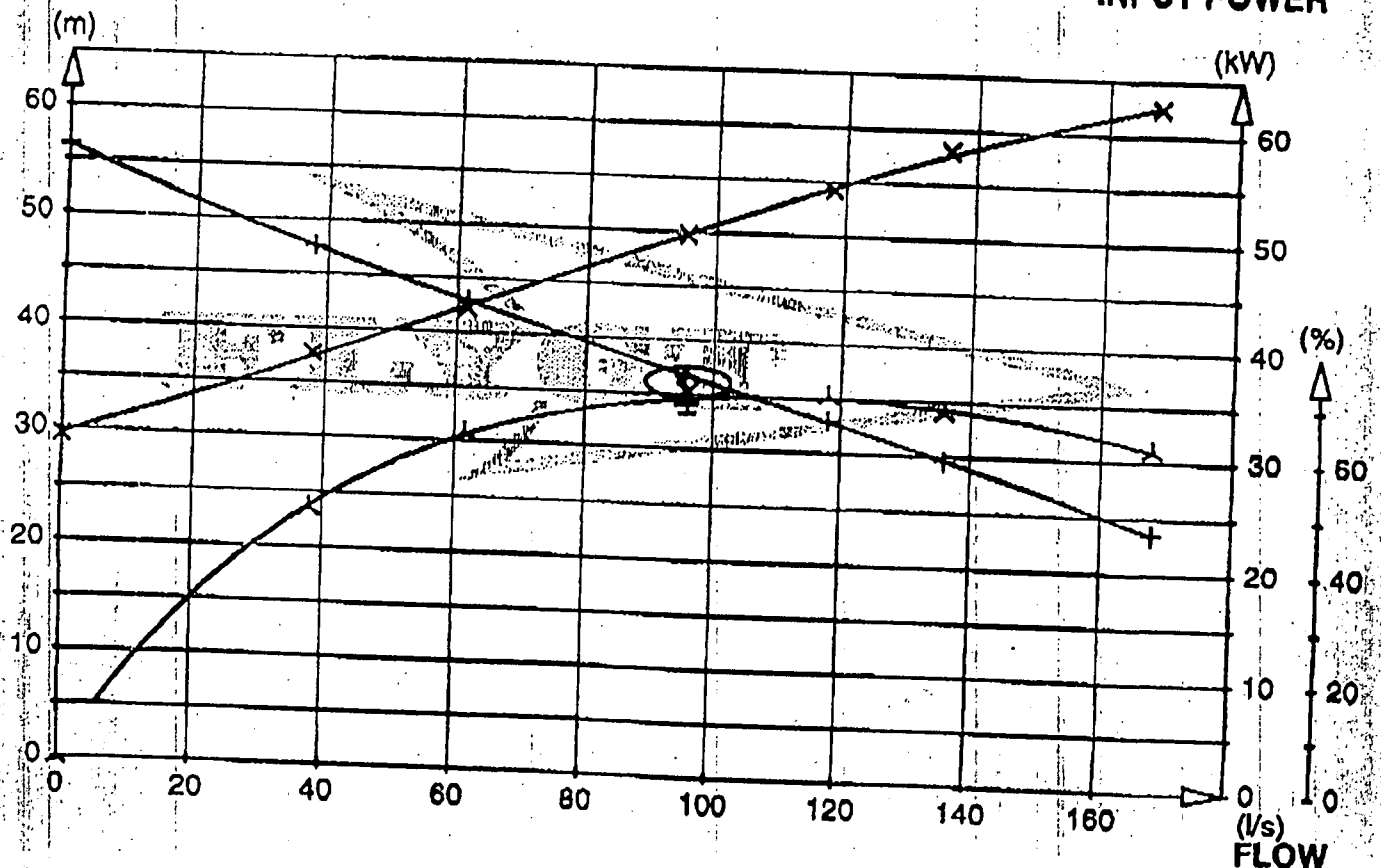
SOUTHBANK MAIN PUMP STATION

## PLOTTED TEST RESULTS

Measured point: + = Q/H  
X = Q/P  
Duty point: ◇ = Q/H  
□ = Q/P  
Calculated point: △ = Q/ETA overall  
3

TOTAL HEAD

INPUT POWER



AN-95 TUE 10:57 ITT FLYGT SPARES

17.01.95 10:59  
P.07

# ITT

## ITT Flygt Limited

A.C.N. 000 632 822  
Unit 31 Slough Estate  
Holker Street Silverwater 2141  
P.O. Box 97, Ermington 2115  
Phone (02) 647 1858  
Fax (02) 648 4701

### ADDITIONAL TEST REPORT

PUMP TYPE: CP3300-181 HT 462	DATE: 17-1-95	CUSTOMER: Richardson J & P.
CONTRACT No.: —	PROJECT: GREY ST SPS SOUTHBANK MAIN Pump Stn	ORDER No.: P0967
TESTING OFFICER: C. White	WITNESS 1: —	WITNESS 2: —
PUMP 1 SERIAL No.: 9440093	TEST No.: 3272	REVISION: A
INSULATION: >1000 mΩ @ 1000V	WATER IN OIL: O.K.	RESISTANCE TEST: 2.45 Ω
PUMP 2 SERIAL No.: 9440094	TEST No.: 3273	REVISION: A
INSULATION: >1000 mΩ @ 1000V	WATER IN OIL: O.K.	RESISTANCE TEST: 2.47 Ω
PUMP 3 SERIAL No.:	TEST No.:	REVISION:
INSULATION:	WATER IN OIL:	RESISTANCE TEST:
PUMP 4 SERIAL No.:	TEST No.:	REVISION:
INSULATION:	WATER IN OIL:	RESISTANCE TEST:
PUMP 5 SERIAL No.:	TEST No.:	REVISION:
INSULATION:	WATER IN OIL:	RESISTANCE TEST:

FLYGT

Branches in Adelaide, Brisbane, Melbourne, Mackay, Mt Isa and Perth.



AN-93 TUE 10:57 ITT FLYGT SPARES



# TEST REPORT

Test No 3273  
 Revision A

## PRODUCT

Serial No. 3300.181	9440094	Performance curve No. 53-482-00-2060	Motor module/type 120	Voltage (V) 418
Base module 060	Impeller No. 481 72 07	Gear type	Gear ratio	Imp.diam/Blade angle
				Water temp °C 18

## TEST RESULTS

Pump total head H (m)	Volume rate of flow Q (l/s)	Motor input power P (kW)	Voltage U (V)	Current I (A)	Overall efficiency η (%)
56.12	0.0	29.29	424	52.9	0.00
49.58	28.5	35.04	425	60.3	36.72
45.62	47.5	39.72	425	66.8	53.55
42.05	68.3	44.41	424	73.0	63.47
37.05	97.9	50.09	424	82.2	71.05
32.76	120.3	55.31	423	88.8	69.89
30.78	132.4	57.80	424	93.0	69.10
25.61	159.8	62.78	422	100.4	63.94

GREY ST SPS SOUTHBANK  
 MAIN PUMPS.

Accepted after ISO2548C	Test facility FAUB Australia	Test date 1	Time 95-01-17 11:59	Chief tester CH <i>Colin</i>
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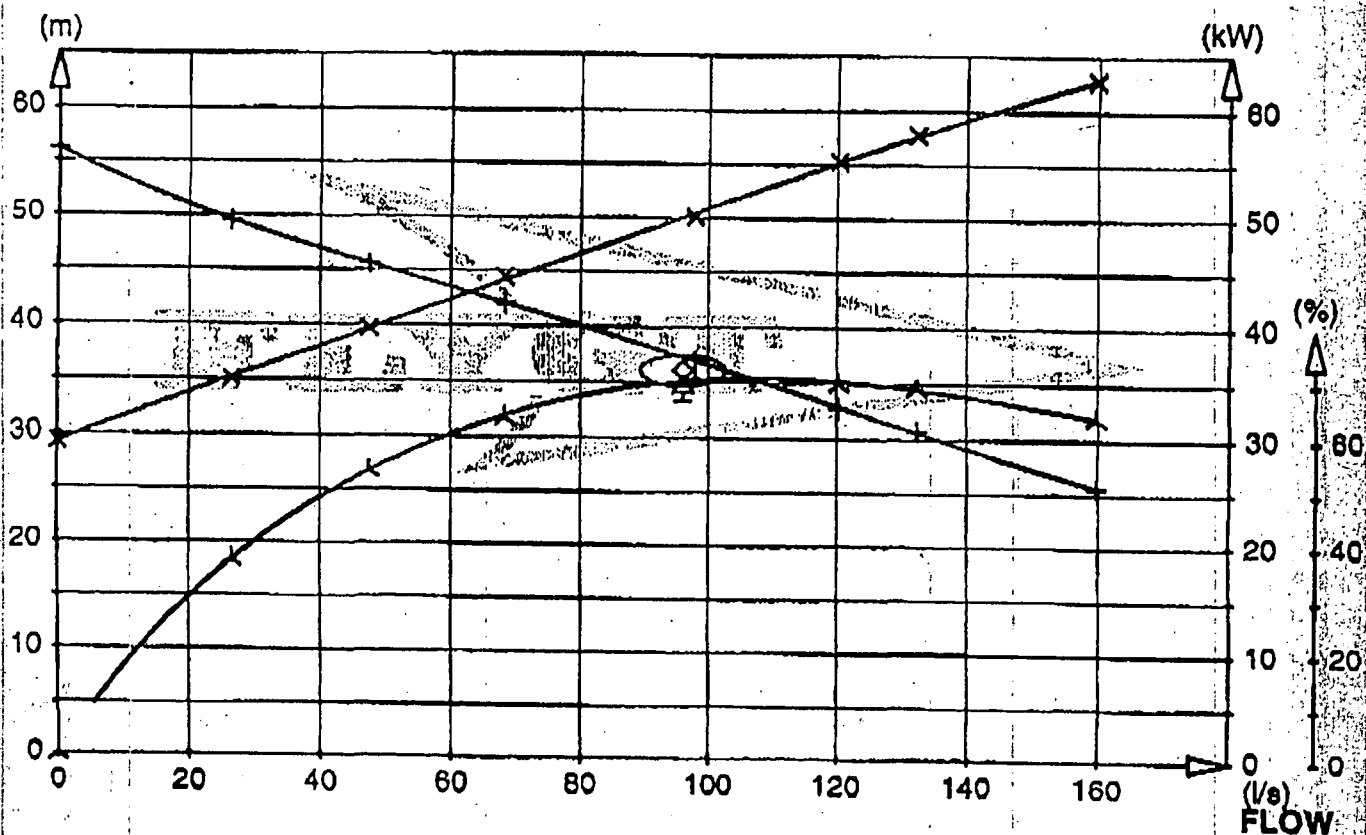
## SOUTHBANK MAIN PUMP STATION

## PLOTTED TEST RESULTS

Measured point: + = Q/H  
 X = Q/P  
 Duty point: ◇ = Q/H  
 □ = Q/P  
 △ = Q/ETA overall  
 Calculated point: 3 = Q/ETA overall

### TOTAL HEAD

### INPUT POWER





# HYDROSTATIC TEST REPORT

ITT Flygt Limited

A C N 000 000 000

JOB NO:	664111	CONT. NO:	- GLEY SI SPS.	TEST NO:	3272/3273
ITP NO:	-	PROJECT:	SOUTHSIDE MAIN PUMP STATION	REVISION:	A
PIT SCHED:	-	CLIENT:	Richardson J & P	DATE:	17-1-95
PRODUCT:	CP3300-181 H+ 462			SHEET NO:	-
SERIAL NO:	9440093/4				

## PROCEDURE:

- 1) The Pump casing is removed from the pump/motor unit
- 2) All openings in the casing are sealed with O-ring sealed steel plates
- 3) The casing is filled with water ensuring all air pockets are removed
- 4) A pressure of 1,350 kPa is applied to the water using a hand pump for a minimum of 10 minutes
- 5) The casing is tapped with a hammer to reveal any cracks which may be propagating in the pump casing
- 6) This certificate is only issued when a pump casing is subjected to the preceding steps without any leakage occurring through the pump casing

I HEREBY CERTIFY THE PUMP CASING REMOVED FROM THE FLYGT PRODUCT OF THE SERIAL NUMBER AS SHOWN ABOVE, WAS SUBJECTED TO THE ABOVE PROCEDURE AND THAT ALL INFORMATION ON THIS DOCUMENT IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE

TESTING OFFICER:

Craig Hutchins

SIGNATURE:

*[Signature]*



Brisbane City

## BRISBANE CITY COUNCIL

Department of Water Supply and Sewerage  
Mechanical and Electrical Services Branch  
I.T. Section

# GREY ST SUBMERSIBLE SEWAGE PUMP STATION (Autotransformer Start) Functional Specification Motorola RTU

Author: Gerard Anderson

Document ID: Grey St Submersible Sewage P/Stn (Autotransformer Start) -  
Functional Specification

*Definitive 1.1 - 2 May 1995*

Derived from: Nil

### APPROVED

B.C.C.

Information  
Technology

Date: \_\_\_\_\_

J & P Richardsons

Date: \_\_\_\_\_

Gutteridge

Haskins & Davey

Date: \_\_\_\_\_

FILE: WSM33\SYS:\APPS\RTU\DOCUMENT\GREY\GREY.D11

## REVISION AND AMENDMENT RECORD SHEET

**SITE:** *GREY ST SUBMERSIBLE SEWAGE PUMP STATION*

**DOCUMENT:** *FUNCTIONAL SPECIFICATION*

Revision Number	Date	Amendment Details	Responsible Officer
V1.0	4/04/95	Initial document generation	Gerard Anderson
V1.1	2/05/95	Knife Gate Valve operation added, Dump Valve alarming added, Attention Indicator operation added, Drain Valve Close output added, Inlet Knife Gate Valve Close added.	Gerard Anderson





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## 1 Introduction

This document outlines the functional requirements for the control, monitoring, and telemetering of the Grey St submersible sewage pump station ATO start.

When the term operator is used, this shall mean the Newstead Control Room Operator.

In all Control Algorithms, PS denotes the present state that the Flag, Counter etc is in. S0, S1 transitions are denoted as C1...Cn.

## 2 I/O Listing

The following I/O are associated with the Grey St submersible three pump sewage pump station Motorola RTU.

### Digital Input Card No.1 - Slot 1

ADDRESS	MNEMONIC	DESCRIPTION	LED OFF	LED ON
DI 1	P1PWR	Pump No.1 Power On	Off	On
DI 2	P1TOL	Pump No.1 Thermal Overload	No Fault	Fault
DI 3	P1PB	Pump No.1 Start Pushbutton	Not Pressed	Pressed
DI 4	P1EMS	Pump No.1 Emergency Stop Pushbutton	Pressed	Not Pressed
DI 5	P1THR	Pump No.1 Thermistor	No Fault	Fault
DI 6	P1ATO	Pump No.1 Autotransformer Thermal Switch	Fault	No Fault
DI 7	P1LOCR	Pump No.1 Local Reset Pushbutton	Not Pressed	Pressed
DI 8	P1STRT	Pump No.1 Started (Transformer Contactor)	Not Started	Started
DI 9	P1SC	Pump No.1 Star Contactor	Not Energised	Energised
DI 10	P1RUN	Pump No.1 Running	Stopped	Running
DI 11	P2PWR	Pump No.2 Power On	Off	On
DI 12	P2TOL	Pump No.2 Thermal Overload	No Fault	Fault
DI 13	P2PB	Pump No.2 Start Pushbutton	Not Pressed	Pressed
DI 14	P2EMS	Pump No.2 Emergency Stop Pushbutton	Pressed	Not Pressed
DI 15	P2THR	Pump No.2 Thermistor	No Fault	Fault
DI 16	P2ATO	Pump No.2 Autotransformer Thermal Switch	Fault	No Fault

### Digital Input Card No.2 - Slot 2

ADDRESS	MNEMONIC	DESCRIPTION	LED OFF	LED ON
DI 1	P2LOCR	Pump No.2 Local Reset Pushbutton	Not Pressed	Pressed
DI 2	P2STRT	Pump No.2 Started	Not Started	Started
DI 3	P2SC	Pump No.2 Star Contactor	Not Energised	Energised
DI 4	P2RUN	Pump No.2 Running	Stopped	Running
DI 5	STPWR	Site Power Fail	Fail	Not Failed
DI 6	SURCH	Surcharge Imminent Alarm	Not Imminent	Imminent
DI 7	LOCREM	Local/Remote	Local	Remote
DI 8	ATTRS	Site Attention Alarm Reset Pushbutton	Not Pressed	Pressed
DI 9	DVFO	Drain Valve Fully Open	Not Fully Open	Fully Open
DI 10	DVFC	Drain Valve Fully Closed	Not Fully Close	Fully Close
DI 11	IKVCC	Inlet Knife Gate Valve Close Command	Off	On
DI 12	SPPWR	Sump Pump Power ON	Fault	No Fault
DI 13	SPPB	Sump Pump Start Push Button	Off	On
DI 14	SPEMS	Sump Pump Emergency Stop Push Button	Not Pressed	Pressed
DI 15	SPLOCR	Sump Pump Local Reset Push Button	Not Pressed	Pressed
DI 16	SPRUN	Sump Pump Running	Not Running	Running



ADDRESS	MNEMONIC	DESCRIPTION	LED OFF	LED ON
DO 1	DERECT	De-energise CP Rectifier Unit	Not Enabled	Enabled
DO 2	CRELEC	Connect Reference CP Electrodes	Not Enabled	Enabled
DO 3	CPALM	Cathodic Protection Alarm	Not Enabled	Enabled
DO 4		SPARE	Not Enabled	Enabled
DO 5	P1LOCI	Pump No.1 Status Indication Lamp	Not Enabled	Enabled
DO 6	P1TCC	Pump No.1 Transformer Contactor Close	Not Enabled	Enabled
DO 7	P1SCC	Pump No.1 Star Contactor Close	Not Enabled	Enabled
DO 8	P1LCC	Pump No.1 Line Contactor Close	Not Enabled	Enabled
DO 9	P2LOCI	Pump No.2 Status Indication Lamp	Not Enabled	Enabled
DO 10	P2TCC	Pump No.2 Transformer Contactor Close	Not Enabled	Enabled
DO 11	P2SCC	Pump No.2 Star Contactor Close	Not Enabled	Enabled
DO 12	P2LCC	Pump No.2 Line Contactor Close	Not Enabled	Enabled
DO 13	ATTI	Site Attention Indicator	Not Enabled	Enabled
DO 14	SPLOCI	Sump Pump Status Lamp	Not Enabled	Enabled
DO 15	SPLCC	Sump Pump Line Contactor	Not Enabled	Enabled
DO 16		SPARE	Not Enabled	Enabled

ADDRESS	MNEMONIC	DESCRIPTION	LED OFF	LED ON
DO 1		SPARE	Not Enabled	Enabled
DO 2		SPARE	Not Enabled	Enabled
DO 3		SPARE	Not Enabled	Enabled
DO 4		SPARE	Not Enabled	Enabled
DO 5	IKVLED	Inlet Knife Gate Valve Open Lamp	Not Enabled	Enabled
DO 6	DVLED	Drain Valve Open Lamp	Not Enabled	Enabled
DO 7	WSVLED	Water Spray Valve Open Lamp	Not Enabled	Enabled
DO 8	IKSVO	Inlet Knife Gate Solenoid Valve Open	Not Enabled	Enabled
DO 9	IKSVC	Inlet Knife Gate Solenoid Valve Closed	Not Enabled	Enabled
DO 10	DSVO	Drain Solenoid Valve Open	Not Enabled	Enabled
DO 11	WSSVO	Water Spray Solenoid Valve Open	Not Enabled	Enabled
DO 12	DSVC	Drain Solenoid Valve Closed	Not Enabled	Enabled
DO 13		SPARE	Not Enabled	Enabled
DO 14		SPARE	Not Enabled	Enabled
DO 15		SPARE	Not Enabled	Enabled
DO 16		SPARE	Not Enabled	Enabled

ADDRESS	MNEMONIC	DESCRIPTION	ENGINEERING UNITS	
AI 1	P1KW	Pump No.1 kW	4mA = 0 KW	20mA = 60 KW
AI 2	P1AMPS	Pump No.1 AMPS	4mA = 0 AMPS	20mA = 5 AMPS
AI 3	P2KW	Pump No.2 kW	4mA = 0 KW	20mA = 60 KW
AI 4	P2AMPS	Pump No.2 AMPS	4mA = 0 AMPS	20mA = 5 AMPS
AI 5	Spare			
AI 6	Spare			
AI 7	Spare			
AI 8	Spare			

ADDRESS	MNEMONIC	DESCRIPTION	ENGINEERING UNITS	
AI 1	WWLEV	Wet Well Level	4mA = 0 mm	20mA = 1620 mm
AI 2	DELPR	Delivery Pressure	4mA = 0 METRES	20mA = 30 METERS
AI 3		Spare		
AI 4	CPCUR	Rectifier Current	4mA = ? mA	20mA = ???? mA
AI 5	CPVOLT	Rectifier Voltage	4mA = ? V	20mA = ????V
AI 6	CPP1RE	CP Reference Electrode Pump No.1	4mA = ? mV	20mA = ????mV
AI 7	CPP2RE	CP Reference Electrode Pump No.2	4mA = ? mV	20mA = ????mV
AI 8	CPSPRE	CP Reference Electrode Sump Pump	4mA = ? L/min	20mA = ????L/m





At overtopping flow greater than the main pump capacity, the connecting sewer, grit manhole and pump station well will flood out at a level which approximates the Hydraulic grade line in the Grey St gravity sewer (initially approx. RL -0.300). The main pump will operate continuously as the level will not decrease.

As the storm flow decreases in the Grey St gravity sewer, and the Hydraulic Grade Line lowers, less sewage will flow to the pump station and the pump will again cycle between start and stop levels. When overtopping of the weir ceases, the pump station will be part full, between main pump start and stop levels. This will cause the one hour timer to time out. At this time, the sump pump will start and the Victoria Bridge rising main drain down valve will open. Sewage in the rising main will drain back into the pump station and depending on the initial level of sewage in the well, could rise to the main pump start level. This start signal will be ignored, as the main pumps will not run when the drain down valve is open. The sump pump will run to return the sewage to the Grey St gravity sewer. On the first occasion that the sump pump reaches its stop level after the drain down valve has operated, the well spray system will operate for the usual 60 seconds as an extra wash over and above the routine weekly wash. The system will then be configured for 'Normal Operation', that is with sump pump operating between levels, drain down valve open and weekly spray wash.

The Grey St pump station will be remotely monitored 24 hours a day by the Newstead Control Room Operators. The pump station status will be telemetered via Motorola trunked radio to the Newstead Control Room on an event driven basis.



In the following descriptions all references to pump will refer to the Grey St pump station main pumps (54kW) unless otherwise stated. ✓

### 3.1.1 PUMP THERMAL OVERLOAD FAULT

#### 3.1.1.1 *Functional Description*

With station power available the presence of a pump thermal overload (PnTOL active) will cause the PnTOLL flag to latch. When the pump thermal overload cools and resets (PnTOL inactive) the thermal overload delay reset timer PnTOTM will start. The thermal overload delay reset timer is used to allow a preset time to pass before unlatching PnTOLL. During this delay faults may have cleared.

PnTOLL will be unlatched if any of the following three conditions are true:

1. The pump thermal overload condition is false (PnTOL inactive) and the local reset (PnLOCR) is pressed.

or

2. The pump thermal overload condition is false (PnTOL inactive) and a reset from the Newstead computer (PnRset) occurs.

or

3. The thermal overload delay reset timer (PnTOTM) times out. This will be indicated to Newstead by the pump thermal overload auto reset flag (PnTOAR) being active.

A pump will be allowed only three thermal overloads in any eight hour period. Each rising edge of the thermal overload digital input (PnTOL) will be counted by the pump thermal overload counter PnTOC.

The eight hour time period is a time window that can occur at anytime. The eight hour timer PnTOT will start when PnTOC increments from 0 to 1.

If PnTOC = 1 or 2 at the end of the eight hour period (PnTOT time out) PnTOC will be reset to 0.

If PnTOC > 2 at the end of the eight hour period (PnTOT timed out) PnTOC will NOT be reset. When PnTOC > 2 the thermal overload fault count exceeded flag PnTOFC will be active and will make the pump unavailable for operation. This pump lockout can be cleared by pressing the pump's local reset pushbutton PnLOCR or by a remote reset from the Operator PnRset. This action will reset PnTOC to 0, making PnTOFC inactive.

#### 3.1.1.2 *Control Algorithms*

The Pump Thermal Overload Fault Flag (PnTOLL) will be set and reset according to the following control algorithm:-

S0: PnTOLL Inactive



S1: PnTOLL Active

case PS of

S0: if C1 and C4 then PS:= S1;

S1: if C2 or ((not C1) and C3) or ((not C1) and C6) then PS:= S0;

end;

The Pump Thermal Overload Fault Delay Reset Timer (PnTOTM) will operate as follows:

if ((not PnTOL) and PnTOLL) then enable PnTOTM (Start Timer)  
else disable PnTOTM (Stop Timer)

The Pump Thermal Overload Fault Auto Reset Flag (PnTOAR) will be set and reset according to the following control algorithm.

S0: PnTOAR Inactive (TOL fault not reset by PnTOTM)  
S1: PnTOAR Active (TOL fault reset by PnTOTM)

case PS of

S0: if C2 then PS = S1

S1: if C1 and C5 then PS = S0

end;

The Pump Thermal Overload Fault Counter (PnTOC) will function as follows:

S0: PnTOC = 0 (no TOL faults present)  
S1: PnTOC > 0 (1 or more TOL faults)  
S2: PnTOC = PnTOC + 1 (count another TOL fault)

case PS of

S0: if (C4 and C10) then PS = S2

S1: if (C4 and C10) then PS = S2

else if ((not C8) and C9) or (C8 and (C3 or C6)) then PS = S0

S2: PS = S1

end;

The Pump Thermal Overload Fault 8 Hour Window Timer (PnTOT<sup>8</sup>) will operate as follows:

if (PnTOC > 0) then enable PnTOT<sup>8</sup> (Start Timer)  
else disable PnTOT<sup>8</sup> (Stop Timer)

The Pump Thermal Overload Fault Count Flag (PnTOFC) will be set and reset according to the following control algorithm.

S0: PnTOFC Inactive (Pump No.n Thermal Overload Fault Count Exceeded Flag inactive)  
S1: PnTOFC Active (Pump No.n Thermal Overload Fault Count Exceeded Flag active)





Count Exceeded Flag active)

```
case PS of
  S0: if (C7 > 2) then PS = S1
  S1: if (C7 <= 2) then PS = S0
end;
```

The conditions for the above Algorithms are defined below.

C1 = PnTOL	(Pump No.n Thermal Overload DI active)
C2 = PnTOTM	(Pump No.n Thermal Overload Delay reset Timer Timed Out)
C3 = PnLOCR	(Pump No.n Local Reset Pushbutton pressed, DI active)
C4 = STPWR	(Site Power Available)
C5 = PnTOAR	(Pump No.n Thermal Overload Auto Reset Flag)
C6 = PnRset	(Pump No.n Operator Reset active)
C7 = PnTOC	(Pump No.n Thermal Overload Counter)
C8 = PnTOFC	(Pump No.n Thermal Overload Count is greater than two)
C9 = PnTOT	(Pump No.n Thermal Overload 8 Hour Timer timed out)
C10 = PnTOL↑	(Rising edge Pump No.n Thermal Overload DI)



### 3.1.2 PUMP THERMISTOR FAULT

#### 3.1.2.1 *Functional Description*

With station power available the presence of a pump thermistor fault (PnTHR active) will cause the PnTHRL flag to latch. When the pump thermistor cools and resets (PnTHR inactive) the thermistor delay reset timer PnTHTM will start. The thermistor delay reset timer is used to allow a preset time to pass before unlatching PnTHRL. During this delay the motor windings may have cooled to an acceptable level for a restart.

PnTHRL will be unlatched if any of the following three conditions are true:

1. The pump thermistor condition is false (PnTHR inactive) and the local reset pushbutton (PnLOCR) is pressed.
- or
2. The pump thermistor condition is false (PnTHR inactive) and a reset from the Newstead computer (PnRset) occurs.
- or
3. The thermistor delay reset timer (PnTHTM) times out. This will be indicated to Newstead by the pump thermistor auto reset flag (PnTHAR) being active.

A pump will be allowed only three thermistor faults in any eight hour period. Each rising edge of the thermistor digital input (PnTHR) will be counted by the pump thermistor counter PnTHC.

The eight hour time period is a time window that can occur at anytime. The eight hour timer PnTHT will start when PnTHC increments from 0 to 1.

If PnTHC = 1 or 2 at the end of the eight hour period (PnTHTH time out) PnTHC will be reset to 0.

If PnTHC > 2 at the end of the eight hour period (PnTHTH timed out) PnTHC will NOT be reset. When PnTHC > 2 the thermistor fault count exceeded flag PnTHFC will be active and will make the pump unavailable for operation. This pump lockout can be cleared by pressing the pump's local reset pushbutton PnLOCR or by a remote reset from the Operator PnRest. This action will reset PnTHC to 0, making PnTHFC inactive.

#### 3.1.2.2 *Control Algorithms*

The Pump Thermistor Fault Flag (PnTHRL) will be set and reset according to the following control algorithm:-

S0: PnTHRL Inactive  
S1: PnTHRL Active

case PS of

S0: if C1 and C4 then PS:= S1;  
S1: if C2 or ((not C1) and C3) or ((not C1) and C6) then PS:= S0;



end;

The Pump Thermistor Fault Delay Reset Timer (PnTHTM) will operate as follows:

if ((not PnTHR) and PnTHRL) then enable PnTHTM (Start Timer)  
else disable PnTHTM (Stop Timer)

The Pump Thermistor Fault Auto Reset Flag (PnTHAR) will be set and reset according to the following control algorithm.

S0: PnTHAR Inactive (Thermistor fault not reset by PnTHTM)  
S1: PnTHAR Active (Thermistor fault reset by PnTHTM)

case PS of  
S0: if C2 then PS = S1  
S1: if C1 and C5 then PS = S0  
end;

The Pump Thermistor Fault Counter (PnTHC) will function as follows:

S0: PnTHC = 0 (No Thermistor faults present)  
S1: PnTHC > 0 (1 or more Thermistor faults)  
S2: PnTHC = PnTHC + 1 (Count another Thermistor fault)

case PS of  
S0: if (C4 and C10) then PS = S2  
S1: if (C4 and C10) then PS = S2  
else if ((not C8) and C9) or (C8 and (C3 or C6)) then PS = S0  
S2: PS = S1  
end;

The Pump Thermistor Fault 8 Hour Window Timer (PnTHTH) will operate as follows:

if (PnTHC > 0) then enable PnTHTH (Start Timer)  
else disable PnTHTH (Stop Timer)

The Pump Thermistor Fault Count Flag (PnTHFC) will be set and reset according to the following control algorithm.

S0: PnTHFC Inactive (Pump No.n Thermistor Fault Count Exceeded Flag inactive)  
S1: PnTHFC Active (Pump No.n Thermistor Fault Count Exceeded Flag active)

case PS of  
S0: if (C7 > 2) then PS = S1  
S1: if (C7 <= 2) then PS = S0  
end;



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The conditions for the above Algorithms are defined below.

C1 = PnTHR	(Pump No.n Thermistor DI active)
C2 = PnTHTM	(Pump No.n Thermistor Delay reset Timer Timed Out)
C3 = PnLOCR	(Pump No.n Local Reset Pushbutton pressed, DI active)
C4 = STPWR	(Site Power Available)
C5 = PnTHAR	(Pump No.n Thermistor Auto Reset Flag)
C6 = PnRset	(Pump No.n Operator Reset active)
C7 = PnTHC	(Pump No.n Thermistor Counter)
C8 = PnTHFC	(Pump No.n Thermistor Count is greater than two)
C9 = PnTHTH	(Pump No.n thermistor 8 Hour Timer timed out)
C10 = PnTHR↑	(rising edge Pump No.n Thermistor DI)

### 3.1.3 PUMP AUTO-TRANSFORMER THERMO-SWITCH

#### 3.1.3.1 *Functional Description*

With station power available the presence of a pump auto-transformer thermal fault (PnATO inactive) will cause the PnATOL flag to latch. When the autotransformer resets (PnATO active) the pump autotransformer fault delay reset timer PnATTM will start. The auto-transformer delay reset timer is used to allow a preset time to pass before unlatching PnATOL. During this delay the core windings may have cooled to an acceptable level for a restart.

PnATOL will be unlatched if any of the following three conditions are true:

1. The pump auto-transformer fault condition is false (PnATOL  $\overline{\text{active}}$ ) and the local reset (PnLOCR) is pressed.

or

2. The pump auto-transformer fault condition is false (PnATOL active) and a reset from the Newstead computer (PnRset) occurs

or

3. The auto-transformer delay reset timer (PnAATM) times out. This will be indicated to Newstead by the pump auto-transformer auto reset flag (PnATAR) being active.



A pump will be allowed only three auto-transformer faults in any eight hour period. Each falling edge of the auto-transformer digital input (PnTOL) will be counted by the pump auto-transformer counter PnATC.

The eight hour time period is a time window that can occur at anytime. The eight hour timer PnATT will start when PnATC increments from 0 to 1.

If PnATC = 1 or 2 at the end of the eight hour period (PnATT time out) PnATC will be reset to 0.

If PnATC > 2 at the end of the eight hour period (PnATT timed out) PnATC will NOT be reset. When PnATC > 2 the auto-transformer fault count exceeded flag PnATFC will be active and will make the pump unavailable for operation. This pump lockout can be cleared by pressing the pump's local reset pushbutton PnLOCR or by a remote reset from the Operator PnRest. This action will reset PnATC to 0, making PnATFC inactive.

### 3.1.3.2 Control Algorithms

The Pump Auto-Transformer Fault Flag (PnATOL) will be set and reset according to the following control algorithm:-

S0: PnATOL Inactive

S1: PnATOL Active

case PS of

S0: if (not C1) and C4 then PS:= S1;

S1: if C2 or (C1 and C3) or (C1 and C6) then PS:= S0;

end;

The Pump Auto-Transformer Fault Delay Reset Timer (PnATTM) will operate as follows:

if (PnATO and PnATOL) then enable PnATTM (Start Timer)

else disable PnATTM (Stop Timer)

The Pump Auto-Transformer Fault Auto Reset Flag (PnATAR) will be set and reset according to the following control algorithm.

S0: PnATAR Inactive

(Auto-Trans fault not reset by PnATTM)

S1: PnATAR Active

(Auto-Trans fault reset by PnATTM)

case PS of

S0: if C2 then PS = S1

S1: if (not C1) and C5 then PS = S0

end;

The Pump Auto-Transformer Fault Counter (PnATC) will function as follows:

S0: PnATC = 0

(no Auto-Trans faults present)

S1: PnATC > 0

(1 or more Auto-Trans faults)

S2: PnATC = PnATC + 1

(count another Auto-Trans fault)



```

case PS of
    S0: if (C4 and C10) then PS = S2
    S1: if (C4 and C10) then PS = S2
        else if ((not C8) and C9) or (C8 and (C3 or C6)) then PS = S0
    S2: PS = S1
end;
    
```

The Pump Auto-Transformer Fault 8 Hour Window Timer (PnATTH) will operate as follows:

```

if (PnATC > 0) then enable PnATTH      (Start Timer)
else disable PnATTH                    (Stop Timer)
    
```

The Pump Auto-Transformer Fault Count Flag (PnATFC) will be set and reset according to the following control algorithm.

```

S0: PnATFC Inactive                    (Pump No.n auto-trans Fault Count
                                        Exceeded Flag inactive)
S1: PnATFC Active                      (Pump No.n auto-trans Fault Count
                                        Exceeded Flag active)
    
```

```

case PS of
    S0: if (C7 > 2) then PS = S1
    S1: if (C7 <= 2) then PS = S0
end;
    
```

The conditions for the above Algorithms are defined below.

C1 = PnATOL	(Pump No.n Auto-Transformer DI active)
C2 = PnATTM	(Pump No.n Auto-Transformer Delay reset Timer Timed Out)
C3 = PnLOCR	(Pump No.n Local Reset Pushbutton pressed, DI active)
C4 = STPWR	(Site Power Available)
C5 = PnATAR	(Auto-Transformer <u>Auto</u> Reset Flag)
C6 = PnRset	(Pump No.n Operator Reset active)
C7 = PnATC	(Pump No.n Auto-Transformer Counter)
C8 = PnATFC	(Pump No.n Auto-Transformer Count is greater than two)
C9 = PnATTH	(Pump No.n Auto-Transformer 8 Hour Timer timed out)
C10 = PnATO↓	(Falling edge Pump No.n Auto-Transformer DI)



3.1.4 PUMP FAILURE3.1.4.1 *Functional Description*

During a pump start-up sequence if a contactor is requested to open or close and fails to do so within a time determined by the contactor timer (all initially set to 3 seconds), a pump failure will occur which shall cause the flag PnFAIL to latch on and the pump to become unavailable for RTU control.

The PnFAIL flag shall remain latched on until reset from either the pumps local reset pushbutton has been pressed or a reset from the Newstead computer (PnRset) occurs. The pump shall then become available for RTU control.

3.1.4.2 *Control Algorithm*

The pump failure internal flag (PnFAIL) will be set and reset according to the following control algorithm:-

S0: Pump Failed	(PnFAIL set)
S1: Pump Not Failed	(PnFAIL reset)

case PS of

S0: if C1 or C8 then PS:= S1;

S1: if C2 or C3 or C4 or C5 or C6 or C7 then PS:= S0;

end;

The conditions are defined below.

C1 = PnLOCR	(Pump No.n Local Reset Pushbutton Pressed)
C2 = (PnTCC and PnSTRT and PnTCCl expired)	(Pump No.n Transformer Contactor Fail to Close Timer Expired)
C3 = (PnTCC and PnSTRT and PnTCOp expired)	(Pump No.n Transformer Contactor Fail to Open Timer Expired)
C4 = (PnSCC and PnSC and PnSCCl expired)	(Pump No.n Star Contactor Fail to Close Timer Expired)
C5 = (PnSCC and PnSC and PnSCOp expired)	(Pump No.n Star Contactor Fail to Open Timer Expired)
C6 = (PnLCC and PnRUN and PnLCCl expired)	(Pump No.n Line Contactor Fail to Close Timer Expired)
C7 = (PnLCC and PnRUN and PnLCOp expired)	(Pump No.n Line Contactor Fail to Close Timer Expired)
C8 = PnRset	(Pump No.n Operator Reset Active)



### 3.1.5 PUMP EMERGENCY STOP CONTROL

#### 3.1.5.1 *Functional Description*

Upon detection of the operation of the EMERGENCY STOP pushbutton via RTU input PnEMS, the flag PnEMSL will be latched on. If the station is in REMOTE, the flag will remain latched on until the EMERGENCY STOP pushbutton has been released and either the pump LOCAL RESET pushbutton has been operated or the station is switched to LOCAL. If the station is in LOCAL the flag will remain latched on until the EMERGENCY STOP pushbutton has been released.

#### 3.1.5.2 *Control Algorithm*

The control of the emergency stop pushbutton latch flag (PnEMSL) is based on the following control algorithm:-

S0: EMS Inactive (PnEMSL inactive)  
S1: EMS Active (PnEMSL active)

case PS of

S0: if C1 PS:= S1;

S1: if not(C1) and (not(C3) or (C3 and C2)) then PS:= S0;

end;

The conditions are defined below.

C1 = PnEMS (Pump No.n Emergency Stop Pushbutton)  
C2 = PnLOCR (Pump No.n Local Reset Pushbutton)  
C3 = LOCREM (Pump Station In Remote)

### 3.1.6 PUMP AVAILABILITY

A pump will be available for RTU control according to the following algorithm:-

P1AV = P1PWR and P1TOLL and P1THRL and P1ATOL and P1FAIL and P1TOFC and  
P1THFC and P1ATFC and P1EMSL

P2AV = P2PWR and P2TOLL and P2THRL and P2ATOL and P2FAIL and P2TOFC and  
P2THFC and P2ATFC and P2EMSL

If any of these conditions are not met then the pump is unavailable for RTU control and will not be able to be started automatically or locally via the LOCAL START pushbutton.





### 3.1.7 PUMP LOCKOUT

#### 3.1.7.1 *Functional Description*

A pump (when selected in remote) is only permitted 12 starts within any 1 hour period. To ensure this limit is not exceeded, when a pump completes a full start-up sequence it will not be permitted to start again for five minutes. This will ensure that a maximum of 12 pump starts can occur for each pump every hour.

In the event of a surcharge or the pump being selected in local, this lockout will be disabled allowing the pump to start after an initial one second delay.

#### 3.1.7.2 *Control Algorithm*

The pump lockout flag (PnLOK) will be set and reset according to the following control algorithm:-

S0: Pump Able to Start	(PnLok reset)
S1: Pump Locked Out	(PnLok set)

case PS of

S0: if C1 and C4 then PS:= S1;

S1: if C2 or C3 or (not C4) or ((not C5) and (not C6)) then PS:= S0;

end;

The conditions are defined below.

C1 = PnSTR ↑	(Rising edge of Pump No.n Start)
C2 = SURCH	(Surcharge Alarm Active)
C3 = PnLock	(Lockout Timer Expired)
C4 = LOCREM	(Pump Station in Remote, DI active)
C5 = PnHldL	(Pump No. n Hold <u>L</u> atch Flag)
C6 = PnSTR	(Pump No. n Start Request Flag)



### 3.1.8 SUMP PUMP EMERGENCY STOP CONTROL

#### 3.1.8.1 *Functional Description*

Upon detection of the operation of the Sump Pump Emergency Stop pushbutton via RTU input SPEMS, the flag SPEMSL will be latched on. If the station is in Remote, the flag will remain latched on until the Sump Pump Emergency Stop pushbutton has been released and either the sump pump Local Reset pushbutton has been operated or the station is switched to Local. If the station is in Local the flag will remain latched on until the Sump Pump Emergency Stop pushbutton has been released.

#### 3.1.8.2 *Control Algorithm*

The control of the sump pump emergency stop pushbutton latch flag (SPEMSL) is based on the following control algorithm:-

S0: SPEMS Inactive (SPEMSL inactive)  
S1: SPEMS Active (SPEMSL active)

case PS of

S0: if C1 PS:= S1;

S1: if not(C1) and (not(C3) or (C3 and C2)) then PS:= S0;

end;

The conditions are defined below.

C1 = SPEMS	(Sump Pump Emergency Stop Pushbutton Pressed)
C2 = SPLOCR	(Sump Pump Local Reset Pushbutton Pressed)
C3 = LOCREM	(Pump Station In Remote)



### 3.1.9 SUMP PUMP FAILURE

#### 3.1.9.1 *Functional Description*

During a sump pump start-up sequence if the sump pump line contactor is requested to open or close and fails to do so within a time determined by the sump pump line contactor timer (initially set to 5 seconds), a sump pump failure will occur which shall cause the flag SPFAIL to latch on and the pump to become unavailable for RTU control.

The SPFAIL flag shall remain latched on until reset from either the sump pump local reset pushbutton has been pressed or a reset from the Newstead computer (SPRset) occurs. The pump shall then become available for RTU control.

#### 3.1.9.2 *Control Algorithm*

The sump pump failure internal flag (SPFAIL) will be set and reset according to the following control algorithm:-

S0: Sump Pump Failed	(SPFAIL set)
S1: Sump Pump Not Failed	(SPFAIL reset)

```

case PS of
    S0: if C1 or C4 then PS:= S1;
    S1: if C2 or C3 then PS:= S0;
end;
```

The conditions are defined below.

C1 = SPLOCR	(Sump Pump Local Reset Pushbutton pressed, SPLOCR DI active)
C2 = (SPLCC and not SPRUN and SPLCCI expired)	(Sump Pump Line Contactor Fail to Close Timer Expired)
C3 = (not SPLCC and SPRUN and SPLCOp expired)	(Sump Pump Line Contactor Fail to Open Timer Expired)
C4 = SPRset	(Sump Pump Operator Reset Active)

### 3.1.10 SUMP PUMP AVAILABILITY

The sump pump will be available for RTU control according to the following algorithm:-

SPAV = SPPWR and (not SPFAIL) and (not SPEMSL)

If any of these conditions are not met then the pump is unavailable for RTU control and will not be able to be started automatically or locally via the Local Start pushbutton.



### 3.1.11 PUMP STATION CONTROL

#### 3.1.11.1 *Functional Description*

Control of the pump station will be based on the current state of the sewage wet well level with the station operating on two setpoint level ranges. The sump pump shall operate based on start and stop sump pump level setpoints and the main pumps shall operate in a duty/standby configuration based on start and stop duty level setpoints. The following percentage level setpoints are based on a wet well probe level range of -4.5 M to +5.0 M (i.e. span of 9.5 M). Under normal conditions, with the wet well rising, the Victoria Bridge rising main drain down valve will be open and the sump pump will start when the wet well level is greater than the Start Sump Pump Level Setpoint (STRSMP - initially set to 6%). The sump pump will stop when the wet well level is less than the Stop Sump Pump Level Setpoint (STPSMP - initially set to 4%) or when the duty pump starts. The duty pump will start once the wet well level is greater than the Start Duty Pump Level Setpoint (STRDTY - initially set to 26%). The duty pump will then stop when the wet well level is less than the Stop Duty Pump Setpoint (STPDTY - initially set to 10%). Only one pump shall operate at any time. A High level alarm will be generated at the Newstead Control Room if the wet well level is greater than 47%.

In the event of a failure of the wet well level probe, any running pump will immediately stop and control of the pump station will be based on activation of the surcharge electrode. Once the surcharge alarm; RTU input SURCH, becomes active the duty pump will start and the Victoria Bridge rising main drain down valve will close. The duty pump will operate until the surcharge electrode goes inactive and has been inactive for a time determined by the surcharge inactive timer - duty (SATIMD - initially set to 5 minutes).

The Drain Delay Timer (DDT) will be operated when conditions C12 and C13 are true. This is to prevent the sump pump from operating for one hour following the operation of the main duty pumps. This timer will be reset to one hour whenever either main pump operates. This timer will be reset when switched to local.

The Duty Pump Drain Down Lockout Timer (DTDDLTL) will start once the DDT timer has expired, i.e. when the main pumps have not operated for a period of one hour and the drain down valve is opened to drain the Victoria Bridge Rising main. This is to prevent the duty pump from operating while the Victoria Bridge Rising main is being drained. This timer will be reset whenever the pump station is switched to local.

N.B. The operation of the above two timers (DDT and DTDDLTL) is performed with the aid of flag latches (DDTL and DTDDLFL) to allow reset of the timers for various events.

There is no practical reason for running the main pumps while the drain down valve is open although doing so will not harm the pumps and simply pump sewage in a circle. Thus the drain down valve will close whenever the main duty pump is required to operate. The drain down valve will also be closed whenever the pump station is switched to local as this is the state in which all pumps can operate and there are no manual controls to close the drain down valve. An added advantage of closing the drain down valve when the station is switched to local is to prevent the wet well filling from the Victoria Bridge Rising main while no pumps can automatically start. The drain down valve will initially be opened when the pump station is switched to remote to prevent the sewage in the Victoria Bridge rising main from going septic after the station is operated in local.



## 3.1.11.2 Control Algorithm

The automatic operation of the pump station will be based on the wet well level according to the following control algorithm:-

S0: Stop Sump Pump, Open Drain Down Valve ( Reset SUMPRN, Reset Drain Down Valve Close Command DVCC )  
 S1: Start Sump Pump ( Set SUMPRN )  
 S2: Start Duty Pump, Stop Sump, Close Drain Down Valve (Set RUNDTY, Set DVCC, Reset SUMPRN)  
 S3: Stop Duty Pump (Start Drain Delay Timer DDT, Reset RUNDTY)

case PS of

S0: if (C2 and not(C7) and not(C11)) or C5 then PS := S2;  
       else if (C1 and not(C7) and not(C10)) then PS := S1;  
 S1: if C3 or C7 then PS := S0;  
       else if (C2 and not(C7) and not(C11)) then PS := S2;  
 S2: if (C4 and not(C7)) or (C9 and C7 and not(C5)) then PS := S3;  
 S3: if C10 then PS := S0;  
       else if (C2 and not(C7)) or C5 then PS := S2;

end;

The conditions are defined below.

C1 = (WWLEV > STRSMP)	( WWL > Start Sump Pump )
C2 = (WWLEV > STRDTY)	( WWL > Start Duty Pump )
C3 = (WWLEV < STPSMP)	( WWL < Stop Sump Pump )
C4 = (WWLEV < STPDY)	( WWL < Stop Duty Pump )
C5 = SURCH	( Surge alarm active )
C7 = WWLEVI	( Wet Well Level Invalid )
C8 = WWLEVI↑	( Rising Edge of Wet Well Level Invalid )
C9 = WWLEVI and SATIMD	( Wet Well Level Invalid and Surge Electrode Inactive Timer - Duty Expired )
C10 = DDT	( Drain Down Delay Timer expired )
C11 = DTDDL	( Duty Pump Drain Down Lockout Timer expired )
C12 = LOCREM	
C13 = (P1LCC or P2LCC)↓	( Pump 1 or Pump 2 Falling edge of line contactor digital output )



### 3.1.12 INDIVIDUAL PUMP CONTROL

#### 3.1.12.1 *Functional Description*

A pump will start if it is the sump pump and the sump pump is required to start, or if it is the duty pump and the duty pump is required to start, or if it is the standby pump and the standby pump is required to start. Each pump will only start if it is available for RTU control and the pump lockout flags are inactive. A pump start shall be delayed by the pump start delay timer PnSTDT (initially set to 1 second). A pump will stop if it is no longer required to run in remote, or if the emergency stop pushbutton is operated.

When the station is switched to local, the RTU will stop all pumps and will perform no automatic pump controls until the station is returned to remote.

#### 3.1.12.2 *Control Algorithm*

The control of each individual pump will be based on the following algorithm:-

##### SUMP PUMP

SO: Stop Sump Pump

(Reset SPSTR)

S1: Start Sump Pump

(Set SPSTR)

case PS of

S0: if C11 and  
(C6 and C12) or  
(not(C6) and C17)) then PS := S1;

S1: if (not(C11) or  
(C6 and not(C12)) or  
C10) then PS:= S0;

end;

The conditions are defined below.

C1 = P1AV

(Pump 1 Available)

C2 = DUTYP1

(Pump 1 Duty)

C3 = RUNDTY

(Duty Pump Required to Run)

C5 = P2AV

(Pump 2 Available)

C6 = LOCREM

(Pump Station in Remote)

C7 = P1STRPB

(Pump No.1 Start Pushbutton Pressed)

C8 = DUTYP2

(Pump 2 Duty)

C9 = P2STRPB

(Pump No.2 Start Pushbutton Pressed)

C10= LOCREM↓

(Station Initially Switched to Local)



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C11= SPAV	(Sump Pump Available)
C12= SUMPRN	(Sump Pump Required to run)
C13= P1Lock	(Pump No.1 Locked Out)
C14= P2Lock	(Pump No.2 Locked Out)
C15= P1STDT	(Pump No.1 Start Delay Timer Expired)
C16= P2STDT	(Pump No.2 Start Delay Timer Expired)
C17= SPPB	(Sump Pump Start Pushbutton Pressed)

PUMP NO.1

SO: Stop Pump No.1 (Reset P1STR)  
S1: Start Pump No.1 (Set P1STR)

case PS of  
     S0: if C1 and not(C13) and C15 and  
         ((C6 and C2 and C3) or  
         (not(C6) and C7 and not(C9))) then PS := S1;  
     S1: if (not(C1) or  
         (C6 and not(C3)) or  
         C10) then PS:= S0;  
end;

PUMP NO.2

SO: Stop Pump No.2 (Reset P2STR)  
S1: Start Pump No.2 (Set P2STR)

case PS of  
     S0: if C5 and not(C14) and C16 and  
         ((C6 and C8 and C3) or  
         (not(C6) and C9 and not(C7))) then PS := S1;  
     S1: if (not(C5) or  
         (C6 and not(C3)) or  
         C10 ) then PS:= S0;  
end;



### 3.1.13 PUMP STATUS INDICATION LAMP

#### 3.1.13.1 *Functional Description*

The pump status indication lamp, RTU output PnLOCI, will remain steady on if the pump has completed its startup sequence and the PnRUN input is active. The lamp will remain active until the PnRUN input becomes inactive.

The pump status indication lamp will flash slow (1 second on / 1 second off) if the pump is unavailable for RTU control. The lamp will cease to flash when the pump becomes available for RTU control.

The pump status indication lamp will flash fast (0.3 second on / 0.3 second off) if the pump is locked out due to lock out timer not expired. The lamp will cease to flash fast when the lock out timer expires.

#### 3.1.13.2 *Control Algorithm*

The pump local indication lamp output will be set and reset according to the following control algorithm:-

S0: Pump Local Indication Lamp Inactive (PnLOCI inactive)  
S1: Pump Local Indication Lamp Active (PnLOCI active)

case PS of

S0: if C1 or ((not C2) and C5) or (C2 and (not C4) and C3 and C6)) then PS:= S1;  
S1: if (not C1) and (C2 or (not C5) and ((not C2) or (not C3) or C4 or (not C6)))  
then PS:= S0;

end;

C1 = PnRUN	(Pump No.n Running)
C2 = $\overline{\text{PnAV}}$	(Pump No.n Unavailable)
C3 = PnLok	(Pump No.n Locked Out)
C4 = PnSTR	(Pump No.n Start Request Flag)
C5 = FlshT1	(Flasher 1 second Timer Expired)
C6 = FlshT3	(Flasher 0.3 second Timer Expired)





### 3.1.14 SUMP PUMP STATUS INDICATION LAMP

#### 3.1.14.1 *Functional Description*

The sump pump status indication lamp, RTU output SPLOCI, will remain steady on if the pump has completed its startup sequence and the SPRUN input is active. The lamp will remain active until the SPRUN input becomes inactive.

The sump pump status indication lamp will flash slow (1 second on / 1 second off) if the sump pump is unavailable for RTU control. The lamp will cease to flash when the sump pump becomes available for RTU control.

#### 3.1.14.2 *Control Algorithm*

The sump pump local indication lamp output will be set and reset according to the following control algorithm:-

S0: Sump Pump Local Indication Lamp Inactive (SPLOCI inactive)  
 S1: Sump Pump Local Indication Lamp Active (SPLOCI active)

case PS of

S0: if C1 or (C2 and C5) then PS:= S1;

S1: if ((not C1) and (not C2)) or ((not C5) and C2) then PS:= S0;

end;

C1 = SPRUN (Sump Pump Running)

C2 = SPAV (Sump Pump Unavailable)

C5 = FlshT1 (Flasher 1 second Timer Expired)

### 3.1.15 PUMP START SEQUENCE

#### 3.1.15.1 *Functional Description*

When a pump is requested to start the following start-up sequence will be followed:-

1. The star contactor shall close.
2. When the star contactor has closed, the transformer contactor shall close.
3. After a time determined by the sequence timer (PnTIME - initially set to 1 second), the star contactor shall open.
4. When the star contactor has opened, the line contactor shall close.
5. When the line contactor has closed, the transformer contactor shall open.

#### 3.1.15.2 *Control Algorithm*

Once selected to run, the start-up sequence for each pump is given by the following algorithm:-

S0: All Contactors Open (PnTCC inactive, PnSCC inactive, PnLCC inactive)



S1: Star Contactor Closed	(PnTCC inactive, PnSCC active, PnLCC inactive)
S2: Transformer Contactor Closed	(PnTCC active, PnSCC active, PnLCC inactive)
S3: Star Contactor Open	(PnTCC active, PnSCC inactive, PnLCC inactive)
S4: Line Contactor Closed	(PnTCC active, PnSCC inactive, PnLCC active)
S5: Transformer Contactor Open	(PnTCC inactive, PnSCC inactive, PnLCC active)

case PS of

```

S0: if C3 then PS:= S1;
S1: if C1 and C7 then PS:= S2;
    else if (not C1) then PS:= S0;
S2: if C2 and C4 and C5 and then PS:= S3;
    else if (not C1) then PS:= S0;
S3: if C1 and C4 and C8 then PS:= S4;
    else if (not C1) then PS:= S0;
S4: if (not C2) and C6 then PS:= S5;
    else if not(C1) the PS:= S0;
S5: if not(C1) then PS:= S0;
    
```

end;

The conditions are defined below.

C1 = PnSTR	(Pump No.n Start Request Flag)
C2 = PnSC	(Pump No.n Star Contactor DI)
C3 = PnSTR↑	(Rising Edge Pump No.n Start Request Flag)
C4 = PnSTRT	(Pump No.n Transformer Contactor DI)
C5 = PnTIME	(Pump No.n Sequence Timer Expired)
C6 = PnRUN	(Pump No.n Line Contactor DI)
C7 = PnSC↑	(Rising Edge of Pump No.n Star Contactor DI)
C8 = PnSC↓	(Falling Edge of Pump No.n Star Contactor DI)



### 3.1.16 PUMP DUTY SELECTION

#### 3.1.16.1 *Functional Description*

The main pumps operate on a duty/standby configuration whereby one pump is designated the duty, the second pump the standby. A pump duty/standby change will occur if the duty pump becomes unavailable for RTU control or when the duty pump stops. The pump duty/standby change will occur regardless of the station local/remote (LOCREM) switch.

#### 3.1.16.2 *Control Algorithm*

The selection of the duty pump will be based on the following algorithm:-

S0: Pump No.1 Duty	(P1DUTY active, P2DUTY inactive)
S1: Pump No.2 Duty	(P1DUTY inactive, P2DUTY active)
S2: No Duty	(P1DUTY inactive, P2DUTY inactive RTU startup only)

case PS of

S0: if C4 and ((not C3) or (C5 and C7) then PS:= S1;

S1: if C3 and ((not C4) or (C6 and C7) then PS:= S0;

S2: if C3 then PS:= S0;

else if (not C3) and C4 then PS:= S1;

end;

The conditions are defined below.

C1 = DUTYP1	(Pump No.1 Duty)
C2 = DUTYP2	(Pump No.2 Duty)
C3 = P1AV	(Pump No.1 Available)
C4 = P2AV	(Pump No.2 Available)
C5 = P1RUN↓	(Falling Edge of Pump No.1 Running)
C6 = P2RUN↓	(Falling Edge of Pump No.2 Running)
C7 = DtyLok	(Duty Lock Flag)



## 3.2 Pump Station Auxiliary Equipment Operation

### 3.2.1 WASHDOWN CYCLE

#### 3.2.1.1 *Functional Description*

The washdown cycle is used to reduce odours within the Grey St pump station. The Water Spray Valve Open (WSSVO) Digital Output controls the Water Spray Solenoid valve. A washdown cycle will consist of enabling the WSSVO digital output for 60 seconds. Under normal operation i.e. no main pumps operating, sump pump cycling only, the washdown cycle will commence every Wednesday Morning at 10.00AM. The washdown cycle will also commence following the operation of the Victoria Bridge rising main drain down valve and the first occurrence of the sump pump stop signal.

#### 3.2.1.2 *Control Algorithm*

The operation of the washdown cycle will be based on the following algorithm:-

S0: Stop Washdown Cycle	(Open WSSVO)
S1: Start Washdown Cycle	(Close WSSVO, Start WSSVOT Timer)

case PS of

S0: if (C2 and C3) or (C4 and C5 and C6) then PS:= S1;

S1: if C1 then PS:= S0;

end;

The conditions are defined below.

C1 = WSSVOT	(WSSVOT Timer Expired)
C2 = DVCC↓	(Falling Edge of DVCC)
C3 = SPRUN↓	(First Instance of Sump Pump Stopped)
C4 = (DAY = "WED")	(Current Day is Wednesday)
C5 = (HOUR = 10)↑	(First occurrence of the 10th hour, i.e. 10.00AM)
C6 = LOCREM	(Station in Remote)



### 3.2.2 KNIFE GATE VALVE OPERATION

#### 3.2.2.1 *Functional Description*

The inlet knife gate valve will operate under manual control only from the Inlet Knife Gate Valve Close Command (IKVCC) Digital Input. When the IKVCC digital input is high the Inlet Knife Gate Solenoid Valve Open (KSVO) digital output will be disabled, the Inlet Knife Gate Solenoid Valve Closed (KSVC) digital output will be enabled and the Inlet Knife Gate Valve Open Lamp (IKVLED) digital output will be disabled. When the IKVCC digital input is disabled the KSVO and IKVLED digital outputs will be enabled and the KSVC digital output will be disabled. The inlet knife gate valve will operate independently of the pumps and other auxiliary equipment within the pump station.

#### 3.2.2.2 *Control Algorithm*

The operation of the inlet knife gate valve will be based on the following algorithm:-

S0: Close Knife Gate Valve

(Open KSVO and IKVLED,  
Close KSVC)

S1: Open Knife Gate Valve

(Close KSVO and IKVLED,  
Open KSVC)

case PS of

S0: if not C1 then PS:= S1;

S1: if C1 then PS:= S0;

end;

The conditions are defined below.

C1 = IKVCC

(IKVCC Input Enabled)

### 3.2.3 DRAIN DOWN VALVE CONTROL AND ALARMS

#### 3.2.3.1 *Functional Description*

The Victoria Bridge rising main drain down valve will operate automatically under storm flow conditions within the Grey St pump station as described in Section 3.11 Pump Station Control (DVCC). The purpose of the drain down valve is to drain the rising main back into the pump station to avoid sewage fermenting following storm flow periods. Under normal flows the drain down valve will be open i.e. the rising main will be drained. Whenever the main pumps are operating the drain down valve will be closed, i.e. prevent rising main drainage.

Once the drain down valve is requested to operate, a fail to operate timer will be started and the appropriate limit switch monitored for correct operation within time. Two alarms will be generated for incorrect drain down valve operation i.e. drain down valve fail to fully close and drain down valve fail to fully open alarms (DVFFC, DVFFO). The DVFFC or DVFFO alarms will be unlatched if any of the following two conditions are true:

1. Any local reset button is pressed (i.e. P1LOCR DI active or P2LOCR DI active or SPLOCR DI active).

or

2. A reset from the Newstead computer (DVRset) occurs.

The generation of drain down valve alarms will not prevent the RTU from attempting to control the drain down valve in any way. The alarms are generated purely from a maintenance viewpoint.

#### 3.2.3.2 *Control Algorithm*

The operation of the inlet knife gate valve will be based on the following algorithm:-

S0: Close Drain down valve	(Reset DSV0, Set DSVC, Set DVFFCT timer)
S1: Open Drain down valve	(Set DSV0, Reset DSVC, Set DVFFOT timer)
S2: Set DVFFC	(drain down valve fail to fully close alarm)
S3: Set DVFFO	(drain down valve fail to full open alarm)
S4: Reset DVFFC, DVFFO	

case PS of

```

S0: if not C3 then PS:= S1;
    else if C4 then PS:= S2;
S1: if C3 then PS:= S0;
    else if C5 then PS:= S3;
S2: if C6 or C7 or C8 or C9 or C10 then PS:= S4;
    else if not C3 then PS:= S1;
S3: if C6 or C7 or C8 or C9 or C10 then PS:= S4;
    else if C3 then PS:= S0;
S4: if C3 then PS:= S0;
    else if not C3 then PS:= S1;
    
```

end;



The conditions are defined below.

C1 = DVFO	(drain down valve fully open)
C2 = DVFC	(drain down valve fully closed)
C3 = DVCC	(drain down valve close command)
C4 = DVFFCT	(drain down valve fail to fully close timer expired)
C5 = DVFFOT	(drain down valve fail to fully open timer expired)
C6 = LOCREM	(Station in Remote)
C7 = P1PB	(Pump 1 PB Pressed)
C8 = P2PB	(Pump 2 PB Pressed)
C9 = SPPB	(Sump Pump PB Pressed)
C10 = DVRset	(Operator drain down valve reset)

### 3.2.4 CATHODIC PROTECTION

#### 3.2.4.1 Functional Description

The Cathodic Protection control routines will not be included within the initial installation of the Grey St pump station RTU. They will be added to the program at a later stage.



### 3.3 RTU Power-UP Control

Initially after power up the RTU shall perform the following control.

1. Make pump no.1 duty;
2. Inhibit all transmissions for five seconds;

### 3.4 RTU Generated Alarms

The following events will be generated by the RTU and sent back to Newstead SCADA system.

#### Alarm Description

#### Alarm Point

Pump No.1 Power Off Flag	P1PWRL
Pump No.1 Thermal Overload Fault Flag	P1TOLL
Pump No.1 Emergency Stop Fault Flag	P1EMSL
Pump No.1 Thermistor Fault Flag	P1THRL
Pump No.1 Autotransformer Fault Flag	P1ATOL
Pump No.1 Failure Fault Flag	P1FAIL
Pump No.1 Running Flag	P1RUNF
Pump No.1 Thermal Overload Fault Auto Reset Flag	P1TOAR
Pump No.1 Thermal Overload Fault Count Exceeded Flag	P1TOFC
Pump No.1 Thermistor Fault Count Exceeded Flag	P1THFC
Pump No.1 Autotransformer Fault Count-Exceeded Flag	P1ATFC
Pump No.1 Thermistor Fault Auto Reset Flag	P1THAR
Pump No.1 Autotransformer Fault Auto Reset Flag	P1ATAR
Pump No.1 kW Signal Invalid Flag	P1kWl
Pump No.1 Amps Signal Invalid Flag	P1AmpI
Pump No.2 Power Off Flag	P2PWRL
Pump No.2 Thermal Overload Fault Flag	P2TOLL
Pump No.2 Emergency Stop Fault Flag	P2EMSL
Pump No.2 Thermistor Fault Flag	P2THRL
Pump No.2 Autotransformer Fault Flag	P2ATOL
Pump No.2 Failure Fault Flag	P2FAIL
Pump No.2 Running Flag	P2RUNF
Pump No.2 Thermal Overload Fault Auto Reset Flag	P2TOAR
Pump No.2 Thermal Overload Fault Count Exceeded Flag	P2TOFC
Pump No.2 Thermistor Fault Count Exceeded Flag	P2THFC
Pump No.2 Autotransformer Fault Count Exceeded Flag	P2ATFC
Pump No.2 Thermistor Fault Auto Reset Flag	P2THAR
Pump No.2 Autotransformer Fault Auto Reset Flag	P2ATAR
Pump No.2 kW Signal Invalid Flag	P2kWl
Pump No.2 Amps Signal Invalid Flag	P2AmpI





Site Power Fail Flag	SPFL
Station Surge Imminent Flag	SURCHL
Station in Local Flag	LOCL
Sump Pump Power Fail	SPPWRL
Sump Pump Fail	SPFAIL
Sump Pump Emergency Stop Latch	SPEMSL
Drain Down Valve Fail to Fully Close	DVFFC
Drain Down Valve Fail to Fully Open	DVFFO
Wet Well Level Invalid Flag	WWLEVI
Delivery Pressure Invalid Flag	PresI
RTU I/O Module Failure Flag	I/OFal
RTU AC Failure Flag	ACFail
RTU Battery Failure Flag	Batery

### 3.5 RTU Communications

The RTU shall initiate a communication to the Newstead SCADA system upon the detection of the following conditions.

1. A change of state of any digital input or specified internal flags;
2. A percentage change in wet well level defined as follows:

All pumps stopped - +2% change in level.

Any pump running - -10% change in level.

Sump Pump running - -5% change in level

For each RTU-Newstead communication the status of the entire site shall be sent. The format of the reply message is defined below.

TxBuf,0	Bit 15	Pump No.1 Power Off Flag
	Bit 14	Pump No.1 Thermal Overload Fault Flag
	Bit 13	Pump No.1 Emergency Stop Fault Flag
	Bit 12	Pump No.1 Thermistor Fault Flag
	Bit 11	Pump No.1 Autotransformer Fault Flag
	Bit 10	Pump No.1 Failure Fault Flag
	Bit 9	Pump No.1 Running Flag
	Bit 8	Pump No.1 Thermal Overload Fault Auto Reset Flag
	Bit 7	Pump No.1 Thermal Overload Fault Count Exceeded Flag
	Bit 6	Pump No.1 Thermistor Fault Count Exceeded Flag
	Bit 5	Pump No.1 Autotransformer Fault Count Exceeded Flag
	Bit 4	Pump No.1 Thermistor Fault Auto Reset Flag
	Bit 3	Pump No.1 Autotransformer Fault Auto Reset Flag
	Bit 2	Pump No.1 kW Signal Invalid Flag
	Bit 1	Pump No.1 Amps Signal Invalid Flag
	Bit 0	Spare



<b>TxBuf,1</b>	<b>Bit 15</b>	<b>Pump No.2 Power Off Flag</b>
	<b>Bit 14</b>	<b>Pump No.2 Thermal Overload Fault Flag</b>
	<b>Bit 13</b>	<b>Pump No.2 Emergency Stop Fault Flag</b>
	<b>Bit 12</b>	<b>Pump No.2 Thermistor Fault Flag</b>
	<b>Bit 11</b>	<b>Pump No.2 Autotransformer Fault Flag</b>
	<b>Bit 10</b>	<b>Pump No.2 Failure Fault Flag</b>
	<b>Bit 9</b>	<b>Pump No.2 Running Flag</b>
	<b>Bit 8</b>	<b>Pump No.2 Thermal Overload Fault Auto Reset Flag</b>
	<b>Bit 7</b>	<b>Pump No.2 Thermal Overload Fault Count Exceeded Flag</b>
	<b>Bit 6</b>	<b>Pump No.2 Thermistor Fault Count Exceeded Flag</b>
	<b>Bit 5</b>	<b>Pump No.2 Autotransformer Fault Count Exceeded Flag</b>
	<b>Bit 4</b>	<b>Pump No.2 Thermistor Fault Auto Reset Flag</b>
	<b>Bit 3</b>	<b>Pump No.2 Autotransformer Fault Auto Reset Flag</b>
	<b>Bit 2</b>	<b>Pump No.2 kW Signal Invalid Flag</b>
	<b>Bit 1</b>	<b>Pump No.2 Amps Signal Invalid Flag</b>
	<b>Bit 0</b>	<b>Spare</b>

<b>TxBuf,2</b>	<b>Bit 15</b>	<b>Site Power Fail Flag</b>
	<b>Bit 14</b>	<b>Station Surcharge Imminent Flag</b>
	<b>Bit 13</b>	<b>Station in Local Flag</b>
	<b>Bit 12</b>	<b>Wet Well Level Invalid Flag</b>
	<b>Bit 11</b>	<b>Delivery Pressure Invalid Flag</b>
	<b>Bit 10</b>	<b>RTU I/O Module Failure Flag</b>
	<b>Bit 9</b>	<b>RTU AC Failure Flag</b>
	<b>Bit 8</b>	<b>RTU Battery Failure Flag</b>
	<b>Bit 7</b>	<b>Dump Valve Fully Closed Flag</b>
	<b>Bit 6</b>	<b>Dump Valve Fully Open Flag</b>
	<b>Bit 5</b>	<b>Dump Valve Fail to Fully Close Alarm</b>
	<b>Bit 4</b>	<b>Dump Valve Fail to Fully Open Alarm</b>
	<b>Bit 3</b>	<b>Sump Pump Emergency Stop Fault Flag</b>
	<b>Bit 2</b>	<b>Sump Pump Fail Fault Flag</b>
	<b>Bit 1</b>	<b>Sump Pump Power Off Flag</b>
	<b>Bit 0</b>	<b>Inlet Knife Gate Valve Close Command</b>

TxBuf,3	Wet Well Level
TxBuf,4	Delivery Pressure
TxBuf,5	Pump No.1 kWatts
TxBuf,6	Pump No.2 kWatts
TxBuf,7	Pump No.1 Amps
TxBuf,8	Pump No.2 Amps
TxBuf,9	RTU Temperature
TxBuf,10(11)	Volume Pumped
TxBuf,12(13)	Inflow
TxBuf,14	Sump Pump Minutes Run
TxBuf,15	Pump No.1 Minutes Run
TxBuf,16	Pump No.2 Minutes Run
TxBuf,17	Sump Pump Operations
TxBuf,18	Pump No.1 Operations
TxBuf,19	Pump No.2 Operations





### 3.6.2 INFLOW

#### 3.6.2.1 *Functional Description*

Inflow into the wet well will be calculated using the wet well level. From the wet well level and using provided constants, a storage value (in m<sup>3</sup>) for any wet well level can be determined. At constant specified periods an increase in storage capacity will be calculated for that period, and this increase will be converted to a litres per minute inflow value. This calculation will only occur when the pumps are not in operation. During times when a pump is operating, the inflow will be kept constant at the value prior to the pump operation.

#### 3.6.2.2 *Calculation Algorithm*

The calculation of wet well inflow will be based on the following calculation algorithm:-

if C1 and C2 and C3 then

```
{
    Head = Level% * K1;                (Head in Metres)
    StoNow = Head * K2;                (Storage in m3)
    InFlow = (StoNow - StoOld) * 1000 ; (InFlow in l/min)
    StoOld = StoNow;
}
```

The conditions are defined below.

C1 = P1RUN and P2RUN and SPRUN	(No Pumps Running)
C2 = INFTIM	(Inflow Timer Expired)
C3 = StpDly	(Stop Delay Timer Expired)

### 3.6.3 VOLUME PUMPED

#### 3.6.3.1 *Functional Description*

This calculation is performed to determine the volume pumped by the pump station. The volume pumped is calculated by determining the total flow into the wet well during pump operation and adding to this volume change in the wet well during this same period. This volume change is determined by storing the volume in the wet well when the duty pump starts (or standby pump if required) and subtracting the volume when the duty pump stops. These calculations shall be performed at the end of each pump cycle.

#### 3.6.3.2 *Calculation Algorithm*

The calculation of wet well inflow will be based on the following calculation algorithm:-

```
if (C1 and (not C2)) or (C3 and C4) then
{
    StrPSr = StoNow;
}
if (C1 and (not C2)) then
```



```
{
    IntPSr = TotInf;
}
if C5 and (not C2) then
{
    TotVol = TotVol + (TotInf - InfPSr) + (StoStr - StoNow);
}
```

The conditions are defined below.

- |                                   |   |
|-----------------------------------|---|
| C1 = (P1RUN or P2RUN or SPRUN)↑   | (Rising Edge of any Pump Running)                 |
| C2 = MidPls                       | (Midnight Pulse)                                  |
| C3 = (P1RUN or P2RUN or SPRUN)    | (Any Pump Running)                                |
| C4 = (StoNow > StrPSr)            | (Storage Level Now > Storage Level at Pump Start) |
| C5 = (P1RUN and P2RUN and SPRUN)↓ | (Falling Edge of No Pumps Running)                |



### 3.6.4 MOTOR POWER FILTERING

#### 3.6.4.1 *Functional Description*

Motor power kiloWatt signals for each pump are inputs to the RTU. Filtering of these signals shall occur prior to transmission to Newstead. This sampling will involve calculating a rolling average over 5 seconds at the maximum RTU sampling rate.

#### 3.6.4.2 *Calculation Algorithm*

The filtering of the kilowatt motor power signals will be based on the following algorithm :-

```

if (not 5 second) then
{
    PnKWTo = PnKW + PnKWTo;
    ScnCnt = ScnCnt + 1;
}

if (5 seconds) then
{
    PnKWFi = PnKWTo/ScnCnt;
    Reset ScnCnt;
    Reset PnKWTo;
}
    
```

### 3.6.5 PUMP OPERATIONS

#### 3.6.5.1 *Functional Description*

A value will kept for each pump on the number of pump starts that have occurred since midnight.

#### 3.6.5.2 *Calculation Algorithm*

The determination of the number of pump operations will be based on the following algorithm:-

```

if PnRUN↑ then PnOp = PnOp + 1;
    
```



### 3.6.6 PUMP MINUTES RUN

#### 3.6.6.1 *Functional Description*

A hours run counter shall be kept for both pumps that will be cleared at midnight. For every second that the pump is running a pumps seconds counter (PnSECS) counter will be incremented. When this counter reaches 60, a pumps minutes counter (PnMIN) will be incremented by one and the pump seconds counter will be cleared.

#### 3.6.6.2 *Calculation Algorithm*

The calculation of pump minutes run will be based on the following calculation algorithm:-

if second and PnRUN then PnSECS = PnSECS + 1;

if PnSECS = 60 then

```
{
    PnMin = PnMin + 1;
    PnSECS = 0;
}
```

end;

### 3.7 Event History

There are two (2) tables, each consisting of 230 rows, which make up the event history tables. The maximum number of recorded events is  $2 \times 230 = 460$ . These tables are continuously overwritten so that only the last 460 events are recorded.

Upon updating the event history table the following information is stored the date, time, seconds, inflow, level and three (3) words consisting of 16 bits. The breakdown of these words are as follows.

Word = PnAF

Value

1	= Pump No.n Thermal Overload Fault Auto Reset Flag
2	= Pump No.n Running Flag
4	= Pump No.n Failure Fault Flag
8	= Pump No.n Autotransformer Fault Flag
16	= Pump No.n Thermistor Fault Flag
32	= Pump No.n Emergency Stop Fault Flag
64	= Pump No.n Thermal Overload Fault Flag
128	= Pump No.n Power Off Flag
256	= Spare
512	= Pump No.n Amps Signal Invalid Flag
1024	= Pump No.n kW Signal Invalid Flag
2048	= Pump No.n Autotransformer Fault Auto Reset Flag
4096	= Pump No.n Thermistor Fault Auto Reset Flag
8192	= Pump No.n Autotransformer Fault Count Exceeded Flag
16384	= Pump No.n Thermistor Fault Count Exceeded Flag
32768	= Pump No.n Thermal Overload Fault Count Exceeded Flag



Word = SAF1

Value

- 1 = RTU Battery Failure Flag
- 2 = RTU AC Failure Flag
- 4 = RTU I/O Module Failure Flag
- 8 = Delivery Pressure Invalid Flag
- 16 = Wet Well Level Invalid Flag
- 32 = Station in Local Flag
- 64 = Station Surge Imminent Flag
- 128 = Site Power Fail Flag
- 256 = Drain Valve Fully Closed
- 512 = Drain Valve Fully Open
- 1024 = Drain Valve fail to fully close
- 2048 = Drain Valve fail to fully open
- 4096 = Sump Pump Emergency Stop Pressed
- 8192 = Sump Pump Fail
- 16384 = Sump Pump Power Fail
- 32768 = Inlet Knife Gate Valve close command

Word = SAF2

Value

- 1 = Spare
- 2 = Spare
- 4 = Spare
- 8 = Spare
- 16 = Spare
- 32 = Spare
- 64 = Sump Pump Running
- 128 = Water Spray Solenoid Valve Operated
- 256 = Spare
- 512 = Spare
- 1024 = Spare
- 2048 = Spare
- 4096 = Spare
- 8192 = Spare
- 16384 = Spare
- 32768 = Spare

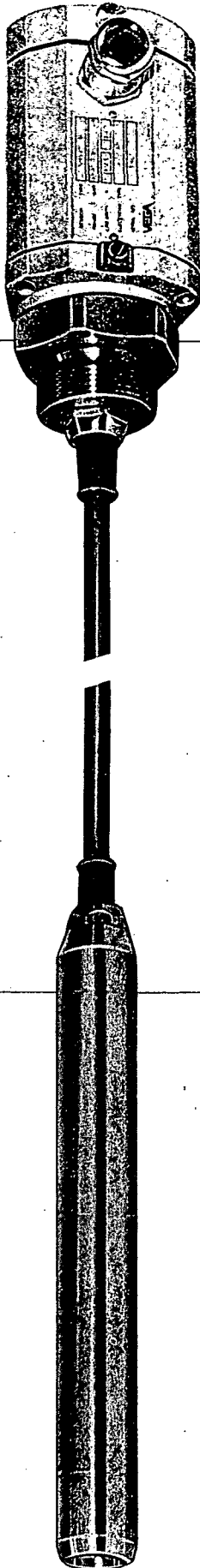




# VEGA

TIB • Technical Information • Operating instructions

**Pressure sensor type 131 ...**  
**type 136 ...**  
**type 137 ...**  
**type 138 ...**



02 MAR 1992

**Capacitive pressure sensors  
for continuous measurement  
of liquids**

Rugged construction  
High operational reliability  
Maintenancefree  
Simple installation



## Application

VEGA-pressure sensors are used in conjunction with remote evaluation instruments and are suitable for continuous level measurement or level detection. The rugged construction enables virtually all liquids and slurries to be measured e.g. water, sewage, sludge, grease, oil, chocolate, milk, beer etc. Special versions are available for chemically aggressive liquids or in hygienic construction for food industry applications.

## Configuration

The pressure sensor consists of:

- transducer
- cable, suspension hose or extension tube
- connection housing
- incorporated electronics in two or three-wire system

A measuring system in **two-wire system** consists of:

- a) pressure sensor
- b) oscillator type 127 W or type 127 WB (integrated lightning protection)
- c) evaluation instrument
  - for continuous measurement VEGAMET 407 AF or 507 F
  - for continuous measurement and level detection VEGAMET 510, 511 or VEGALOG 570
  - for level detection VEGATOR 425..., 524 or 525 F

A measuring system in **three-wire system** consists of:

- a) pressure sensor
- b) oscillator type 126
- c) evaluation instrument
  - for continuous measurement VEGAMET 319 B
  - for continuous measurement and level detection VEGAMET 320

## Function

The diaphragm transforms the hydrostatic pressure of the product into a mechanical movement (max. 0,3 mm).

This movement is transmitted via a plunger-type capacitor, the capacitance of which changes proportional to the pressure (level).

The incorporated oscillator transforms this capacitance change into a DC-signal.

The connected evaluation instrument converts this DC-signal into a 0 – 100 % indication or a level signal.

## Technical Data

Characteristics:

Fault in characteristics incl. hysteresis and reproducibility:

Longtime drift:

Average temperature influence over the whole temperature range related to 20°C/68°F:

Permissible material temperature:  
Permissible ambient temperature on the housing:  
Storage and transport temperature:  
Max. pressure load of the diaphragm:

Transducer:  
Diaphragm material:  
Extension tube 28x1,5

Protection class:

linear

≤ 0,5 % related to the adjusted measuring distance  
≤ 0,5 % related to the max. measuring distance for 3 months

≤ 1,5 %/100 K related to the max. measuring distance in standard version with oscillator type 127 W or 127 WB  
≤ 2,5 %/100 K related to the max. measuring distance for: Dr-version, or gold coated diaphragm; or oscillator type 126

–20 ... +80°C / –4 ... 175°F  
–20 ... +60°C / –4 ... 140°F  
–20 ... +80°C / –4 ... 176°F  
15 times related to the max. measuring distance, however max. 25 bar (355 psi)  
Stainless steel  
Duratherm 600 (special steel)  
Stainless steel, min. length 500 mm/1,6 ft.  
max. length 4000 mm/13 ft.

III

Measuring range type	max. measuring distance in bar/psi	min. measuring distance in bar/psi	Pressure sensor type						
			131 A	136 A	136 A DR 63	137 A	137 A DR 42	137 A DR 52	138 A
... 99	0 – 0,1/0 – 1,42	0,025/0,36	•						
... 00	0 – 0,2/0 – 2,84	0,05/0,71	•						
... 01	0 – 0,4/0 – 5,86	0,1/1,42	•	•	•	•	•	•	•
... 02	0 – 1,0/0 – 14,2	0,25/3,6	•	•	•	•	•	•	•
... 03	0 – 2,5/0 – 35,5	0,625/8,9	•	•	•	•	•	•	
... 04	0 – 5,0/0 – 71	1,25/17,8	•			•	•	•	
... 05	0 – 10/0 – 142	2,5/36				•	•	•	
... 06	0 – 16/0 – 227	4,0/56,8				•	•	•	
Oscillator type 126 (three-wire system)			•	•	•	•	•	•	•
or oscillator type 127 W (two-wire system)			•	•	•	•	•	•	•
or type 127 WB with integrated lightning protection			•	•	•	•	•	•	
Connection housing Al-anodized:				•	•		•		•
Protection: housing IP 54				•	•		•		•
Mounting boss 1 1/2" BSP				•			•		•
Flange DN 40 PN 16, material PP					•				
Extension tube made of stainless steel									•
Suspension hose made of PTFE (Teflon)				•	•				
Galvanized straining clamp for suspension			•			•		•	
Suspension cable plastic PE, fixed			•			•	•	•	
with PE-coating for aggressive products					•			•	
Gold coated diaphragm for aggressive products					•			•	
Plastic funnel to protect the diaphragm					•			•	
Weight approx.			2,5 kg	2,9 kg	3,2 kg	1,1 kg	2,7 kg	1,2kg	3,2 kg

### Special versions

Increased measuring accuracy	•	•	•	•	•	•	•
Increased protection, housing with fixed, connected PE-cable IP 67		•	•		•		•
with PE-coating for aggressive products	•	•		•	•		•
Gold coated measuring diaphragm for aggressive products	•	•		•	•		•
Plastic funnel to protect the diaphragm	•	•		•	•		•

# VEGA

## Versions

Type 131 A



Type 136 A



Type 136 A Dr 63



Type 137 A



Type 137 A Dr 42



Type 137 A Dr 52

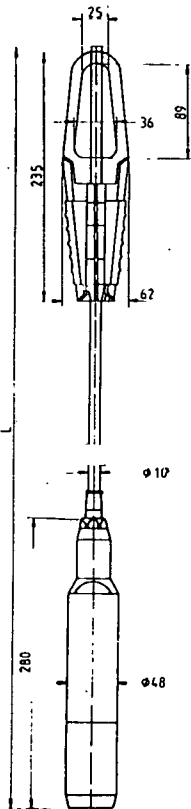


Type 138 A

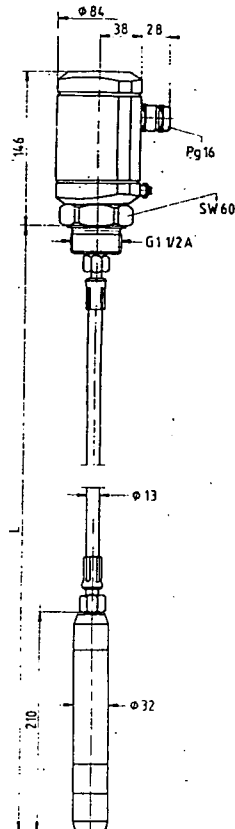


## Dimensional drawings

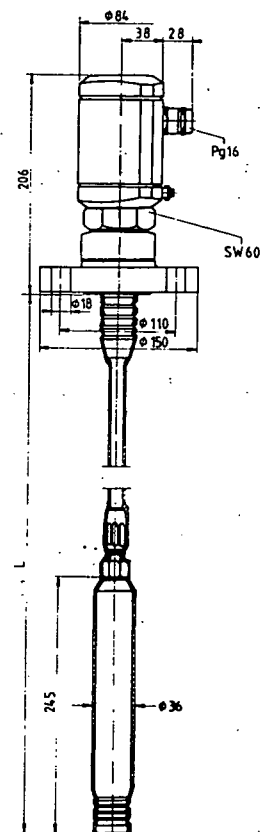
**Type 131 A**



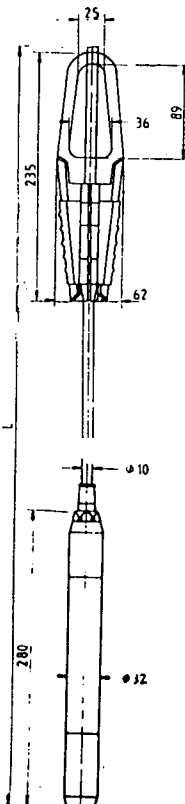
**Type 136 A**



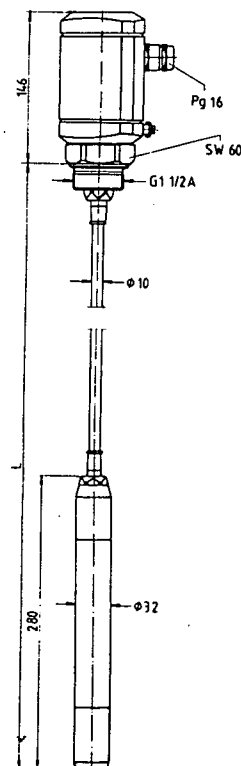
**Type 136 A Dr 63**



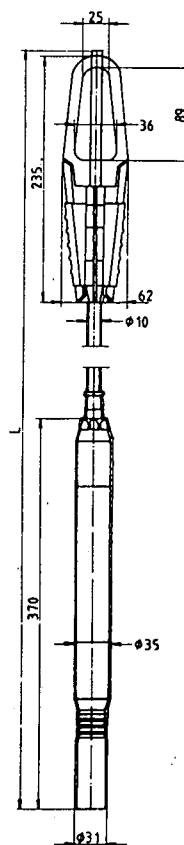
**Type 137 A**



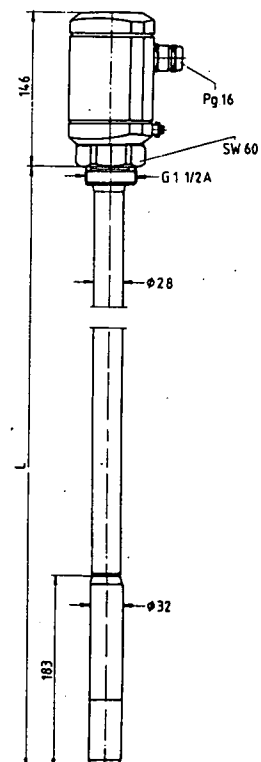
**Type 137 A Dr 42**



**Type 137 A Dr 52**



**Type 138 A**



## Installation instructions

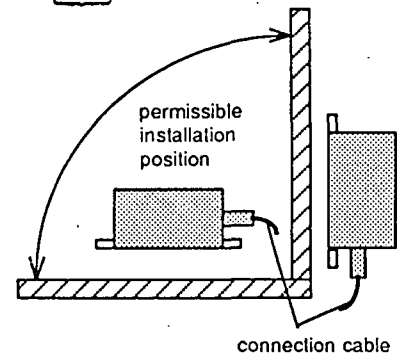
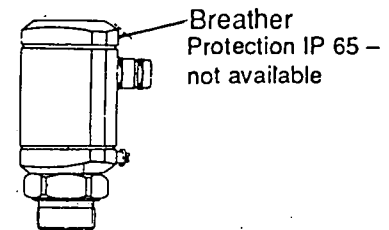
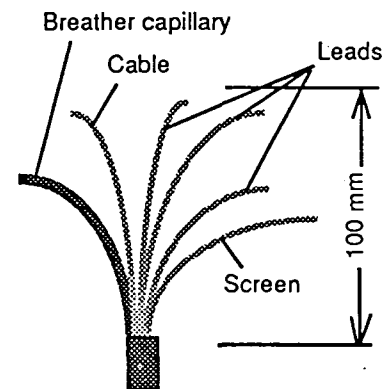
### • Examples

#### Attention!

All pressure sensors include a breather to allow an atmospheric pressure onto the backside of the diaphragm.

The following items should be observed when using pressure sensors with fixed connection cable.

- dismantle the cable (see drawing)
- the breather capillaries should be clean cut. The connection housing should be allowed to breathe to atmosphere.
- insert the cable into the connection housing acc. to drawing.
- on pressure sensors without fixed connection cable the breather is located in the cover of the housing.
- it should be observed that this opening is free.
- **Attention:** It is essential that the screening of the pressure sensor is earthed.

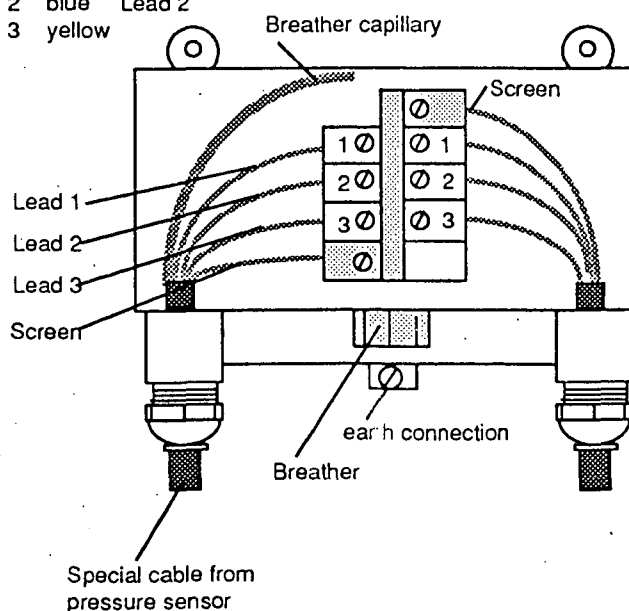


#### Attention:

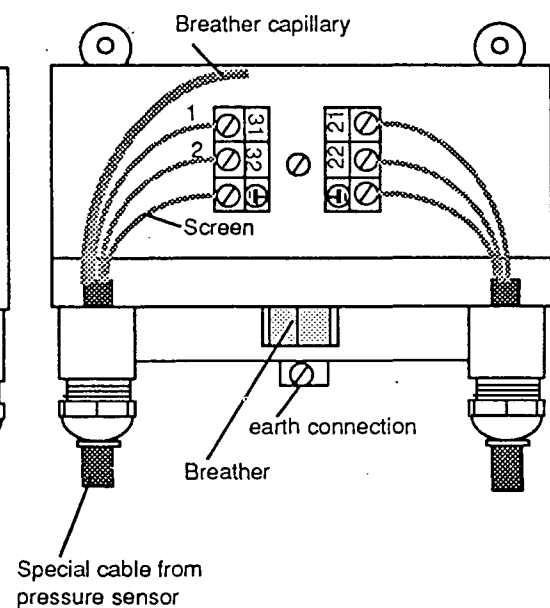
The connection housing should only be mounted in the positions indicated on the drawing, to avoid water ingress.

Lead colour for oscillator  
type 126 ... type 127...  
Lead 1 brown Lead 1  
Lead 2 blue Lead 2  
Lead 3 yellow

Connection housing  
with terminals



Connection housing  
with lightning protection



Attention: The screen connection is connected with the outer earth terminal on the connection housing.

## Start-up

The adjustment should be carried out acc. to the TIB (Technical Information/Operating Instructions) of the evaluation instrument used.

### Adjustment of the measuring range

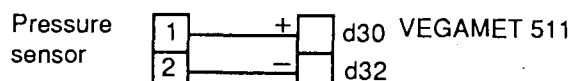
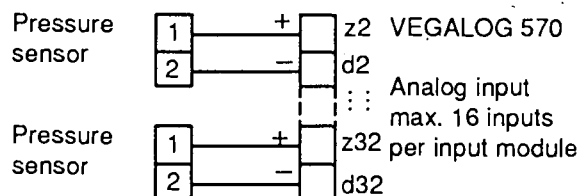
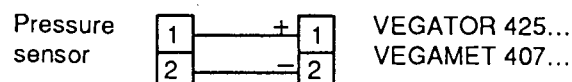
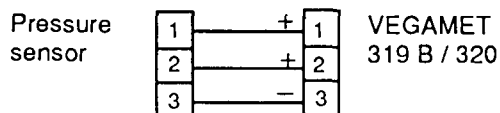
The measuring distance of the pressure sensor is adjusted on the evaluation instrument via the empty and full adjustment. The distance can be expanded in the ratio 1 : 1 to 4 : 1.

**Attention:** On pressure sensors with oscillator type 126 and evaluation instrument VEGAMET 319 B/320 the empty adjustment can be only carried out at 0 bar/psi.

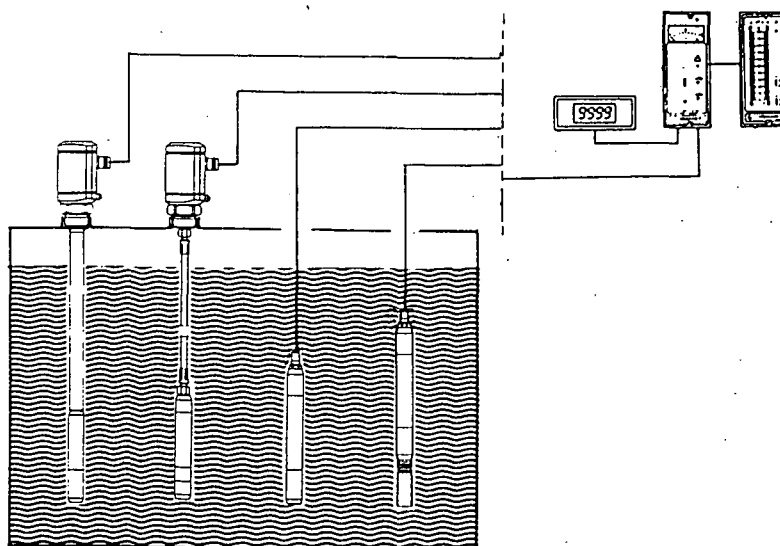
Example: Measuring range of the pressure sensor 0 ... 1 bar/0 ... 14,2 psi

Pressure at empty adjustment bar/psi	Indication on the evaluation instrument	Current at the output of the evaluation instrument	Pressure at full adjustment bar/psi	Indication on the evaluation instrument	Current at the output of the evaluation instrument
0	0 %	0/4 mA	1/14,2	100 %	20 mA
0	0 %	0/4 mA	0,25/3,6	100 %	20 mA
0,75/10,65	0 %	0/4 mA	1/14,2	100 %	20 mA
0,25/3,6	0 %	0/4 mA	0,75/10,65	100 %	20 mA

## Connection



## Examples





## Fault finding

### General test of the measuring system

**Attention:** In case of faulty indication, first check that the sensor is breathing to atmosphere.

- Check that the breather is clear on sensor housing.
- On pressure sensors with extension cables ensure capillaries and junction boxes are clear of obstruction.
- The reading on the remote amplifier should not change when the junction box or sensor housing is opened.

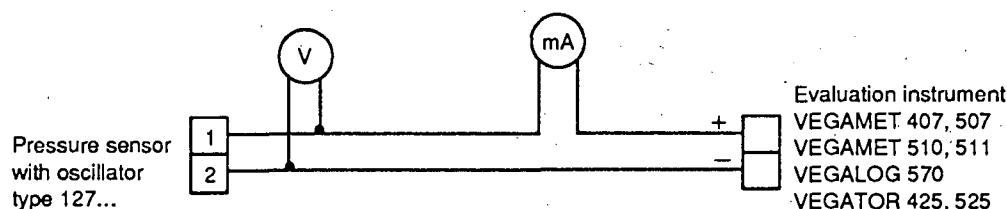
### Electrical test of the measuring system

**Attention!**

- When measuring systems in conjunction with lightning protection devices are used, they should be first checked on line break and short-circuit.

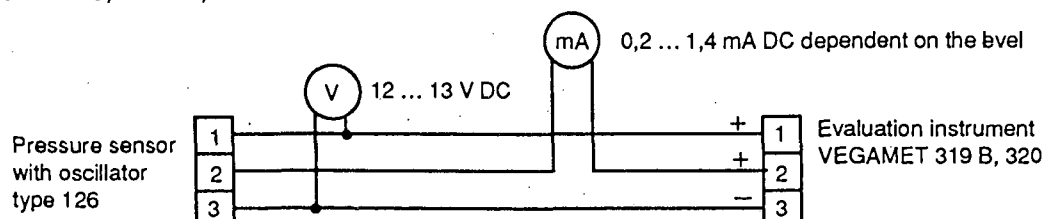
### Two-wire system

- Disconnect the pressure sensor from the evaluation instrument
- The supply voltage for the pressure sensor should be between 18 and 24 V DC from the evaluation instrument
- Connect the pressure sensor and measure the current  
the initial current should be approx. 4 mA when the diaphragm is covered  
4 ... 20 mA measurement is o.k. (current depends on the level)  
 < 4 mA oscillator defect  
 0 mA line break  
 > 20 mA oscillator, pressure sensor defect or short-circuit
- The supply voltage for the oscillator should be min. 12 V DC at max. measuring current on the pressure sensor



### Three-wire system

- The supply voltage from VEGAMET 319 B/320 should be 12 ... 13 V DC between terminal 3 (–) and terminal 1 (+)
- The line on terminal 2 transmits the measuring current. Depending on the level there should be a current of > 0,2 ... < 1,4 mA DC.

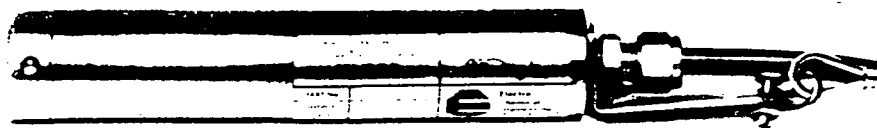
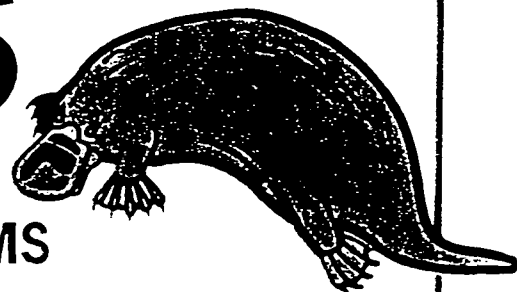


## Electronic level measurement

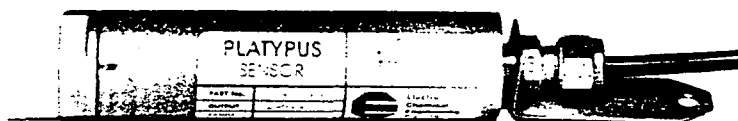


# PLATYPUS

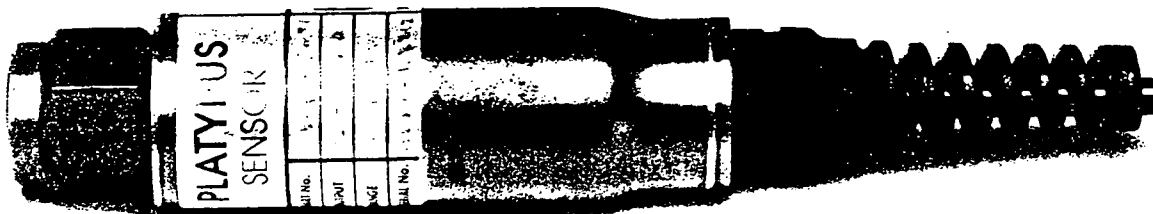
- LEVEL TRANSDUCER SYSTEMS
- PRESSURE TRANSMITTER SYSTEMS



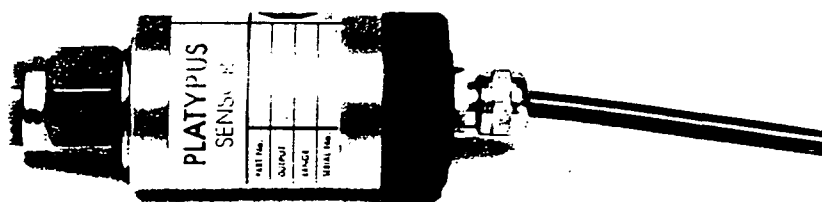
PLATYPUS I



PLATYPUS II



PLATYPUS III



PLATYPUS IV

## MAINTENANCE MANUAL

# **PLATYPUS MANUAL      VER. I, II, III & IV**

## **INSTALLATION**

The sensor is supplied fully assembled and is ready for installation. Sensors are matched and pre-calibrated with transmitters, if supplied, to the span specified, and should not require any adjustment. External transmitters are clearly marked with the sensor serial number to allow correct matching.

FOR THOSE WHO DON'T HAVE TIME TO READ INSTRUCTIONS.

## **DON'T!**

- ♦ PUSH ON SENSOR DIAPHRAGM TO TEST THE SYSTEM.
- ♦ SHOCK LOAD BY DROPPING SUBMERSIBLE INTO THE WATER, OR OPENING VALVES IN CLOSED SYSTEMS TOO QUICKLY.
- ♦ CONNECT UNREGULATED OR INCORRECT VOLTAGE POWER SUPPLIES.
- ♦ DISSASSEMBLE UNIT IN WARRANTY PERIOD.

## **DO!**

- ♦ CHECK LOOP INTEGRITY AND CURRENT AS SOON AS SENSOR IS INSTALLED CURRENT OUTPUT MUST CORRESPOND TO LEVEL.
- ♦ MAKE SURE VENT TUBE IS EXPOSED TO ATMOSPHERIC PRESSURE, BUT POSITIONED TO PREVENT INGRESS OF MOISTURE.
- ♦ REMOVE FROM SERVICE IMMEDIATELY A FAULT IS DETECTED.

**LIGHTNING PROTECTION** - Transmitters and sensors can be damaged by direct and indirect lightning strikes from power surges. If you are in a lightning prone area, fit suitable protection devices.

Four wire sensors cannot have protection fitted between the sensor and transmitter, although this section is fully isolated. Critic LSJK/3R/36 has been recommended for protection of 4-20mA loops.

Where it is necessary to have lightning protection devices fitted within the sensor, Platypus III or IV must be specified. These sensors have earth paths through the sensor body and conform to IEC-801-5.

## **CALIBRATION**

### **PLATYPUS I, II & III mV VERSIONS**

These devices are calibrated using zero & span potentiometers on the matching transmitter or indicator, or through menu driven software for microprocessor devices. Refer to the instrument calibration instructions. This procedure also applies to two wire sensors with remote power supplies which incorporate zero & span adjustments.

## **PLATYPUS II - INTERNAL TRANSMITTER**

When external calibration is not possible, the internal transmitter can be calibrated with zero & span potentiometers.

With PCB at the bottom, the RH Potentiometer is zero. This is conventional on Platypus II but works backwards on Platypus I. The span pot works conventionally or inversely depending on the span version.

By loosening the outer nut and unscrewing the swagelock fitting, the zero/span adjustments are accessed through the tapped hole in the housing. During re-assembly be very careful with sealing the thread and the olive. Use teflon tape or (preferably) a sealing grade of LOCTITE such as 567 and use a drop of penetrating grade such as LOCTITE 290 on the olive.

Do not over tighten the swagelock fitting or the venting passage will be constricted - replace fitting or olives if fitting has been overtightened.

When vented cables and conventional glands are fitted to Platypus II, these can be removed for calibration.

## **PLATYPUS IV - INTERNAL TRANSMITTER**

Access to zero & span adjustments is obtained by loosening the locking screw and releasing the end cap of the transmitter which is a "part turn" bayonet lock with 'O' ring sealing. Make sure the sealing area is perfectly clean and use Molycote 111 Silicon 'O' ring grease on re-assembly.

## **MAJOR CHANGES TO CALIBRATION**

**DIN RAIL TRANSMITTERS** - These can be recalibrated for large range changes by replacing resistors on the main PCB. Please contact us for details if you foresee a requirement for this.

**INTERNAL TRANSMITTERS** - These can be easily replaced. You need to specify the sensor serial number, type and required range when ordering a new PCB.

**MICROPROCESSOR DEVICES** - These can be re-calibrated in the field without restriction.

## **MAINTENANCE**

Sensors should be inspected annually for mechanical damage. If any parts are damaged, they should be replaced. Pay particular attention to cuts or wear on the cable outer sheath.

## **PROBLEMS IN SERVICE**

If the output is erratic at any time, the sensor should be removed from service immediately.

The most probable cause is condensation in the housing or tube. Drying the sensor and passing dry air through the tube should solve the problem. Replace the "O" rings and swagelock fitting on re-assembly and if in doubt, replace the nylon tube - all these are low cost items.

If excessive drift is noticed on a daily cycle, it is possible the venting of the sensor is obstructed. Remove the swagelock outer nut and check there is clearance between the nylon tube and the cable, under the olive.

If output is zero the most probable cause is electronic failure. The most common cause, is power surges caused by lightning. Electronics can be repaired or replaced at board level. Internal transmitters are inexpensive and would generally be replaced. (Platypus I & II only).

### **SENSOR FAILURE - PLATYPUS I & II**

Sensor can be replaced independent of the rest of the system if damaged by over-pressure or power surges (which can burn out the bridge connections). Sensors are tested by measuring voltages on output pins with 5V excitation on excitation pins (of the sensor). Voltages at zero pressure vary widely from -10mV to +10mV but are normally from -3mV to +2mV and will vary linearly with pressure. Output of Philips sensors is 25 mV at full pressure and 100 mV for the Novasensor. The bridge resistance and continuity can also be checked with a multi meter in the range 2Kohm to 6Kohm. If the sensor is damaged it must be replaced.

### **USE IN SEWERAGE SLUDGE**

We recommend Platypus II with a special nose assembly for use in sewerage. The nose is supplied without 1/2 BSP thread, and has only a shallow recess to avoid clogging. This gives no problems in service.

For Platypus III and IV, isolating diaphragms must be used. These are supplied as part of original equipment and cannot be removed or replaced without special tools.

When used in PUMP STATIONS we recommend using internal transmitters to avoid interference from the pump power cables and supply system.

### **INTERCHANGABILITY OF PARTS - PLATYPUS I & II**

Transmitters are different and cannot be interchanged - Platypus I is Voltage excitation and Platypus II is constant current excitation.

Housing bodies and cables are common to both types and sensors are exchanged by replacing the nose section of the housing only.

A small satchel of desiccant is included inside the housing of both types.

### **DISASSEMBLY AND ASSEMBLY**

#### **PLATYPUS I**

##### **Disassembly**

The Platypus I uses a Philips P13 sensor and is a No-Twist assembly. To disassemble, the body can be held in a vice and the gland and nose removed. Push the sensor out of the housing using a small diameter rod and minimum force. Be careful not to push on the sensor diaphragm from the front side. The sensor can be unsoldered from its wires or removed complete with its PCB (if fitted). The internal transmitter version must be fitted in a long body, whilst the 4 wire version may use either long or short body.

There are two versions only of internal transmitter, the low range, and the high range, covering spans of 0-10 and 0-25mV respectively from the sensor.

##### **Reassembly**

Reassembly is the reverse of this procedure. Make sure all components are clean, and wiring colour codes are adhered to. Use new "O" rings and Molybond 111 Silicon Grease on the sensor and include a new or reactivated satchel of desiccant inside the housing. Use heat-shrink to insulate all soldered joints and to insulate the top end of the PCB (note on disassembly).

Use Loctite 290 on the swagelock olive and Loctite 567 on the 1/4 BSP thread for sealing.

Do not overtighten the swagelock fitting - use a gauge to determine correct tightness and allow a maximum of 1/2 turn more - if fitting is not tight, replace the olive.

**Note:** If internal PCB is fitted, calibrate the system before the swagelock fitting is installed. (see CALIBRATION)

**CHECK** - THAT THERE IS 20Meg Ohms ISOLATION BETWEEN LEAD WIRES AND HOUSING BODY.

## **PLATYPUS II**

**NOTE:** THIS VERSION IS NOT A "NO-TWIST" ASSEMBLY - CARE MUST BE TAKEN TO OBSERVE THESE INSTRUCTIONS TO PREVENT BREAKING WIRES DURING ASSEMBLY OR DISASSEMBLY.

## **DISSASSEMBLY - ALL TYPES**

Before unscrewing the nose, which holds both the sensor and (if fitted), the transmitter board, the connection at the top end of the housing must be released.

- (a) for swagelock fittings, undo the outer nut and make sure the tube and wiring are free, but be careful not to pull on wiring.
- (b) for plug versions undo four screws and withdraw plug.
- (c) for gland versions release gland and save small ss breather tube.
- (d) for transmitter versions, unsolder the two fine wires from the main cable.

Unscrew the BODY while holding the NOSE stationary. This ensures that the wires attaching to the transmitter PCB or the sensor are not twisted. WITHDRAW the nose carefully from the body.

The sensor is disconnected by unsoldering the four wires after noting the colourcode vs position for each wire. The PCB has two wires soldered to fine wires attached to the main lead. Main lead color code is red/black combined +ve and green/white combined -ve for 2 wire versions.

The sensor can be removed from the nose by removing the brass spacer and blowing the sensor out using air. Attempting to pull or push the sensor could result in permanent damage. Do not use more than twice sensor rated pressure.

**REASSEMBLY** is the reverse of this procedure.

- (a) for PCB version apply a fillet of hot melt glue between the ribbon and the solder pads of the Novasensor (fig 1).
- (b) clean sensor and fit new "O" ring use silicon grease.
- (c) clean nose and push sensor into place using the brass spacer as a follower.
- (d) fit new "O" ring to nose outer groove (clean) using silicon grease.
- (e) attach wiring to sensor ribbon or for PCB attach ribbon to solder pads. Apply Dow Corning 3140RTV in limited quantity over the 4 solder pads and between the ribbon cable and PCB adjacent to the sensor.
- (f) for PCB version solder two small connecting wires to solder pads (observe polarity) and insulate this section with a suitable size of "heat-shrink".
- (g) include a small satchel of desiccant inside the housing, for ease of assembly of PCB versions the satchel can be secured to the PCB with teflon tape.
- (h) screw body onto nose **HOLDING NOSE STATIONARY**.
- (i) for sensor only version the swagelock fitting can now be tightened with a drop of Loctite 290 on the olive. For the transmitter version it can now be calibrated with access to

zero and span potentiometers from the top of the unit (remove swagelock fitting from 1/4 BSP in end of housing). Zero and span are not interactive. If span is grossly altered it will be necessary to alter range resistors on PCB. Use Loctite 567 sealing compound on 1/4 BSP thread on assembly.

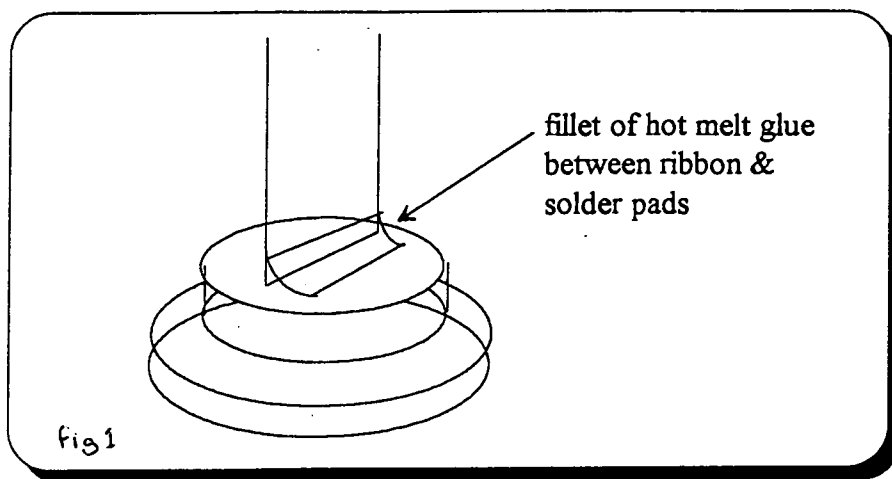
**CHECK - THAT THERE IS 20 MEG OHM ISOLATION BETWEEN LEAD WIRES AND HOUSING BODY.**

### **GENERAL COMMENTS ON NOVASENSOR VERSIONS**

The Novasensor is a lower cost sensor with a different physical arrangement. It has a 316 SS diaphragm and has a nominal output of 100 mV at 1mV excitation. Transmitter excitation is constant current so they are not interchangeable with Philips sensor versions. However, the nose assemblies complete are interchangeable with the long housings. There are only three different sensors and ranging is done in the transmitter electronics.

### **PLATYPUS III & IV**

These units are of welded construction and cannot be dismantled. The gland assemblies and cables are carried as spare parts so cables can be replaced or longer cables fitted. If the gland is removed, a new gland must be fitted on re-assembly



**CONNECTIONS - 2 WIRE VERSIONS****PLATYPUS I, II, III & IV****SENSOR COLOUR CODE**

CONNECTION	NYLON TUBE/4 CORE	VENTED 6 CORE
POSITIVE	RED & BLACK	RED, ORANGE, BLUE
NEGATIVE	GREEN & BLUE	*, YELLOW, WHITE

\*ON PLATYPUS III AND IV GREEN IS CONNECTED TO SENSOR BODY AND SHOULD BE EARTHED.

**COMMON INTERFACE DEVICES - TERMINAL NUMBERS SHOWN**

CONNECTIONS	SC 120	SI 130	PS 109	QUA 805	PM 4	RM 4
POSITIVE	8	8	10	10	F	3
NEGATIVE	10	10	9	12	11	7
					LINK D & 10	LINK 4 & 6

POWER SUPPLY VOLTAGE - 12-36V DC

OUTPUT CURRENT- 4-20 mA

**PLUG VERSION OF PLATYPUS I & II**

POSITIVE - PIN A

NEGATIVE- PIN D

**NOTE:** FOR CONNECTIONS OF PLATYPUS III & IV REFER TO HANDBOOK SUPPLIED WITH SENSORS.

## CONNECTIONS - 4 WIRE VERSIONS

### PLATYPUS I & II

#### SENSOR COLOUR CODE-

BLACK (BLUE)	-	EXCITATION POSITIVE
WHITE	-	EXCITATION NEGATIVE
RED	-	SIGNAL POSITIVE
GREEN	-	SIGNAL NEGATIVE

#### COMMON TRANSMITTERS - TERMINAL NUMBERS SHOWN

COLOUR	WT 227	WT 527	WT 127	PM 4-SG
BLACK (BLUE)	5	4	4	11
WHITE	6	7	5	8
RED	7	6	10	10
GREEN	8	5	9	9

EXCITATION VOLTAGE                      APPROX 5V

EXCITATION CURRENT                      APPROX 1mA

SIGNAL OUTPUT AT ZERO                      APPROX +/-3 mV

\*FOR CONNECTIONS TO SENSOR TO FULLY DISMANTLE/ASSEMBLE - SEE SENSOR DATA SHEET AND USE THE ABOVE COLOUR CODE.

\*FOR CONNECTIONS OF TRANSMITTER OUTPUT SEE INDIVIDUAL DATA SHEET OF DEVICE.



# TRANSIENT SAFETY BARRIERS LSAC

## Specifications

Maximum Line Current	4 Amps DC or AC RMS
Clamping Voltages (RMS)	Selection of 30, 75, 150, 275V AC In each of A-N, A-E, N-E
Earth Leakage Current	< 1mA max.
Installation	Hardwired
Protection Modes	Common and Transverse
Test Waveforms Withstood	ANSI C62.41-1980 Cat A and B
Terminals	Will accept 4mm <sup>2</sup> cables
Weight	Approx 250 grams
Dimensions	75mm(W)x105mm(H)x25mm(D)
Mounting	DIN rail or mounting screw
Housing Material	ABS

## Installation Guide

The LSAC is designed for DIN rail mounting. Install the LSAC near the equipment or sensors to be protected in series with the circuit. It is essential that LSAC Transient Barriers are earthed, preferably to the earth of the equipment or sensors being protected. The circuitry of the LSAC is symmetrical so that Active and Neutral are interchangeable.

## Ordering Information

Catalogue No.	Ordering Code	Max. Working Voltage		Clamp Voltage AC RMS	Maximum Surge Rating 8/20 pS	Maximum Energy Absorption 8/20 pS
		DC	AC RMS			
375155	LSAC4-30	30	24	30	1000A	4.4J
375165	LSAC4-75	75	60	75	4500A	38J
375175	LSAC4-150	150	130	150	4500A	65J
375185	LSAC4-275	275	254	275	4500A	100J

## Warranty

All Critec electronic products are guaranteed to perform the function as specified in our product bulletins for a period of one year from the date of shipment, provided they are installed in accordance with the manufacturer's recommendations. Units suspected of being defective should be returned prepaid to the factory. The manufacturer's liability is limited to the repair or replacement of the product (at the manufacturer's option) which in its judgement has not been abused, misused, or operated under conditions exceeding the manufacturer's specifications. Warranty is void if units are overhauled or repaired by other than Critec factory personnel. Critec is not responsible for consequential or implied damages. This warranty is in addition to any rights accruing under the Australian Trade Practices Act.

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Due to a policy on continuing product improvement, specifications are subject to change without notice.

### EXPORT BULLETIN

# CRITEC

Critec Pty Ltd, (Incorporated in Tasmania)  
Technopark, Dowsings Point, Tas 7010 Australia  
Postal: GPO Box 536 Hobart 7001 Australia  
Phone: 002 • 730066 Fax: 002 • 730399  
International Code: +6102 •

For additional information, please contact:

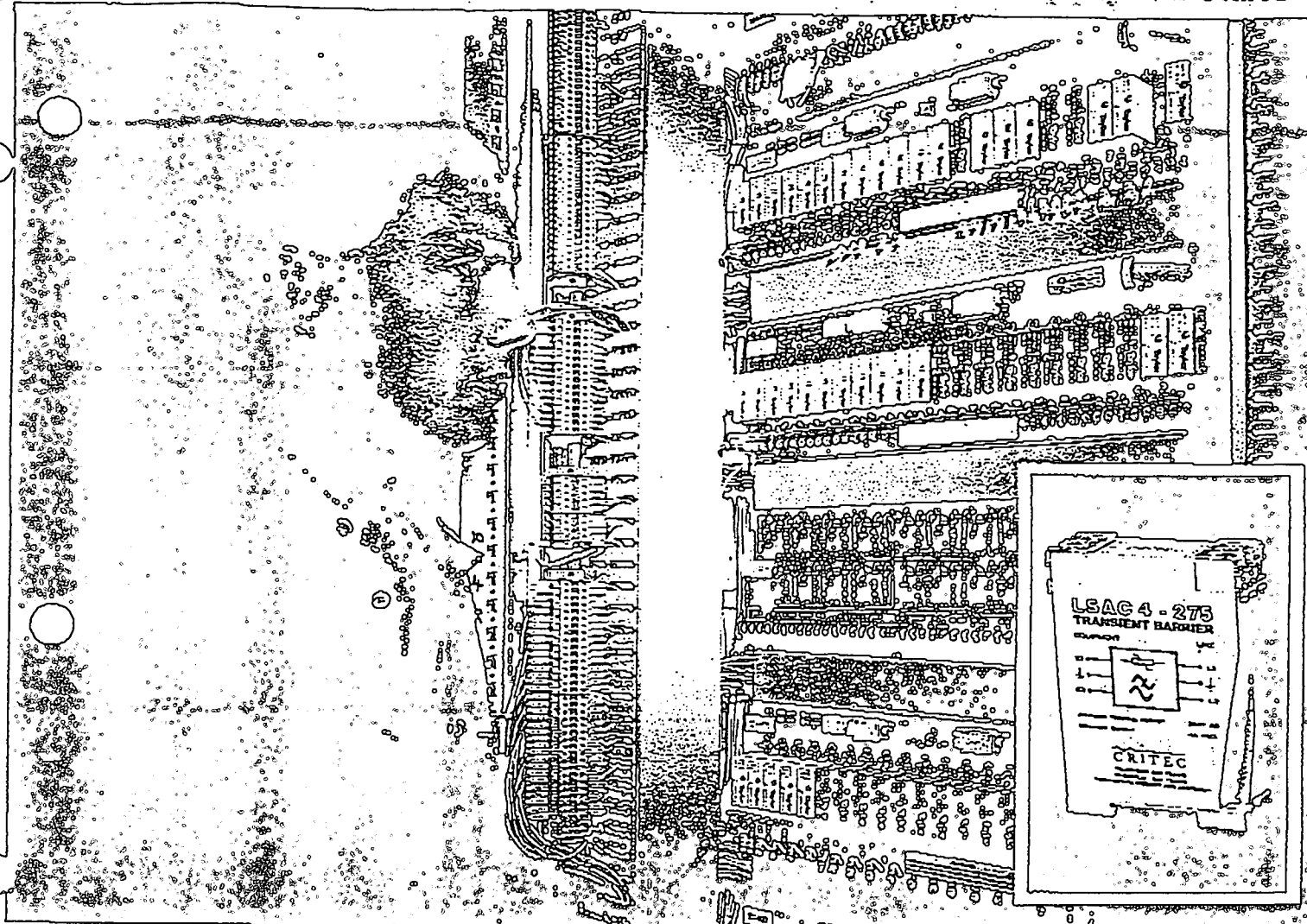


INDUSTRIAL ELECTRICAL & MATERIALS HANDLING

178 Wecker Road, Mansfield, Qld. 4122  
P.O. Box 6505, Upper Mt Gravatt, Qld. 4122

Phone (07) 849 5077 Faxstream (07) 849 7035

CRITEC, AUSTRALIAN DESIGNED AND MANUFACTURED PROTECTION FOR HOSTILE ENVIRONMENTS



# TRANSIENT SAFETY BARRIERS

LSAC

## Application

Protect your equipment from damaging transient voltages, increase safety and improve reliability with LSAC Transient Barriers.

LSAC Transient Barriers are designed for connection to AC or DC supply lines and signalling and control circuits of industrial control equipment such as programmable logic controllers (PLCs), monitors, solenoid drivers, PCs and other low power equipment. The LSAC Transient Barriers are a sister product range to Critec's LSJK family of transient barriers and provide higher voltage and current capability than the LSJKs used in conventional signalling line applications.

LSAC Transient Barriers comprise two stages of voltage clamping to attenuate overvoltage transients. The LSAC also contains a high performance low pass filter to remove noise and residual voltage spikes. The LSAC is effective on both transverse and common mode disturbances.

The LSAC is designed for conventional DIN rail mounting. Its electrical configuration is symmetrical and it may be used on balanced and unbalanced circuits, both AC and DC.

The user selects one of four models of LSAC based upon the working DC or AC RMS voltage of the circuit. Maximum current rating of the LSAC is 4 amps.

## Critec

Critec Pty Ltd is Australia's leader in transient protection. Whether danger arrives via power, data, or telephone lines, Critec engineers can draw on over 20 years experience to find the solution.

Critec products include:

- Surge Reduction Filters
- ▲
- Power Line Filters
- ▲
- Line Conditioners
- ▲
- UPS and SPS
- ▲
- Faxguard/Compuguard
- ▲
- Signal Line Transient Barriers
- ▲
- Intrinsically Safe Barriers
- ▲
- NEMP Filters
- ▲

C R I T E C

MTPB1.1

## Introduction to the Multi Trode System and the Multi-Sensored Probes

The Multi Trode liquid level system is a conductance activated control system, utilising the electrical conductivity of the liquid to carry a small current which activates the necessary controls.

The one-piece, multi-sensored probe unit is central and essential to the effectiveness of the Multi Trode system. The patented design probe provides ease of installation, simple adjustment, extreme versatility and freedom from the effects of fouling and turbulence.

Several devices such as pumps, alarms, valves and solenoids as well as telemetry and monitoring systems can be activated at different levels from one probe.

In situations having large differentials or small level increments, several probes can be configured to achieve the appropriate control over the entire range.

## Reliability and proven performance over a wide range of applications in several countries

Multi Trode probes have been operating effectively in aggressive liquids such as sewage and sludge since early 1980. Extensive trials and close monitoring by water and sewerage engineers have consistently endorsed the fact that Multi Trode saves money by providing many years of trouble-free operation in even the harshest environments.

Fundamental to the effectiveness of the Multi Trode system is the single piece, pressure-injected construction of the probe, making it totally impervious to the ingress of moisture. The sensing points are of AVESTA 254 SMO,\* a highly corrosion-resistant alloy.

Multi Trode Systems are operating effectively every day of every year in over 300 municipal shires in Australia, together with industry and water and sewerage plants in Canada, New Zealand and the U.S.A.

\* Probes are also available with HASTELLOY alloy C-276 Sensors.

## Specific benefits of the Multi-Sensored Probe

- Eliminates bubbler tube blockage, compressor failure and maintenance costs of bubbler systems.
- Eliminates ragging, rafting, tangling and fat build-up on mercury switches.
- Eliminates shorting, ragging, corrosion and electrolysis of fabricated probe systems.
- Enables reliable operation in areas of extreme turbulence.
- Enables reliable operation in fatty pits, even in extremely low temperatures such as those experienced in some areas of Canada.

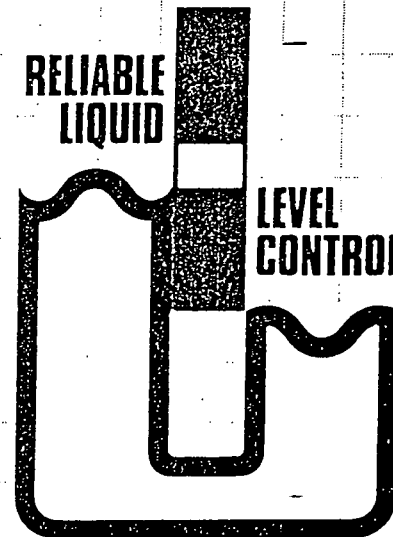
## User benefits of Multi Trode Probes over other forms of Level Control Equipment

- Installation of the Multi Trode system is quick, easy and can be achieved without entering the wet well. All brackets, screws and cleaning devices are supplied with each probe. Servicing does not require personnel to enter hazardous areas.
- Multi Trode provides real savings for pump station operators through low initial cost, low installed cost, low maintenance cost, no replacement parts requirement, commonality of componentry to minimise inventory and greatly reduced call-out costs.
- Operators will appreciate the easy selection of levels to accommodate varying demands by simple switching at cubicle without any need to enter pit.
- Multi Trode provides for multiple stop levels which if used can reduce water hammer problems associated with reflux valves.

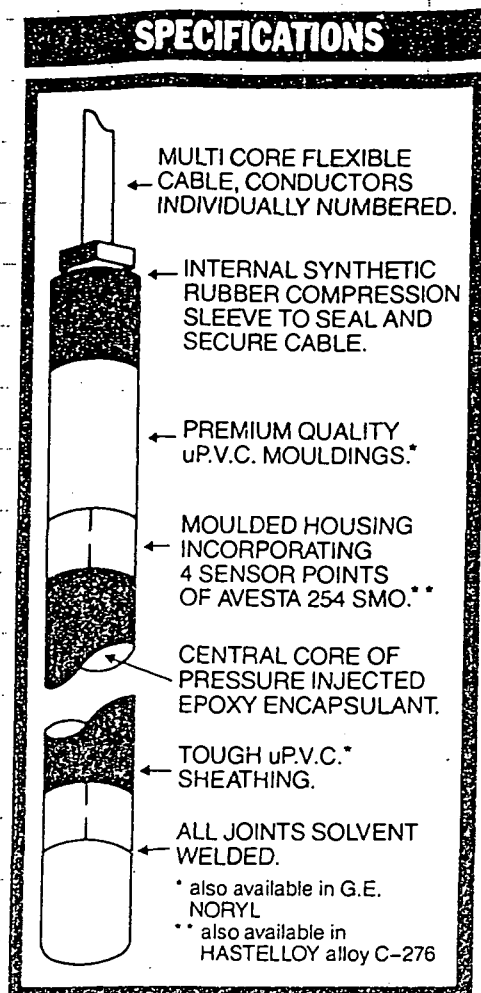
**MULTI TRODE™**  
LIQUID LEVEL SENSOR SYSTEM

RELIABLE  
LIQUID

LEVEL  
CONTROL



## SPECIFICATIONS



## Specifications and construction of Multi Trode Probes

The Multi Trode is a solid-cored, multiple-sensored, conductive liquid level detection probe used for activating pumps, alarms and other monitoring and control devices.

Materials used in its construction are of premium quality with exposed parts being either uP.V.C. or AVESTA 254 SMO stainless steel.\*

The highly corrosion-resistant sensor monitoring points are integrally moulded into uP.V.C.\* housings and located at equal spacings along the length of the probe. Sensor points are internally crimp-connected within the probe to individually numbered control cables which terminate at the control cubicle.

Designed to support the weight of the probe without any additional fixing requirement, the flexible cable is sealed and secured by a synthetic rubber compression fitting at the top of the probe.

To achieve complete sealing of the probe and its component parts, the unit is pressure injected with an epoxy encapsulant, ensuring that the probe is an homogeneous mass totally impervious to the ingress of moisture.

For dimensions and specifications of standard probes, refer to Table 1.

### \* HI-SPEC PROBES

Probes are available for operation in temperatures up to 140°C and for use in a broad range of corrosive liquids. These are manufactured using G.E. NORYL and HASTELLOY alloy C-276 Sensors.

### Two year warranty of Multi Trode probes

Multi Trode probes are subject to a two year warranty against defective workmanship provided probes are installed as per the procedures laid down by Multi Trode Control Systems Pty Ltd and are used in conjunction with an appropriate Multi Trode control device or an approved level control relay.

TABLE 1

	2.4/12	1.2/6	1.8/12	0.4/3	1.2/12	0.2/1
Model designation	2375 (93 1/2)	1180 (46 1/2)	1820 (71)	380 (15)	1275 (50)	175 (7)
Overall length mm (inches)	12	6	12	3	12	1
Number of sensing points	200 (7 7/8)	200 (7 7/8)	150 (5 15/16)	100 (3 15/16)	100 (3 15/16)	—
Sensor increments mm (inches)	2195 (86 1/2)	995 (39 1/4)	1640 (63 1/8)	200 (7 7/8)	1090 (43)	—
Standard cable lengths mm (ft)	34 (1 11/32)	34 (1 11/32)	34 (1 11/32)	34 (1 11/32)	34 (1 11/32)	34 (1 11/32)
Maximum differential mm (inches)	#1-12	#1-6	#1-12	#1-3	#1-12	—
Probe diameter mm (inches)	Avesta 254 SMO Stainless Steel					
Control cable #numerical	Epoxy resin encapsulant					
Sensor material	Top to bottom #1-12, #1-6, #1-3					
Core material	Purpose manufactured PVC/PVC insulated and sheathed, V75, 6 or 12 core, 0.75mm <sup>2</sup> (#18-19 AWG)					
Sensor numbering	4 x 40mm <sup>2</sup> (1/16") per level					
Cable type	90° (194°)					
Surface area of sensor mm <sup>2</sup> (inch <sup>2</sup> )	minus 10° (+14°)					
Max operating temp C (F)	7 (15.5)	4 (9)	6 (13)	3 (6.5)	5 (11)	1 (2.2)
Min operating temp C (F)	10 (22)	6 (13)	9 (20)	5 (11)	8 (17.5)	1.5 (3.0)
Weight packed kg (lbs)	13 (28.5)	8 (17.5)	12 (26)	7 (15.5)	11 (24)	2.0 (4.4)
for cable lengths:						
20 (66)						
30 (99)						

### INSTALLATION KIT SUPPLIED WITH PROBES

- 1 x Stainless Steel suspension hook —
- 1 x SS bracket with polyurethane wiper —
- 3 x SS 25mm (1") #8 fixing screws —
- 2 x nylon cable ties —
- 3 x PVC masonry plugs —
- cubicle identification label —
- installation instructions —
- wiring diagram —

Not supplied with 0.2/1 probes.

### MODEL DESIGNATION ORDERING INFORMATION

MUL X/X X M

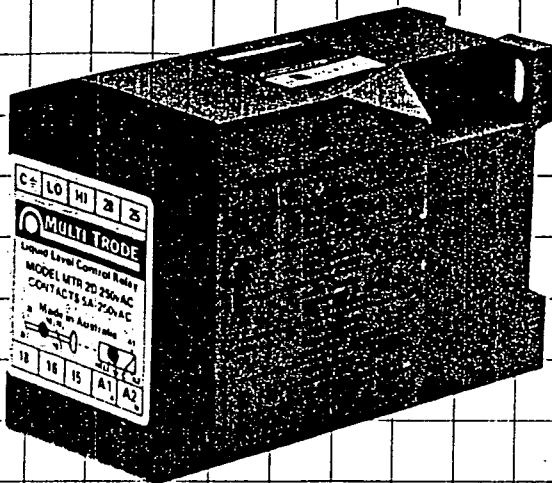
— cable length m (ft)  
— number of sensors  
— length of probe  
— probe series

# MULTI TRODE

LIQUID LEVEL SENSOR SYSTEM

Multi Trode Control Systems Pty. Ltd.  
13 Kenway Drive, Underwood Q 4119 AUSTRALIA  
P.O. BOX 35, Underwood Q 4119  
Phone: (07) 808 5422 Fax: (07) 808 0011

MTPB.2.1



### Many benefits available to users by the incorporation of variable mode switches unique to the MTR control relay

Multi Trode MTR control relays feature variable mode switches to enable users to operate the Multi Trode system in a broad range of applications.

- **CHARGING/DISCHARGING MODE**  
Enabling tanks to be filled or emptied by pumps or gravity.

- **HIGH/LOW SENSITIVITY**  
For operation in high or low conductivity liquids such as clear water through to acid solutions.

- **DELAY/INSTANT OPERATION MODE**  
Enables effective operation from still water through to areas of high wave action.

Timers for pump sequencing are unnecessary when relays are alternatively set on delay and instant settings.

### Introduction to the Multi Trode MTR single appliance control relay

The Multi Trode MTR Control Relay was specifically developed for use with the multi-sensored probe to active and deactivate a single appliance such as a pump, solenoid valve or alarm. The control relay with its internal latching mechanism maintains control through a given differential dependent on the sensor points selected at the multi-sensored probe.

The MTR control relay will function effectively in a wide range of conductive liquids, from clear water through to heavy sludge.

The Multi Trode MTR control relay together with the Multi Trode probe provide an effective, economical method of level control and monitoring for basic pump stations incorporating several pumps and alarms.

### Important time saving features of MTR control relays and Multi Trode probes during testing and commissioning

Simplified testing and commissioning procedures are possible when using MTR relays and multi-sensored probes.

The high intensity leds mounted on the face of the relay will verify the state of the specific appliance to be activated or deactivated as the probe is lifted through the liquid. The various relays will operate in sequence as the liquid makes contact or falls away from the corresponding sensors.

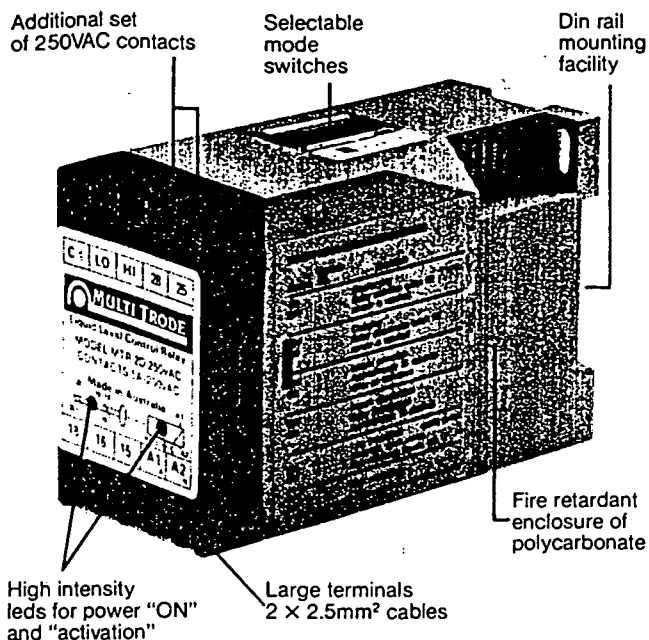
### Applications requiring the control of more than a single appliance

To take full advantage of the Multi Trode multi-sensored probe concept, several MTR control relays can be connected to the probe at various levels, providing a broad range of switching and differential options.

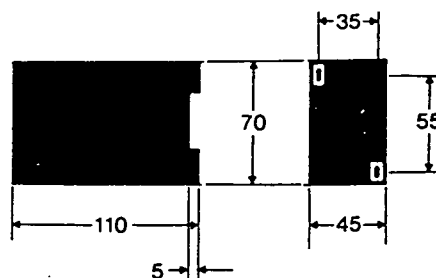
MTR control relays will perform effectively when connected in the following manner:

- Series of control relays each using separate sensors for activation and deactivation.
- Series of control relays using a common low sensor.
- Series of control relays using a common high sensor.
- Series of control relays using different stop sensor points.
- Low and high of separate control relays being connected to a single sensor, enabling activation and deactivation to occur at the one sensor.

## Specification of the MTR control relay



MTR DIMENSIONS — mm



MODEL DESIGNATION  
ORDERING INFORMATION

MTR	X	X
		Sensitivity D 100-20 (K ohms) G 15-3
		2 240 vAC 3 110 vAC 4 24 vDC 5 24 vDC 6 12 vDC
		Supply
		Series

### Method of operation

The Multi Trode MTR Control Relay is a conductive liquid level control device which when used with the Multi Trode multi-sensored probe, enables dual point activation/deactivation of pumps, alarms and other monitoring and control equipment.

The control relay functions by providing an extra low alternating current supply to the selected sensor on the probe, via the numbered probe cable. As the liquid makes contact with the appropriate sensor point on the probe, conductivity occurs as the leakage current circuit loop is completed to earth. The relay senses the conductivity and latches. This state is maintained until the circuit is broken when the liquid passes the selected stop sensor. The relay then resets for the next operation.

### MTR instantaneous or delay mode setting

In the DELAY HIGH MODE, the relay pauses for approximately 15 seconds after the liquid reaches the high sensor to activate/deactivate. In DELAY LOW MODE, the relay will wait 15 seconds before operating after the liquid falls beyond the low sensor to activate/deactivate. (Depending on mode selected — i.e. charging/discharging.)

The control relay is set at INSTANTANEOUS OPERATION MODE reduces the 15 second delay to approximately 500 milliseconds before activation/deactivation occurs after the liquid reaches the appropriate sensor.

### Operation of the MTR control relay set in charging mode

With the control relay switch set to CHARGING MODE ON, contacts #15 #16 changeover to #15 #18 when the liquid falls beyond the low sensor. Concurrently, a second set of electrically separate contacts #25 #28 close, enabling dual control or monitoring if required.

These two sets of contacts are maintained in this state until the liquid reaches the selected high sensor. Deactivation then occurs and the control relay resets to the original mode.

### Operation of the MTR controller set in the discharging mode

In the DISCHARGING MODE the relay activates when the high sensor is reached and contacts #15 #18 and #25 #28 close.

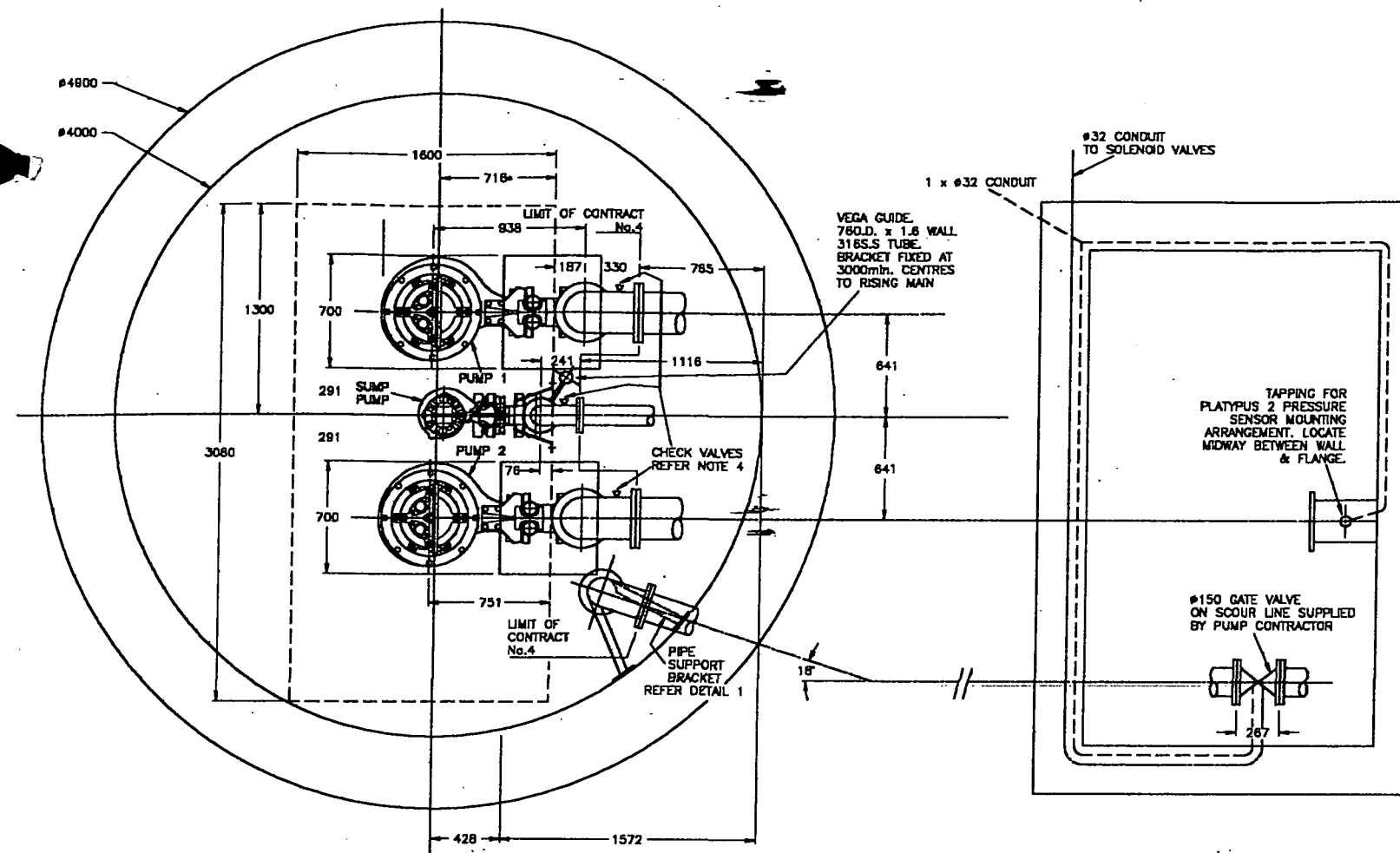
The relay remains in this latched state until the liquid falls beyond the low sensor, when resetting occurs. The liquid must then reach the high sensor to re-activate the control relay.

### Specifications

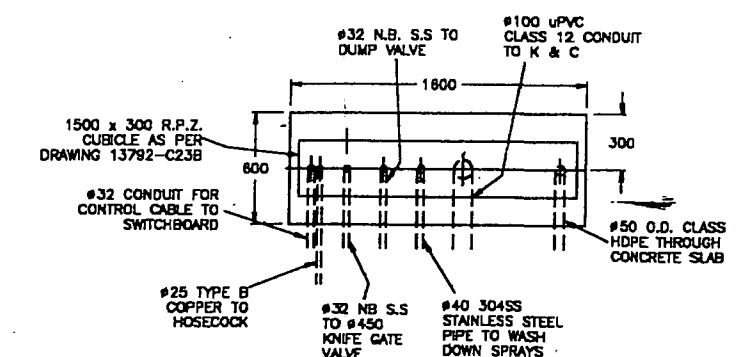
Sensor Voltage	24VAC Nominal (2.5mA)
Number of Outputs	2 sets, 1 no & 1 changeover
Contact Rating	5 amp 250VAC resistive
Contact Life	10 <sup>5</sup> operations
Supply Voltage (+ - 10%)	240, 110, 24VAC 50/60 Hz 24, 12VDC
Power Consumption	3VA (max)
Dimensions mm (inches)	H70 (2.75") x W45 (1.75") x D110 (4.3")
Terminal Size mm (inches)	2 x 2.5mm <sup>2</sup> (0.64" inch)
Display Leds	Green-power on, amber-activation
Enclosure type	Moulded polycarbonate
Mounting arrangement	Din rail or 2 x 4mm screws (3/16")
Sensitivity	Selectable via high/low switch
Standard Sensitives	100K ohms - 20K ohms, 15K ohms - 3K ohms
Other features	Charge/discharge switch Instantaneous/delay (15 sec approx.)
Working temperature C (F)	Minus 10°C (+14°F) plus 60°C (140°F)



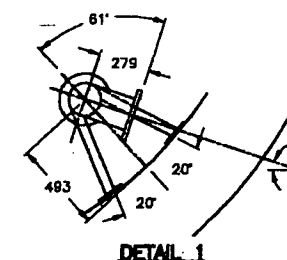
Multi Trode Manufactured and Marketed by  
Systems and Research Technologies Pty. Ltd.  
13 Kenway Dr. Underwood, Queensland, 4119. Australia.  
Ph. (07) 808 5422. Fax (07) 808 0011.  
Multi Trode products are covered by International patents  
and patent applications incl US Pat. No. 4,739,786.



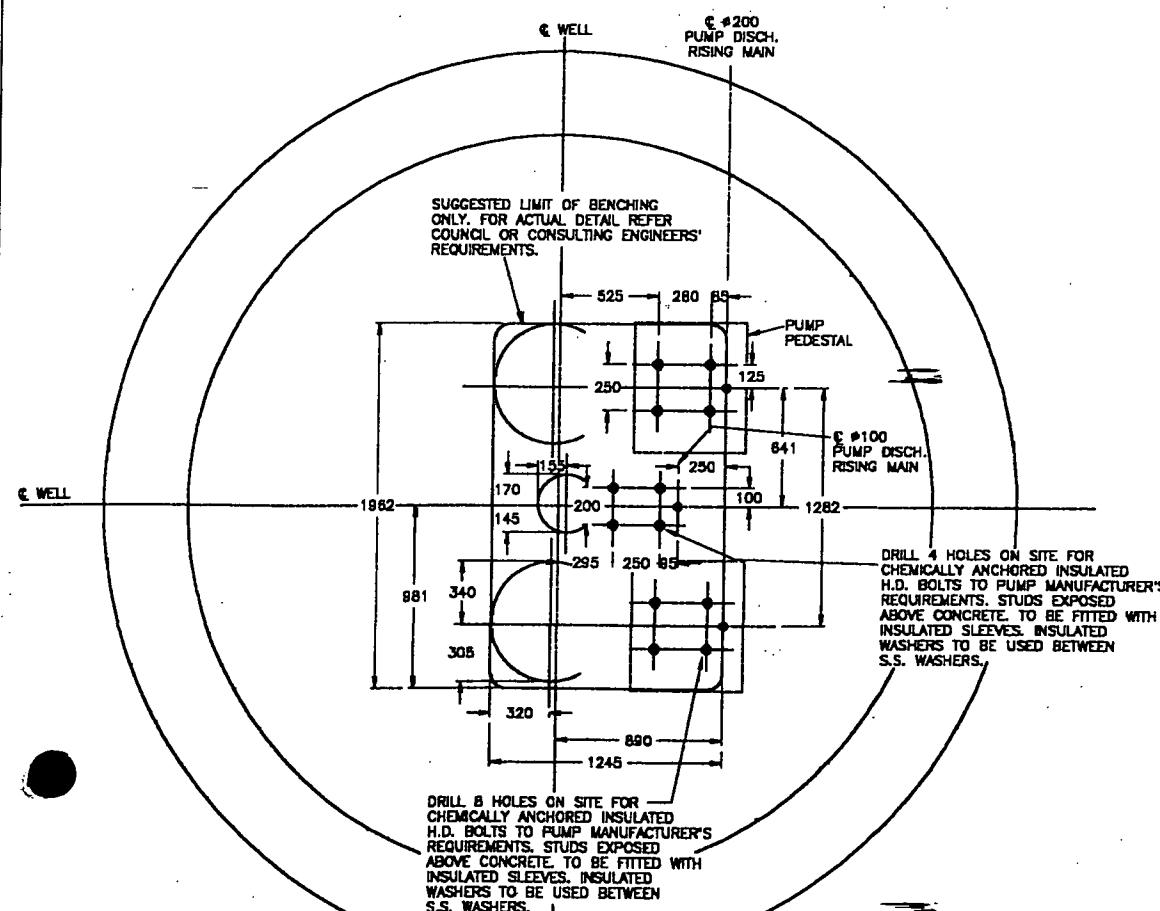
**PLAN**



R.P.Z. VALVE SLAB & CONDUIT DETAIL



**DETAIL:**



**FOUNDATION DETAIL**

ORIGINAL

## NOTES

1. PUMPS (1 & 2): FLYGT MODEL-  
CP3300.181 HT 462 54KW 4PL  
SUMP PUMP (3): FLYGT MODEL-  
CP3085.181 MT 432 2KW 4PL
2. \* CIVIL CONTRACTOR TO HOLD THIS DIMENSION
3. ALL CONDUITS BY OTHERS AS PER DRAWINGS  
13792-C188,C198,C20B,C23B. SWITCHBOARD  
PLINTH AS PER DRAWING 13792-C23B
4. CHECK VALVES (#25) SHALL BE FITTED AT  
TOP OF EACH EXTERNAL RISING MAIN  
ARRANGEMENT TO ACT AS AIR BLEED VALVES  
BY INSTALLING HORIZONTALLY IN TH REVERSE  
DIRECTION. THEY SHALL BE ROTATED SLIGHTLY  
FROM THE VERTICAL SUCH THAT THE VALVE  
SEAT IS PARTIALLY OPEN.

C	29-9-95	ADD BCC TITLE BLOCK	P.H.
B	11-7-95	AMEND POSITION OF SUMP PUMP, INCREASE WIDTH OF RPZ VALVE SLAB	P.H.
A	23-3-95	AMEND AS PER GHD REQUIREMENTS	P.H.
		DATED 3-3-95	
No	DATE	AMENDMENT	INITIALS

## AMENDMENT & ISSUE REGISTER

MANAGER	DIRECTOR OF PLANNING & DESIGN
DATE: ---	DATE:

DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:	DATE:	DATE:

DESIGN	P.H.	4-1-95	ENGINEER IN CHARGE
DRAWN	P.H.	4-1-95	SUPERVISING ENGINEER
TRACED			
CHECKED	T.W.J.	4-1-95	

JPR No.	DATE
CADD FILE No. BF5300X0	REFERENCES



**Brisbane City**

**BRISBANE  
CITY COUNCIL  
DEPARTMENT OF WATER  
SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES**

PROJECT

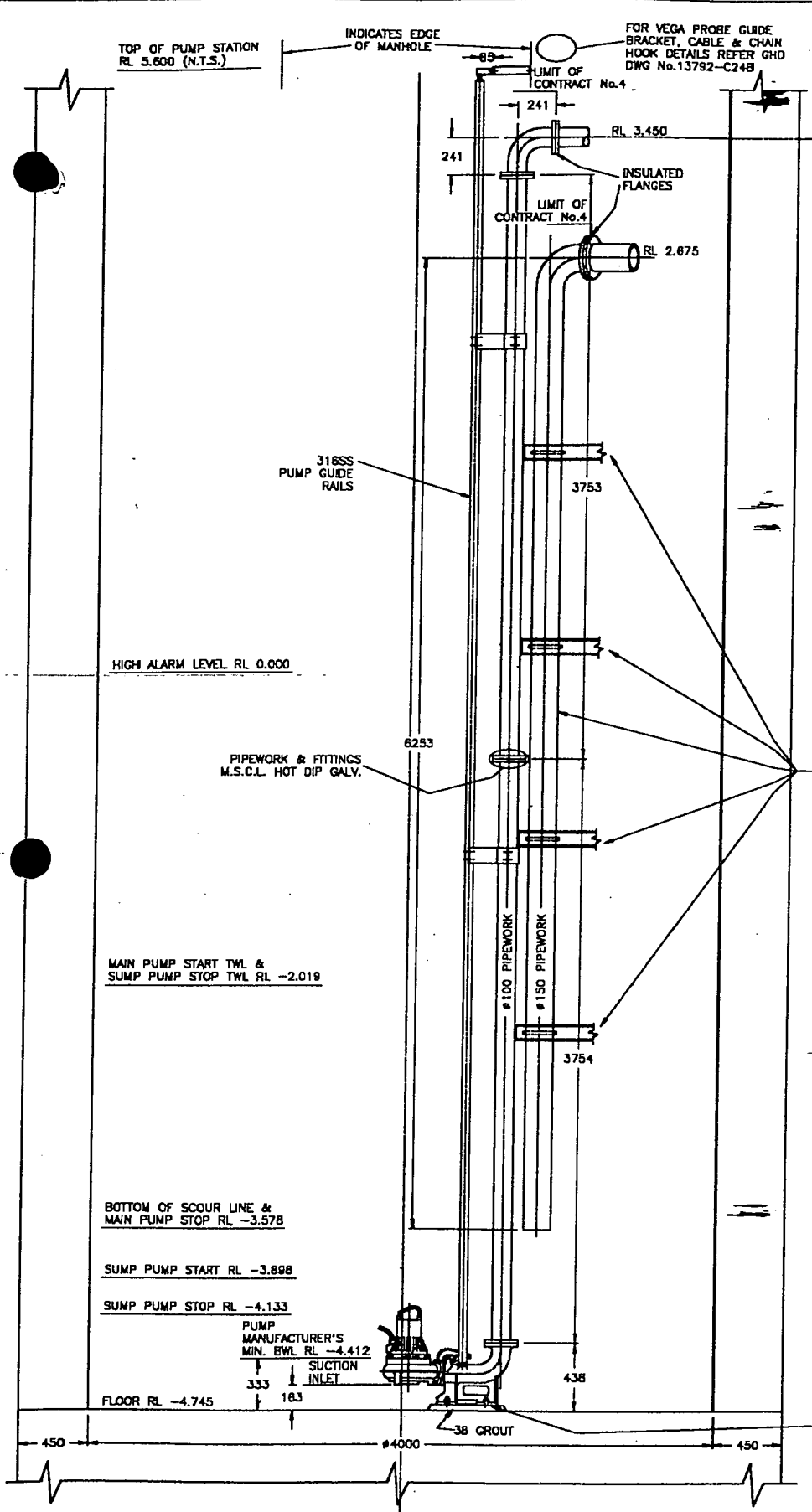
SOUTHBANK CORPORATION SEWERAGE  
PEAK FLOW BY-PASS PUMP STATION

TITLE WET WELL, VALVE PIT, &  
BACKFLOW PREVENTER  
PIPEWORK LAYOUT "AS CONSTRUCTED"

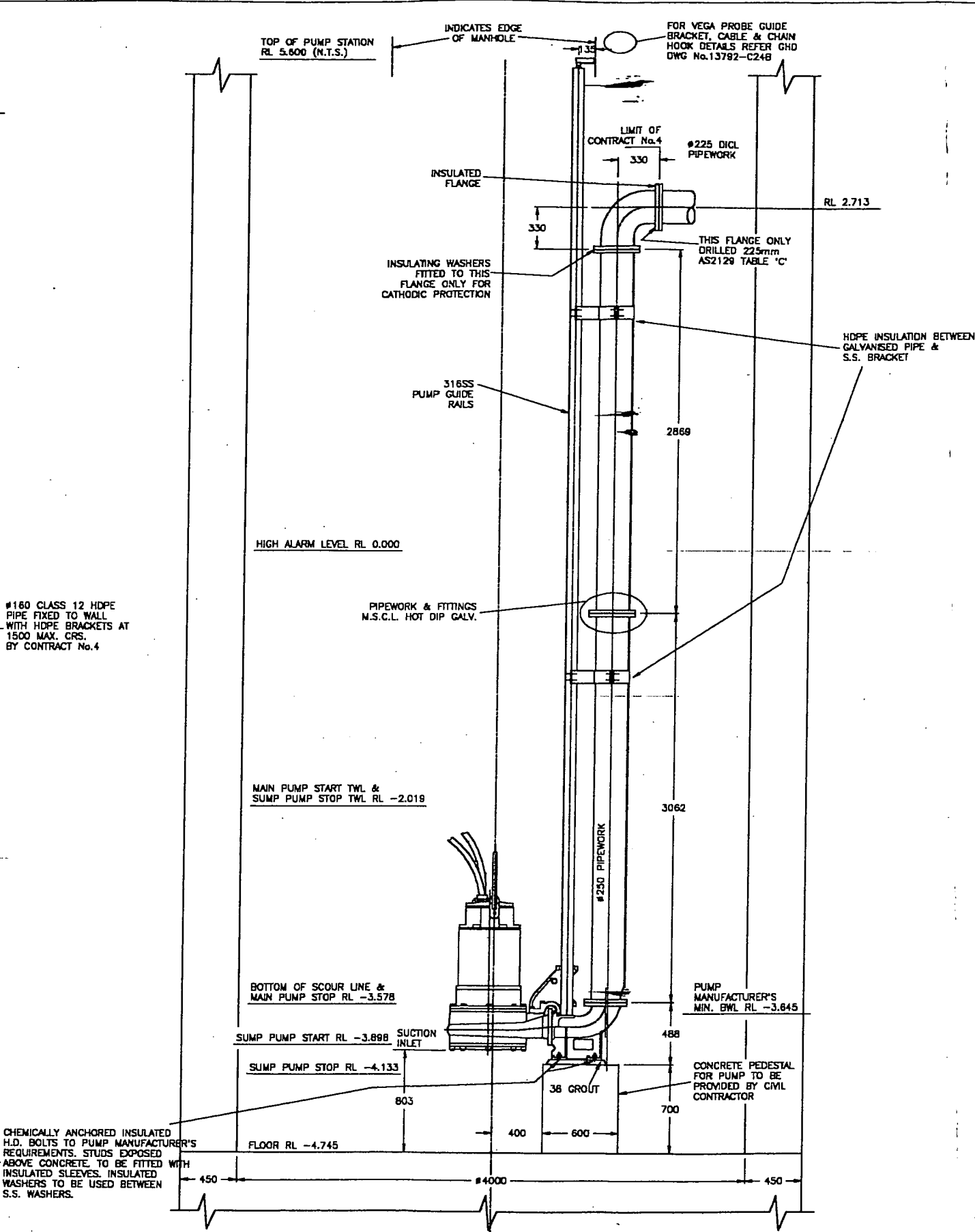
SCALE: 1:20

DRAWING No.	AMEND.
P94-BF5300/X0	





SECTIONAL ELEVATION - #100 RISING MAIN & #150 SCOUR LINE  
(#225 PIPEWORK DELETED FOR CLARITY)



SECTIONAL ELEVATION - #225 RISING MAIN  
(#100 PIPEWORK & #150 SCOUR LINE DELETED FOR CLARITY)

# NOTES

No	DATE	AMENDMENT	INITIALS
D	29-9-95	ADD BCC TITLE BLOCK	P.H.
C	26-7-95	AMEND AS PER GHD REQUIREMENTS DATED 26-7-95	P.H.
B	11-7-95	DELETE INLET SEWER IL, ADD INSULATION NOTE.	P.H.
A	23-3-95	AMEND AS PER GHD REQUIREMENTS DATED 3-3-95	P.H.

## AMENDMENT & ISSUE REGISTER

MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:		DATE:	DATE:
DESIGN	P.H.	4-1-95	ENGINEER IN CHARGE
DRAWN	P.H.	4-1-95	SUPERVISING ENGINEER
TRACED			
CHECKED	T.W.L.	4-1-95	

JPR No.	DATE
CADD FILE No. BF5300X1	REFERENCES



**BRISBANE CITY COUNCIL**  
DEPARTMENT OF WATER SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

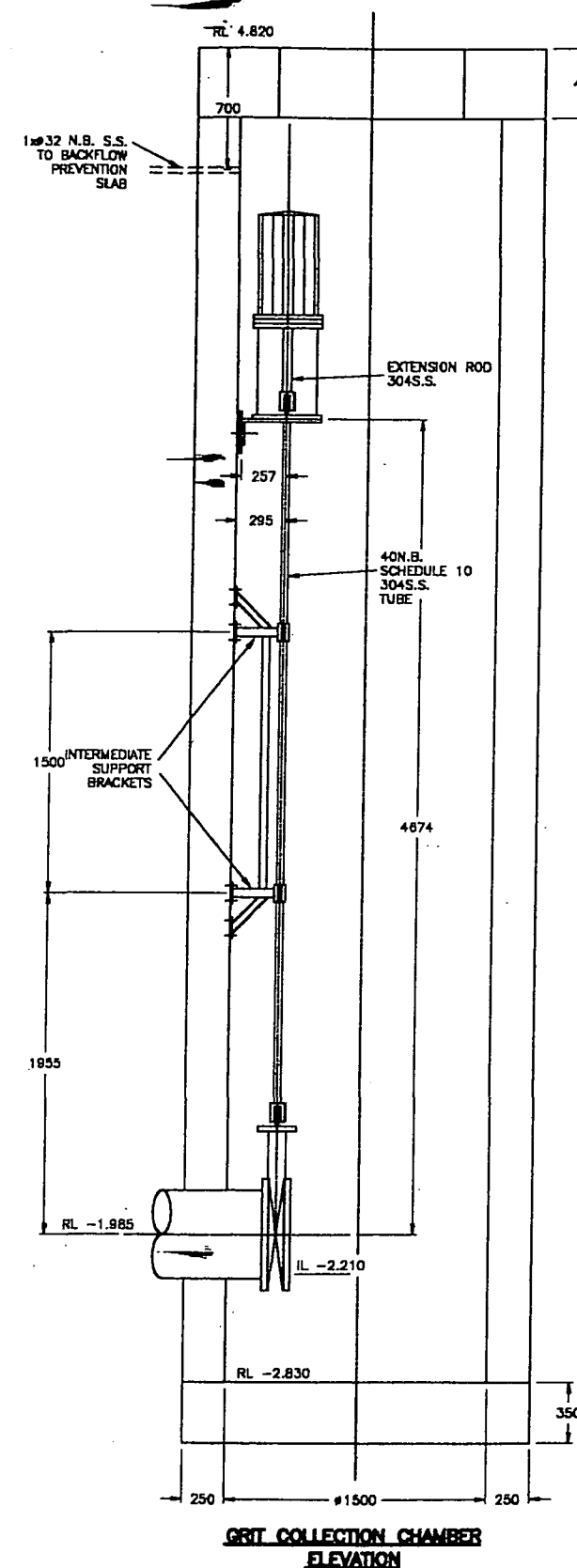
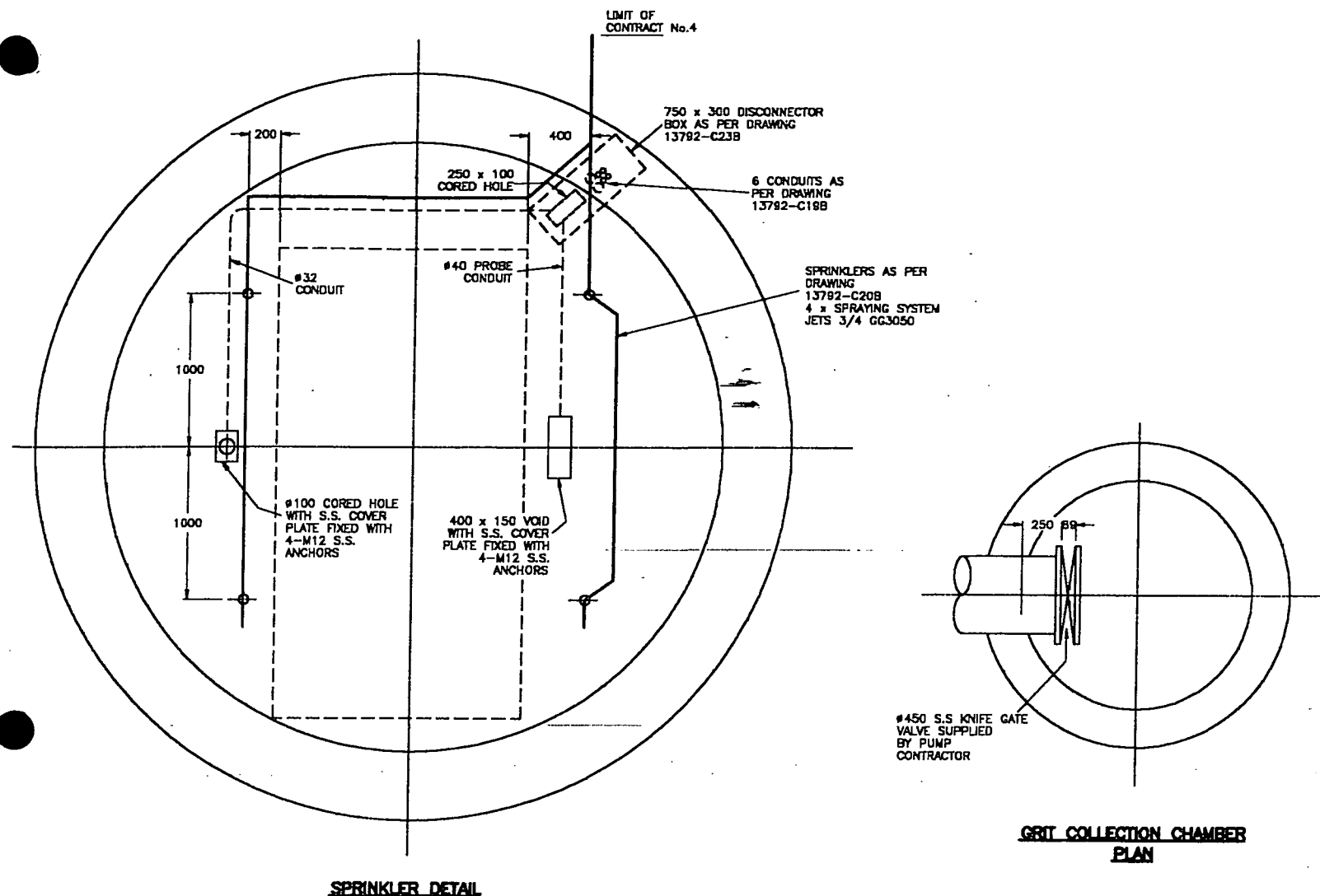
PROJECT  
SOUTHBANK CORPORATION SEWERAGE  
PEAK FLOW BY-PASS PUMP STATION

TITLE  
WET WELL SECTIONAL ELEVATIONS  
PIPEWORK LAYOUT

SCALE: 1:20  
No. OF SHEETS: 10  
SHEET: 99

DRAWING No.  
P94-BF5300/X1  
AMEND.  
D





## NOTES

1. ALL CONDUITS AS PER DRAWINGS 13792-C188, C198, C208, C238. SWITCHBOARD PUNTH AS PER DRAWING 13792-C238

D	29-9-95	ADD BCC TITLE BLOCK	P.H.
C	26-7-95	AMEND AS PER GHD REQUIREMENTS	P.H.
		DATED 25-7-95	
B	11-7-95	ADD 4674 DIMENSION	P.H.
A	23-3-95	AMEND AS PER GHD REQUIREMENTS	P.H.
		DATED 3-3-95, & FAX DATED 9-3-95	
		250 DIMENSION WAS 235, RL-1.985	
		WAS RL -1.754	
No	DATE	AMENDMENT	INITIALS

## AMENDMENT &amp; ISSUE REGISTER

MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	
DATE:		DATE:	
DESIGN		ENGINEER IN CHARGE	
DRAWN		SUPERVISING ENGINEER	
TRACED			
CHECKED			
JPR No.		DATE	
CADD FILE No.		REFERENCES	
BF5300X2			



Brisbane City

**BRISBANE CITY COUNCIL**  
DEPARTMENT OF WATER SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

PROJECT  
SOUTHBANK CORPORATION SEWERAGE  
PEAK FLOW BY-PASS PUMP STATION

TITLE  
WET WELL SECTIONAL ELEVATIONS  
PIPEWORK LAYOUT

**"AS CONSTRUCTED"**

SCALE: 1:20

No. OF SHEETS

DRAWING No.  
P94-BF5300/X2

AMEND.  
D

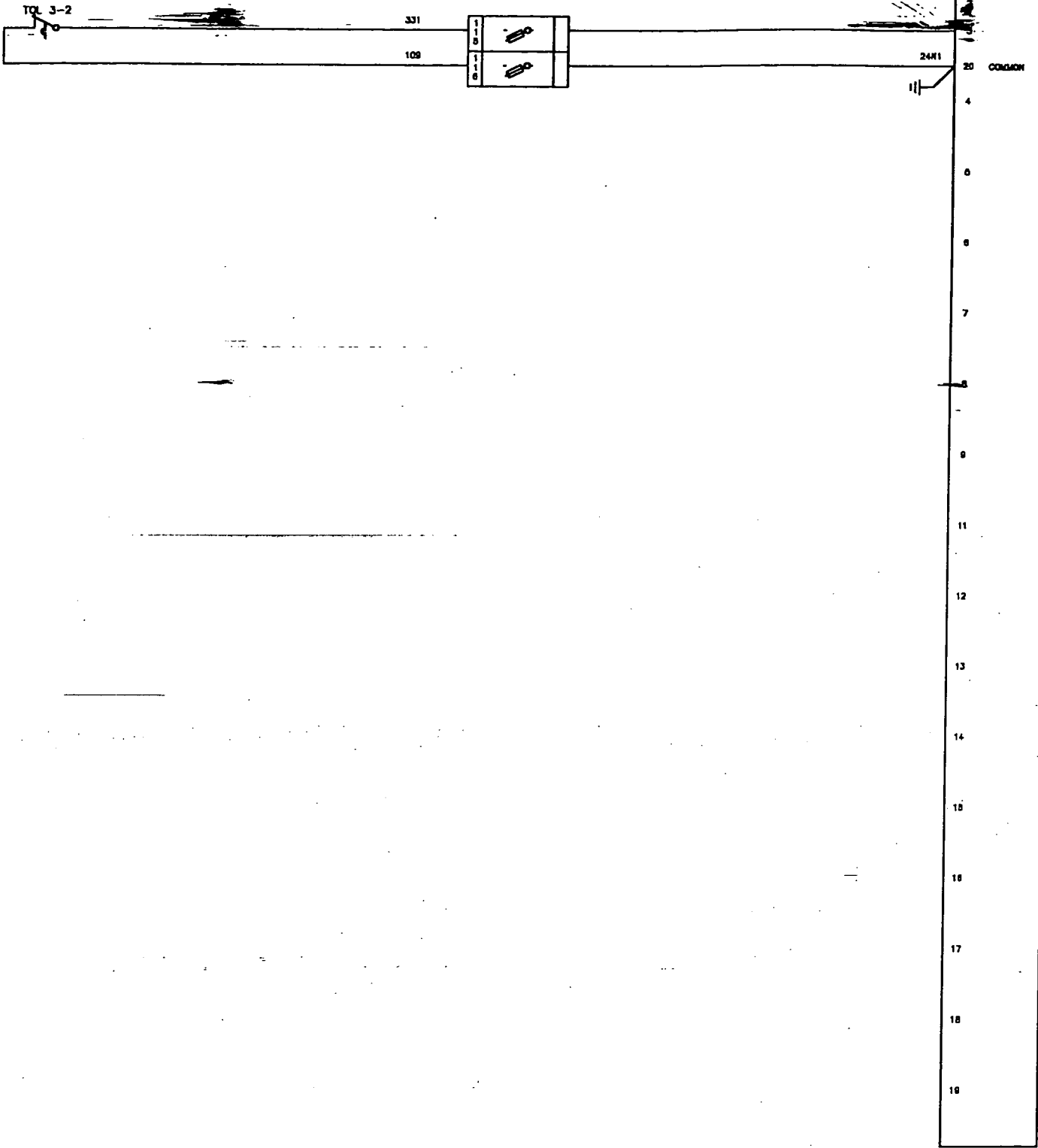
ORIGINAL

SWITCHBOARD

24V DC INTERFACE  
TERMINAL STRIP  
(NOTE 1)

REMOTE TELEMETRY UNIT  
DIGITAL INPUT CARD No 2 TYPE FRN 1420 SLOT 7

THERMAL OVERLOAD



NOTES

A	15-8-95	AMEND AS REQUIRED	P.H.
No	DATE	AMENDMENT	INITIALS

AMENDMENT & ISSUE REGISTER

MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION	
DATE:	DATE:	DATE:	
DESIGN	B.E.B.	4-8-95	ENGINEER IN CHARGE
DRAWN	P.H.	4-8-95	SUPERVISING ENGINEER
TRACED			
CHECKED	<i>P</i>	4-8-95	
JPR No. E94-BF5300/CSA		4-8-95	
CADD FILE No. BF5300C5		REFERENCES	



BRISBANE  
CITY COUNCIL  
DEPARTMENT OF WATER  
SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

PROJECT  
GREY STREET PUMP STATION  
SP266  
TITLE  
SCHEMATIC WIRING DIAGRAM  
**"AS CONSTRUCTED"**

SCALE: N.T.S.	No.	OF	SHEETS
DRAWING No. E94-BF5300/C5			AMEND. A

NOTES  
1. ALL FUSES ARE 100mA RATED  
ORIGINAL

FILE:- 5300.002 22 March 1995

CONSTRUCTION NOTES

- \* Switchboard to be free standing, Form 1 to AS3439.1 providing an IP55 degree of protection.
- \* Switchboard to be constructed from 316 Stainless Steel with a polished 2B finish.
- \* The Switchboard to be designed to accommodate thermal loads generated.
- \* All visible seams and joints of mullions to be fully welded and ground smooth where needed.
- \* All doors fitted with at least two lift off Pintle Hinges (three hinges for full height doors) Selectrix Semi flush type 1107SSQUT Swing handles and three point locking rods (Lockwood 71 Barrel Locks for all handles) except for SEQEB Meter and C.T. Doors which shall be fitted with Selectrix Semi flush type 1107S Padlockable version. C.T. Cubicle door lock to accommodate SEQEB Seal.
- \* All doors fitted with captive style sliding door stays at 110 degree open position mounted at the top of the door. Doors with sun shields only to be stiffened. Where necessary provide clearance holes in stiffeners to gain access to unbolt sun shields.
- \* Where equipment is rail mounted the rail shall be extended as far as practicable to either side of the compartment to allow addition of other equipment at a later date, except in the case of field interface terminals where rail space for 20% extra terminals shall be allowed.
- \* Equipment mounting trays bolted to picture frame supports (at sides only) by four welded studs and secured using four nuts. Use six welded studs/nuts on full height panels.
- \* A minimum 50mm Air gap extending full width of equipment tray, to be provided top and bottom of each vertical tier to allow air movement.
- \* Escutcheons hinged with two lift off Pintle hinges (three hinges for full height Escutcheons) and fixed using two acorn head nuts (three for full height escutcheons).
- \* Removable fold down tray for RTU Laptop PC, hinged at bottom, held in horizontal position by two PVC covered Steel Link chains.
- \* Mounting panels, Escutcheons, and Laptop tray to be 2.5mm Thick Mild Steel.
- \* Sun Roof and Sun Shields constructed from 1.6mm Thick Stainless Steel Grade 316 with a polished 2B finish, with rounded corners and edges turned in.
- \* Provide 6mm Earth Studs, one to each Cubicle Door and one to the Cubicle Body.
- \* Inspection plates to be 6mm thick Bakelite, secured by 8 x 6mm SS Screws. Gasket fitted between Switchboard and Plate.
- \* A Gland Plate and cutout shall be provided when necessary, in the base of the Switchboard to allow entry of SEQEB Mains. Cutout to be 150 x 150 with 190 x 190 Gland Plate Secured using 6 x 6mm SS Screws. Gasket fitted between Switchboard and Plate.
- \* Exterior and interior skin of Switchboard to have a polished 2B finish. Mounting panels, Escutcheons, and Laptop tray to be painted Gloss White.

GENERAL NOTES

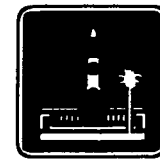
- \* No Equipment which is to be operated or viewed, to be mounted less than 300mm above floor level.
- \* A clear space of 200mm to be allowed for between Inspection/Gland Plates and Equipment.
- \* 24VDC interface terminals may be mounted vertically if necessary.
- \* All external labelling to be Stainless Steel. See details sheet No 4.
- \* Control, Protection, Metering, Alarm and Indication Wiring shall not be less than 1.5mm<sup>2</sup> with at least seven strands except where subject to movement eg. across hinged doors, where wiring shall be double insulated or fully protected by approved sleeving or banding.
- \* Wiring carrying 4-20mA or low level instrumentation signals shall be a shielded pair not less than 0.5mm<sup>2</sup>. Shields grounded as per drawing diagrams.
- \* Meter neutral 4mm<sup>2</sup> to be sealed onto main neutral bar.
- \* Line side of Terminals of C.F.S. and sub-distribution board chassis to be shrouded.
- \* Wiring Colours: 415VAC Power  
Neutral Black  
240VAC Power Phase coloured  
General Control Wiring White numbered cores  
24VDC Wiring Grey numbered cores
- \* All control wiring terminated using crimped pins. Wiring to be numbered using Grafolast numbered ferrules as per wiring diagrams. The following prefix shall be used No 1 Pump = 1, No 2 Pump = 2, Common Wiring = 6, Cathodic Protection = 8.

NOTES

A	30-3-95	BCC TITLE BLOCK ADDED	M.J.
No	DATE	AMENDMENT	INITIALS

AMENDMENT & ISSUE REGISTER

MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:		DATE:	DATE:
DESIGN	B.E.B.	22-3-95	ENGINEER IN CHARGE
DRAWN	M.J.	22-3-95	SUPERVISING ENGINEER
TRACED			
CHECKED			
JPR No. E94-BF5300/C4A		DATE: 30-3-95	
CADD FILE No. BF5300C4		REFERENCES	



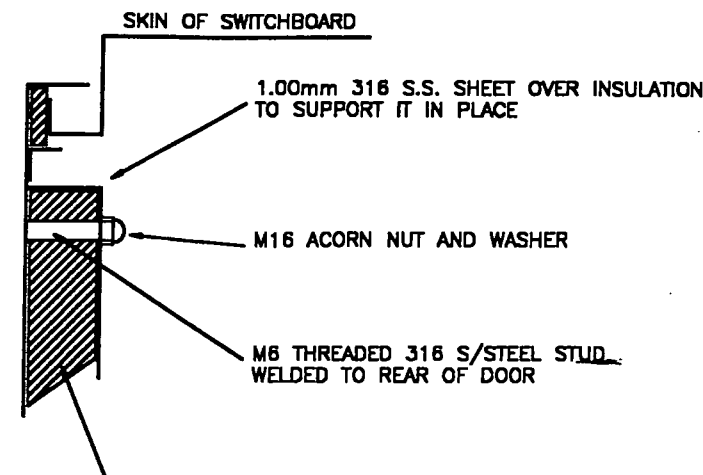
BRISBANE CITY COUNCIL  
DEPARTMENT OF WATER SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

PROJECT  
GREY STREET PUMP STATION  
SP266

TITLE  
CONSTRUCTION NOTES

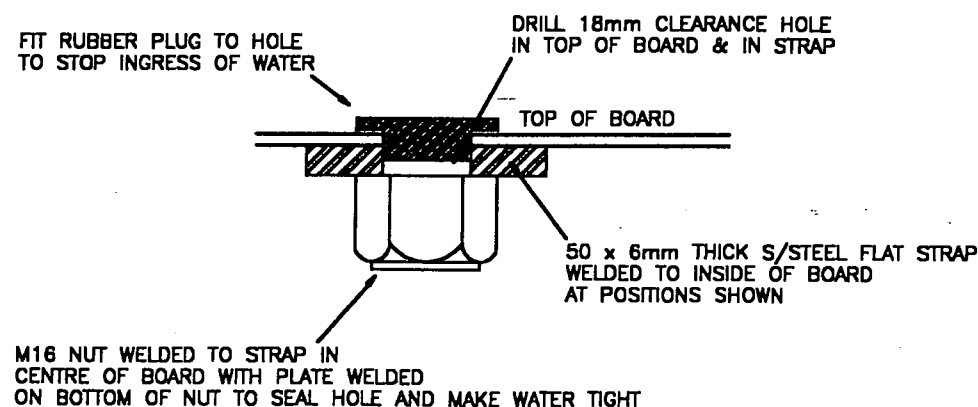
SCALE: N.T.S. No. OF SHEETS  
DRAWING No. E94-BF5300/C4 AMEND.

“AS CONSTRUCTED”

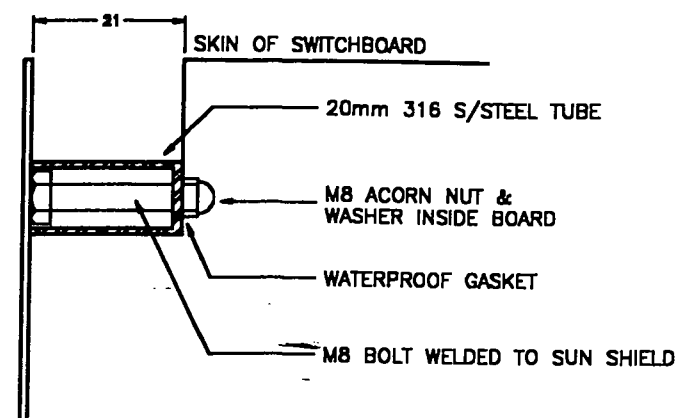


DOOR INSULATION TO BE 25mm THICK FIBREGLASS THERMAL INSULATION IN ALUMINIUM SANDWICH. THE INSULATION SHALL BE GLUED TO INSIDE OF DOOR SUCH THAT THERE IS NO AIR GAP BETWEEN THAT AND THE INSIDE OF THE DOOR. THE INSULATION SHALL COVER AS MUCH OF THE INSIDE OF THE DOOR AS POSSIBLE.

**DETAIL 'A'**  
(THERMAL INSULATION FIXING)

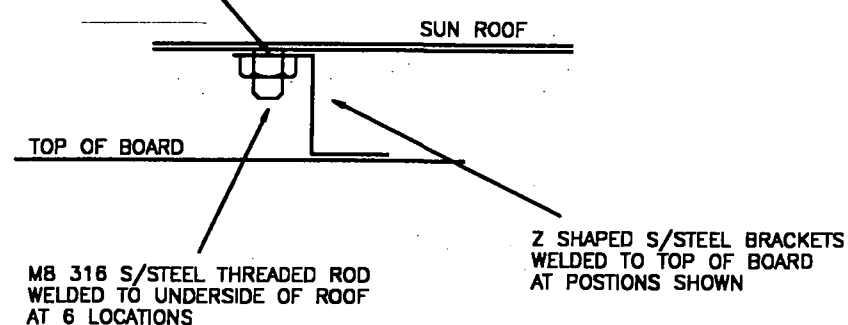


**DETAIL 'D'**  
(EYE BOLT LIFTING DETAIL)

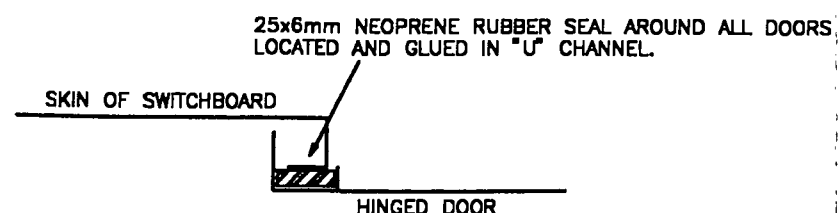


**DETAIL 'B'**  
(FOR SUN SHIELD MOUNTED TO SIDES & DOORS)

THESE NUTS MUST BE ACCESSABLE BY HAND HELD SPANNER



**DETAIL 'C'**  
(SUN ROOF FIXING DETAIL)



**DOOR WEATHER PROOF DETAIL "E"**

## NOTES

A	30-3-95	BCC TITLE BLOCK ADDED	M.J.
No	DATE	AMENDMENT	INITIALS

### AMENDMENT & ISSUE REGISTER

MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	
DATE:		DATE:	
DESIGN		ENGINEER IN CHARGE	
DRAWN		SUPERVISING ENGINEER	
TRACED			
CHECKED			

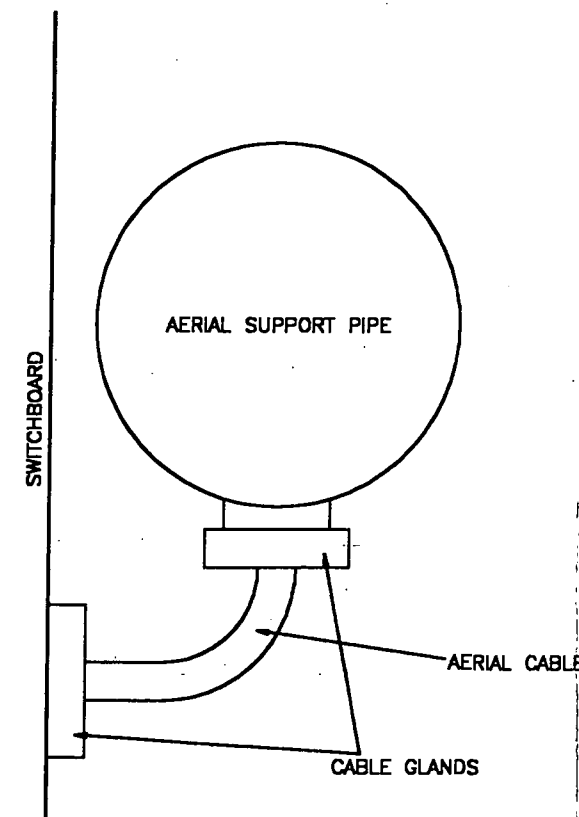
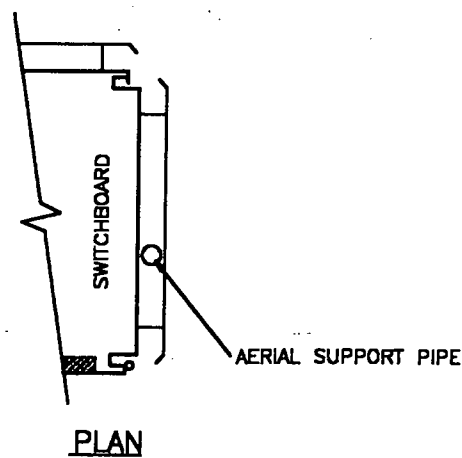
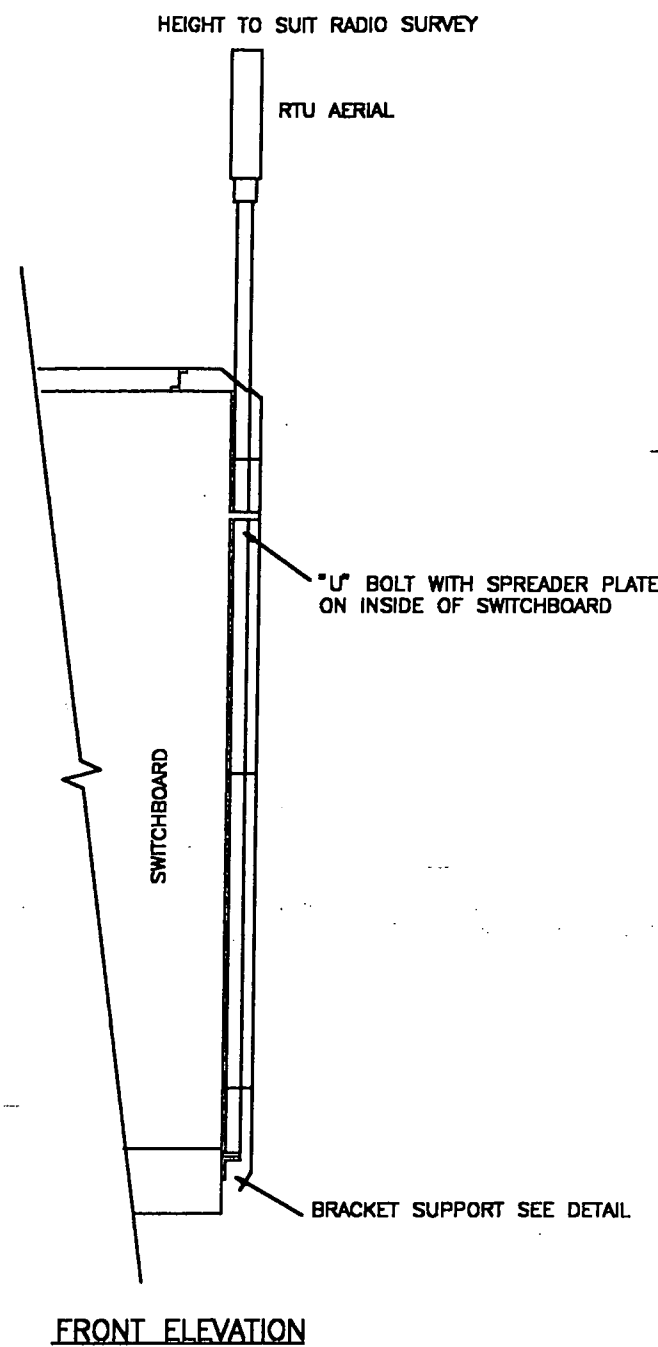
JPR No. E94-BF5300/C3A	DATE: 30-3-95
CADD FILE No. BF5300C3	REFERENCES

**BRISBANE CITY COUNCIL**  
DEPARTMENT OF WATER SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

PROJECT	
GREY STREET PUMP STATION SP266	
TITLE	
DETAIL SHEET	

SCALE: N.T.S.	No. OF SHEETS
DRAWING No. E94-BF5300/C3	AMEND.

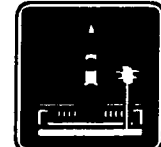
ORIGINAL



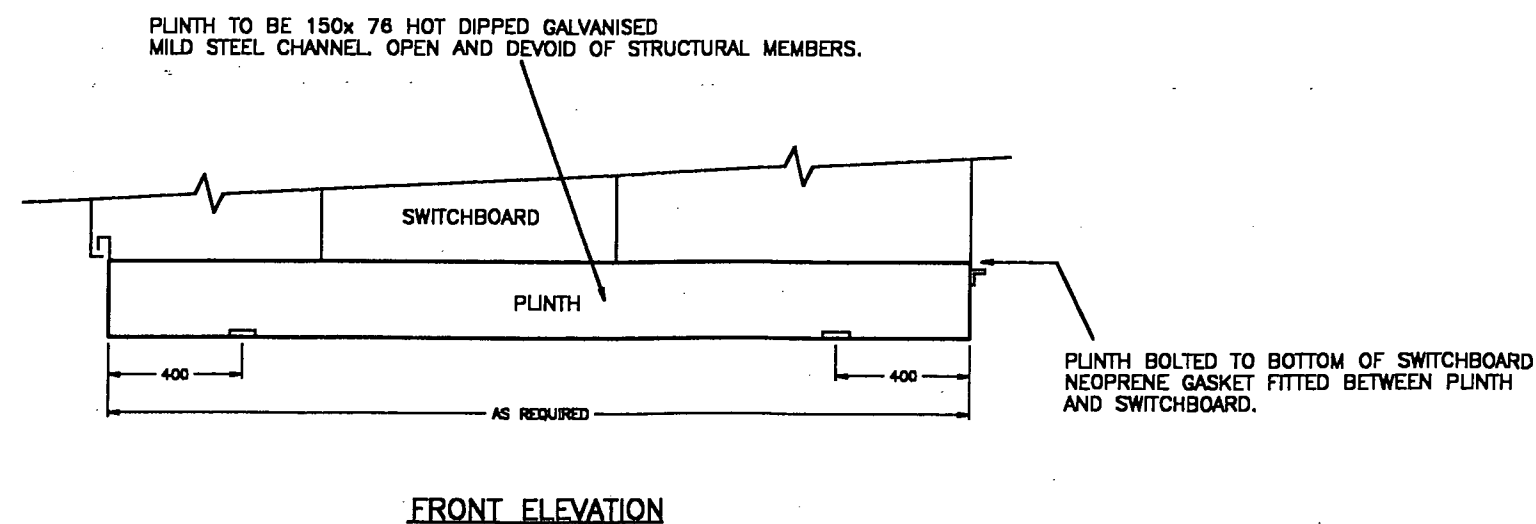
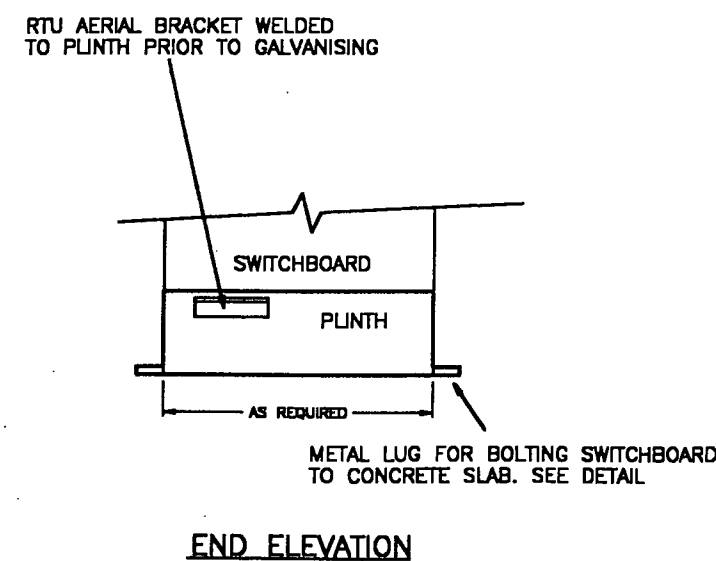
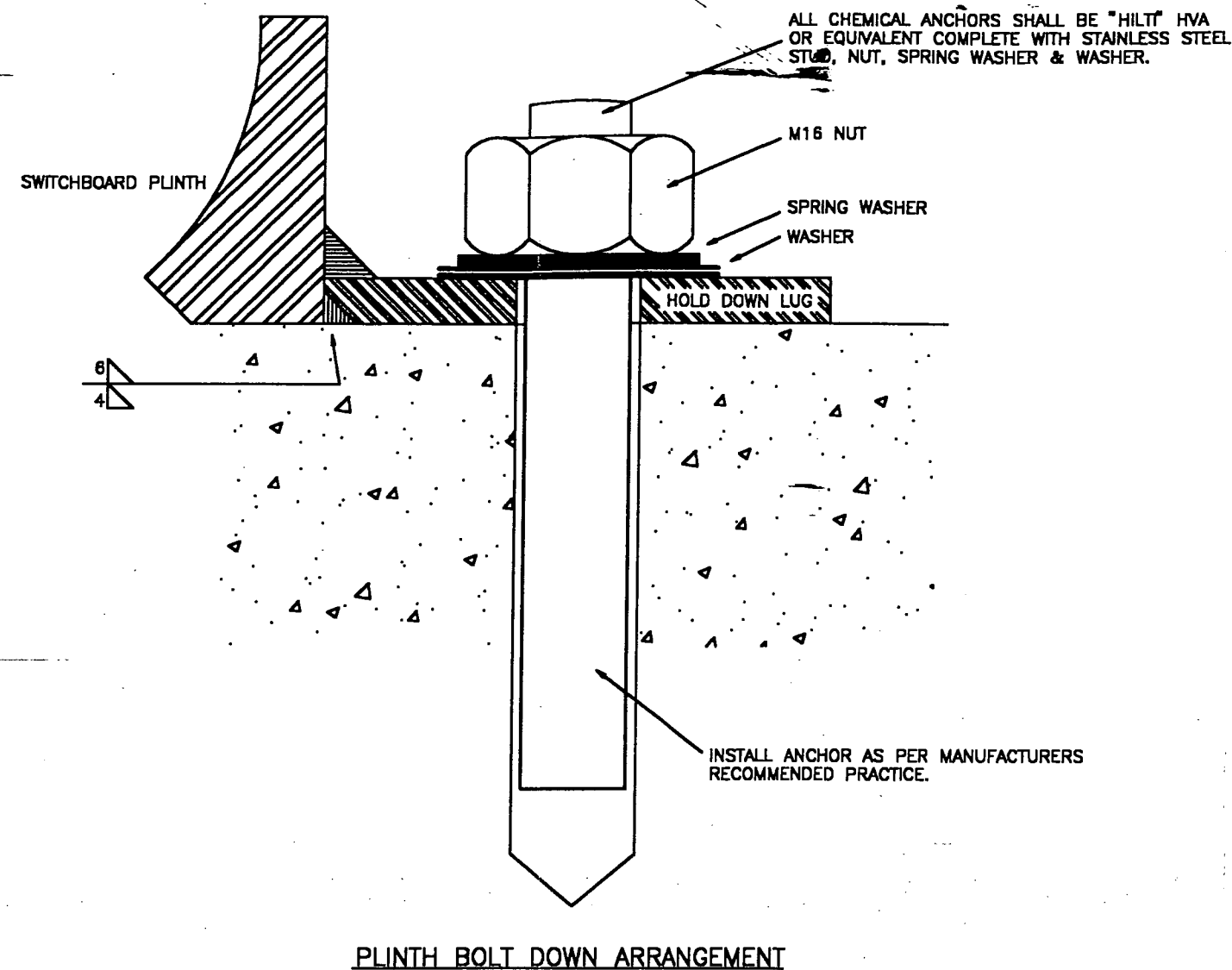
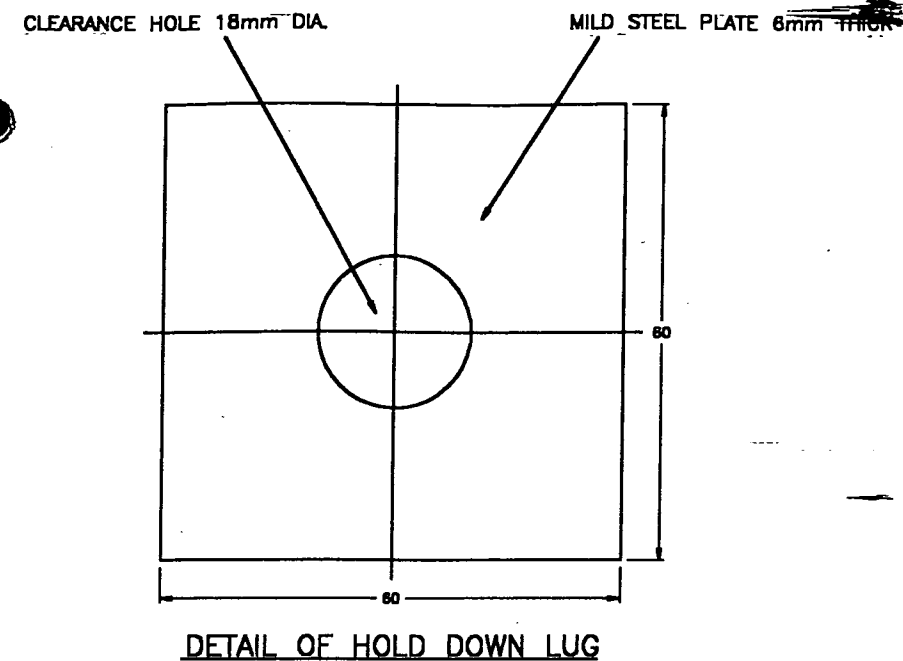
## NOTES

A	30-3-95	BCC TITLE BLOCK ADDED	M.J.
No	DATE	AMENDMENT	INITIALS

AMENDMENT & ISSUE REGISTER			
MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	
DATE:		DATE:	
DESIGN		ENGINEER IN CHARGE	
DRAWN		SUPERVISING ENGINEER	
TRACED			
CHECKED			
JPR No. E94-BF5300/C2A		DATE: 30-3-95	
CADD FILE No. BF5300C2		REFERENCES	

	<b>BRISBANE CITY COUNCIL</b> DEPARTMENT OF WATER SUPPLY & SEWERAGE MECHANICAL & ELECTRICAL SERVICES
PROJECT <b>GREY STREET PUMP STATION SP266</b>	
TITLE <b>DETAIL SHEET</b>	
SCALE: N.T.S.	No. OF SHEETS
DRAWING No. <b>E94-BF5300/C2</b>	AMEND. <b>A</b>

ORIGINAL



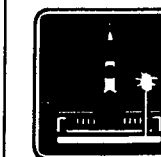
## NOTES

A	29-3-95	BCC TITLE BLOCK ADDED	M.J.
No	DATE	AMENDMENT	INITIALS

## AMENDMENT & ISSUE REGISTER

MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION	
DATE:		DATE:	
DESIGN	B.E.B.	22-3-95	ENGINEER IN CHARGE
DRAWN	M.J.	22-3-95	SUPERVISING ENGINEER
TRACED			
CHECKED	<i>[Signature]</i>	22-3-95	

JPR No. E94-BF5300/C1A	29-3-95
CADD FILE No. BF5300C1	REFERENCES



**Brisbane C**

**BRISBANE  
CITY COUNCIL  
DEPARTMENT OF WATER  
SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES**

PROJECT

GREY STREET PUMP STATION  
SP266

TITLE	1
-------	---

**DETAIL SHEET**

SCALE: N.T.S.	No.	OF	SHEETS
DRAWING No. E94-BF5300/C1			AMEND. A

FILE:-5300.001 22 March 1995

2

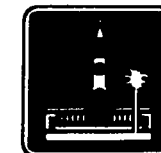
ITEM	QTY	MAKE and NUMBER	DESCRIPTION	LABEL
	1	SPRECHER & SCHUH DL3R-R-Ba9s-RL-24V BA9 FILAMENT TYPE	INDICATOR	
	1	CROMPTON 244-026G 0-120/720A 5A CT OPERATED	AMMETER	
	1	CROMPTON 242-155G 240V	HOURS RUN METER	
	40	SPRECHER & SCHUH VU4-2.5/4	END PIECE	
	30	SPRECHER & SCHUH V4-ECS	END CLAMP	
	1	VEGA E25 LEVEL TRANSMITTER	WELL LEVEL TRANSMITTER	
	1	VEGA 137M SENSOR	WELL LEVEL SENSOR	
	1	STRAIN GAUGE TRANSMITTER WT27	DELIVERY PRESSURE TRANSMITTER	
	1	PLATYPUS 11 PRESSURE SENSOR	DELIVERY PRESSURE SENSOR	
	1	TERASAKI XN125NS-125	PUMP/CIRCUIT BREAKER	
C23	1	SPRECHER & SCHUH CA6-105-11-240V WITH CA6-P2-11	LINE CONTACTOR	C23
C21	1	SPRECHER & SCHUH CA3-60N-11-240V	TRANSFORMER CONTACTOR	C21
C22	1	SPRECHER & SCHUH CA3-37N-11-240V	STAR CONTACTOR	C22
TOL2	1	SPRECHER & SCHUH CT6-110	THERMAL OVERLOAD	TOL2
	1	GEC SC20H WITH GEC NS6	CONTROL CIRCUIT FUSE	
	3	GEC SC20H WITH NS2	KW TRANSUDCER SUPPLY FUSES	
THR2A	1	SPRECHER & SCHUH RT3-M-240V	THERMISTOR RELAY	THR2A
PR2	1	KH-103-2CL-240V WITH BASE	POWER RELAY	PR2
	1	GEC/GAYRAD 3AT55 WITH THERMOSTATS	AUTO TRANSFORMER	
	1	MLL-C-5015 INDUSTRIAL BAYONET TYPE 18-1	CONTROL PLUG & SOCKET	
	1	SPRECHER & SCHUH DPV3NR2	EMERGENCY STOP BUTTON	EMERG STOP
	1	SPRECHER & SCHUH DT3P-MG-10M	START PUSHBUTTON	START
	1	SPRECHER & SCHUH DT3P-MB-10M	FAULT RESET PUSHBUTTON	FAULT RESET
	1	SPRECHER & SCHUH DL3R-R-Ba9s-RL-24L LED CLUSTER	PUMP STATUS INDICATION	PUMP STATUS
RP21	1	KH-103-2CL-24VDC WITH BASE	TRANSFORMER INTERFACE INTERFACE RELAY	RP21
RP22	1	KH-103-2CL-24VDC WITH BASE	STAR INTERFACE RELAY	RP22
RP23	1	KH-103-2CL-24VDC WITH BASE	LINE INTERFACE RELAY	RP23
	1	MULTITEK M100-W-42 & UHA-240V	KW TRANSUDCER	
	1	MULTITEK M100-AL1 & UHA-240V	AMPS TRANSUDCER	
	1	CROMPTON 781-943T 120/5	CURRENT TRANSFORMER	
	1	CROMPTON 244-026G 0-120/720A 5A CT OPERATED	AMMETER	
	1	CROMPTON 242-155G 240V	HOURS RUN METER	
	1	SPRECHER & SCHUH DPV3NR2	EM/STOP BUTTON	
	1	SPRECHER & SCHUH DT3P-MG-10M	START P/BUTTON	EMERG STOP
	1	SPRECHER & SCHUH DT3P-MB-10M	FAULT RESET P/BUTTON	START
	1	SPRECHER & SCHUH DL3R-R-Ba9s-RL-24V LED CLUSTER	PUMP STATUS INDICATION	FAULT RESET
	1	CROMPTON 242-155G-240V	SUMP PUMP HOURS RUN METER	PUMP STATUS
	1	TERASAKI SAFE-T/20/3P	SUMP PUMP/CIRCUIT BREAKER	
C33	1	SPRECHER & SCHUH CA3-9-10-240V WITH CA3-P-P-11	LINE CONTACTOR	C33
	1	GEC SC20H WITH NS6	CONTROL CIRCUIT FUSE	
	3	GEC SC20H WITH NS2	KW TRANSUDCER SUPPLY FUSES	
PR3	1	KH-103-2CL-240V WITH BASE	POWER ON RELAY	PR3
RP3	1	KH-103-2CL-24VDC WITH BASE	LINE INTERFACE RELAY	RP3
	1	SPRECHER & SCHUH DT3P-GRB-10M	PUSHBUTTON	

NOTES

E	29-3-95	BCC TITLE BLOCK ADDED	M.J.
D	22-3-95	AMEND AS REQUIRED	M.J.
C	23-2-95	AMEND AS REQUIRED	D.W.
B	28-2-95	AMEND AS REQUIRED	M.J.
A	15-12-94	PREVIOUSLY B6	M.J.
No	DATE	AMENDMENT	INITIALS

AMENDMENT & ISSUE REGISTER

MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:		DATE:	DATE:
DESIGN	B.E.B.	8-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	8-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED		8-12-94	
JPR No. E94-BF5300/C0E		DATE: 29-3-95	
CADD FILE No. BF5300C0		REFERENCES	



BRISBANE  
CITY COUNCIL  
DEPARTMENT OF WATER  
SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

PROJECT	GREY STREET PUMP STATION SP266
TITLE	EQUIPMENT SCHEDULE

SCALE: N.T.S.	No. OF SHEETS
DRAWING No. E94-BF5300/C0	AMEND.

66 AS CONSTRUCTED 99

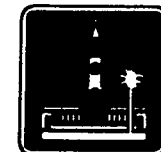
ITEM	QTY	MAKE and NUMBER	DESCRIPTION	LABEL
	1	TERASAKI XS400N3	MAIN CIRCUIT BREAKER	
	1	NHP LXS1-63 WITH GEC T1563 CARTRIDGE	COMBINED FUSE SWITCH	
	3	TERCEL IPT0SD 70KA	LIGHTNING PROTECTION UNITS	
PFR	1	CROMPTON 252-PSG4 WIRE	PHASE FAILURE RELAY	PFR
	1	TERASAKI DIN-T6-302	PHASE FAILURE RELAY	
	1	TERASAKI DIN-T6-110	CATHODIC PROTECTION UNIT	
	1	TERASAKI DIN-T6-102	TRANSUDERS AUX SUPPLY	
	1	TERASAKI DIN-T6-106	S/B LIGHT	
	1	TERASAKI DIN-T6-110	MOSCAD RTU POWER SUPPLY	
	1	TERASAKI DIN-T6-110	G.P.O.	LAPTOP G.P.O.
	1	TERASAKI DIN-T6-106	24VDC POWER SUPPLY	
	1	TERASAKI DIN-T6-106	SPARE	
	1	TERASAKI DIN-T6-106	3 $\phi$ OUTLET SUPPLY	
	1	TERASAKI DIN-T9-320 WITH SAFE-M3-32/30mA	1 $\phi$ OUTLET SUPPLY	
	1	TERASAKI DIN T9-116 WITH SAFE-M1-32/30mA	1 $\phi$ OUTLET EARTH LEAKAGE	
	1	CLIPSAL 56C315	20 AMP 3 $\phi$ OUTLET	
	1	CLIPSAL 56C420	1 $\phi$ G.P.O.	
	1	CLIPSAL 15/15	INDICATOR	
	3	SPRECHER & SCHUH DL3R-G-8a9s-GL-24V LED CLUSTER	ALARM RESET BUTTON	
	1	SPRECHER & SCHUH DT3P-MB-10M	CONTROL MODE SELECTOR	
	1	SPRECHER & SCHUH DSK3P-A-10M	LEVEL RELAY	
MTR2	1	MULTITRODE MTR-2	RTU POWER INPUT MODULE	
	1	SCA CRITEC LSAC4-275	SURGE DIVERTER	
			LIGHTNING PROTECTION MODULES	
	3	SCA CRITEC LSJK-3R-30	ANALOGUE INPUTS	
	1	CROMPTON 244-01AG 4-20mA 0-100% SCALE	WELL LEVEL METER	
	1	COLOUR 3A POWER SUPPLY	24VDC 3 AMP POWER SUPPLY	
	6	TERASAKI DIN-T6-102	24VDC SUB-CIRCUIT SUPPLY	
	100	SPRECHER & SCHUH VU4-4	MCC TERMINAL	
	125	SPRECHER & SCHUH VU14-4M	RTU TERMINAL	
	120	SPRECHER & SCHUH VU4-4	FIELD TERMINALS	
	10	SPRECHER & SCHUH VU4-4	CATHODIC PROTECTION TERMINAL	
	16	SPRECHER & SCHUH VU1M4-4	ISOLATING TERMINALS	
	5	SPRECHER & SCHUH VAST4-4	ISOLATING TERMINALS END PIECE	
	125	SPRECHER & SCHUH V4-0.5F	500mA FUSES 5mm X 20mm	
	1	TERASAKI XH125N3/125	PUMP/CIRCUIT BREAKER	
C13	1	SPRECHER & SCHUH CAG-105-11-240V WITH CAG-P2-11	LINE CONTACTOR	C13
C11	1	SPRECHER & SCHUH CA3-60N-11-240V	TRANSFORMER CONTACTOR	C11
C12	1	SPRECHER & SCHUH CA3-37N-11-240V	STAR CONTACTOR	C12
TOL1	1	SPRECHER & SCHUH CT6-110	THERMAL OVERLOAD	TOL1
	1	GEC SC20H WITH NS6	CONTROL CIRCUIT FUSE	
TH1A	1	GEC SC20H WITH GEC NS2	KW TRANSUDER SUPPLY FUSES	TH1A
PR1	3	SPRECHER & SCHUH RT3-M-240V	THERMISTOR RELAY	PR1
	1	KH-103-2CL-240V WITH BASE	POWER RELAY	
	1	GEC/GAVRAD 3AT55 WITH THERMOSTATS	AUTO TRANSFORMER	
	1	MIL-C-5015 INDUSTRIAL BAYONET TYPE 18-1	CONTROL PLUG & SOCKET	
	1	SPRECHER & SCHUH DPV3NR2	EMERGENCY STOP BUTTON	EMERG STOP
	1	SPRECHER & SCHUH DT3P-MG-10M	START PUSHBUTTON	START
	1	SPRECHER & SCHUH DT3P-MB-10M	FAULT RESET PUSHBUTTON	FAULT RESET
	1	SPRECHER & SCHUH DL3R-R-8a9s-RL-24V BA9 FILAMENT TYPE	PUMP STATUS INDICATION	PUMP STATUS
RP11	1	KH-103-2CL-24VDC WITH BASE	TRANSFORMER INTERFACE INTERFACE RELAY	RP11
	1	KH-103-2CL-24VDC WITH BASE	STAR INTERFACE RELAY	RP12
RP12	1	KH-103-2CL-24VDC WITH BASE	LINE INTERFACE RELAY	RP13
RP13	1	MULTITEK M100-W-A2 & UHA-240V	KW TRANSUDER	
	1	MULTITEK M100-AL1 & UHA-240V	AMPS TRANSUDER	
	1	CROMPTON 781-943T 120/5	CURRENT TRANSFORMER	

## NOTES

E	29-3-95	BCC TITLE BLOCK ADDED	M.J.
D	22-3-95	AMEND A5 REQUIRED	M.J.
C	23-2-95	AMEND A5 REQUIRED	D.W.
B	21-2-95	AMEND A5 REQUIRED	M.J.
A	15-12-94	PREVIOUSLY B7	M.J.
No	DATE	AMENDMENT	INITIALS

## AMENDMENT &amp; ISSUE REGISTER

MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	
DATE:		DATE:	
DESIGN		ENGINEER IN CHARGE	
DRAWN		SUPERVISING ENGINEER	
TRACED			
CHECKED			
JPR No. E94-BF5300B9E		DATE: 29-3-95	
CADD FILE No. BF5300B9		REFERENCES	



BRISBANE  
CITY COUNCIL  
DEPARTMENT OF WATER  
SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

## PROJECT

GREY STREET PUMP STATION  
SP266

## TITLE

EQUIPMENT SCHEDULE

SCALE: N.T.S.

No. OF SHEETS

DRAWING No.

E94-BF5300/B9

AMEND.



DANGER ELECTRICAL  
EQUIPMENT

DANGER - 415V

SP266

NOTE:  
PLEASE CHECK THAT THE  
STATION IS IN REMOTE  
MODE BEFORE LEAVING SITE.

SUPPLY AUTHORITY METER PANEL

SUPPLY AUTHORITY C.T. CHAMBER

LOCATION - FRONT OF BOARD  
LABEL SIZE - 160W x 40H  
LETTER SIZE - 15mm  
LETTER COLOUR - WHITE  
BACKGROUND - RED  
MATERIAL - STAINLESS STEEL

LOCATION - PUMP STARTER DOOR  
LABEL SIZE - 400W x 50H  
LETTER SIZE - 25mm  
LETTER COLOUR - WHITE  
BACKGROUND - RED  
MATERIAL - STAINLESS STEEL


LOCATION - PUMP STARTER DOOR  
LABEL SIZE - 100W x 35H  
LETTER SIZE - 20mm  
LETTER COLOUR - BLACK  
MATERIAL - STAINLESS STEEL

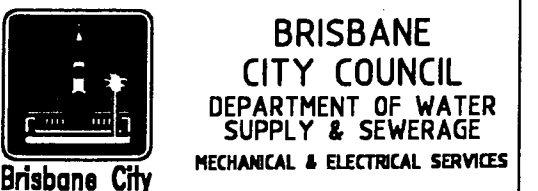
LOCATION - PUMP STARTER DOOR  
LABEL SIZE - 210W x 60H  
LETTER SIZE - 8mm  
LETTER COLOUR - BLACK  
MATERIAL - STAINLESS STEEL

LOCATION - SUPPLY AUTHORITY  
CHAMBER DOORS  
LABEL SIZE - 300W x 60H  
LETTER SIZE - 10mm  
LETTER COLOUR - BLACK  
MATERIAL - STAINLESS STEEL

NOTES



D	29-3-95	BCC TITLE BLOCK ADDED	M.J.
C	22-3-95	AMEND LABEL SIZES	M.J.
B	28-2-95	AMEND AS REQUIRED	M.J.
A	15-12-94	PREVIOUSLY B6	M.J.
No	DATE	AMENDMENT	INITIALS

AMENDMENT & ISSUE REGISTER			
MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:		DATE:	DATE:
DESIGN	B.E.B.	8-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	8-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED		8-12-94	
JPR No. E94-BF5300/B80		DATE: 29-3-95	
CADD FILE No. BF5300B8		REFERENCES	

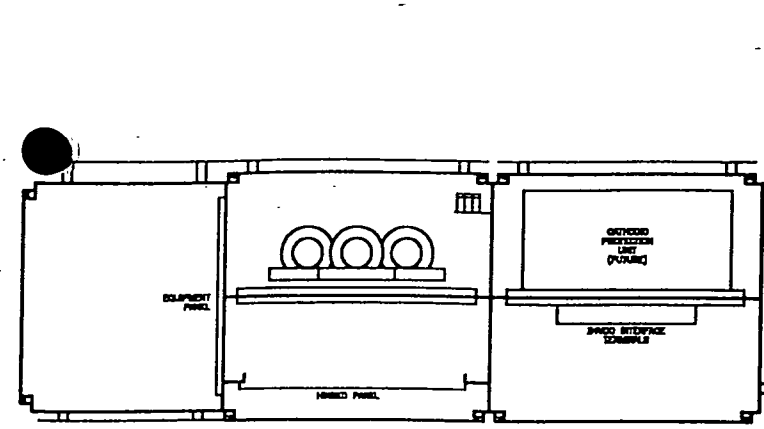


PROJECT	
GREY STREET PUMP STATION SP266	
TITLE	
EXTERNAL STAINLESS STEEL LABEL SCHEDULE	
SCALE: 1:1	No. OF SHEETS
DRAWING No. E94-BF5300/B8	
AMEND.	

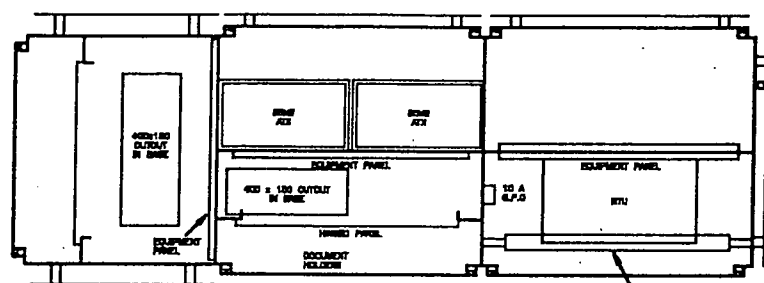
SPARE SHEET

NOTES			
D	29-3-95	BCC TITLE BLOCK ADDED	M.J.
C	22-3-95	AMEND TITLE BLOCK	M.J.
B	18-2-95	NOW SPARE SHEET	M.J.
A	15-12-94	NEW DRAWING	M.J.
No	DATE	AMENDMENT	INITIALS
AMENDMENT & ISSUE REGISTER			
MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:		DATE:	DATE:
DESIGN	B.E.B.	15-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	15-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED		15-12-94	
JPR No. E94-BF5300/B7		DATE: 29-3-95	
CADD FILE No. BF5300B7		REFERENCES	
 Brisbane City		BRISBANE CITY COUNCIL DEPARTMENT OF WATER SUPPLY & SEWERAGE MECHANICAL & ELECTRICAL SERVICES	
PROJECT GREY STREET PUMP STATION SP266			
TITLE SPARE SHEET		"AS CONSTRUCTED"	
SCALE: N.T.S.		No. OF SHEETS	
DRAWING No. E94-BF5300/B7		AMEND.	

ORIGINAL



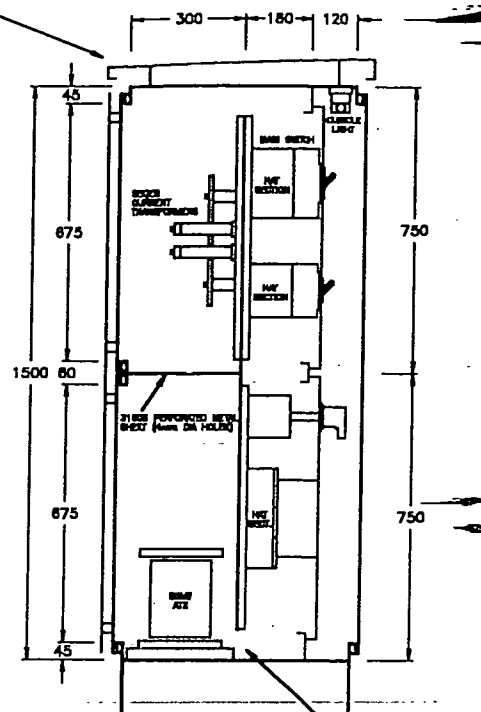
SECTION A-A



SECTION B-B

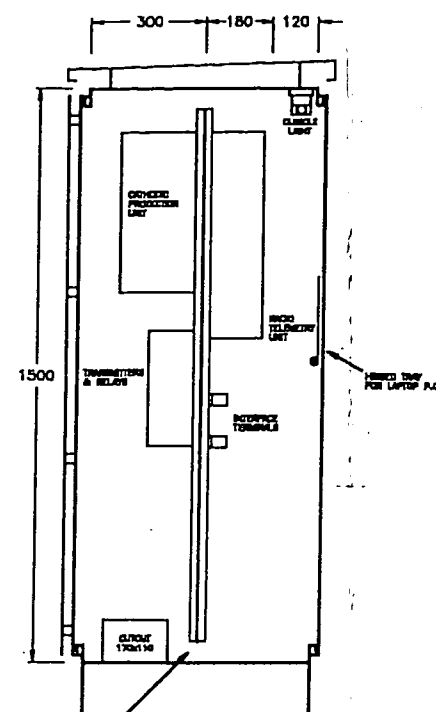
# NOTES

- WHERE EQUIPMENT IS RAIL MOUNTED, THE RAIL SHALL BE EXTENDED AS FAR AS PRACTICABLE TO EITHER SIDE OF THE COMPARTMENT TO ALLOW ADDITION OF OTHER EQUIPMENT AT LATER DATE.
- EQUIPMENT MOUNTING TRAYS BOLTED TO PICTURE FRAME SUPPORTS AT SIDES ONLY. 50mm AIR GAP TO BE PROVIDED TOP & BOTTOM OF EACH VERTICAL TIER TO ALLOW AIR MOVEMENT.
- ALL FIELD CONTROL & INSTRUMENT CABLES SHALL BE CONNECTED TO THE FIELD DEVICE INTERFACE TERMINALS.
- 24V DC INTERFACE TERMINALS MAY BE MOUNTED VERTICALLY IF NECESSARY.
- ALL DOORS TO INCORPORATE SELECTRIX SEMI-FLUSH TYPE 1107SSC02 SWING HANDLES WITH 1107-U8 3 POINT LOCKING ROD.
- DOOR INSULATION TO BE 25mm THICK FIBREGLASS THERMAL INSULATION COVERED WITH 1.0mm 816SS SHEETING 1.6mm THICK REAR SUNSHIELD IS ALSO A MECHANICAL BARRIER.
- 30mm LONG STAINLESS STEEL STANDOFFS TO BE DEMOUNTABLE FROM INSIDE THE CUBICLE, BUT BE WELDED TO ACTUAL SUNSHIELD. STANDOFFS TO BE 12mm DIAMETER 316 SS ROD
- THIS SWITCHBOARD DESIGN SHALL ACCOMMODATE THE THERMAL LOADS OF SEWAGE PUMPS UP TO A RATING OF 54kW EACH IN CONJUNCTION WITH THE CONTROL & MONITORING EQUIPMENT LISTED ABOVE.
- THE TOP SUNSHIELD SHALL BE SUPPORTED BY 316 SS "Z" SECTIONS WHICH SHALL BE WELDED TO THE TOP SKIN OF THE SWITCHBOARD. THE SUNSHIELD SHALL BE BOLTED TO THESE SUPPORTS.
- AUTO-TRANSFORMERS TO BE CLASS 01 INTERMITTENT DUTY TO AS 1202, PART 3 - 1978.
- SWITCHBOARD SUPPLIER SHALL SUBMIT ESCUTCHEON LAYOUT, SHOWING ACTUAL DEVICE SIZES & POSITIONS TO BOC FOR APPROVAL PRIOR TO CONSTRUCTION.
- DOORS TO SEVER METER & CURRENT TRANSFORMERS SHALL BE PADLOCKABLE
- HANDLES TO BE CHROME PADLOCKABLE SWING HANDLES TYPE 1107SSC08

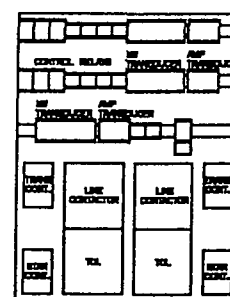


SECTION D-D

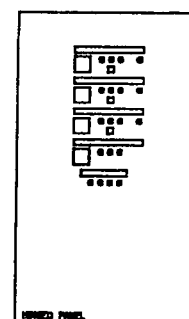
MOUNTING PANELS BOLTED TO VERTICAL SUPPORTS TO ALLOW 50mm AIR GAP FOR AIR MOVEMENT EXTENDING FULL WIDTH OF CUBICLE TIER



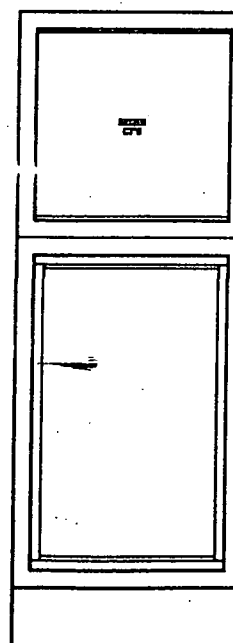
SECTION E-E



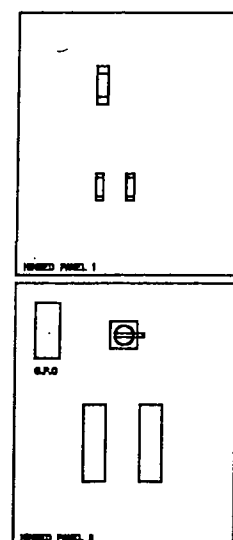
EQUIPMENT PANEL  
END ELEVATION



HINGED PANEL  
END ELEVATION



END ELEVATION



HINGED PANELS  
SECTION D-D

## NOTES

No	DATE	AMENDMENT	INITIALS
E	24-9-95	GENERAL REVISION	P.H.
D	22-3-95	GENERAL REVISION	M.J.
C	23-2-95	GENERAL REVISION	D.W.
B	28-2-95	GENERAL REVISION	M.J.
A	15-12-94	DELETE SECTION F-F, PREVIOUSLY B5	M.J.

## AMENDMENT & ISSUE REGISTER

MANAGER	DIRECTOR OF PLANNING & DESIGN
DATE:	DATE:

DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:	DATE:	DATE:

DESIGN	B.E.B.	9-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	9-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED			

JPR No. E94-BF5300/B6E	DATE: 27-3-95
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CADD FILE No. BF5300B6	REFERENCES
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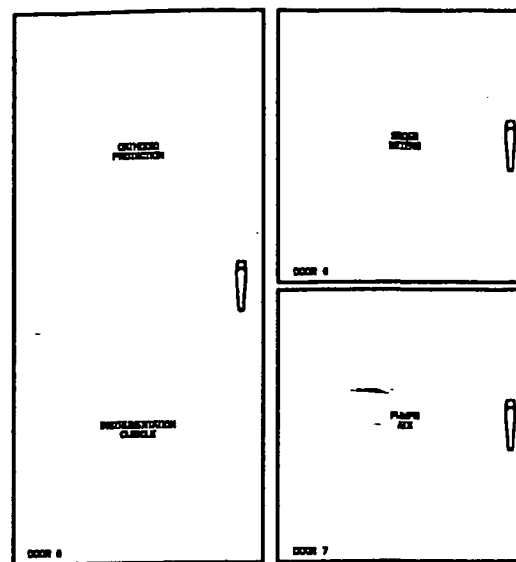
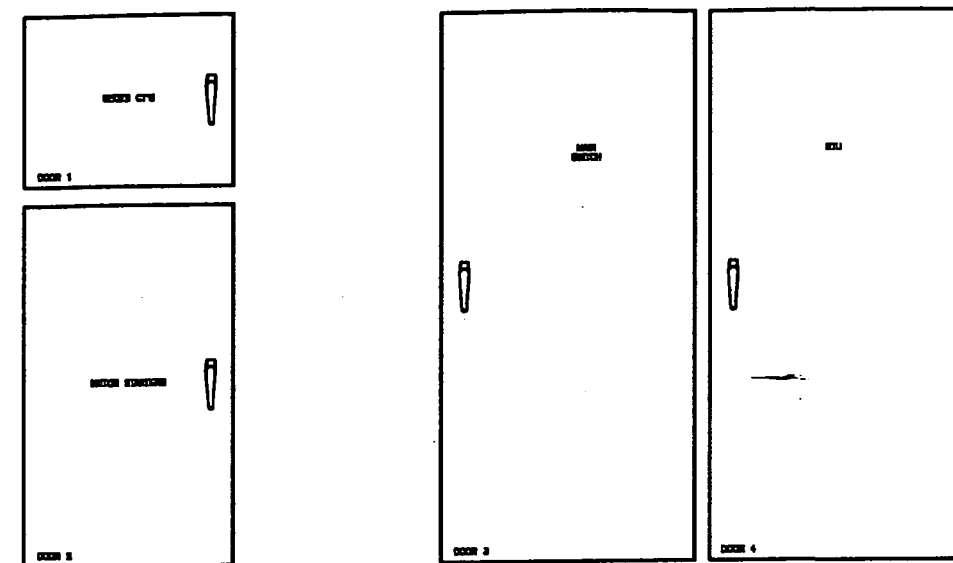
**BRISBANE CITY COUNCIL**  
DEPARTMENT OF WATER SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

PROJECT	GREY STREET PUMP STATION SPS 266
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TITLE	"AS CONSTRUCTED" MAIN SWITCHBOARD SECTIONAL VIEWS
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SCALE: 1:10	No. OF SHEETS
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DRAWING No. E94-BF5300/B6	AMEND. E
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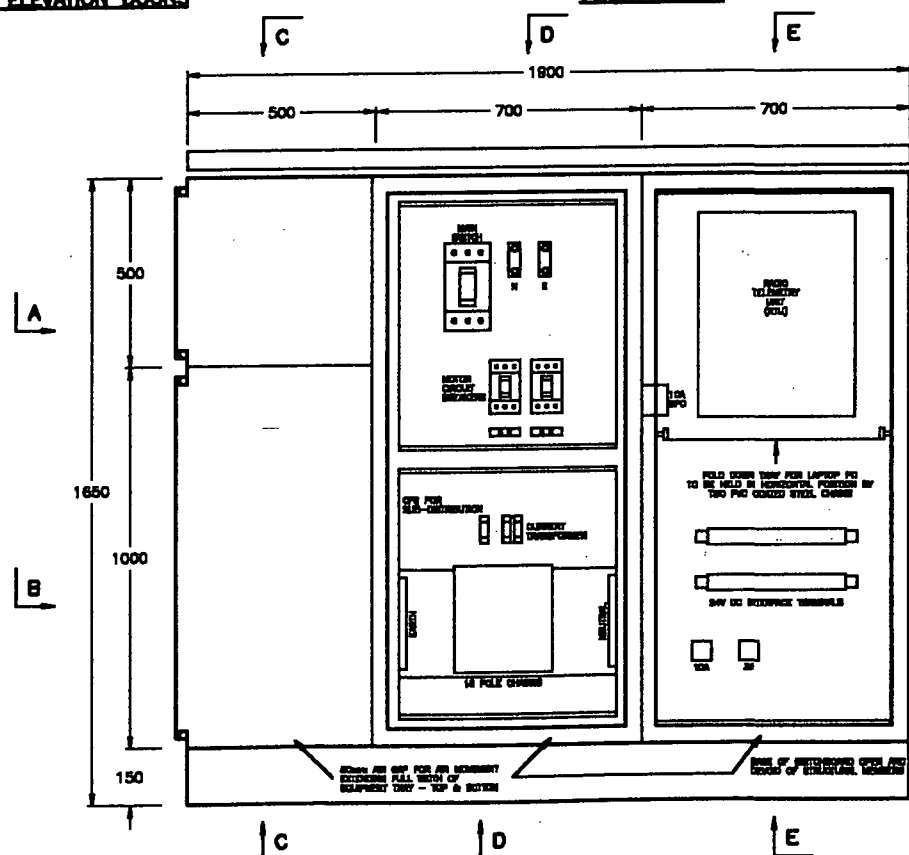


END ELEVATION DOORS

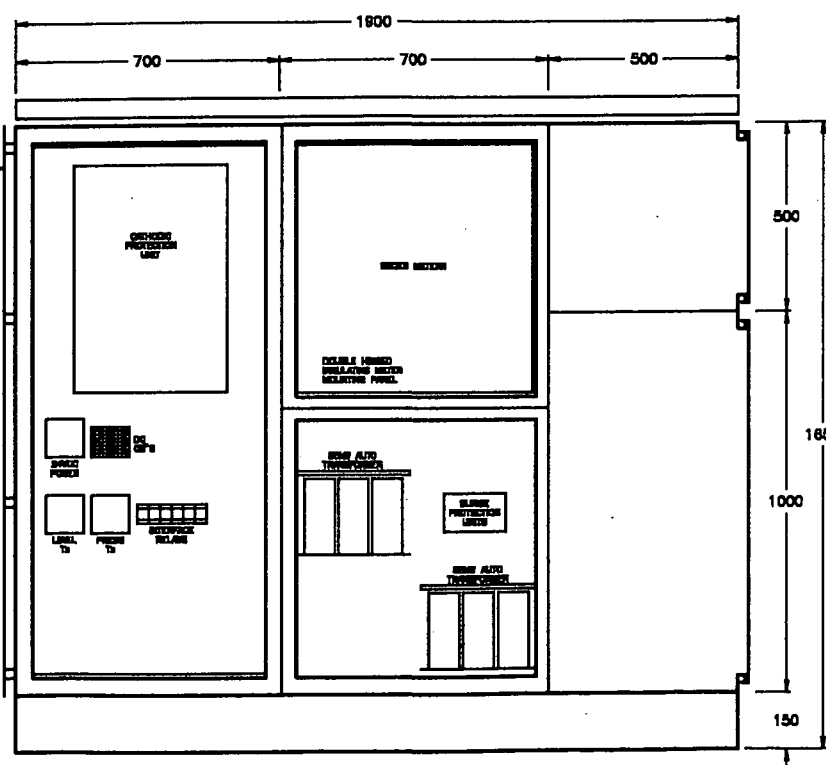
FRONT DOORS

REAR DOORS

DOORS FOR LIFTING BY HOIST  
SHALL NOT ALLOW BARRING OF HOIST  
CABLE OR ROPE TO BE LOADED  
THERE SHALL BE SUFFICIENT SPACE  
ON THE TOP OF THE DOORFRAME



FRONT ELEVATION  
(DOORS REMOVED)




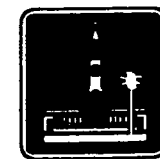
REAR ELEVATION  
(DOORS REMOVED)

## NOTES

No	DATE	AMENDMENT	INITIALS
E	29-3-95	BCC TITLE BLOCK ADDED	M.J.
D	21-3-95	REPOSITION EQUIPMENT	M.J.
C	23-2-95	GENERAL REVISION	D.W.
B	16-2-95	GENERAL REVISION	M.J.
A	15-12-94	DELETE DOORS 4 & 5	M.J.

### AMENDMENT & ISSUE REGISTER

MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	
DATE:		DATE:	
DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION		DATE:	
DESIGN	B.E.B.	9-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	9-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED		9-12-94	
JPR No. E94-BF5300/BSE			DATE: 29-3-95
CADD FILE No. BF530085			REFERENCES



Brisbane City

**BRISBANE CITY COUNCIL**  
DEPARTMENT OF WATER SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

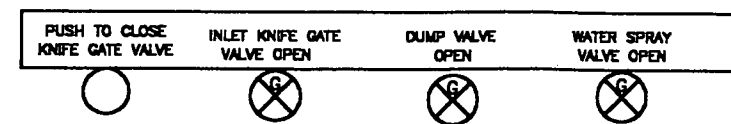
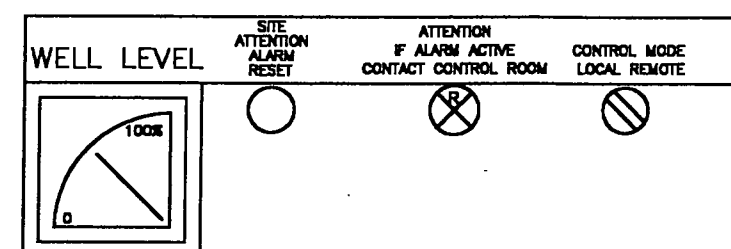
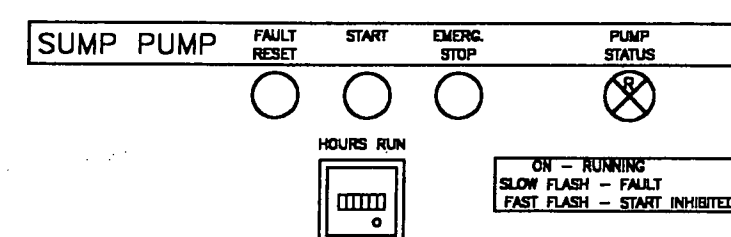
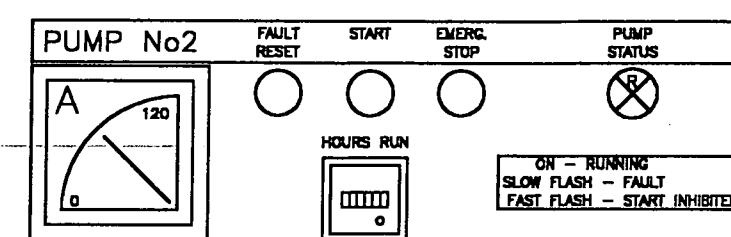
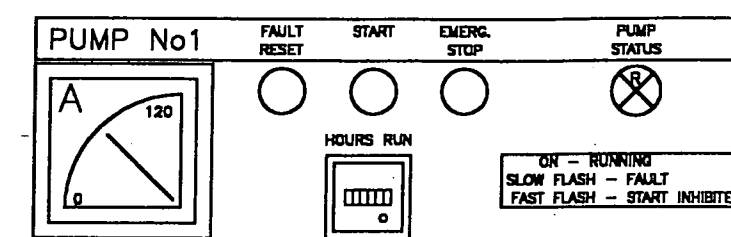
PROJECT  
**GREY STREET PUMP STATION SP266**

TITLE  
**MAIN SWITCHBOARD GENERAL ARRANGEMENT**

SCALE: N.T.S.	No. OF SHEETS
DRAWING No. E94-BF5300/B5	AMEND. E

ORIGINAL

ONLY ONE MAIN PUMP CAN OPERATE AT ANY TIME



INDICATION PANEL LAYOUT

NOTES

E	29-3-95	BCC TITLE BLOCK ADDED	M.J.
D	21-3-95	AMEND PUMP STATUS LABEL	M.J.
C	22-2-95	AMEND AS REQUIRED	D.W.
B	21-2-95	AMEND AS REQUIRED	M.J.
A	15-12-94	GENERAL REVISION	M.J.
No	DATE	AMENDMENT	INITIALS

AMENDMENT & ISSUE REGISTER

MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:		DATE:	DATE:
DESIGN	B.E.B.	8-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	8-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED	8-12-94		
JPR No. E94-BF5300/B4E		DATE: 29-3-95	
CADD FILE No. BF5300B4		REFERENCES	

BRISBANE CITY COUNCIL  
DEPARTMENT OF WATER SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

PROJECT  
GREY STREET PUMP STATION  
SP266

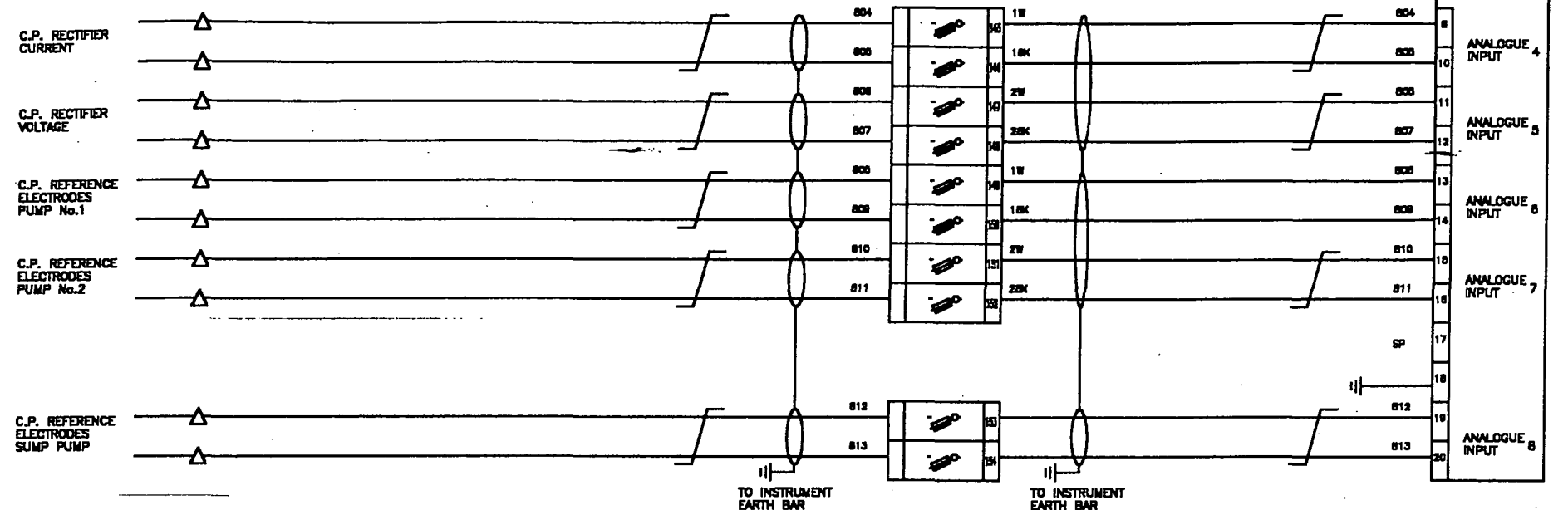
TITLE  
SCHEMATIC WIRING DIAGRAM

SCALE: 1:10	No. OF SHEETS
DRAWING No. E94-BF5300/B4	AMEND. E

CATHODIC PROTECTION UNIT

24V DC INTERFACE  
TERMINAL STRIP  
(NOTE 1)

CONTINUED FROM DRAWING E94-BF5300/B2  
TELEMETRY UNIT  
ANALOG INPUT CARR. No. 2 TYPE FRN 1421 SLOT 6



## NOTES

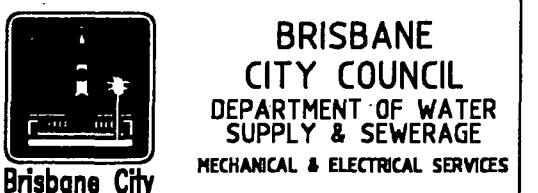
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E	29-3-95	BCC TITLE BLOCK ADDED	M.J.
D	22-3-95	AMEND TITLE BLOCK	M.J.
C	22-2-95	AMEND AS REQUIRED	M.J.
B	21-2-95	AMEND AS REQUIRED	M.J.
A	15-12-94	AMEND AS REQUIRED	M.J.

### AMENDMENT & ISSUE REGISTER

MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION	
DATE:	DATE:	DATE:	

DESIGN	B.E.B.	8-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	8-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED		8-12-94	

JPR No. E94-BF5300/B3E	DATE: 29-3-95
CADD FILE No. BF5300B3	REFERENCES



PROJECT  
GREY STREET PUMP STATION  
SP266

TITLE  
"AS CONSTRUCTED"  
SCHEMATIC WIRING DIAGRAM

SCALE: N.T.S.	No. OF SHEETS
DRAWING No. E94-BF5300/B3	AMEND.

#### NOTES

ALL FUSES ARE 100mA RATED

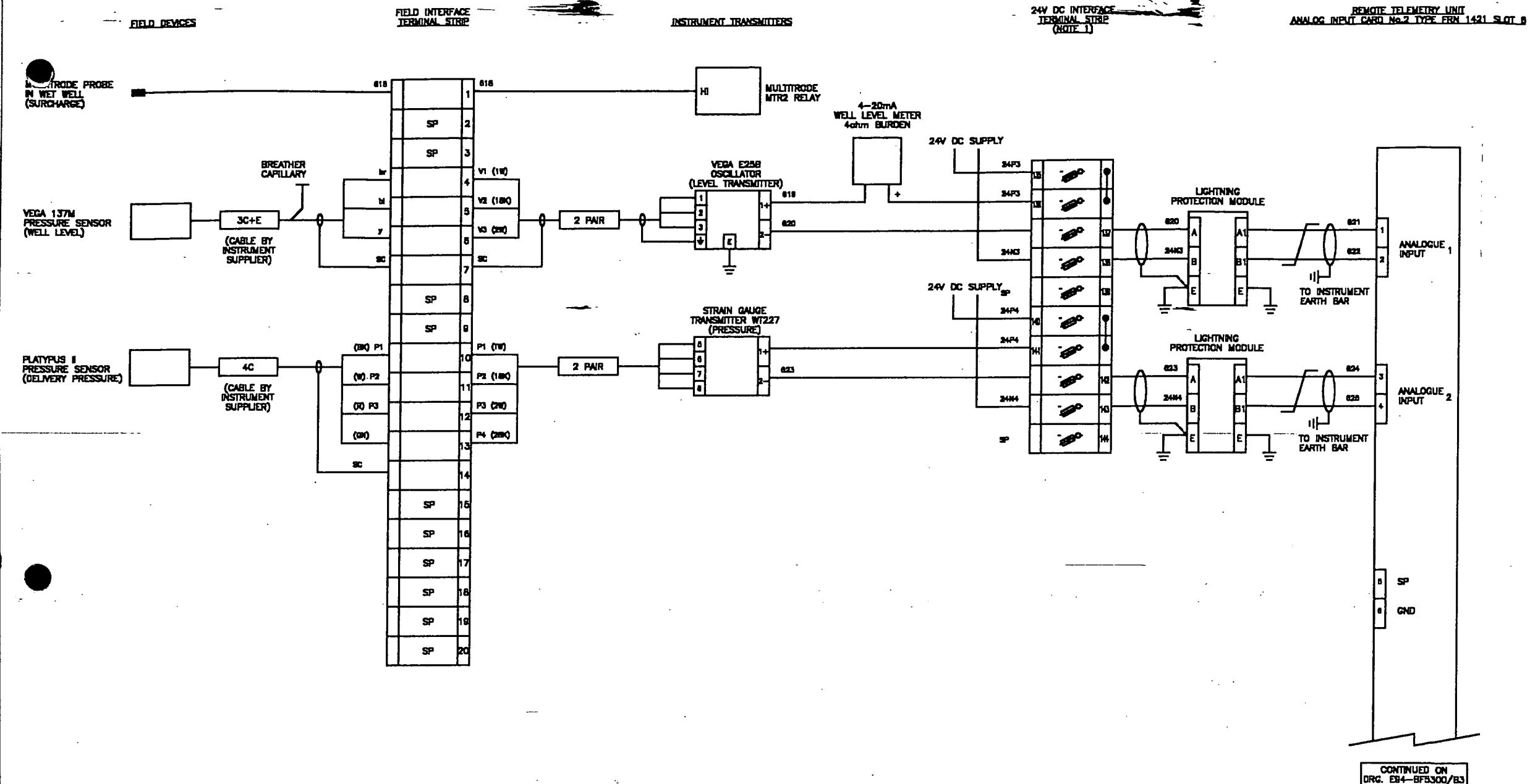
ORIGINAL

Q-Pulse ID TM6718

Active 29/01/2014

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# NOTES




CONTINUED ON  
DRG. E94-BF5300/B3

No	DATE	AMENDMENT	INITIALS
E	29-3-95	BCC TITLE BLOCK ADDED	M.J.
D	22-3-95	AMEND TITLE BLOCK	M.J.
C	22-2-95	AMEND AS REQUIRED	D.W.
B	28-2-95	AMEND AS REQUIRED	M.J.
A	14-12-94	AMEND WIRE, SLOT & DRG NUMBERS	M.J.

AMENDMENT & ISSUE REGISTER			
MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	
DATE:		DATE:	
DESIGN		ENGINEER IN CHARGE	
DRAWN		SUPERVISING ENGINEER	
TRACED			
CHECKED			

JPR No. E94-BF5300/B2E	DATE: 29-3-95
CADD FILE No. BF5300B2	REFERENCES


**BRISBANE CITY COUNCIL**  
 DEPARTMENT OF WATER SUPPLY & SEWERAGE  
 MECHANICAL & ELECTRICAL SERVICES

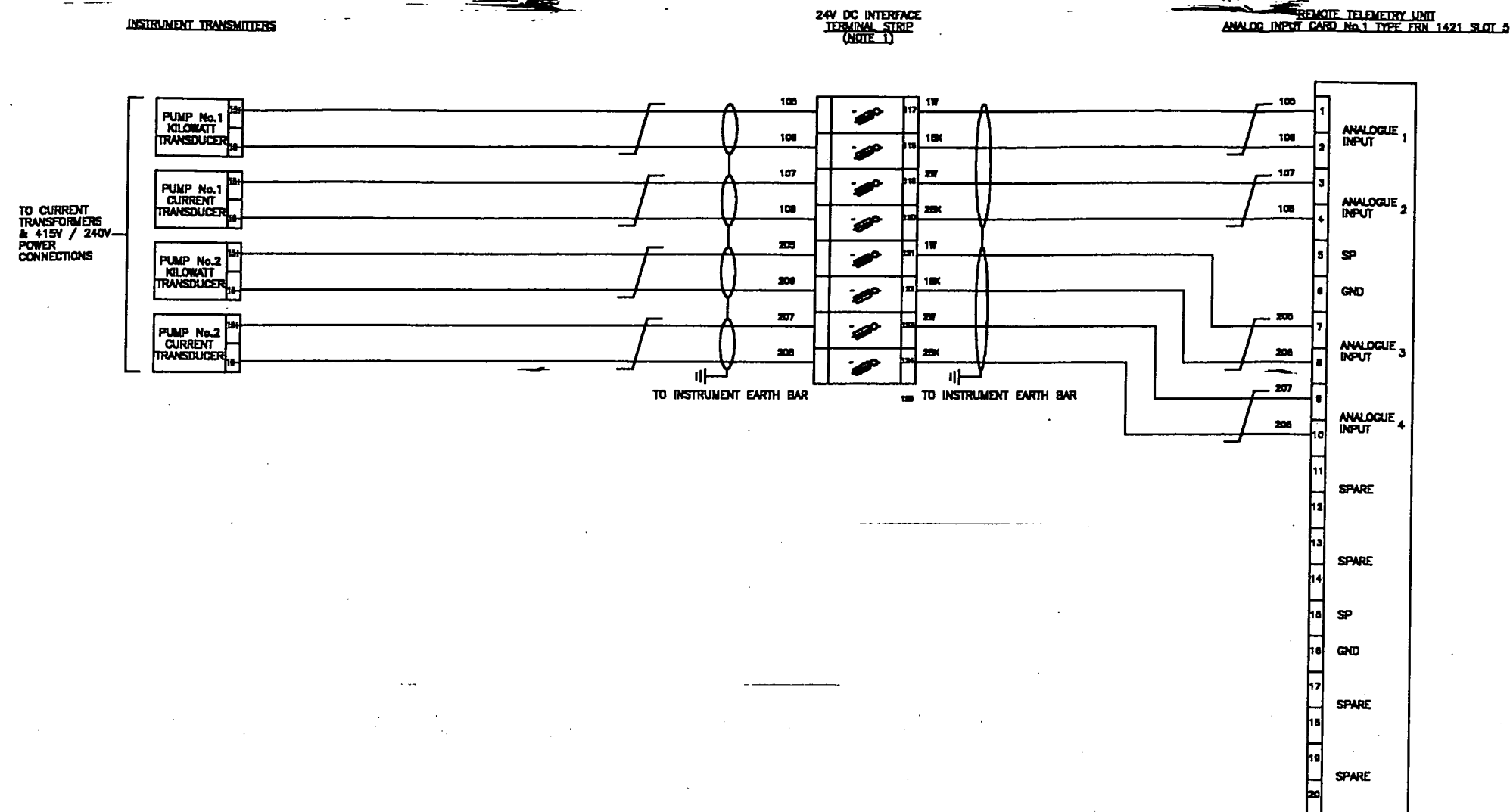
PROJECT  
 GREY STREET PUMP STATION  
 SP266

TITLE  
 SCHEMATIC WIRING-DIAGRAM

SCALE: N.T.S.	No. OF SHEETS
DRAWING No. E95-BF5300/B2	AMEND. E

NOTES  
 1. ALL FUSES ARE 100mA RATED

ORIGINAL



**NOTES**

ALL FUSES ARE 100mA  
RATED

ORIGINAL

Q-Pulse Id TM\$718

Active 29/01/2014

## NOTES

E	29-3-95	BCC TITLE BLOCK ADDED	M.J.
D	22-3-95	AMEND TITLE BLOCK	M.J.
C	22-2-95	AMEND AS REQUIRED	D.W.
B	28-2-95	AMEND AS REQUIRED	M.J.
A	14-12-94	AMEND AS REQUIRED	M.J.
No	DATE	AMENDMENT	INITIALS

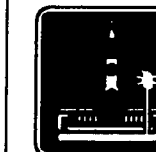
## AMENDMENT & ISSUE REGISTER

MANAGER	DIRECTOR OF PLANNING & DESIGN
DATE:	DATE:

DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:	DATE:	DATE:

DESIGN	B.F.B.	8-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	8-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED	<i>[Signature]</i>	8-12-94	

JPR No. E94-BF5300/B/E	DATE: 29-3-95
CADD FILE No. BF5300B1	REFERENCES



**Brisbane C**

**BRISBANE  
CITY COUNCIL  
DEPARTMENT OF WATER  
SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES**

## PROJECT

GREY STREET PUMP STATION  
SP266

**TITLE**

### SCHEMATIC WIRING DIAGRA

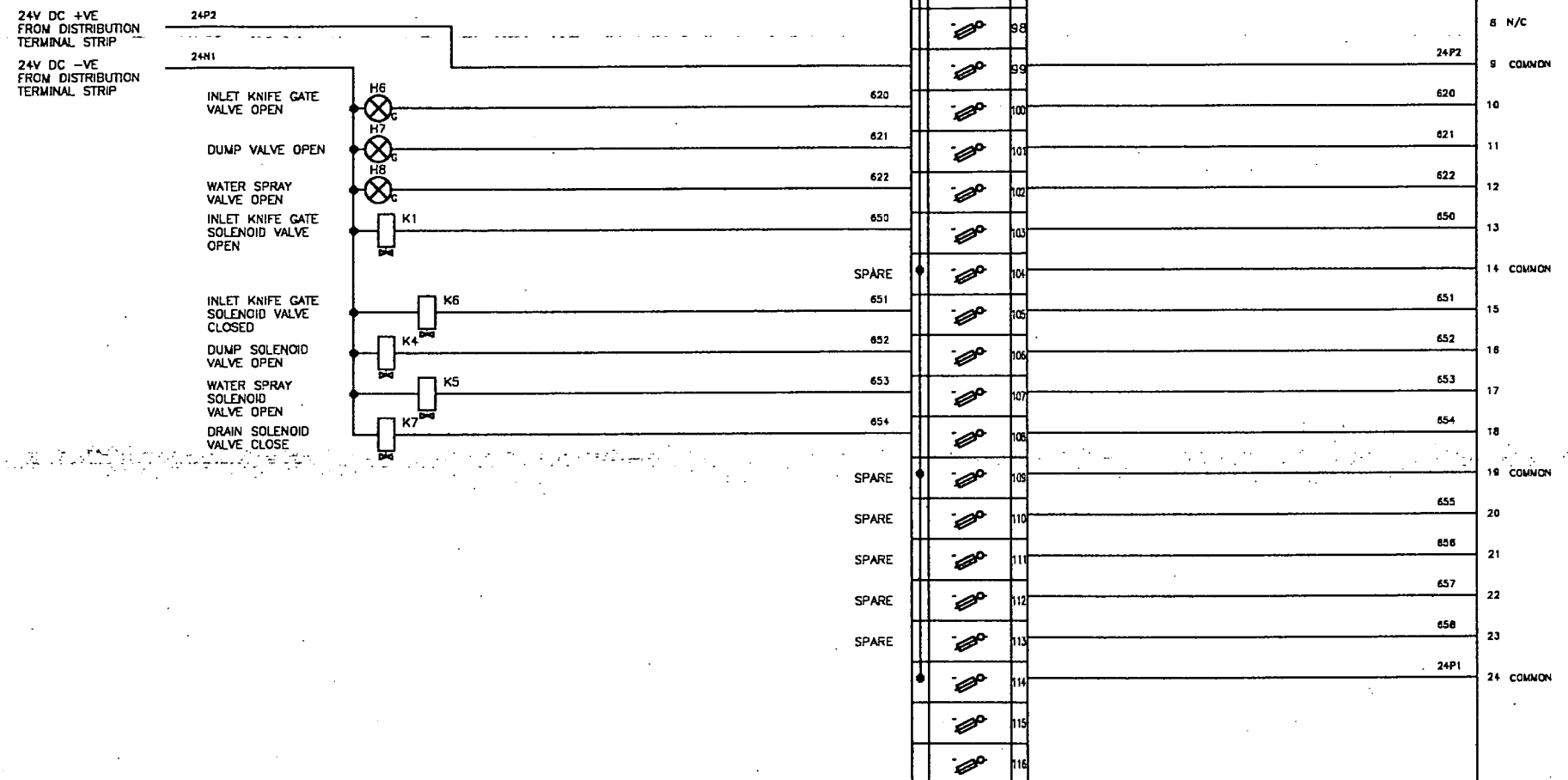
SCALE: N.T.S.	No. OF SHEETS
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DRAWING No.	AMEND.
E94-BF5300/B1	Page 33



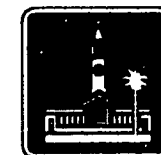
REMOTE TELEMETRY UNIT  
DIGITAL OUTPUT CARD TYPE FRN 1419 SLOT 4

24V DC INTERFACE  
TERMINAL STRIP



**"AS CONSTRUCTED"**

AMENDMENT & ISSUE REGISTER				
MANAGER		DIRECTOR OF PLANNING & DESIGN		
DATE:		DATE:		
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES		DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:		DATE:		DATE:
DESIGN	B.E.B.	14-12-94	ENGINEER IN CHARGE	
DRAWN	M.J.	14-12-94	SUPERVISING ENGINEER	
TRACED				
CHECKED	<i>KCB</i>			
JPR No. E94-BF5300/B0E			DATE: 29-3-95	
CADD FILE No. BF5300B0			REFERENCES	



**Brisbane City**

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DEPARTMENT OF WATER  
SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES**

PROJECT  
GREY STREET PUMP STATION  
SP266

TITLE

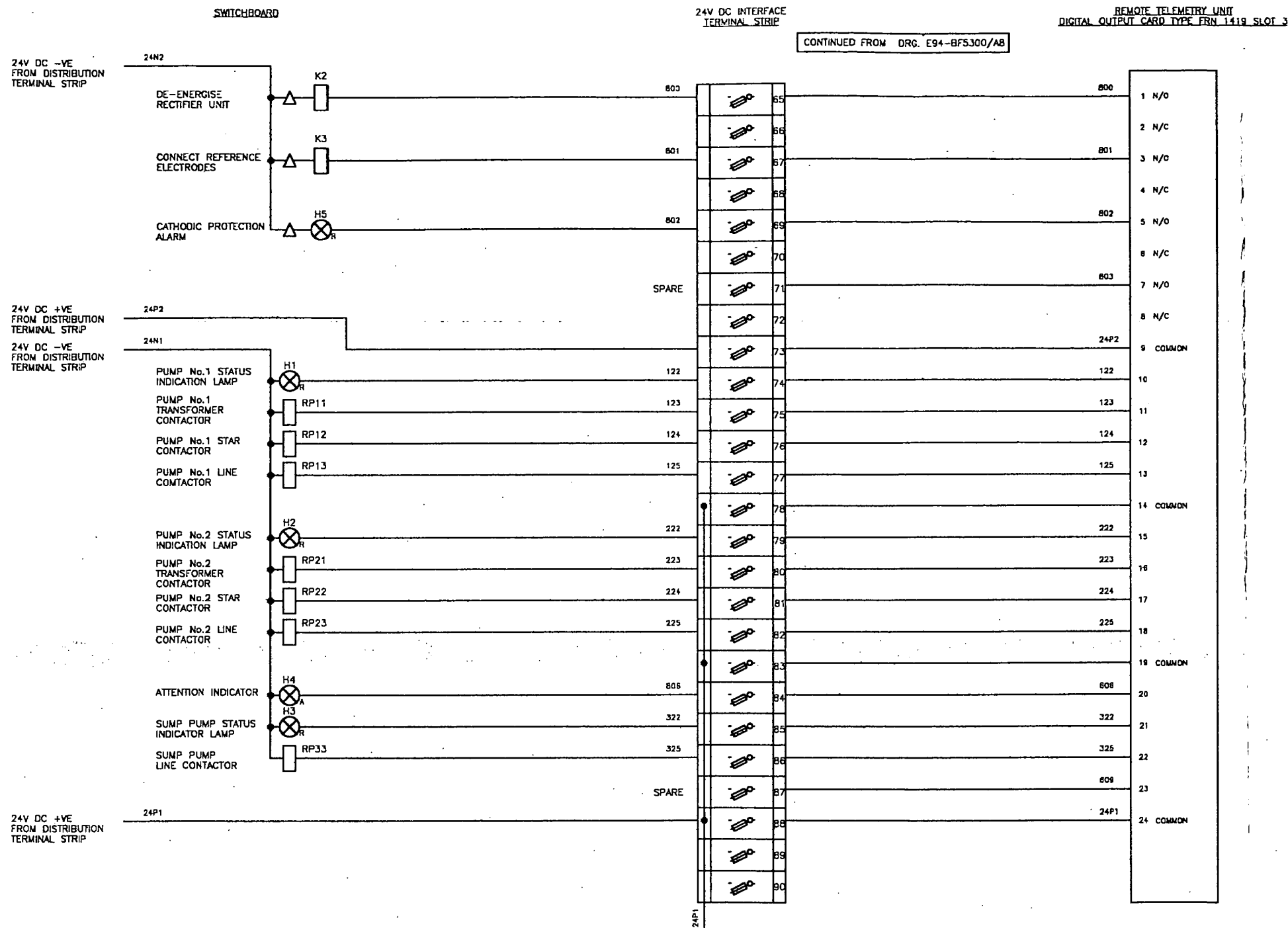
SCHEMATIC WIRING DIAGRAM

SCALE: N.T.S.	No.	OF	SHEETS
DRAWING No. E94-BF5300/B0			AMEND. H

## NOTES

1. FUSES ARE RATED TO  
SUIT THE LOAD

ORIGINAL



NOTES

No	DATE	AMENDMENT	INITIALS
F	3-10-95	REVISE 24P1 SUPPLY	P.G.B.
E	29-3-95	BCC TITLE BLOCK ADDED	M.J.
D	22-3-95	DRAWING REFERENCE ADDED	M.J.
C	22-2-95	AMEND DRAWING REFERENCE	D.W.
B	28-2-95	AMEND DRAWING REFERENCE	M.J.
A	14-12-94	ADD H1, H2, H3, H4, H5 & SPARES	M.J.

AMENDMENT & ISSUE REGISTER			
MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:		DATE:	DATE:
DESIGN	B.E.B.	8-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	8-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED	110		
JPR No. E94-BF5300/A9E		DATE: 29-3-95	
CADD FILE No. BF5300A9		REFERENCES	

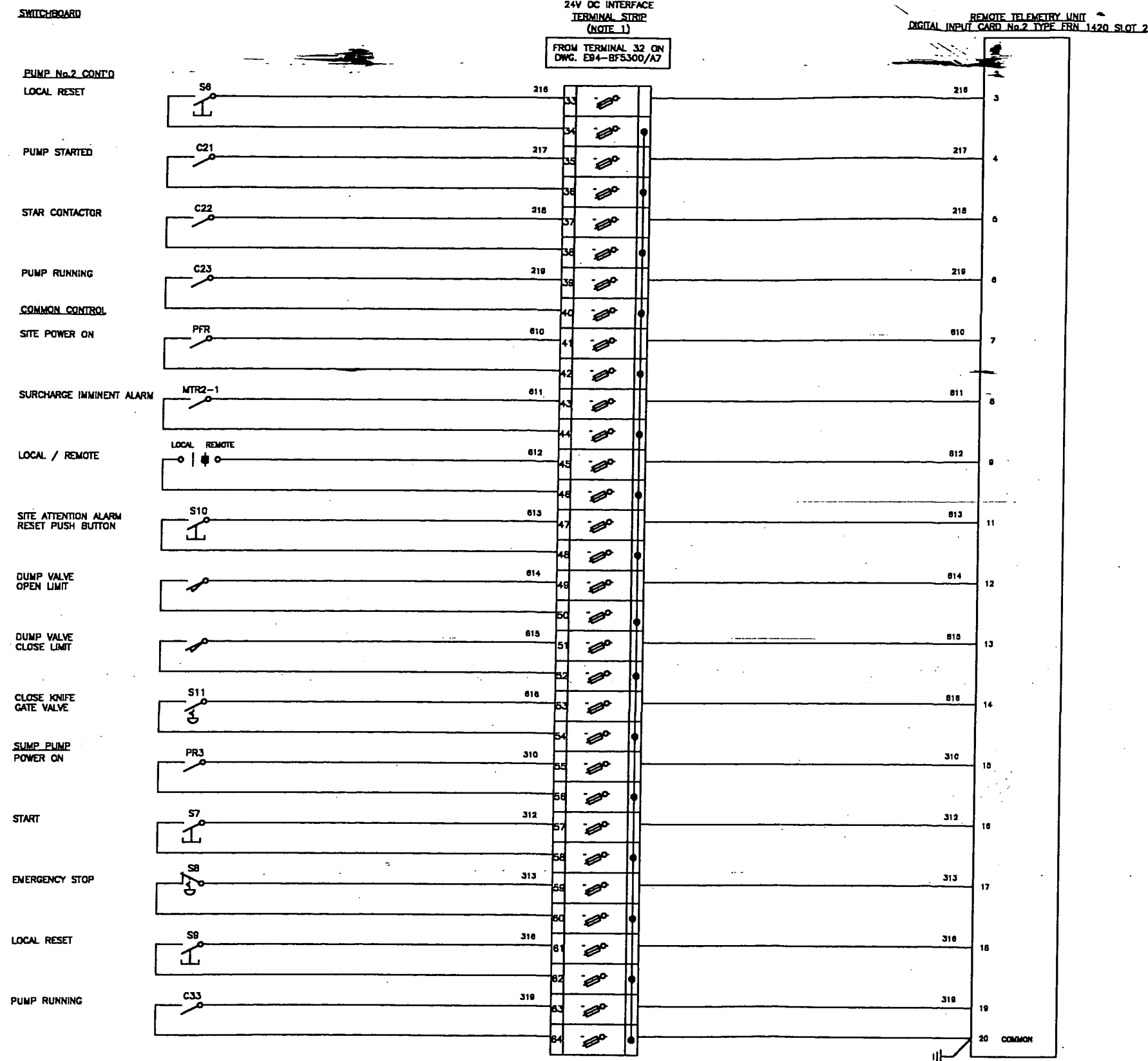


BRISBANE CITY COUNCIL  
DEPARTMENT OF WATER SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

PROJECT GREY STREET PUMP STATION SP266			
TITLE SCHEMATIC WIRING DIAGRAM			
SCALE: N.T.S.	No.	OF	SHEETS
DRAWING No. E94-BF5300/A9	AMEND. F		

"AS CONSTRUCTED"

NOTES  
1. FUSES ARE RATED TO SUIT THE LOAD  
ORIGINAL

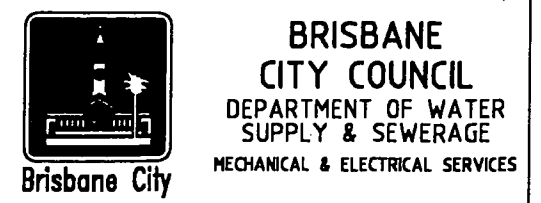


CONTINUED ON  
DRAWING E94-BF5300/A8

## NOTES

No	DATE	AMENDMENT	INITIALS
G	4-8-95	DELETE THERMAL O/L LOAD C33	P.H.
F	12-7-95	ADD THERMAL OVERLOAD	B.R.
E	29-3-95	BCC TITLE BLOCK ADDED	M.J.
D	22-3-95	DRAWING REFERENCE ADDED	M.J.
C	22-2-95	AMEND DRAWING REFERENCES	D.W.
B	20-2-95	AMEND DRAWING REFERENCES	M.J.
A	15-12-94	GENERAL REVISION	M.J.

AMENDMENT & ISSUE REGISTER			
MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:		DATE:	DATE:
DESIGN	B.E.B.	8-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	8-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED		8-12-94	
JPR No. E94-BF5300/A8E		29-3-95	
CADD FILE No. BF5300A8		REFERENCES	



PROJECT	
GREY STREET PUMP STATION SP266	
TITLE	
SCHEMATIC WIRING DIAGRAM	
SCALE: N.T.S.	No. OF SHEETS
DRAWING No. E94-BF5300/A8	AMEND. G

NOTES

1. ALL FUSES ARE 100mA RATED

ORIGINAL

# SWITCHBOARD

PUMP No.1  
POWER ON

THERMAL OVERLOAD

START

EMERGENCY STOP

MOTOR WINDINGS THERMISTOR

AUTO TRANSFORMER  
THERMO SWITCH

LOCAL RESET

PUMP STARTED

STAR CONTACTOR

PUMP RUNNING

PUMP No.2  
POWER ON

THERMAL OVERLOAD

START

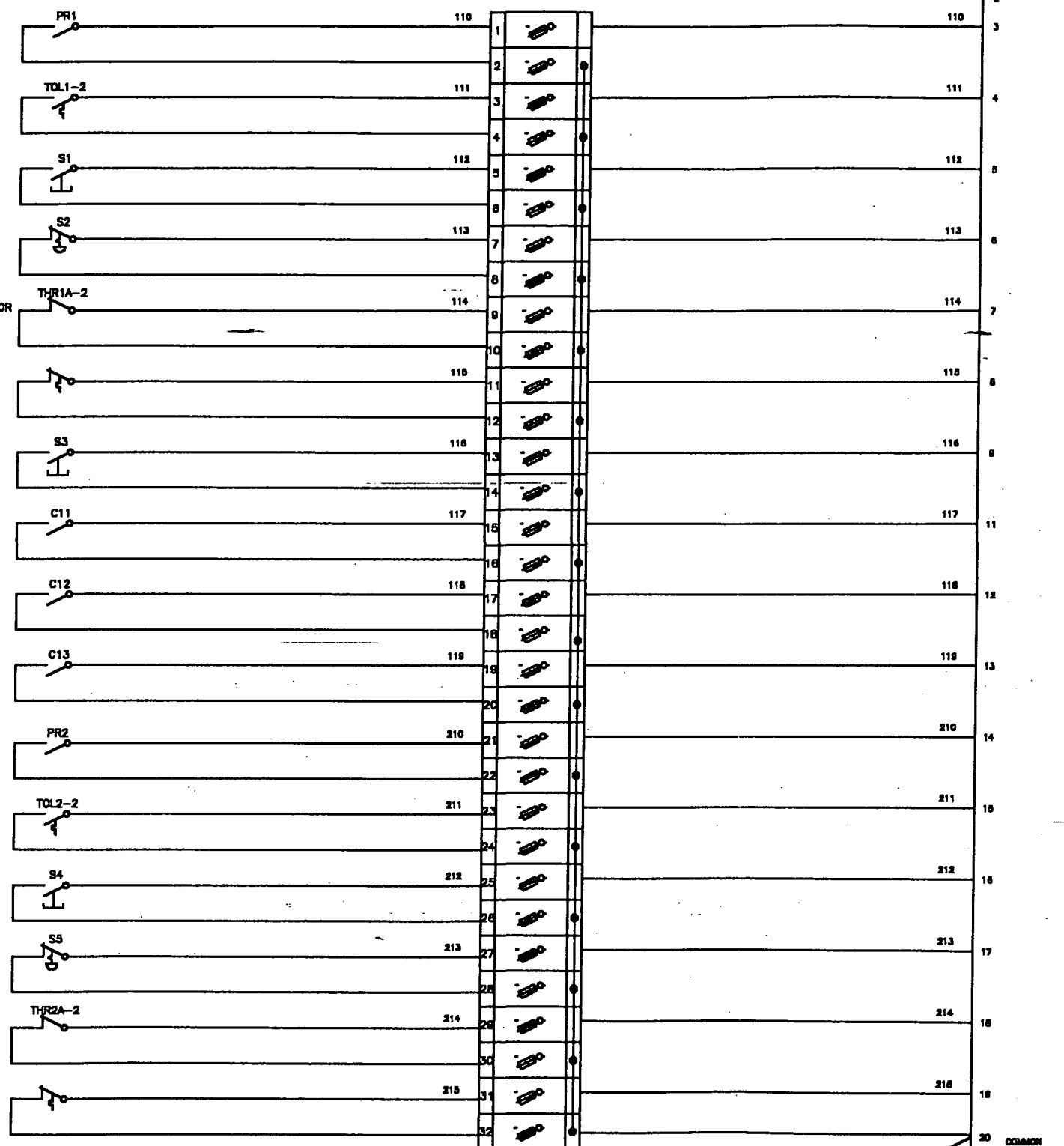
EMERGENCY STOP

MOTOR WINDINGS  
THERMISTOR

AUTO TRANSFORMER  
THERMO SWITCH

## 24V DC INTERFACE TERMINAL STRIP (NOTE 1)

## REMOTE TELEMETRY UNIT DIGITAL INPUT CARD No.1 TYPE FRN 1420 SLOT 1



CONTINUED ON DRG. E94-BF3300/A8

## NOTES

No	DATE	AMENDMENT	INITIALS
E	29-3-95	BCC TITLE BLOCK ADDED	M.J.
D	22-3-95	AMEND TITLE BLOCK	M.J.
C	22-2-95	AMEND DRAWING REFERENCE	D.W.
B	28-2-95	AMEND DRAWING REFERENCE	M.J.
A	14-12-94	AMEND AS REQUIRED	M.J.

## AMENDMENT & ISSUE REGISTER

MANAGER	DIRECTOR OF PLANNING & DESIGN
DATE:	DATE:

DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:	DATE:	DATE:

DESIGN	B.E.B.	8-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	8-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED	Q	8-12-94	

JPR No. E94-BF3300/A7E	DATE: 29-3-95
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CADD FILE No. BF3300A7	REFERENCES
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Brisbane City

BRISBANE  
CITY COUNCIL  
DEPARTMENT OF WATER  
SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

PROJECT  
GREY STREET PUMP STATION  
SP266

TITLE  
SCHEMATIC WIRING-DIAGRAM

SCALE: N.T.S. No. OF SHEETS

DRAWING No. E94-BF3300/A7 AMEND.

## NOTES

ALL FUSES ARE 100mA  
RATED

ORIGINAL

Q-Pulse to TM6718

Active 29/01/2014

Page 335 of 342

SWITCHBOARD

24V DC DISTRIBUTION  
TERMINAL STRIP

PUMPS Nos.1, 2 & SUMP PUMP  
24V DC CONTROL

CATHODIC PROTECTION 24V DC CONTROL

LEVEL TRANSMITTER 24V DC SUPPLY

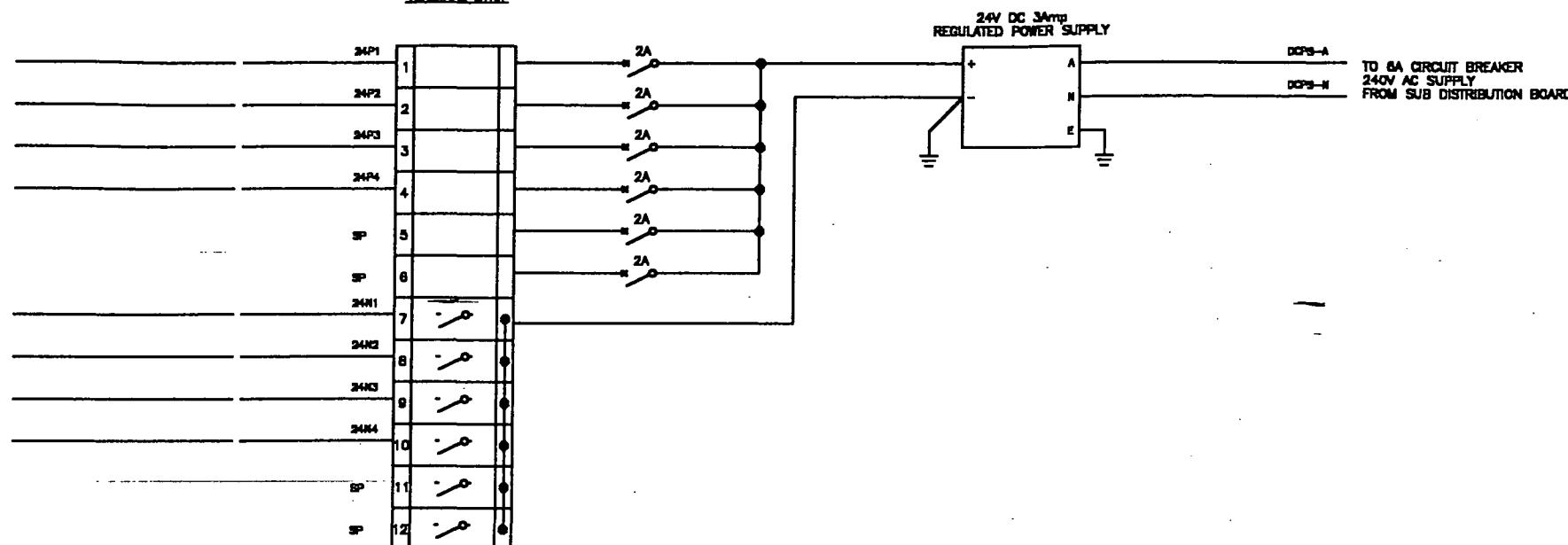
PRESSURE TRANSMITTER 24V DC SUPPLY

PUMPS Nos.1, 2 & SUMP PUMP  
24V DC CONTROL

CATHODIC PROTECTION 24V DC CONTROL

LEVEL TRANSMITTER 24V DC SUPPLY

PRESSURE TRANSMITTER 24V DC SUPPLY

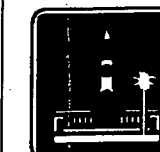


# NOTES

D	29-3-95	BCC TITLE BLOCK ADDED	M.J.
C	22-3-95	AMEND TITLE BLOCK	M.J.
B	28-2-95	AMEND AS REQUIRED	M.J.
A	14-12-94	ADD SUMP PUMP TO 24P1 & 24N1	M.J.
No	DATE	AMENDMENT	INITIALS

## AMENDMENT & ISSUE REGISTER

MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	
DATE:		DATE:	
DESIGN		ENGINEER IN CHARGE	
DRAWN		SUPERVISING ENGINEER	
TRACED			
CHECKED			
JPR No. E94-BF5300/A6D		DATE: 29-3-95	
CADD FILE No. BF5300A6		REFERENCES	



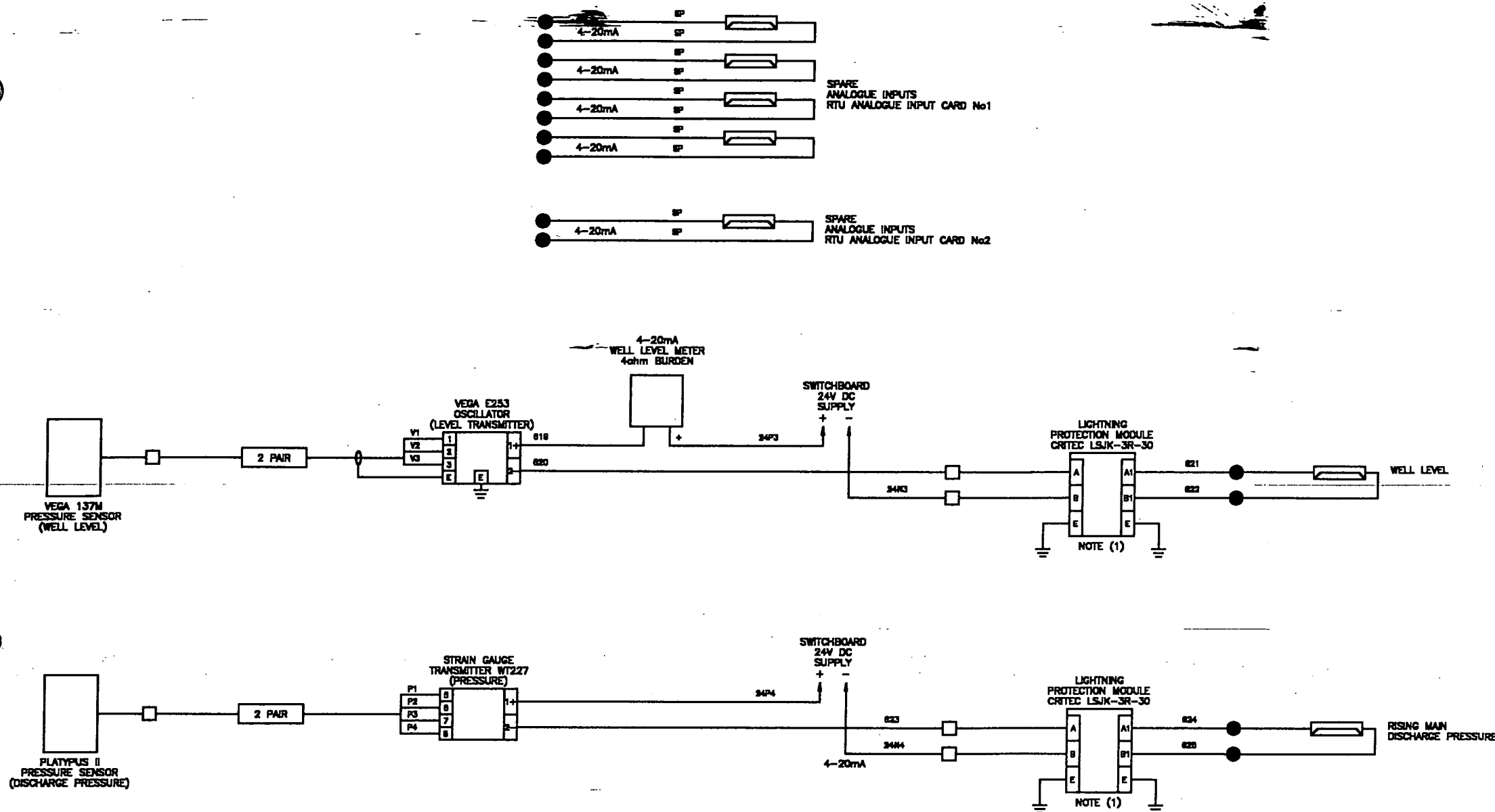
**BRISBANE  
CITY COUNCIL**  
DEPARTMENT OF WATER  
SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

PROJECT	
GREY STREET PUMP STATION SP266	
TITLE	
SCHEMATIC WIRING DIAGRAM	

SCALE: N.T.S.	No. OF SHEETS
DRAWING No. E94-BF5300/A6	AMEND. D

NOTES  
DISCONNECT TERMINALS

ORIGINAL  
Q Pulso Id TM5718



NOTES:  
1. FIELD SIDE AND PROTECTED SIDE  
WIRING TO LIGHTNING PROTECTION MODULE  
SHALL BE KEPT FULLY SEGREGATED IN  
SEPARATE DUCTS.  
(MINIMUM SEPARATION 300mm)

## NOTES

No	DATE	AMENDMENT	INITIALS
D	29-3-95	BCC TITLE BLOCK ADDED	M.J.
C	21-3-95	AMEND VEGA OSCILLATOR	M.J.
B	21-2-95	AMEND AS REQUIRED	M.J.
A	14-12-94	AMEND AS REQUIRED	M.J.

### AMENDMENT & ISSUE REGISTER

MANAGER	DIRECTOR OF PLANNING & DESIGN		
DATE:	DATE:		
DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION	
DATE:	DATE:	DATE:	
DESIGN	B.E.B.	8-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	8-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED		8-12-94	

JPR No. E94-BF5300/ASD	DATE: 29-3-95
CADD FILE No. BF5300AS	REFERENCES



**BRISBANE  
CITY COUNCIL**  
DEPARTMENT OF WATER  
SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

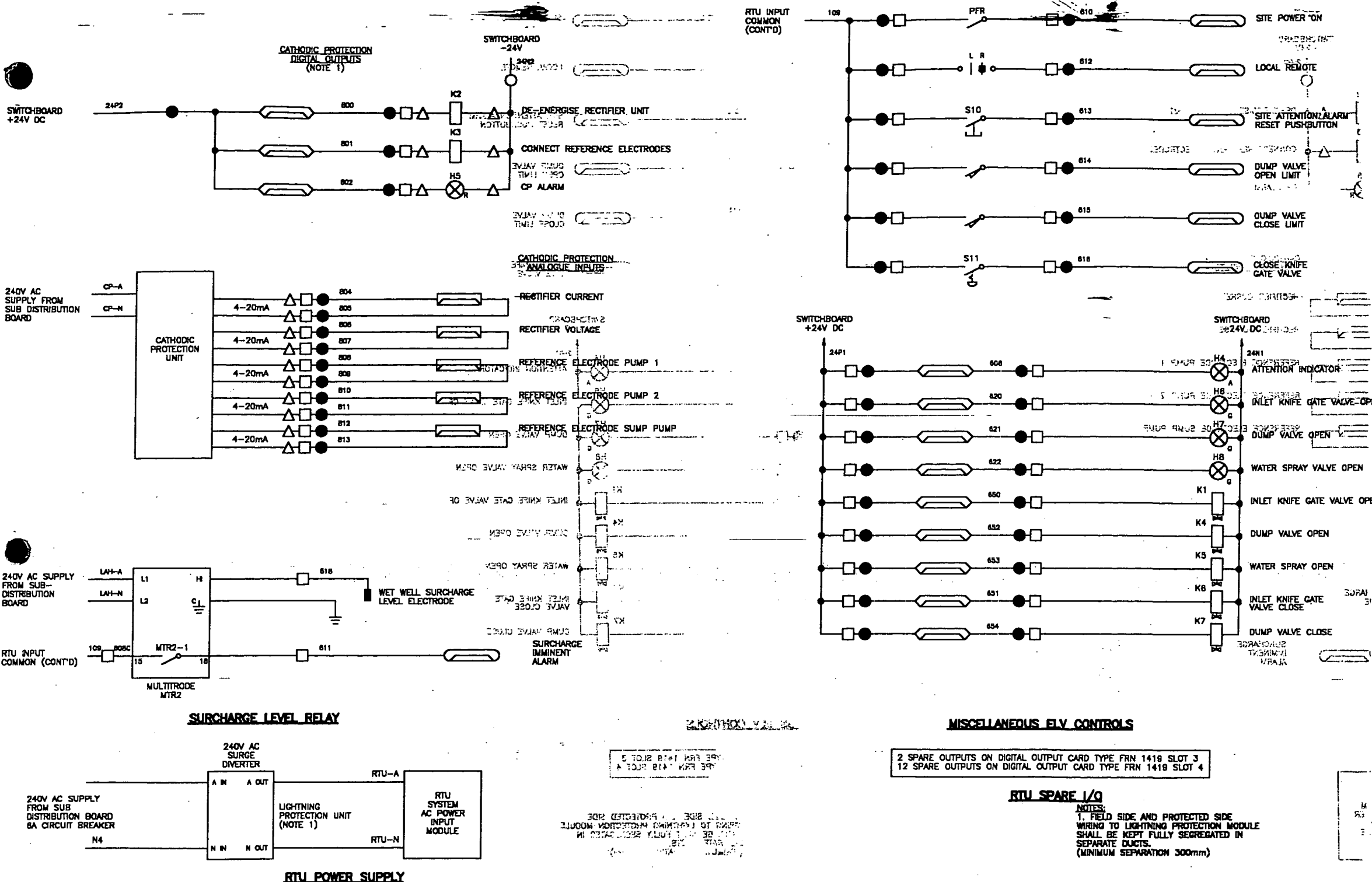
PROJECT  
GREY STREET PUMP STATION  
SP266

TITLE  
SCHEMATIC WIRING DIAGRAM

SCALE: N.T.S.	No. OF SHEETS
DRAWING No. E94-BF5300/AS	AMEND. Page 337 of 342


ORIGINAL

NOTES



No	DATE	AMENDMENT	INITIALS
G	4-8-95	ADD WIRE No.'s 651 & 654	P.H.
F	12-7-95	ADD SOLENOID VALVE K6 & K7	B.R.
E	29-3-95	ADD NEUTRAL N4	M.J.
D	22-3-95	AMEND TITLE BLOCK	M.J.
C	22-2-95	AMEND AS REQUIRED	D.W.
B	20-2-95	AMEND AS REQUIRED	M.J.
A	14-12-94	GENERAL REVISION	M.J.

AMENDMENT & ISSUE REGISTER			
MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:		DATE:	DATE:
DESIGN	B.E.B.	8-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	8-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED			
JPR No. E94-BF5300/A4E		DATE: 29-3-95	
CADD FILE No. BF5300A4		REFERENCES	



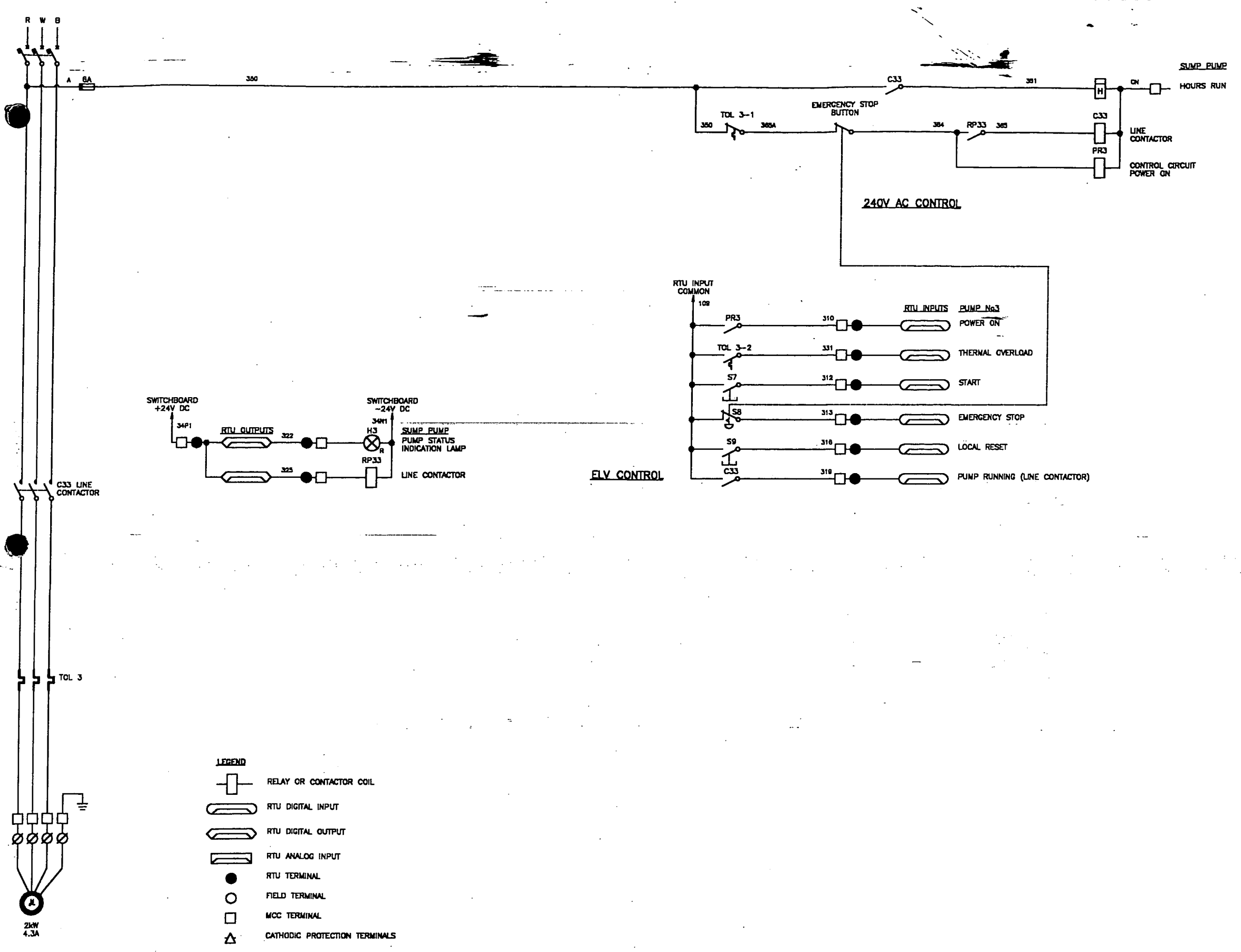
**BRISBANE CITY COUNCIL**  
DEPARTMENT OF WATER SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

PROJECT  
**GREY STREET PUMP STATION SP266**

TITLE  
**SCHEMATIC WIRING DIAGRAM**

SCALE: N.T.S.      No. OF SHEETS  
DRAWING No. **E95-BF5300/A4**      AMEND. **G**


ORIGINAL



# NOTES

H	15-8-95	AMEND AS REQUIRED	P.H.
G	4-8-95	RELOCATE TOL 3-1 CONTACT	P.H.
F	12-7-95	ADD OVERLOAD CONTACT	B.R.
E	29-3-95	AMEND NEUTRAL NUMBER	M.J.
D	22-3-95	ADD TERMINALS TO MOTOR	M.J.
C	22-2-95	AMEND AS REQUIRED	D.W.
B	20-2-95	AMEND AS REQUIRED	M.J.
A	14-12-94	AMEND AS REQUIRED	M.J.
No	DATE	AMENDMENT	INITIALS

AMENDMENT & ISSUE REGISTER			
MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	
DATE:		DATE:	
DESIGN		ENGINEER IN CHARGE	
DRAWN		SUPERVISING ENGINEER	
TRACED			
CHECKED			
JPR No. E94-BF5300/A3H		29-3-95	
CADD FILE No. BF5300A3		REFERENCES	



**BRISBANE CITY COUNCIL**  
DEPARTMENT OF WATER SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

PROJECT  
GREY STREET PUMP STATION  
SP266

TITLE  
SCHEMATIC WIRING DIAGRAM

SCALE: N.T.S.      No. OF SHEETS

DRAWING No. E94-BF5300/A3      AMEND. H

"AS CONSTRUCTED"

ORIGINAL



# NOTES

No	DATE	AMENDMENT	INITIALS
E	29-3-95	C12 NOW C22 & C13 NOW C23	M.J.
D	21-3-95	ADD TERMS, AMEND STATUS IND.	M.J.
C	22-2-95	AMEND AS REQUIRED	D.W.
B	28-2-95	AMEND AS REQUIRED	M.J.
A	14-12-94	AMEND H2, TOL2, C21 & C23	M.J.

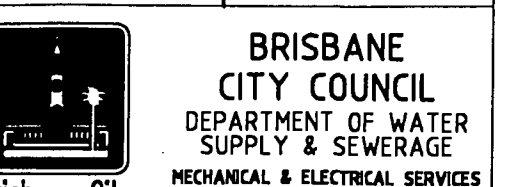
## AMENDMENT & ISSUE REGISTER

MANAGER	DIRECTOR OF PLANNING & DESIGN
DATE:	DATE:

DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:	DATE:	DATE:

DESIGN	B.E.B.	8-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	8-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED			

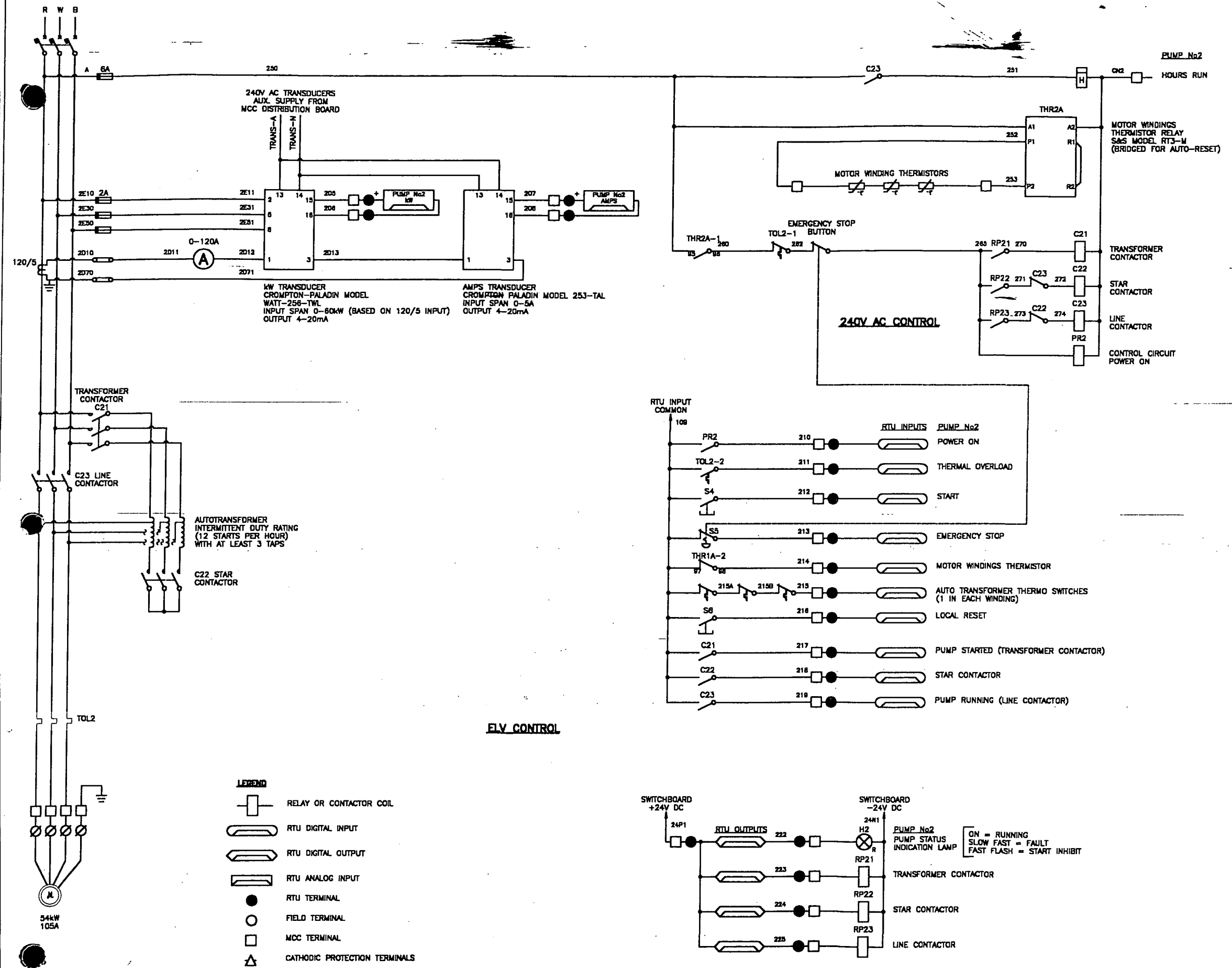
JPR No. E94-BF5300/A2E	DATE: 29-3-95
CADD FILE No. BF5300A2	REFERENCES

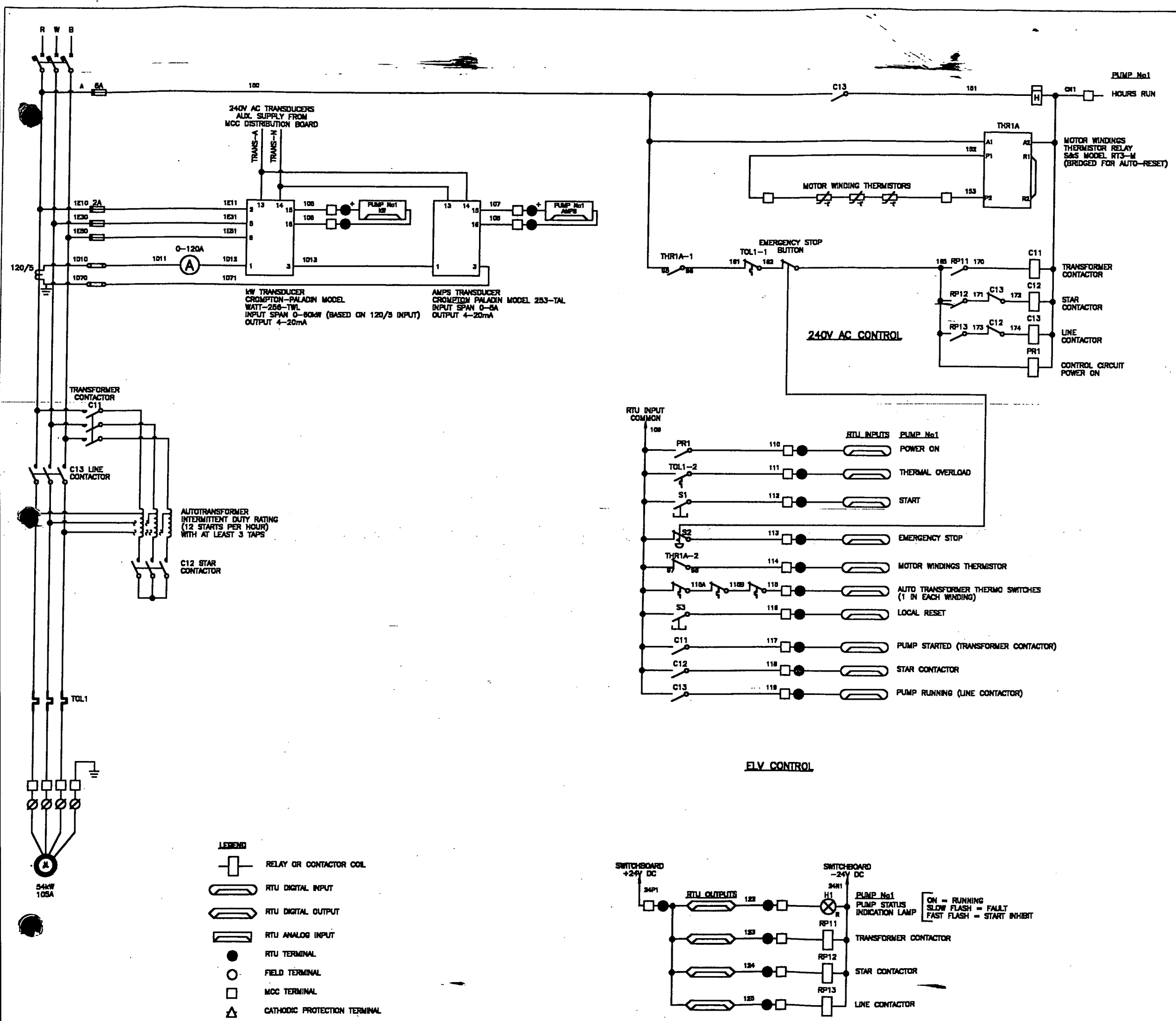


PROJECT	GREY STREET PUMP STATION SP266
TITLE	SCHEMATIC WIRING DIAGRAM

SCALE: N.T.S.	No. OF SHEETS
DRAWING No. E94-BF5300/A2	AMEND.

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# NOTES

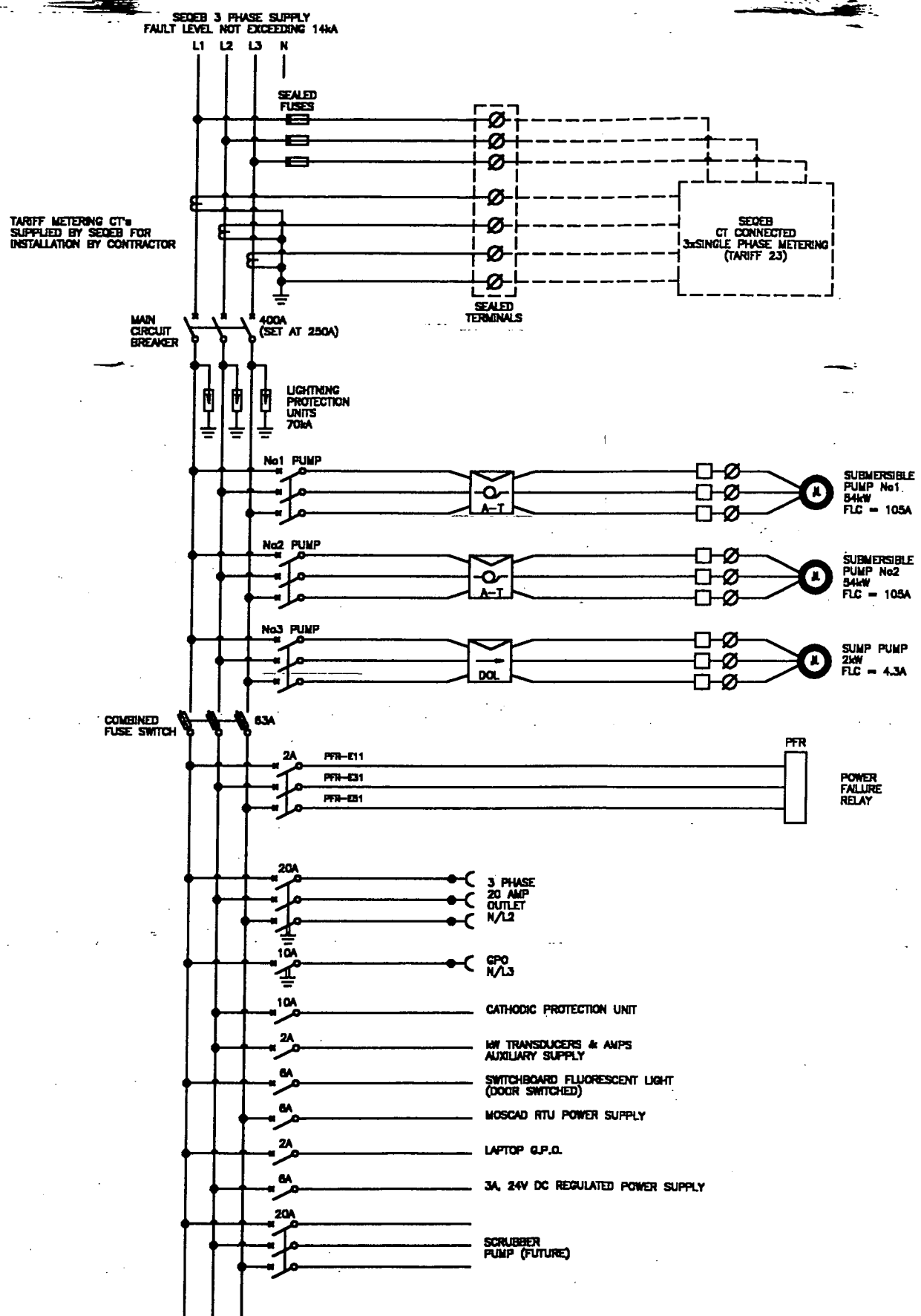
No	DATE	AMENDMENT	INITIALS
E	29-3-95	ADD BCC TITLE BLOCK	M.J.
D	21-3-95	ADD TERMS & AMEND IND. LAMP	M.J.
C	22-2-95	AMEND AS REQUIRED	D.W.
B	28-2-95	AMEND AS REQUIRED	M.J.
A	14-12-94	PUMP RUNNING (LINE CONTACTOR)	M.J.

AMENDMENT & ISSUE REGISTER			
MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION
DATE:		DATE:	DATE:
DESIGN	B.E.B.	8-12-94	ENGINEER IN CHARGE
DRAWN	M.J.	8-12-94	SUPERVISING ENGINEER
TRACED			
CHECKED		8-12-94	
JPR No.	E94-BF5300/A1E	29-3-95	
CADD FILE No.	BF5300A1	REFERENCES	



**BRISBANE CITY COUNCIL**  
DEPARTMENT OF WATER SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES


PROJECT		No. OF SHEETS	
GREY STREET PUMP STATION		No.	
SP266		AMEND.	
TITLE		Page 341 of 342	
SCHEMATIC WIRING DIAGRAM			
SCALE: N.T.S.			
DRAWING No.			
E94-BF5300/A1			




POWER CIRCUIT DIAGRAM

# NOTES

No	DATE	AMENDMENT	INITIALS
E	29-3-95	DELETE SURCHARGE ELECT RELAY	M.J.
D	21-3-95	AMEND AS REQUIRED	M.J.
C	22-2-95	AMEND AS REQUIRED	D.W.
B	28-2-95	AMEND AS REQUIRED	M.J.
A	14-12-94	AMEND AS REQUIRED	M.J.

AMENDMENT & ISSUE REGISTER					
MANAGER			DIRECTOR OF PLANNING & DESIGN		
DATE:			DATE:		
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES		DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION	
DATE:		DATE:		DATE:	
DESIGN	B.E.B.	8-12-94	ENGINEER IN CHARGE		
DRAWN	M.J.	8-12-94	SUPERVISING ENGINEER		
TRACED					
CHECKED					
JPR No. E95-BF5300/A0E			DATE: 29-3-95		
CADD FILE No. BF5300A0			REFERENCES		



**BRISBANE CITY COUNCIL**  
DEPARTMENT OF WATER SUPPLY & SEWERAGE  
MECHANICAL & ELECTRICAL SERVICES

PROJECT		GREY STREET PUMP STATION SP266	
TITLE		"AS CONSTRUCTED"	
SCHEMATIC WIRING DIAGRAM			
SCALE: N.T.S.	No.	OF	SHEETS
DRAWING No.	E94-BF5300/A0		AMEND.