

TRINITY GREENS ESTATE
TRINITY WAY, DREWVALE
SEWAGE PUMPING STATION SP304
Operation and Maintenance Manual



John Goss Projects Pty Ltd



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CALAMVALE

4116

Calamvale Community College
Calamvale Primary
Special School

STRETTON

4116

Karawatha

Forest

DREWVALE

4116

BERF

41

TRINITY
GREENS

BROWNS PLAINS

4118

REGENTS

PARK

1.0 INTRODUCTION

These operating instructions cover the SP 304 pumping station electrical equipment supplied by John Goss Projects Pty Ltd.

1.1 Operating Instructions

Normal operation of the pumping station is in the automatic mode with control by means of a Master Programmable Logic Controller (PLC) which receives level signals from the Level Measurement System in the wet well / Electronic Level Relays/ Float Switches.

Manual operation control of the station is available by means of selector switches on the pump station switchboard.

2.0 DESCRIPTION OF OPERATION

2.1 Mode Selection

The station can be operated either automatically or manually with mode selection being made by means of the mode selector switches mounted on each pump section of the switchboard. These selector switches are designated with the following mode selections: REMOTE - LOCAL.

2.2 Manual Control

Each pumping unit can be run in manual control from the motor control centre by:

- a) Selecting the "LOCAL" setting on the "MODE SELECTOR SWITCHES" as described in Clause 2.1.
- b) Starting by "START" button.
- c) Stopping by "STOP" button.

NOTE: DO NOT LEAVE IN MANUAL WHILE STATION IS UNATTENDED

2.3 Automatic Control

For automatic control of the station:

- a) The "MODE SELECTOR SWITCHES" on the switchboard should be in the "REMOTE" position.
- b) The automatic Duty Selection is done via the PLC software. Refer PLC SOFTWARE Section for details. The total running hours of each pump unit is displayed on the hour meter located on each pump section of the switchboard.
- c) The automatic starting and stopping of the pumps is controlled by signals from Master PLC.

For NORMAL OPERATION, each of the pump selector switches should have "REMOTE" mode selected.

In the AUTOMATIC mode, the selected Duty Pump unit will start automatically as preset by the level in the wet well. In the event of the duty pump not being capable of supplying enough flow to continue draining the wet well and the wet well level rises to a second preset level, then the Standby Pump unit will automatically start to provide additional pumping. The supplementary pump unit also takes over for the respective pump duty on the occurrence of one of the Duty Pump units failing.



3.0 **CUBICLES**

3.1 **Sewage Pumping Station Switchboard**

This custom built sheet metal cubicle is based in free standing form access with bottom cable entry in accordance with FORM 3 compartmented concept to AS 1136:1998.

CARE MUST BE TAKEN FOR ANY FUTURE ADDITIONS AND/OR REPAIRS TO ENSURE SWITCHBOARD RETAINS VALIDITY OF TYPE TEST CERTIFICATES.

This cubicle contains the main isolator, protection equipment, motor starters, electromechanical control devices, operator type controls, level measuring devices, indicating devices, PLC / Telemetry equipment and terminals necessary to provide the required method of operation.

The sewage pumping station switchboard was manufactured by:

Sunline Switchboards Pty Ltd
7 Duntroon St
BRENDAL QLD 4500

Ph: 07 3881 3433
Fax: 07 3881 3611

4.0 EQUIPMENT DESCRIPTION

4.1 Main Pumps

The two 17 kw Main Pump motors have Soft Starter starting with individual isolation achieved using a Moulded Case Circuit Breaker.

Protection of the motors is achieved by the use of electronic motor protection integral to the Soft Starter.

The Main Pump motor electrical indication is provided by Soft Starter, hour metres and associated selector switches located at the switchboard.

4.2 Level Control

The level detection system provides a 4-20mA analogue signal that is used by the Master PLC to control the operation of the main pump units.

4.3 Indication

Indication lights indicating motor operation and motor protection operation are located in the respective drive sections on the switchboard. Common and Level Control indication of supply status and wet well level alarms are also present on the switchboard.

4.4 Telemetry

Due to problems with radio signals the Telemetry is transmitted via modems and telco land lines.

4.5 Programming

All RTU/PLC programming was done by Brisbane Water.

McBerns AutoWellWasher™

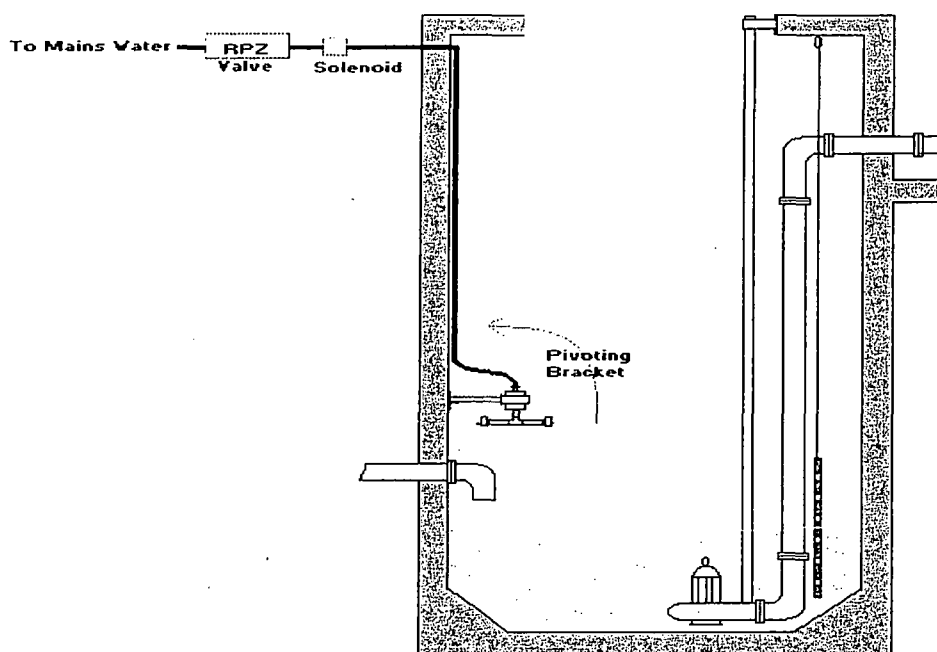
(Australian Patent No. 655111)

(International Patent Appl.No.PCT/AU00/00084)

INSTALLATION INSTRUCTIONS for WALL MOUNT BRACKET

Positioning of the device in the well can be critical to the effectiveness of the wash system. Configuration of wells can differ but, in general the Washer should be positioned in the clearest available space to ensure the rotating arms do not come in contact with guide rails, chains, probes, etc.

The mounting bracket is designed to pivot back against the wall (see Figure 1) so as not to impede access when a pump needs to be removed.



Having chosen the position, the mounting bracket is secured to the wall by means of four 12mm stainless steel Dynabolts™. The bolt holes should be drilled approximately 1 metre above the normal high water line.

Once the bracket is secured, the Washer head is inserted in the semi-circular clamp and the two locknuts tightened.

In wells of larger diameter (over 4 metres), it may be desirable to telescope the bracket arm to position the Washer closer to the well centre.

This is achieved by loosening the two locating bolts and removing the bolt which passes through the inner and outer arm sections. The inner arm section can now be extended and resecured.

Now the water supply can be connected to the Washer head. You can use good quality 3/4" hose (not garden hose), poly, PVC, copper or whatever best suits your

Each nozzle gives a wide fan of spray. Usually, one would be directed to cover the well wall from high to low water line. The other can be directed at a sharper angle to hit the top of the pumps, probe/float switches, guide rails etc.

The last task while in the well is to double check that all nuts have been tightened. Above ground you should have already installed an approved back-flow prevention device to the water supply line. Australian Standard specifies a Reduced Pressure Zone (RPZ) valve, and we recommend a 25mm model. Between this and the Washer a solenoid valve should be fitted in the water line. This solenoid is wired to the sewage pump control board so as to open when the pump turns on, and close when the pump stops. Thus the Washer operates as the well is being emptied

THE WELL WASHER KIT CONTAINS:

Rotating Washer Assembly
Pivoting Mounting Bracket
Installation Instructions

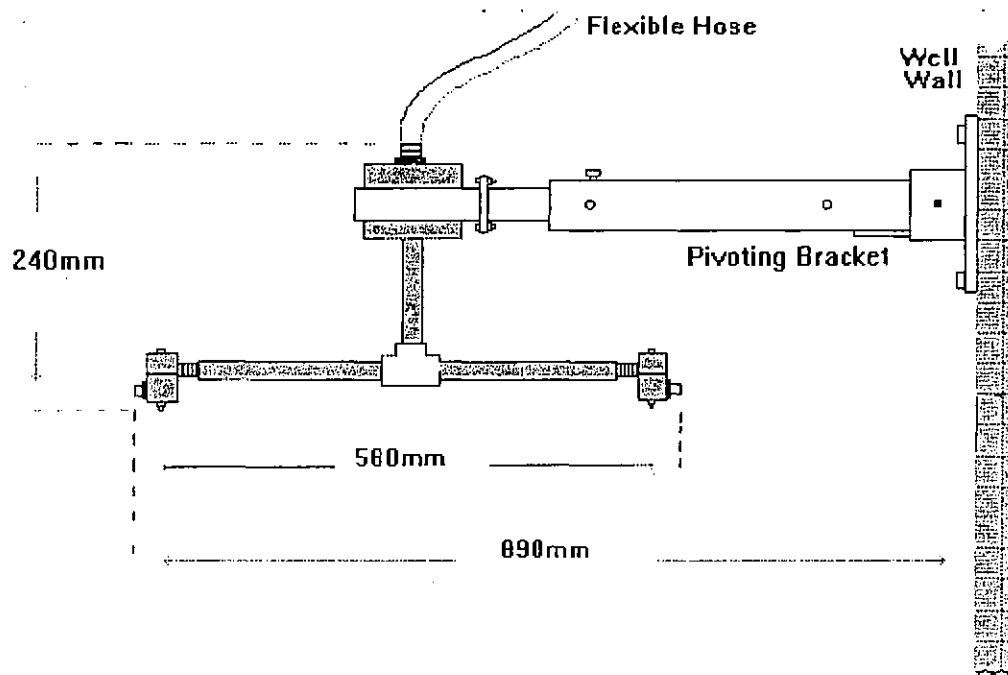
TO INSTALL YOU NEED TO PROCURE:

Back flow prevention device. (Brand is your choice but we recommend 25mm size.)

* 24volt AC Solenoid. (Brand and type is best chosen by your Electrician).

4 x 12mm 316 Stainless Dynabolts™ (or similar).

Water conduit and connectors (water inlet for Washer head is 3/4" BSP male).



Please note the dimensions above are a guide only. Slight variations may occur.

McBerns Pty Ltd
61 07 54467167
PO Box 304
Yandina Qld 4561 Australia
www.autowellwashers.com

©McBerns Pty Ltd June 2000



PRODUCT INFORMATION PUMP

S1 174 H1A

50 Hz

Page 1

073081

96064362

Pump	Parts list	972370	
	Assembly drawing	941342	
	Dimension drawing	98883	
	Performance curves	941470/3	
	Rate	07954-154	
	Weight	320	kg
	Stator casing material	GRS 250	
	Standard	SFS 4855-82	
	Overall efficiency	61.5	%
	Pump efficiency	71.5	%
Volute casing 13630A	Material	GRS250	
	Inlet diameter	130	mm
	Outlet diameter	100	mm
	Min. wall thickness	10	mm
	Volute interface diameter	330	mm
Impeller 11316A	Material	GRS 250	
	Free passage	80	mm
	no. of vanes	1	
	Diameter	297.0/310.5	mm
	Eye diameter	130	mm
	Shroud thickness	10	mm
	Channel width	82	mm
	Vane thickness	8	mm
Baseplate	Type	UK35441E	
	Weight without bend	28	kg
	Weight with bend	45	kg
Shaft	Material	X8CrNiMo275	
	Diameter at impeller	38.0	mm
	Max diameter	55.0	mm
Seal materials	Upper seal	Carbon/SiC	
	Lower seal	SiC/SiC	
Oil	Type	SAE 10W30	
	Amount	3,5	l
Lubrication grease	Type	Esso Unirex N2	
	Upper bearing	160	cm ³
	Lower bearing	240	cm ³
Painting	Type	Epoxy paint	
	Thickness	1 * 150 µm	

PRODUCT INFORMATION PUMP

Page 2



S1 174 H1A

50 Hz

073081

96064362

Motor Unit	Parts list	193900/2
	Assembly drawing	941334
	Class of insulation	F
	Number of poles	4
	Nominal power PN (kW)	17
	Max power Pmax (kW)	16.6
	Nominal speed nN (rpm)	1455
	Nominal torque TN (Nm)	112
	Starting torque TS (Nm)	238
	Max torque Tmax (Nm)	248

		UN	UN - 5%	UN +5%
Power factor	1.00 * Pn	0.81	0.84	0.77
(Cos phi)	0.75 * Pn	0.73	0.78	0.68
	0.50 * Pn	0.6	0.66	0.55
Efficiency	1.00 * Pn	0.86	0.86	0.86
	0.75 * Pn	0.86	0.86	0.85
	0.50 * Pn	0.84	0.85	0.83

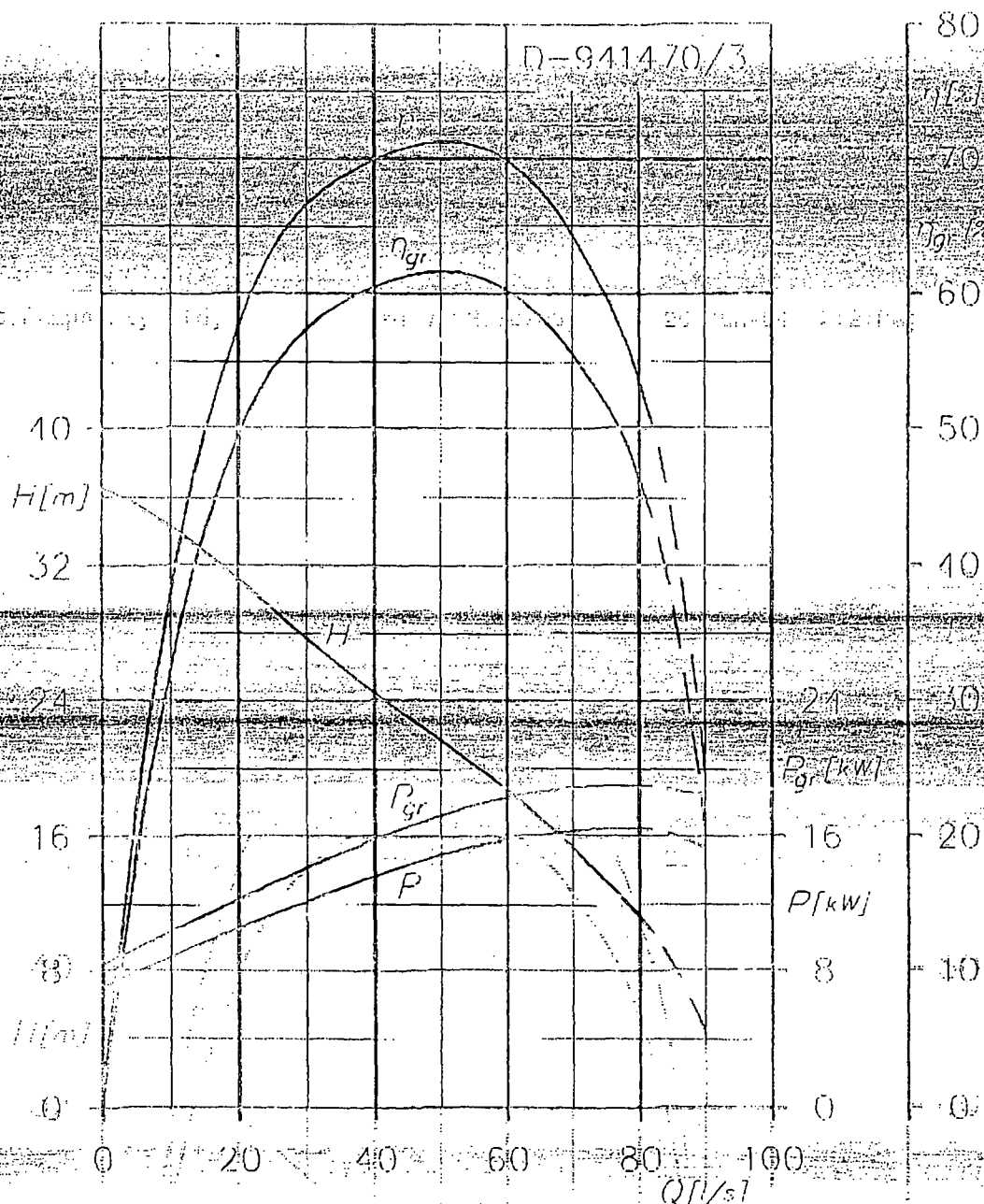
Current	Voltage	Nominal IN / A	Idle IO / A
	220	61.5	29.4
(UN)	230	61.6	33.9
	240	61.6	38
	380	35.6	17
(UN)	400	35.4	19.5
(UN)	415	34.1	18.8
(UN)	500	28.3	15.6
	660	20.5	9.8
(UN)	690	20.5	11.3
	719	20.5	12.7

4.8

Cables	Type	H07RN-F...G...
	Length	8 m

Var.

11	400/690 V	1* 7*6 mm ² + 2*2.5 mm ²
12	230/400 V	2* 5*10 mm ²
13	415/(719) V	1* 7*6 mm ² + 2*2.5 mm ²
14	500/(865) V	1* 7*6 mm ² + 2*2.5 mm ²



Q = Volume rate of flow
 H = Pump total head
 P_{gr} = Motor power input
 η_{gr} = Overall efficiency
 P = Pump power input
 η = Pump efficiency

ilavuusvirta
 Pumpun nostokorkeus
 Moottorin ottama teho
 Kokonaishyötysuhde
 Pumpun ottama teho
 Pumpun hyötysuhde

Testing and tolerances: ISO 2548 (Annex B) 1973.
 Testaus ja toleranssit: ISO 2548 (Liite B) 1973.

PERFORMANCE CURVES
 OMINAISKÄYRÄT
 S1(X) 174 H
 vers. 1 and 4
 50 Hz

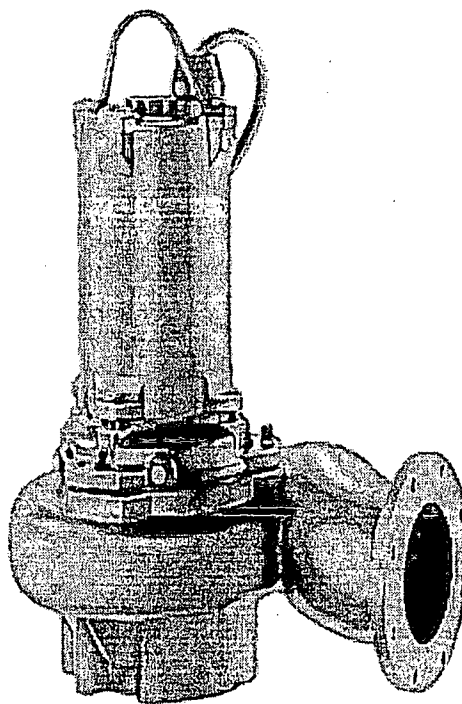
$P_N = 17.0 \text{ kW}$
 $P_{max} = 16.6 \text{ kW}$
 $\eta_{max} = 71.5 \%$
 $\eta_{gr,max} = 61.5 \%$
 $n_N = 1455 \text{ r/min}$

GRUNDFOS
 Oy Grundfos
 Environment
 Finland Ab

Part. 07.11.1995 SIM
 Jark. 09.11.1995 TJI
 Hyv. 09.11.1995 TJI
 Code KN810220

D-941470/3

Operator's Manual



This manual contains instructions for installation, use and maintenance of Sarlin submersible pumps of frame sizes 50 and 54 comprising the following pumps:

50 Hz				
Frame size 50			Frame size 54	
SV 072 BH	S1 054 L	S1 074 H	S1 134 M	S2 134 E
SV 092 BH	S1 054 M	S1 074 S	S1 134 H	S2 134 L
SV 122 BH	S1 054 H	S1 124 AE	S1 174 L	S2 174 E
SS/SR 038	S1 074 E	S1 124 BM	S1 174 M	S2 174 L
SS/SR 066	S1 074 CM	S1 124 AH	S1 174 H	S1 212 H
SR 210				S1 212 S
60 Hz				
Frame size 50			Frame size 54	
SV 092 BH	S1 094 AM	S1 134 AL	S1 164 L	S1 204 L
SV 122 BH	S1 094 AH	S1 134 AM	S1 164 M	S1 204 M
S1 094 AL	S1 114 AH	S1 134 AH	S1 164 H	S1 204 H

The manual also contains specific instructions for the pumps in this range executed in explosion-proof construction. The pumps are further specified in the applicable Sarlin pump preselection sheet and in the individual pump data and curve sheets. These documents are available on request from Oy E. Sarlin Ab at the address below or from your nearest Sarlin dealer.

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GRUNDFOS®
SARLIN PUMPS


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1. Definitions

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1. Definitions

1.1. About this manual

This instruction manual has been prepared by the Technical Department of the Pump Division of Oy E. Sarlin Ab. It provides instructions on the installation, commission, function, operation and maintenance of Sarlin submersible pumps.

The manual is directed at pump and municipal engineering professionals. These professionals are expected to have working knowledge of pumps and pumping in general as well as of pump operation and maintenance.

The illustrations in this manual may not exactly depict all pumps covered but are provided as general reference on dimensions and as an illustration of a particular operation being described.

1.2. Measurement Units

The SI system of measurement units, as implemented for pumping use by the ISO standard 2548, is used in this manual wherever reference is made to dimensions or other quantities. The unit used in drawings for the length dimension is millimetre (mm).

1.3. CE Marking

The Sarlin submersible pumps bear the CE marking according to the Declaration of Conformity forming the Section 11. The CE marking is presented on the pump rating plate affixed to the pump top cover.



1.4. Notes, Attentions and Warnings

Notes, attentions and warnings are provided throughout this manual to provide important information to the reader.

NOTE

A note is used to convey special information or to highlight an operating procedure or practice that requires specific information, knowledge, tools or equipment in order to achieve the desired result.

ATTENTION

An attention is used to convey special information or to highlight an operating procedure or practice where non-compliance could lead to damage of the unit or other equipment.



A warning or safety instruction provides instructions on an operating procedure or practice where nonobservance may lead to serious personal injury or cause danger to the life of operation personnel or others.



A warning of the presence of dangerous voltage is provided with this symbol. Disregard of the warning may lead to electrical shock with consequent risk of serious personal injury or death of the operational personnel.



2. Pump Information

2.1. Type Designation Code

Each Sarlin pump is identified by the type designation code provided in full on the order acknowledgement and other documentation accompanying the pump upon delivery. The code comprises 15 items in the following fashion:

S	1	X	100	4		H	1	A		5	11	P	Z	R
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

The shaded code items are provided on the rating plate of the pump.

Code Item	Description																											
1. Pump type	S Sarlin S-type																											
2. Impeller	V Vortex 1 Single channel 2 Double-channel 3 Three-channel 4 Four-channel N Multi-channel A Axial S Semi-axial																											
3. Motor specification	[] Standard X Explosion-proof																											
4. Motor power	Motor power in kW																											
5. Motor pole number	Indicates motor speed at <table><thead><tr><th></th><th>50 Hz</th><th>60 Hz</th></tr><tr><th></th><th>rpm</th><th>rpm</th></tr></thead><tbody><tr><td>2 2-pole</td><td>3000</td><td>3600</td></tr><tr><td>4 4-pole</td><td>1500</td><td>1800</td></tr><tr><td>6 6-pole</td><td>1000</td><td>1200</td></tr><tr><td>8 8-pole</td><td>750</td><td>900</td></tr><tr><td>10 10-pole</td><td>600</td><td>720</td></tr><tr><td>12 12-pole</td><td>500</td><td>600</td></tr><tr><td>14 14-pole</td><td>428</td><td>514</td></tr></tbody></table>		50 Hz	60 Hz		rpm	rpm	2 2-pole	3000	3600	4 4-pole	1500	1800	6 6-pole	1000	1200	8 8-pole	750	900	10 10-pole	600	720	12 12-pole	500	600	14 14-pole	428	514
	50 Hz	60 Hz																										
	rpm	rpm																										
2 2-pole	3000	3600																										
4 4-pole	1500	1800																										
6 6-pole	1000	1200																										
8 8-pole	750	900																										
10 10-pole	600	720																										
12 12-pole	500	600																										
14 14-pole	428	514																										
6. Generation marker	[] 1st generation A 2nd generation B 3rd generation, etc. The generation indicator differentiates between structurally different pumps that have the same power rating.																											
7. Impeller classification	[] No classification F Ultra low head E Extra low head L Low head M Medium head H High head S Super high head																											

2. Pump Information

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GRUNDFOS
SARLIN PUMPS


- | 8. Installation version | 1 Submerged with baseplate and guide rails.
2 Submerged with baseplate and guide rails.
May operate continuously with motor exposed.
3 Vertical dry with stand.
4 Submerged portable.
5 Submerged portable.
May operate continuously with motor exposed.
6 Horizontal dry with stand.
7 Submerged in column | | | | | | | | | | | | | | | | | | | | |
|---------------------------|---|-------|-------|----------------------|---------------------|----------------------|---------------------|----------------------|---------------------|----------------------|---------------------|----------------------|---------------------|----------------------|---------------------|----------------------|---------------------|----------------------|---------------------|----------------------|--|
| 9. Interchangeability | Interchangeability letter (A, B, C...) indicates interchangeability limitation of parts between otherwise identical pumps. Pumps with no or the same letter have full interchangeability of all parts and use the same spare parts catalogue. | | | | | | | | | | | | | | | | | | | | |
| 10. Supply phase number | <input type="checkbox"/> 3-phase
1 1-phase | | | | | | | | | | | | | | | | | | | | |
| 11. Supply frequency | 5 50 Hz
6 60 Hz | | | | | | | | | | | | | | | | | | | | |
| 12. Voltage and starting | <table border="0"> <thead> <tr> <th style="text-align: left;">50 Hz</th> <th style="text-align: left;">60 Hz</th> </tr> </thead> <tbody> <tr> <td>01 400 V, DOL</td> <td>01 460 V DOL</td> </tr> <tr> <td>11 400 V, Y/D</td> <td>11 460 V Y/D</td> </tr> <tr> <td>02 230 V, DOL</td> <td>03 500 V DOL</td> </tr> <tr> <td>12 230 V, Y/D</td> <td>13 500 V Y/D</td> </tr> <tr> <td>03 415 V, DOL</td> <td>05 380 V DOL</td> </tr> <tr> <td>13 415 V, Y/D</td> <td>15 380 V Y/D</td> </tr> <tr> <td>04 500 V, DOL</td> <td>07 220 V DOL</td> </tr> <tr> <td>14 500 V, Y/D</td> <td>17 220 V Y/D</td> </tr> <tr> <td>06 690 V, DOL</td> <td></td> </tr> </tbody> </table> | 50 Hz | 60 Hz | 01 400 V, DOL | 01 460 V DOL | 11 400 V, Y/D | 11 460 V Y/D | 02 230 V, DOL | 03 500 V DOL | 12 230 V, Y/D | 13 500 V Y/D | 03 415 V, DOL | 05 380 V DOL | 13 415 V, Y/D | 15 380 V Y/D | 04 500 V, DOL | 07 220 V DOL | 14 500 V, Y/D | 17 220 V Y/D | 06 690 V, DOL | |
| 50 Hz | 60 Hz | | | | | | | | | | | | | | | | | | | | |
| 01 400 V, DOL | 01 460 V DOL | | | | | | | | | | | | | | | | | | | | |
| 11 400 V, Y/D | 11 460 V Y/D | | | | | | | | | | | | | | | | | | | | |
| 02 230 V, DOL | 03 500 V DOL | | | | | | | | | | | | | | | | | | | | |
| 12 230 V, Y/D | 13 500 V Y/D | | | | | | | | | | | | | | | | | | | | |
| 03 415 V, DOL | 05 380 V DOL | | | | | | | | | | | | | | | | | | | | |
| 13 415 V, Y/D | 15 380 V Y/D | | | | | | | | | | | | | | | | | | | | |
| 04 500 V, DOL | 07 220 V DOL | | | | | | | | | | | | | | | | | | | | |
| 14 500 V, Y/D | 17 220 V Y/D | | | | | | | | | | | | | | | | | | | | |
| 06 690 V, DOL | | | | | | | | | | | | | | | | | | | | | |
| 13. Special features | P Indicates that protection circuitry is included in motors on models where this feature is optional.
U Flanges drilled to ANSI specifications. Protection circuitry provided. | | | | | | | | | | | | | | | | | | | | |
| 14. Non-standard items | D Trimmed impeller
C Cable length
Z Combination of D and C or other.
Refer to order acknowledgement for details | | | | | | | | | | | | | | | | | | | | |
| 15. Construction material | <input type="checkbox"/> Standard materials
R All stainless steel
S Wet parts, including volute, impeller, oil housing and guide shoe (version 1 & 2) stainless steel
Q Impeller stainless steel | | | | | | | | | | | | | | | | | | | | |



2. Pump Information

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2.2. Rating Plate Information

All pumps can be identified by the rating plate (located on the top cover of the motor). If the rating plate is missing or damaged the pump can be identified by the serial number stamped in the casting located under the rating plate.

1. Type designation
2. Serial number
3. Nominal motor power
4. Mains voltage for delta (D) and star (U) connection. If the value for star connection is given in brackets, the pump can be connected in delta only
5. Frequency, 50 or 60 Hz
6. Nominal drawn current for delta and star connection
7. Mains phase number
8. Fuse rating in delta connection
9. Nominal motor speed
10. Volume rate of flow range
11. Maximum submergence
12. Head range
13. Gross weight
14. CE Marking
15. Year of manufacture
16. Encapsulation class IEC

Pumps rated for use in an explosive environment (EX-pumps) are fitted with additional nameplates (located on the side of the motor stator housing). Please refer to the Section 10 for information on the rating plates.

2.3. Pump Noise Emission

Without taking account of installation effects the noise level emitted from the pump proper is less than 70 dB(A) when it is measured according to the following procedures:

- The noise level is measured for various load conditions with readings taken at different pump duty points on the entire operating range.
- Submersible pump noise is measured at a point 1.6 m above the wet well rim with the pump submerged to minimum depth according to installation version requirement.
- Dry-installed pump noise is measured at a distance of 1 m from the pump and at 1.6 m above floor level at four points in different direction quadrants. Highest measured value is used for assessment.

3. Safety

Page 1 (6)



3. Safety

These general safety instructions must be read and understood before any work on or operation of the pumps. All sections of this manual dealing with specific aspects of pump handling and operation contain safety information on each matter at hand where required.

3.1. Regulations and Standards

All work involving the installation and use of machinery is regulated by various local occupational safety ordinances, rules and regulations issued by governmental authorities or other pertinent bodies. It is required that these rules are acquired and followed at all phases and times of installing, using and maintenance of the Sarlin submersible pumps.

3.2. Duties of Owner and Operator

The owner and operator of a pump installation is responsible for the safe conduct of all work and actions on the pumps by employees and subcontractors. The owner must make certain that at least the following procedures are carried out whenever dealing with these submersible pumps:

- Pertinent safety actions must be undertaken whenever required by apparent risk or danger situation
- Pumps and equipment must be inspected for safety and function before any activity is commenced
- All concerned personnel and third parties must be informed both on any known danger or risk prevailing at the installation or operation site and the procedures of safe work during special circumstances
- All work should be carried out by qualified personnel only using the pertinent personal safety equipment, such as safety glasses or goggles, hearing protection, hard hats and protective clothing, as required by the work in progress
- All work in confined or potentially dangerous areas, such as pumping wells, should be done under close supervision only. All work sites should have one person appointed responsible for safety procedures.
- Any effluent or waste harmful to the environment must be disposed of in a suitable manner during all phases of work

3.3. Duties of the Personnel

All persons involved in the installation, operation or maintenance work of submersible pumps and equipment must familiarise themselves with these safety instructions before beginning to work. All persons must follow these procedures during the work on the installation, operation and maintenance of submersible pumps:

- Always follow occupational safety and hygienic instructions for work in wastewater installations. All work phases must be conducted safely with special consideration of personal hygiene.
- Wear at all times the required personal safety equipment, such as safety glasses or goggles, hearing protection, hard hats, breathing masks and protective clothing as required by the work in progress
- Acquire information on the following important items before commencing the work:
 - Potential danger from pump and equipment including the danger of exposure to oil and chemical substances

- Environmental dangers at the work site, such risk of explosion, noxious gases, steam, lack of oxygen and chemicals
- The function of the safety features on pumps and other equipment
- Operational controls and the location and operation of emergency stop buttons
- Make sure that the required controls, especially the stop button, are within reach at all times
- Make sure that all emergency exits are available and kept free of obstructions
- Learn the use of the fire extinguishing equipment on the site
- Make sure that starting the equipment can be done safely for people and equipment
- Do not start any equipment if there is any risk of danger from malfunctioning or lack of safety equipment
- Never start a pump if people are present in the pump well or in the wet well.
- Start a pump only after any operational problem has been fixed or service job properly completed and all damaged parts exchanged
- Conduct all visual inspections according to schedule
- Report all pump or operational problems or findings to your supervisor or the service department
- Stop all pumps immediately in case of malfunction. Especially if any people or equipment is in danger
- Work only on pumps that have been stopped and safely isolated from the electrical supply to prevent accidental starting. Remove fuses or have an authorised electrician disconnect the pump.
- At all times keep all safety instructions available and visible as well as pump identification and rating plates readable
- Do not make unauthorised modifications or changes to the pumps or to other equipment
- Dispose of all effluents, such as used oil, properly. Clean up all spills and report all accidental effluent emissions in the environment
- Keep the pumping station or installation site clean and in order at all times

3.4. Qualifications

Qualification for installation, operation or maintenance of submersible pumps and their equipment is defined as a combination of formal and on-the-job training on the subject. Special qualifications are acquired i.e. by:

- Formal training in mechanical engineering combined with work experience and company training on pumps and pumping
- Formal training in electrical engineering with official authorisation for low and high voltage installation work

Qualification for work on submersible pumps and accessories requires further the following from all persons qualifying:

- Knowledge of these instructions and the pumps in question
- Education or experience in the implementation of official safety procedures at mechanical installation, operation and maintenance work
- Knowledge of first aid

3. Safety

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3.5. Dangers



Disregard of the warnings in these instruction may lead to equipment damage and/or personal injury or death of the operating personnel.

3.6. Transportation

Lifting devices must be used for the handling of all pumps and other equipment weighing more than 50 kg. Items weighing between 35 kg and 50 kg may be lifted only without lifting device but not carried or positioned for installation by a person.

Suitable pallets or other cargo securing devices must be used if fork lifting devices are used.

The equipment must be properly secured to floor or wall surfaces if hoists are used for pump lifting and lowering into wells. The hoist rating must not exceed under any circumstances.

All hooks, chains and slings used with a hoist must have a suitable rating and must only be used according to instructions. The submersible pump may only be lifted from its lifting handle unless expressly advised otherwise in these instructions.



Submersible pumps must never be lifted by the electric supply cable, the delivery pipework or the hose. The risk of the damage to equipment or electric shock with consequent risk of serious personal injury or death may follow.



Do not walk under hoisted pumps or attempt to work on pumps supported by hoist only. The risk of serious injury may follow to operating or servicing personnel.

Pumps must be handled with suitable care during all phases of transportation. Do not bump pumps or leave unsupported on uneven or slanting surfaces. Protect pumps from falling objects at construction sites.

ATTENTION

Do not remove pump cable free end protection sleeve until necessary for electrical connection work. Never subject cable free end, protected or unprotected, to moisture or water. Non-compliance may lead to moisture seepage into cable with consequent risk of damage to motor.

3.7. Installation and Connection

Make sure before commencing installation work that the site is cleared from construction debris and that the site is suitably prepared for work. Install protective barriers around openings to wet wells and elsewhere where required. Restrict access to the site to necessary installation crew only.

Observe all safety rules at installation site, such as the usage of blowers for the supply of fresh air to well sites.

Fasten pump lifting chains and power cables so as to prevent them from being sucked into pump suction during pump testing.

Use only approved pipework assembling practices when connecting pumps with flanged joints.



All electrical connection work, either for testing purposes during work or final, may be done by suitably qualified and certified electrician only.



Electrical switchgear and supply lines may be live at all times. Touching and working with electrical equipment may lead to electrical shock with consequent risk of serious injury or death of personnel.



Do not insert hands or tools in pump inlet or outlet openings after the pump has been connected to the electrical supply without prior isolation of pump by removal of fuses. The pump may start with consequent serious injury to personnel.

3.8. Commissioning

Check the pump after completion of installation work for possible safety shortcomings according to these instructions.

Check that all safety installations on site are completed according to site and installation plans of all associated equipment. Do not attempt commissioning the pump if the installation of the specified safety equipment on the site, such as wet well access covers and barriers, switchgear enclosures, fire extinguishers, etc., is incomplete.

All installed equipment must be protected against damage from contact with equipment used on site, i.e. vehicles and hoisting equipment.

3.9. Operation and Control

Make sure that no persons work on the pumps or in areas where danger may arise from running the pumps whenever manually starting pumps or switching them to the automatic control.

Check the pump operation for abnormal noise or vibrations while the pump is running. Compare the actual output and the metered data with the data on the rating plate or supplied in the pump specifications.

ATTENTION

Stop the pumps immediately if you note abnormal noise or vibrations from the pumps or any other problems with the pump operation or the electric supply. Do not attempt to restart the pumps before the reason for the problems has been established and the problems solved.

The operation of the pumps should always be governed by established routines with scheduled controls of pump monitoring equipment and accessories (valves, etc.). Make sure that the pump and equipment settings are not tampered or otherwise adjusted without authorisation.

3.10. Servicing

Servicing may be undertaken only after the pumps have been effectively isolated from the electric supply. Pumps may be disconnected only by a certified electrician. The responsible operator must always be notified before any work on the pumps may begin.

3. Safety

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Wet wells may only be accessed using appropriate personal protective equipment and clothing. All wet well work must be directly supervised by one person who stays outside for safety reasons.



Submersible pump wet wells contain sewage with toxic substances and/or pathogens. Entering wet wells or withdrawing of pumps must therefore always be carried out carefully observing hygienic precautions. All persons involved must wear appropriate personal protective equipment and strictly follow personal hygienic procedures.

All pumps and other equipment withdrawn from the wet well must be thoroughly cleaned before work can begin. The use of pressure or steam cleaning and disinfectants is strongly recommended. No flammable or toxic industrial solvents nor strong detergents may be used. Grease and oil may be removed using approved solvents only.

Make sure all washing effluents are disposed of properly according to local instructions and regulations.

After the cleaning the pumps must be inspected for visible damage. The lifting handle and chain must be inspected for breakage or wear before any attempts to lift the pump.

Do not use undue force when working on the pumps, especially when loosening bolted connections and other fasteners. Tighten loose connections to the specified torque whenever observed using the correct tools and procedures.

Check the working atmosphere for explosive substances before beginning to weld or to use electric tools. Make sure that the object is safely isolated from the power mains.

Collect all waste and especially used lubrication oil in containers and dispose all properly. Oil spills must immediately be wiped or collected using suitable absorbent material and disposed of. Never dispose oil to the sewers or to the environment.

Report all damages on the electric equipment and supply cables to an authorised electrician for appropriate repair actions. Replace burned fuses with new ones of the correct rating only. Use only slow-blow fuses for motors.

Reinstall protective equipment immediately after completion of work.

Repairing

ATTENTION

Do not make unauthorised modifications to the pumps or accessories. Never make modifications that affect the safety of the equipment.

Troubleshooting and repairs on the pumps may be made only to the extent described in this manual. Should more extensive repair or modifications of the pumps be needed, it has to be referred to an authorised SARLIN service agent or company only. Unauthorised repair or modifications of the pumps will void the product guarantee.

ATTENTION

Worn or damaged parts lower the operational safety and must be replaced whenever noted.

Only original SARLIN spare parts must be used. The usage of unauthorised spare parts voids the guarantee and may lower the product safety.

Replace all worn fasteners when assembling. Always use torque wrenches or spanners when tightening fasteners to specified torque. Replace all locking washers with new original spare parts.



3.11. Disposal and Environment Protection

The pump owners are responsible for the correct disposal of waste and other by-products from the operation of the pumps. The following substances will have to be dealt with:

- Sewage or other pumped liquids that may travel with the pumps to service sites or other outside locations
- Lubricants
- Cleaning agents and solvents
- Other debris and trash, such as replaced pump parts and accessories

Scrapped pumps must be cleaned and emptied of all lubricants before disposal. Old pumps should be dismantled and the parts should be used for recycling as appropriate. Non-recyclable parts not containing contaminants only may be disposed of in municipal landfills or brought to garbage collecting stations.

Never dispose of waste oil and grease in the environment or the sewerage system. Follow local rules for their safe disposal at all times.

4. Pump Handling

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4. Pump Handling

4.1. Pump Weight and Dimensions

The pump gross weight is stated on the pump rating plate located on the top cover of the pump motor. Complete pump weight and dimension information is given on the individual pump data sheets. Installation dimensions of pump baseplates and stands are found in section 5. For weights of separate parts please refer to the transportation and delivery documents or project specifications.

4.2. Pump Lifting and Site Transportation

The pumps in this manual may be lifted and positioned using an appropriate lifting aid or hoist only. All lifting equipment must be rated for the intended load and checked for damages before any attempts are made to lift pumps. Use only adequate chains, shackles, hooks and bands as required. Make sure that enough room is available for safe handling of the pumps along the transport route and at the end location. Items weighing less than 35 kg may be lifted and positioned for installation by hand. Figure 4.1 shows correct pump lifting method.

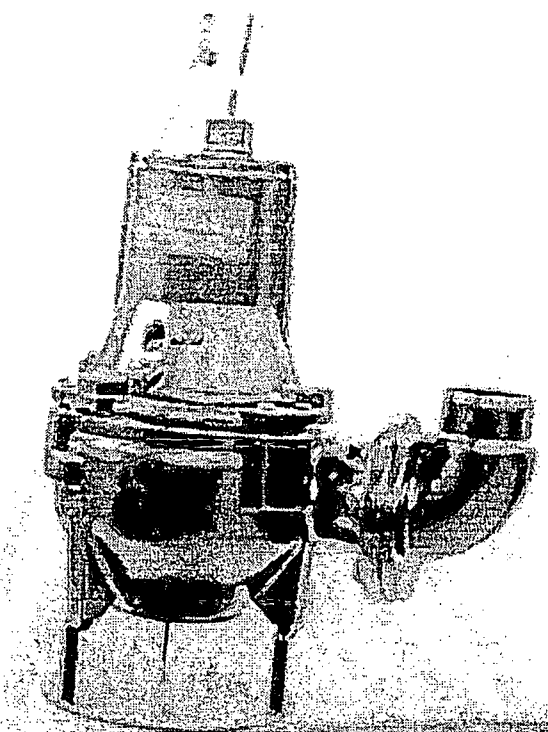


Figure 4.1 Lifting pump using hoist

ATTENTION



Do not attempt to lift pump at any other point than the lifting handle unless expressly advised otherwise in these instructions. Tipping over of the pump may lead to damage to pump or other equipment.

Do not lift the pump from the electric cable under any circumstances. An electric short and risk of shock to the personnel may follow if the pump is connected to the mains. The cable and cable inlet may be damaged, leading to loss of watertightness and consequent severe damage to the motor.

New pumps should not be unpacked from their transport crates until brought to the installation site. Secure other pumps to pallets or otherwise if transported by fork lifting equipment. Handle pumps with care whenever handling or lifting.

The pumps covered by this manual are delivered from the factory completely assembled and no further assembly is required (except with the frame sizes 74 and 78 which are delivered in two parts).

4.3. Pump Accessories

The pump delivery may contain various accessories as required by the installation. Depending on pump installation version and scope of delivery these may include the pump baseplate, guide rails and upper guide rail holders, lifting chains with the suspension equipment, access covers and the control equipment. It is essential that these items are checked against delivery documents and stored safely until needed for installation.



4.4. Pump Storage

The pumps are prepared and packed at the factory for overland transportation by covered carriage. Upon delivery the pumps should be stored in a dry and covered area if storage for a prolonged period is foreseen.

ATTENTION

Do not remove the original watertight closure of the pump cable free end during storage. Make sure that the cable is coiled and secured to the pump and protected from exposure to water. Otherwise the water may seep into the cable and reach the motor with a consequent risk of causing severe damage to the motor windings.

ATTENTION

If new pumps are being stored for a period longer than 2 months the pump impeller should be turned by hand at least every two months to prevent the lower mechanical seal faces from possibly bonding from drying. Failure to do so may lead to seal damage when the pumps are started. If the impeller cannot be turned by hand the pump must be referred to an authorised shop for service before being commissioned.

5. Pump Installation

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5. Pump Installation

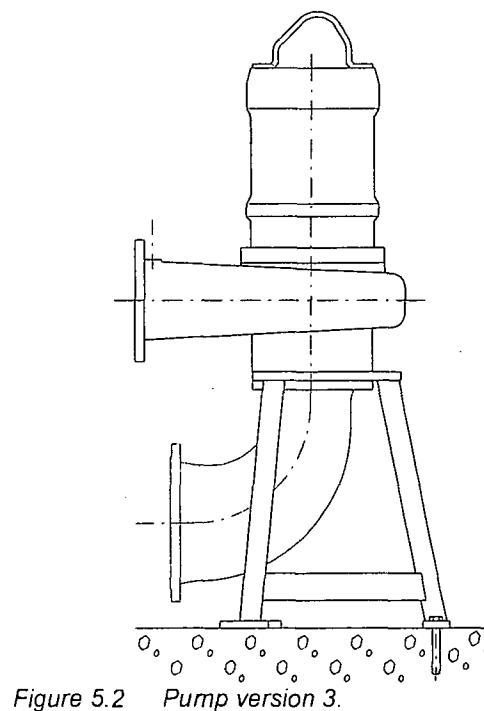
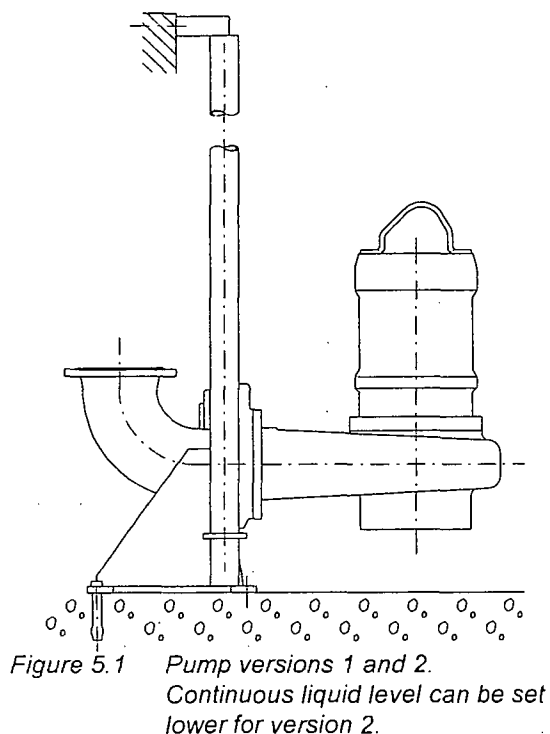
ATTENTION

Always read and observe the safety instructions in section 3.7 before beginning to install pumps.

5.1. Installation Versions

The pumps are configured for different installations, either submerged or dry according to the following schedule of installation versions:

- Version 1** Submerged with baseplate and guide rails. Permanent installation in wet well where the pump can be easily withdrawn from and lowered into the wet well along guide rails. A guide shoe bolted to the pressure flange connects automatically to a matching baseplate mounted on the wet well floor where the pump is kept in place by its own weight. The pump motor cooling is by submergence in the liquid requiring that the lowest continuous liquid level in the wet well is set at half motor level. Please refer to figure 5.1.
- Version 2** Similar to version 1 but with motor cooling independent of submergence in the pumped liquid by means of a cooling jacket encasing the motor stator housing. The lowest continuous liquid level in the wet well may be set lower. Please refer to figure 5.1.
- Version 3** Vertical dry installation with stand. Permanent installation in dry well with pump connected to suction line and rising main by bolted flange connections. Pump motor cooling is by means of a cooling jacket encasing the motor stator housing. Please refer to figure 5.2.



- Version 4** Submerged with stand for portable use in wet wells or for temporary use. The pump is equipped with a hose coupling for connection to delivery hose. The pump motor cooling is by submergence in the liquid requiring the pump is submerged to at least half motor level when operating. Please refer to Figure 5.3 for details.
- Version 5** Similar to version 4 but with motor cooling independent of submergence in the pumped liquid by means of a cooling jacket encasing the motor stator housing. Pump must be submerged sufficiently for the required suction head only. Please refer to Figure 5.3 for details.
- Version 6** Horizontal dry installation with stand. Permanent installation in dry well with pump connected to suction line and rising main by bolted flange connections. Pump motor cooling is by means of a cooling jacket encasing the motor stator housing. Please refer to Figure 5.4 for details.

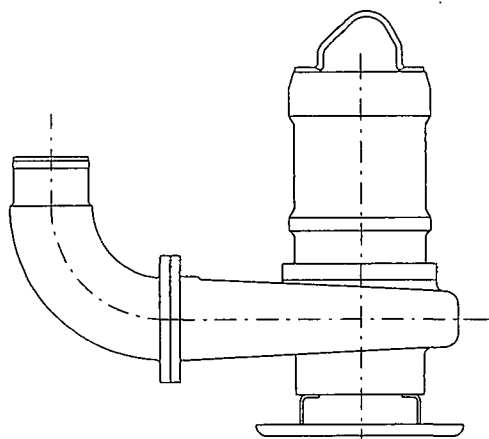


Figure 5.3 Pump versions 4 and 5.
Continuous liquid level can be set lower for version 5.

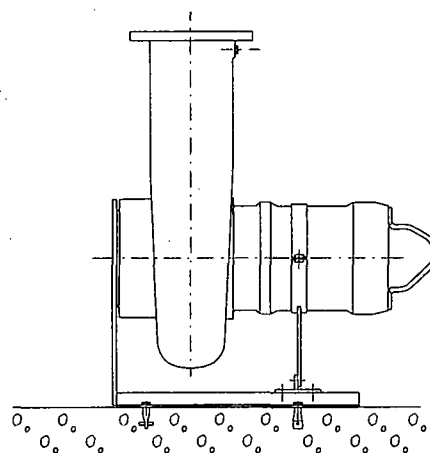


Figure 5.4 Pump version 6.

- Version 7** Vertical column installation. Permanent submersible installation in steel tube or concrete shaft. The circular pump casing fits onto a seat ring installed at the shaft or tube bottom opening and the pump stays in place by its own weight and from the reaction forces from the pumping action. The pump casing is special for the version and is open with trailing vanes. The version finds applications in low head installations for large pumped volumes. Please refer to figure 5.7 below.

5. Pump Installation

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5.2. Installation of Foundations for Versions 1 and 2

Make sure before commencing installation work the construction work is finished according to specifications. It is especially important that the surface under the baseplates is level and even.

Begin the work by fastening the upper guide rail holder (figure 5.5, use Sarlin part according to table 5.1 or equivalent third party fitting) in its final position relative to the wet well access opening. Use appropriate fasteners only. Lower the baseplate(s), selected according to table 5.1 as required, onto the wet well floor and place them approximately in their final position. Please refer to figures 5.6, 5.7, 5.8 and 5.9 below for reference on dimensions.

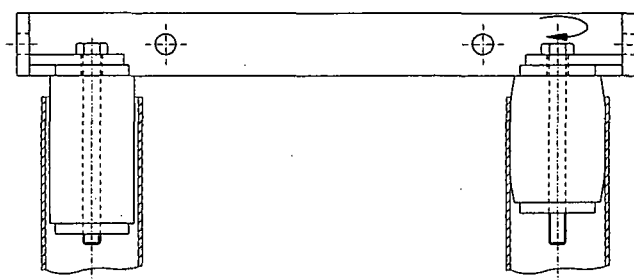


Figure 5.5 Upper guide rail holder with expanding dowels.

NOTE

Using a plumb line suspended from the upper guide rail holder the baseplates can be positioned exactly. The baseplate integral lower guide rail ears are used for correct line-up reference.

Mark the foundation bolts on the wet well floor and remove the baseplate. Install the baseplate bolts or sleeves using appropriate expansion elements or by grouting. Use M 20 or M 24 installation sleeves (Sarlin part No. FMTZ 20070 or FMTZ 24130) as required, or equivalent foundation bolts. Fix the baseplate to the floor and tighten the bolts or nuts to the torque specified in the fastener specifications.

Install the pressure pipework in the wet well according to project plumbing specifications. Use ISO PN 10 flanged joints for the baseplate delivery bend connection.

Table 5.1 Selection of upper guide rail holders and baseplates

Pump size	Upper guide rail holder	Baseplate
DN 80	71-32462 D	UK 35692
DN 80/100	71-32462 D	UK 35693
DN 100	71-32462 C	UV 35586
DN 150	71-32462 E	UK 35402
DN 150/200	71-32462 E	UK 35552
DN 200	71-32462 F	UK 35524

NOTE

Make sure that the pipework is installed without the use of undue force. The use of pipe joints with loose flanges is recommended for ease of installation and to avoid pipe tension at flanges and bolts.

Mark the correct length of the guide rails considering that the upper guide rail holder rubber dowels will go into the guide rail. Cut the guide rails to length and install them by removing the upper guide rail holder dowels and slide the rails into the lower guide rail ears on the baseplate. Reinstall the guide rail holder dowels and tighten the nuts so as to expand the rubber elements. The guide rails are now installed and the pumps can be lowered into the wet well.

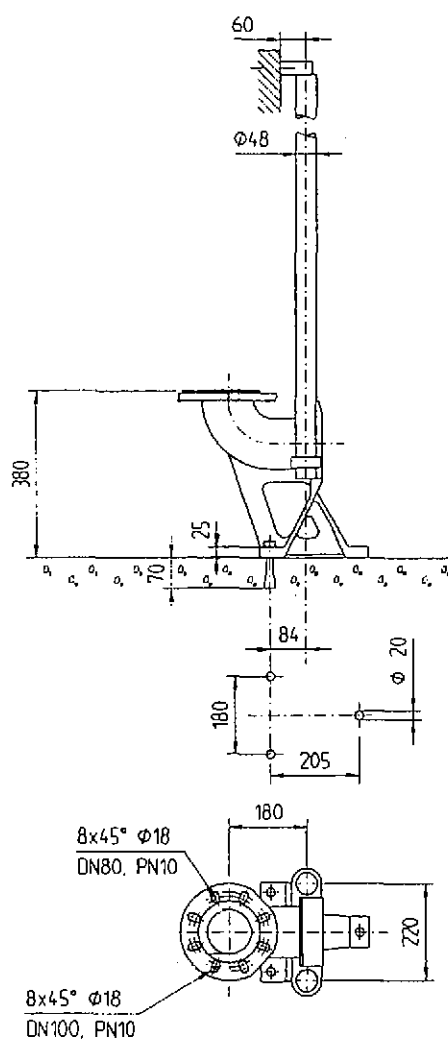


Figure 5.6 DN 100 guide rail system installation dimensions

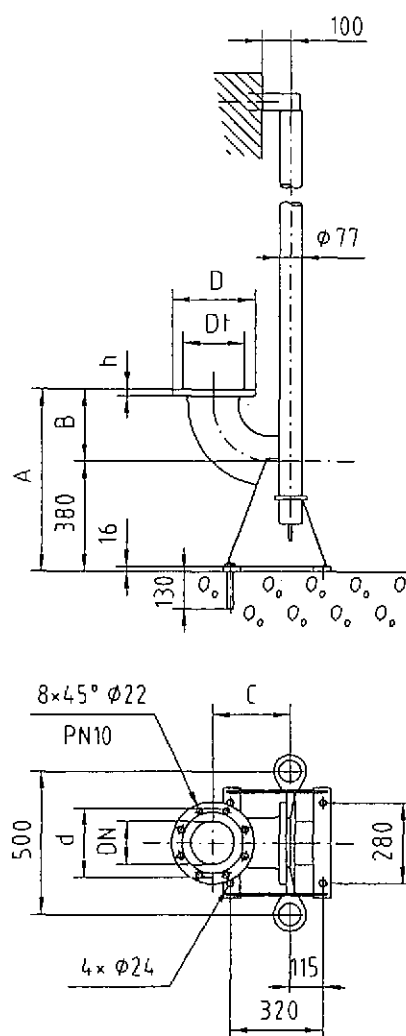


Figure 5.7 DN 150 and DN 150/200 guide rail system installation dimensions. The variable dimensions are given in table 5.2.

Table 5.2 DN 150 and DN 150/200 baseplate dimensions

Baseplate	DN	D	Dt	d	h	A	B	C
UK 35402	150	285	212	240	24	630	250	265
UK 35552	200	340	268	295	26	680	300	315

Table 5.3 DN 80 and DN 80/100 baseplate dimensions

Baseplate	DN	D	Dt	d	d ₁	h	A	B	C
UK 35692	80	200	138	160	18	22	440	180	203
UK 35693	100	220	158	180	18	22	460	200	223

5. Pump Installation

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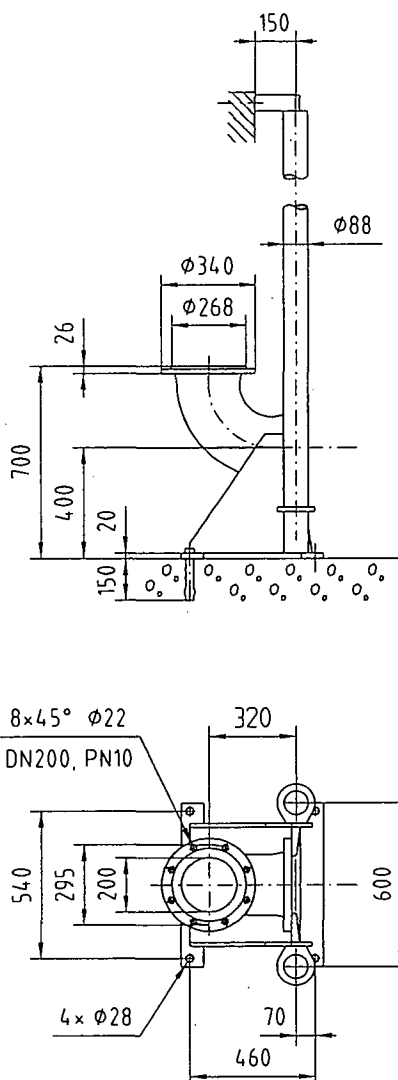
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Figure 5.8 DN 200 guide rail system installation dimensions

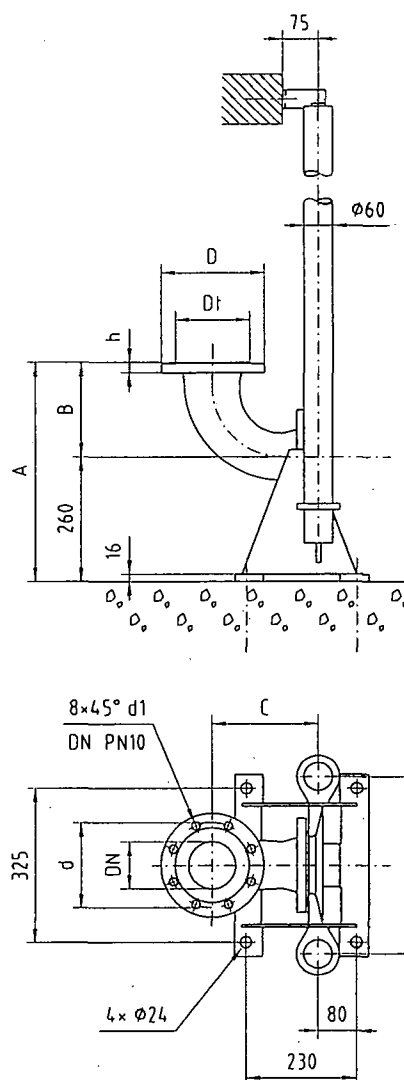


Figure 5.9 DN 80 and DN 80/100 guide rail system installation dimensions. The variable dimensions are given in table 5.3.

5.3. Pump Installation Version 1 and 2

Prepare the pump for lowering into the wet well by fastening the lifting chain to the pump handle and by uncoiling the electric cable. Make sure your lifting device is in working order.

ATTENTION

Use only the original lifting chain and shackle or if third-party components are used make sure that these are rated for the pump weight. Inferior components may break and cause the pump to fall with risk of severe damage to the pump and the accessories.

Lift the pump and position the guide shoe between the guide rails at the access opening. Please refer to figure 5.10 for reference. Lower the pump slowly along the guide rails onto the baseplate. Make sure that the pump cable can move freely and does not seize or fall into the well. Attach the upper end of the lifting chain to a suitable hook or eye bolt at or near the upper guide rail holder. Remove chain slack by cutting off the surplus length if necessary.

Route the pump cable through a suitable conduit to the control panel and secure with clamps where necessary. Do not unnecessarily remove the protective sleeve on the pump free end. The pump cable should not be cut to length, but laid in loops so that the end easily reaches the terminal blocks. Connection to the control panel terminals may be completed by authorised electrician only. Please refer to section 5.8 for information on pump wiring.

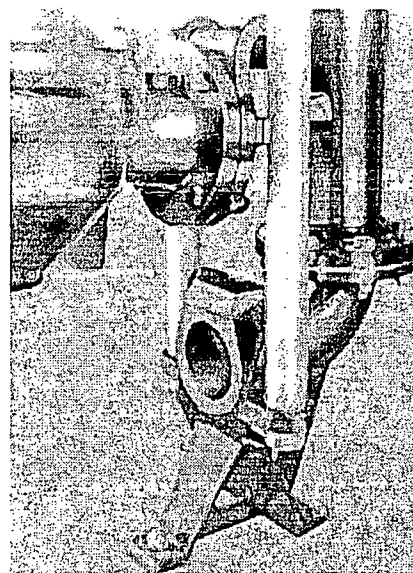


Figure 5.10 Pump being lowered onto submersible baseplate.

5.4. Pump Installation Version 3 and 6

Before commencing installation work make sure that the construction work is finished according to specifications. It is especially important that the surface under the pump stands is level and even.

Begin work by marking the location of the pump and stand in relation to the suction pipe and rising main to the extent these are installed or according to the site drawings. Use a mock-up arrangement to secure a good fit of the components if required. Please refer to Figure 5.11 and Figure 5.12 for reference.

NOTE

For ease of installation, it is advisable to separate pump and stand, especially in cramped locations. The pump should be supported when the fastening screws are loosened to prevent tipping over. The use of a water level is recommended for adjustment.

Table 5.4 DN 150 and DN 200 pump stand dimensions

Stand	DN	A	B	C	D
DN 150	150	300	600	150	240
DN 200	200	325	700	200	295

Mark the foundation bolts on the dry well floor using the stand as a template. Remove the stand. Install the stand bolts or ground sleeves using expansion elements or by grouting. Use M 24 installation sleeves (Sarlin part No. FMTZ 24130) as required or equivalent foundation bolts. Fix the stand to the floor and tighten the bolts or nuts to the torque specified for the bolts used. Shims may be used to ensure stand is level and to adjust the height to fit the pipework.

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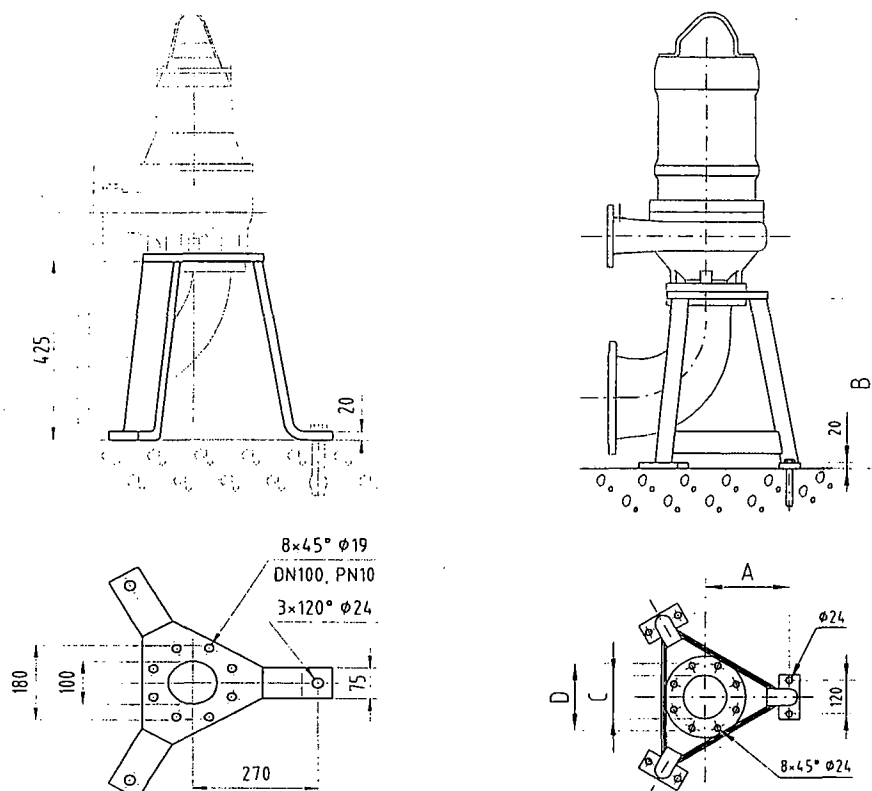
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Figure 5.11 Vertical dry installation stand dimensions. The variable dimensions are given in table 5.4.

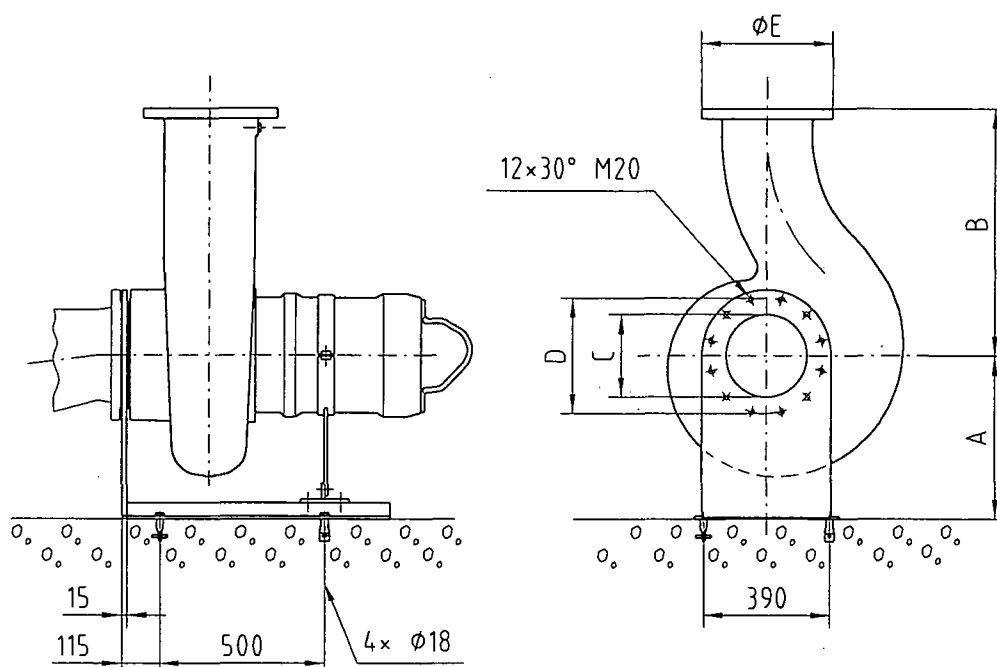


Figure 5.12 Horizontal dry installation stand dimensions. The variable dimensions are given in table 5.5.

Table 5.5 Variable installation dimensions for pump version 6

Pump suction inlet size	DN (C)	A	B	D	DN (E)	M
Frame size 50, DN 100	100	300	285	180	100	M16
Frame size 50, DN 150	150	300	310	240	100	M20
Frame size 50, DN 200	200	350	460	295	200	M20
Frame size 54, DN 150	150	375	355	240	100	M20
Frame size 54, DN 150	150	375	360	240	125	M20
Frame size 54, DN 200	200	375	500	295	200	M20
Frame size 54, DN 250	250	500	750	350	250	M20

For vertical pumps (version 3) install the bend between the suction pipework and the stand. Use reducing bends wherever required by the pipework dimensions. For horizontal pumps (Version 6) install a connection pipe or reducer for the same purpose. Please refer to figures 5.13 and 5.14 for reference.

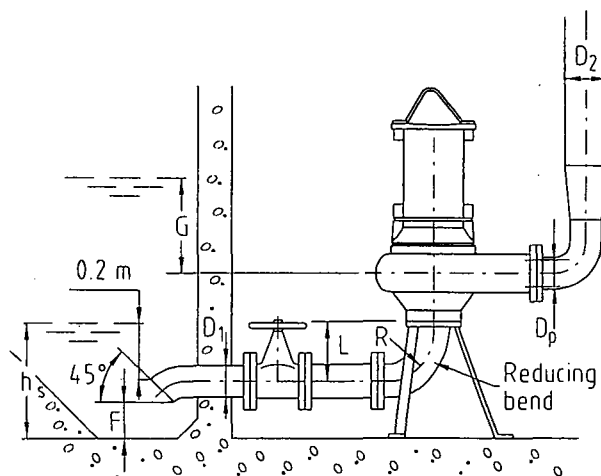


Figure 5.13 Recommended pipework dimensions for vertical dry-installed pumps. $F = 0.5 \times D_1$, $v_{max} = 2.0 \text{ m/s}$, $G = D_p$, $L \geq D_1 + 100 \text{ mm}$, $R \approx L$.

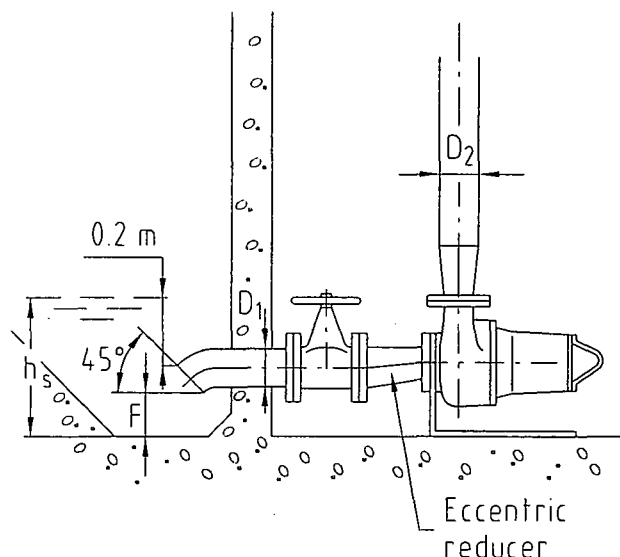


Figure 5.14 Recommended pipework dimensions for horizontal dry-installed pumps. $F = 0.5 \times D_1$, $v_{max} = 2.5 \text{ m/s}$.

ATTENTION

If a reducer is used between the suction pipework and the pump in horizontal installations it must be of the eccentric type and installed so that the straight edge is upwards. This way the accumulation of air in the suction pipeline and possible pump blockage is prevented.

Reinstall the pump onto the stand, using the original fastening bolts. Install the pressure pipework including valves and bends according to the project plumbing specifications. Connect the pump to the

5. Pump Installation

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rising main using ISO PN 10 flanged joints for the pump delivery connection. Use gaskets at all joints to ensure tightness.

NOTE

Make sure that the pipework is installed without the use of undue force. No loads from the pipework weight must be carried by the pump. The use of pipe joints with loose flanges is recommended for ease of installation and to avoid tension at flanges and bolts. The use of elastic elements or bellows in the pipework is not recommended and these elements should never be used as a means to align the pipework.

Uncoil the electric cable and route it to the control panel. Use cable trays and cable clamps where necessary. Do not unnecessarily remove the protective sleeve on the pump cable free end. The pump cable should not be cut to length, but laid in loops so that the end easily reaches the terminal blocks. Connection to the control panel terminals may be completed by authorised electrician only. Please refer to section 5.8 for information on pump wiring.

5.5. Pump Installation Version 4 and 5

Prepare the pump installation location by levelling the floor or ground under the pump to prevent the pump from tipping over when placed.

Ready the pumps for installation by connecting the delivery hose to the hose connector on the pump. Use stainless clamps of suitable size only. Uncoil the electric cable and route it to the control panel. Attach a suitable lifting chain or wire to the pump handle and lower the pump into the well or pit using a suitable lifting device. Make sure that the pump is standing upright on its integral stand.

Protect the cable and fasten it using clamps or cable ties as appropriate to prevent it from falling into the pumping pit or well and to keep it out of way during pump usage.

NOTE

If the pump is shifted frequently and used at different locations it is good practice to install a cable connector at the free end of the power cable to simplify electrical connection. Please refer to section 5.8 for detailed information.

5.6. Pump Installation Version 7

Make sure before commencing installation work the construction work is finished according to specifications. The seat ring, supplied with the pump, is either welded in place in the riser pipe lower opening or grouted into the concrete shaft at the bottom opening. The seat rings should be specified for either installation method when ordering pumps. Please refer to figure 5.15.

Prepare the pump for lowering into the wet well by fastening the lifting chain to the pump handle and by uncoiling the electric cable. If preferred, the site hoist can be hooked directly to the pump lifting bail and used for lifting and lowering the pumps into the wet well.

With the seat ring in place the assembled pump is inserted in the pump shaft and lowered in place. Make sure that the sealing O-ring (item 031) is located in the groove on the outside of the pump casing. The O-ring seals between pump casing and seat ring preventing back flow and loss off pumping efficiency. Three dowel pins in the seat ring guide the pump to correct position and prevents the pump from turning in the seat when running.

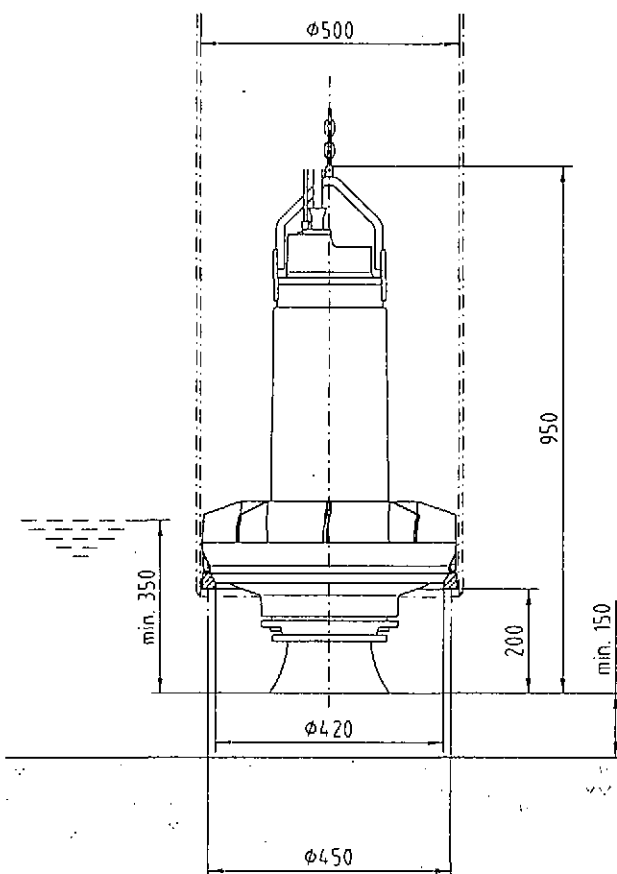


Figure 5.15 Vertical column installation dimensions

ATTENTION

Use only the original lifting chain and shackle or if third-party components are used make sure that these are rated for the pump weight. Inferior components may break and cause the pump to fall with risk of severe damage to the pump and the accessories.

Make sure that the pump cables can move freely and do not seize or fall into the shaft. Attach the upper end of the lifting chain to a suitable hook or eye bolt at or near the shaft upper entry cover. Remove chain slack by cutting off the surplus length if necessary.

Route the pump cables through a suitable conduit to the control panel. Remove slack from the cable in the column and clamp at the conduit only. The cable conduit through the shaft wall may be watertight if called for by the installation. Secure cable with clamps along route to the panel where necessary. Do not unnecessarily remove the protective sleeves on the free end of the pump cables. The pump cables should not be cut to length but instead laid in loops so that the ends easily reach the terminal blocks. Connection to the control panel terminals may be completed by authorised electrician only. Please refer to section 5.8 for information on pump wiring.

5. Pump Installation

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5.7. Pump Installation Type SR

The circulation pumps of type SR are installed submerged on a wall thimble with guide rails. They are intended for permanent installation in basins, and the pump can easily be hoisted from and lowered down into the basin along guide rails. A guide shoe bolted to the propeller nozzle guides the pump down onto a matching flange on a pipe cast into the wall. The guide shoe engages automatically with the pipe flange and the pump is kept in place by its own weight. Pump motor cooling is by submergence in the liquid, requiring that the lowest liquid level does not fall below the motor centre line. Please refer to Figure . Minimum dimensions: $a = 400 \text{ mm}$, $b = 1000 \text{ mm}$.

The guide rails are installed according to the instructions given in section 5.1. The thimble is fitted with a girdle flange and is grouted in place in the hole in the wall separating the basin sections. The thimble must be horizontal and the mating flange in a vertical position and level with the upper guide rail holder.

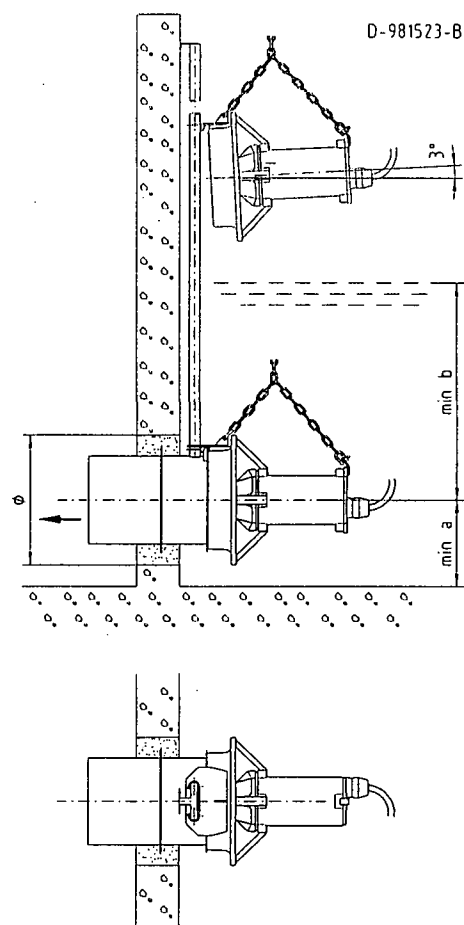


Figure 5.16 Circulation pump type SR.
Installation on wallpipe and
with guide rails.

NOTE

Using a plumb line suspended from the upper guide rail holder, the thimble flange can be positioned exactly. The integral lower guide rail hollows on the flange are used for correct line-up reference.

Attach the lifting chain at both lifting lugs using the shackles provided and uncoil the electric cable. Make sure your lifting device is in working order.

ATTENTION

Use only the original lifting chain and shackle or, if third-party components are used, make sure these are rated for the pump weight. Inferior components may break and cause the pump to fall with risk of severe damage to the pump and the wall thimble or other components.

Lift the pump and position the guide shoe between the guide rails. Please refer to Figure for reference. Lower the pump slowly along the guide rails onto the mating flange. Make sure that the pump cable can move freely and does not seize or fall into the basin. Attach the upper end of the lifting chain to a

suitable hook or eye bolt at or near the upper guide rail holder. Remove chain slack by hanging in loops and cut off surplus length if necessary.

Route the pump cable through a suitable conduit to the control panel and secure with clamps where necessary. Do not unnecessarily remove the protective sleeve on the pump cable free end. The pump cable should not be cut to length, but laid in loops so that the end easily reaches the terminal blocks. Connection to the control panel terminals may be completed by authorised electrician only. Please refer to section 5.8 for information on pump wiring.

5.8. Pump Electrical Connection

Electrical supply and control of the pumps is provided by the control panel. Control panel specifications vary greatly with the intended pump duty and installation. Panels may include circuitry for pump duty alternation, level control, alarm detection and transfer, and other functions. However, the pump start and stop circuitry must always be executed according to the scheme presented in figures 5.17 and 5.18 below for DOL and Y/D start respectively.

ATTENTION

The control panel starter must include overload protection relays adjustable according to the pump nominal current and provisions for the pump moisture and overheat protection devices whenever these are fitted. Usage of non-complying control panels increases the risk of motor damage and voids the pump warranty.



Make sure that the control panel is isolated from the electrical supply before beginning to work. Turn off the mains switch or remove the main fuses. Non-compliance to do so may lead to electrical shock with consequent serious personal injury or death of the personnel.

Insert the cable through the control panel cable gland and remove the protective sleeve. Note the markings on the leads and connect according to the cable identification and connection chart in figures 5.19 and 5.20. If the markings are missing or if the cable has been cut the leads can be identified with the help of the identification chart as follows:

- Strip back the cable sheath and identify the yellow/green ground wire
- Identify your cable according to the schedule of the connection charts
- Keeping the cable in the position of the chart the leads can be identified
- Mark the leads and proceed with the connection procedure

Tighten the cable clamp of the control panel (if fitted) and finish the cable routing to the panel using clamps where required.

5. Pump Installation

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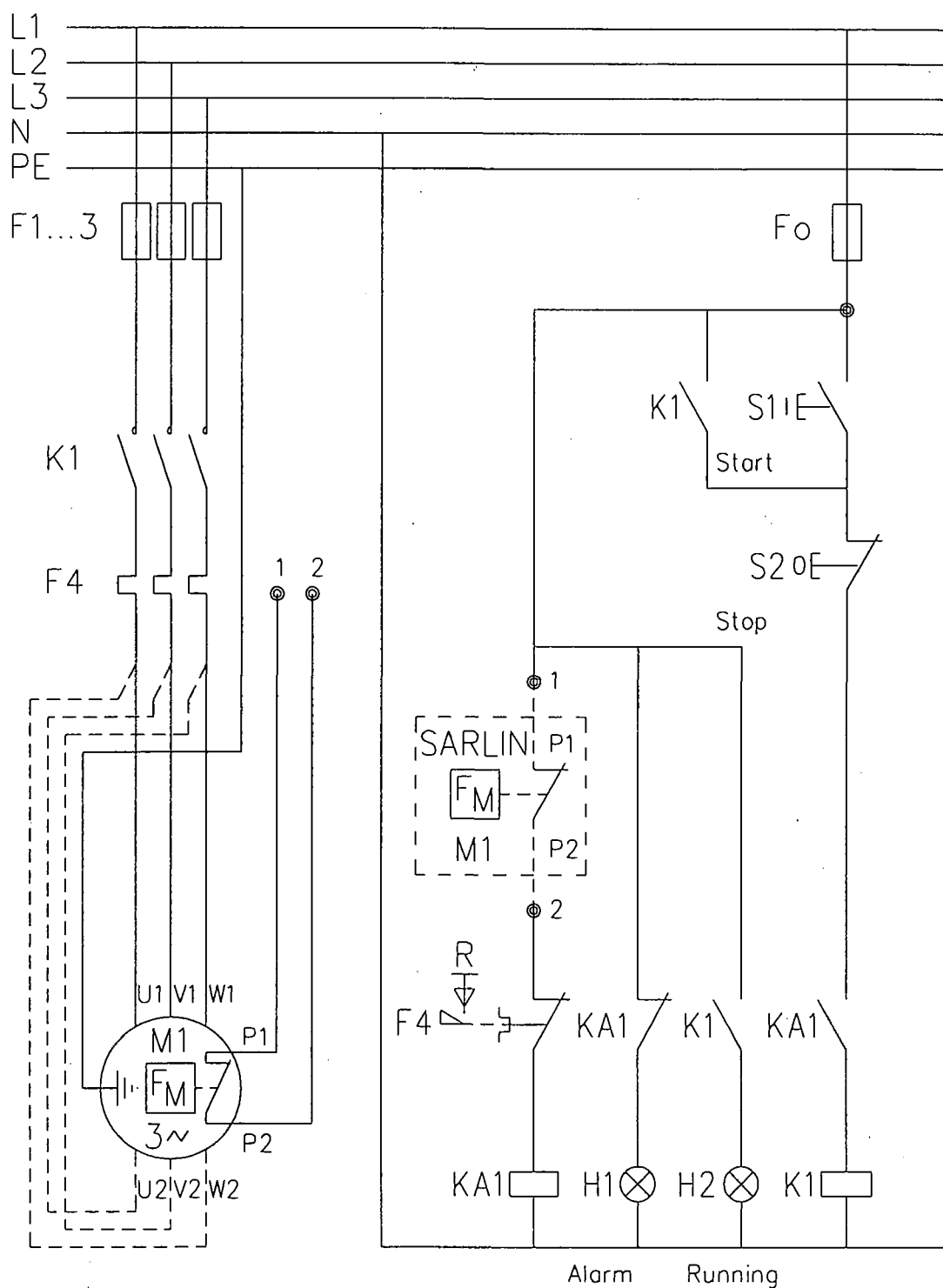
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Figure 5.17 Pump wiring diagram for DOL start. F_M = internal motor protection device (moisture switch and winding thermal protectors)

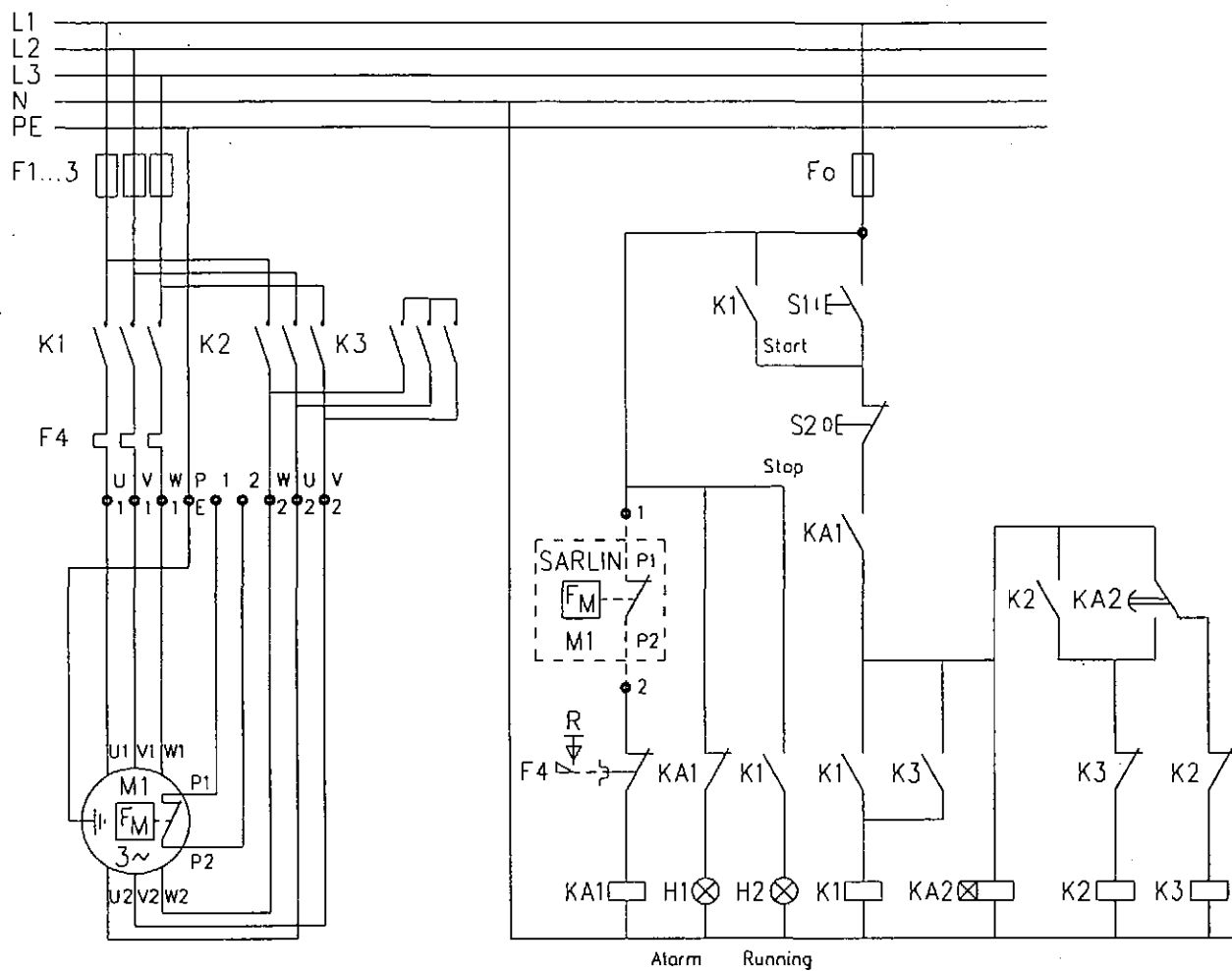
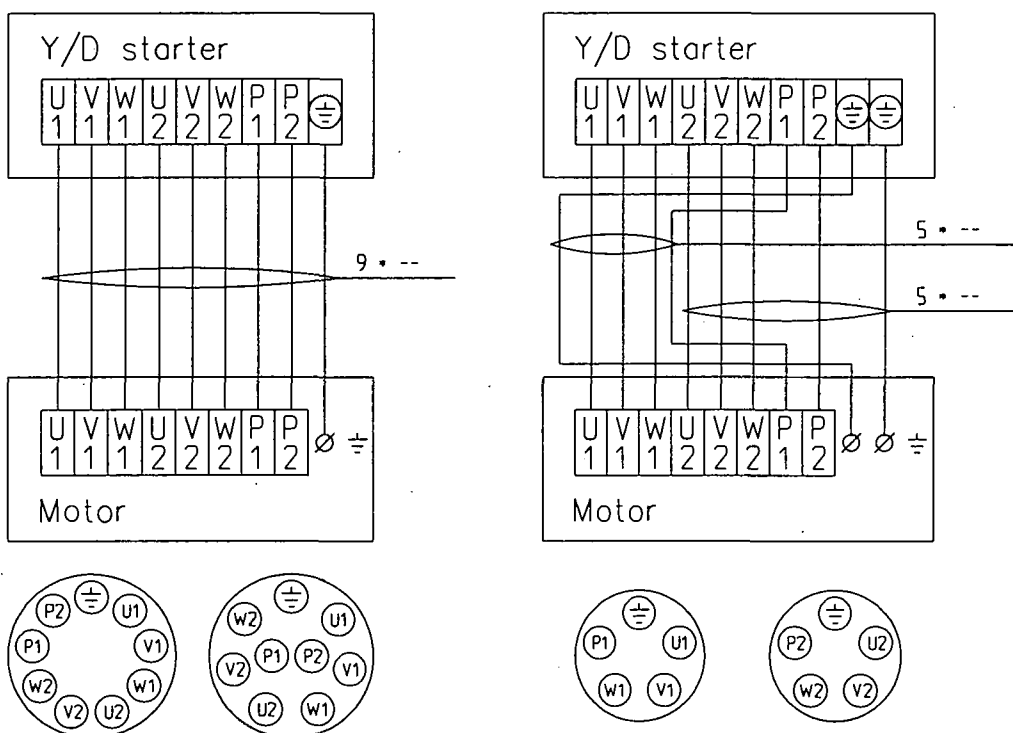
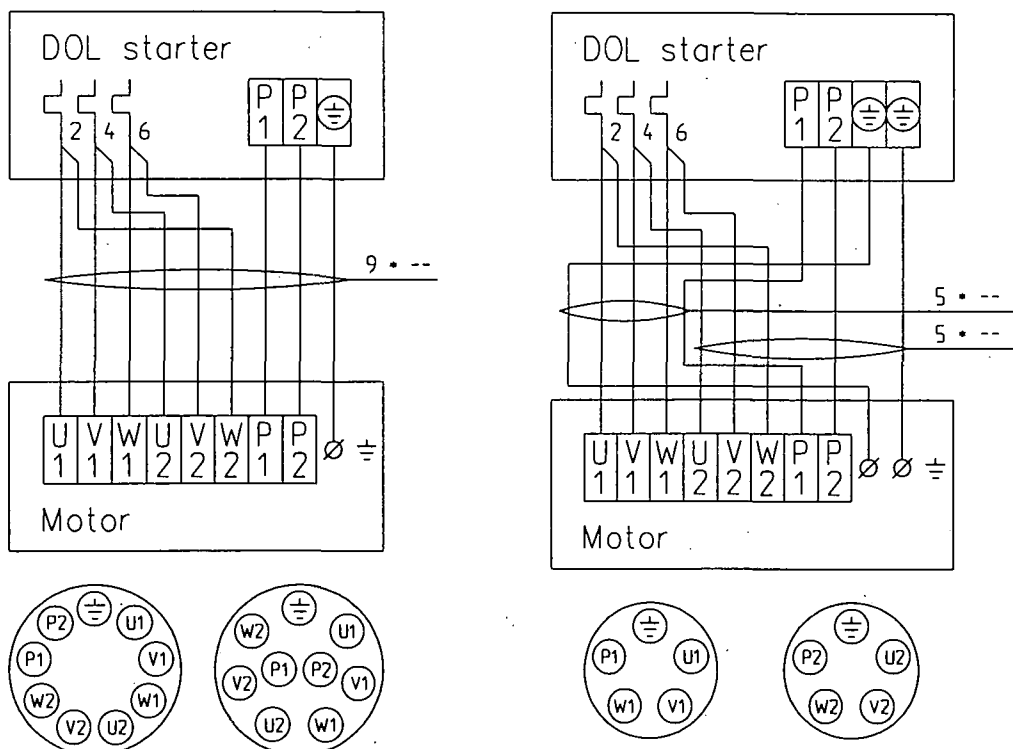


Figure 5.18 Pump wiring diagram for Y/D start. F_M = internal motor protection device (moisture switch and winding thermal protectors)

5. Pump Installation

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NOTE

A cable connector on the cable simplifies pump removal and reconnection. The use of a SARLIN pump cable connector, part No. PKL 9-25, is recommended for its suitability for the pump cables and complete watertightness. Figure 5.21 shows the use of the cable connector in a submersible pump installation.

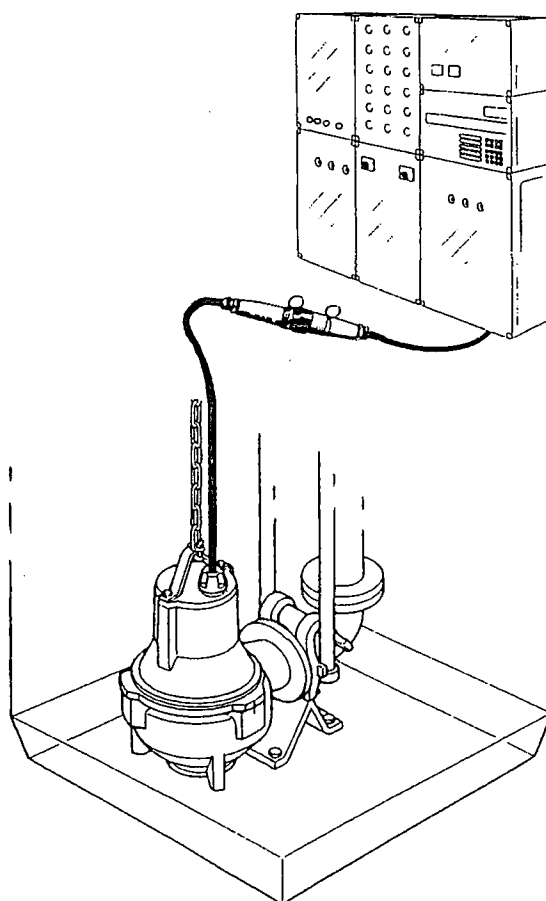


Figure 5.21 A pump cable connector simplifies pump installation and removal.

6. Pump Use and Operation

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6. Pump Use and Operation

ATTENTION

Always read and observe the safety instructions in sections 3.8 and 3.9 before beginning to operate pumps.

6.1. Pump Usage

The Sarlin submersible pumps are designed for pumping of unscreened wastewater in municipal and industrial installations and for low to medium density sludge pumping in sewage treatment plants. The pumps are also suitable for various raw water pumping duties where the conditions call for submersible pumps to be installed. The pumps have the capacity to handle unscreened sewage containing solids of 80 mm or 100 mm in spherical size depending on model. The impeller design allows stringy matter and long fibres to pass through the pump. Different pump material specifications are available for use in corrosive liquids.

Pump usage is restricted by the following ambient conditions used as design criteria limits:

- Maximum ambient and pumped liquid temperature is 40 °C
- Storage temperature range is -30 °C...+60 °C
- Maximum allowable voltage fluctuation is $\pm 5\%$ of nominal voltage (U_N)

ATTENTION

Usage of the pumps in installations where conditions exceed those allowed in the pump specifications may lead to pump malfunction and damage.

6.2. Pump Function

The Sarlin submersible pumps are short-coupled centrifugal pumps with the pump connected to a proprietary electric motor. The pumps are installed submerged in the pumped liquid or alternatively dry-installed. Submerged pump motors are cooled by submergence in the pumped liquid or independently of submergence by encasing the motor stator housing with a cooling jacket. In these a part of the pumped liquid is diverted through channels from the pump casing and circulated in the jacket. Dry-installed motors are always cooled by means of a cooling jacket.

The pump impellers are of vortex or channel type with one or two vanes, and they are available in a number of standard diameters making up a range of pumps within each frame size.

ATTENTION

Only complete pumps of specified installation versions are delivered from the factory. Unauthorised pump conversion may lead to pump or motor damage from overheating, corrosion or leakage, and voids all factory guarantees.

6.3. Pump Description

The pump unit consists of pump (hydraulic) parts and motor. Sections showing vortex and single-channel pumps are presented in figure 6.1 and figure 6.2 below.

Vortex pumps feature a recessed impeller working in a slightly volute shaped pump casing. The pump casing is fixed to the submersible motor with three fastening screws and can easily be removed for impeller inspection and removal. The open pump casing offers a large unobstructed passage for solids and fibrous matter. The impeller features between two and four vanes with winglets for symmetry and good pumping efficiency.

Channel-impeller pumps feature an impeller with one or two vanes and a patented axial suction clearance between the impeller and the pump casing. The pump casing is fixed to the motor with six

fasteners and three set screws for impeller clearance adjustment. The long vane in single-channel impellers offers a single passage through the impeller for solids and fibrous matter. The asymmetric impeller includes counterweight masses for balance and offers excellent pumping efficiency. Double-channel impellers have wider passages than the one-channeled impellers for solids and fibrous matter. These impellers are symmetric and inherently balanced.

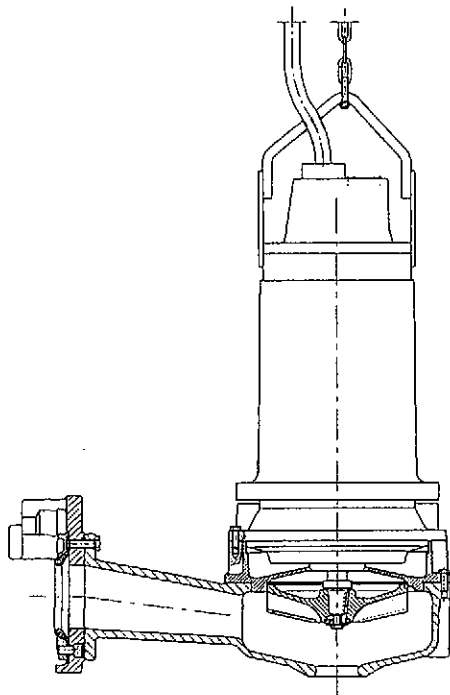


Figure 6.1 Section of vortex pump showing spacious casing.

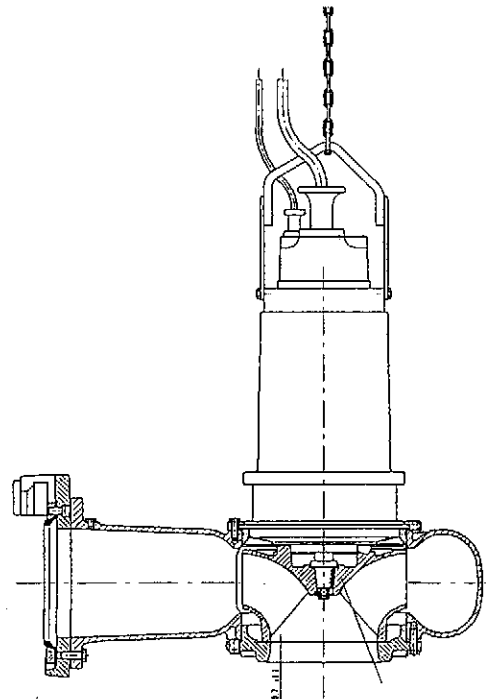


Figure 6.2 Section of single-channel pump showing impeller clearance at suction opening.

The pump motor includes independent double shaft seal with an oil chamber at the motor lower end. The oil serves as a lubricant and a coolant for the shaft seals. The oil chamber is accessible through inspection and fill holes. The state of the lubrication oil serves as an indicator of seal wear and is inspected according to the service schedule. Please refer to section 7 for information on seal oil inspection and replacement procedure.

The pump motor is totally enclosed (IEC IP 68) and may be opened for service only by workshops authorised by Sarlin in order to ensure that the watertight integrity remains intact. The motor may be fitted with internal moisture and winding temperature switches wired in series to a common circuit. The moisture switch is non-reversing and breaks the circuit in case of moisture entering the motor. The thermal switches, one in each phase of the windings, open when the temperature reaches a predetermined, set limit value of 150 °C, breaking the circuit. Upon cooling these switches reset and close the circuit.

The pump control panel must include circuitry for the protection devices, and set to break the pump motor current in the event of the protection circuit opening. The control panel specifications may call for either manual or automatic restarting of the motor after the protection circuit has closed. This, of course, is possible only if the circuit was broken by the thermal switches. The principle of the protective circuit is shown in figure 5.17 and figure 5.18 in section 5.

6. Pump Use and Operation

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Pump motors for dry installation (version 3 and version 6) are generally identical to those for submerged installation. The motor casing and oil housing flanges are designed for efficient heat transport and dissipation into the pumped media. This cooling system may require that these pumps are rated lower than the largest submersible pumps and, for some models, may have stator casings made of aluminium in lieu of cast iron for enhanced heat conductivity. Therefore, they cannot always serve as motors for a submersible pump of the same type.

6.4. Pump Direction of Rotation

Whenever a pump has been connected to the mains during commissioning the direction of rotation must be ascertained. The pump impeller direction of rotation is clockwise when observed from the driving end. An arrow cast in the pump casing shows the direction. All new pumps have a large sticker clearly showing the direction of rotation.

The direction of rotation of a squirrel-cage electric motor is dependent of the order the three phases were connected at the control panel. Despite the phase markings on the leads the phases may be confused at the panel and the pump may run in the wrong direction when started. The direction of rotation can be controlled with the following procedure:

- With the submersible pump suspended from a lifting device either freely or in the wet well and guided by the guide rails the pump is started briefly from the control panel. By observing the direction the pump spins or "kicks" at the starting moment the direction of rotation can be determined.

NOTE

The pump kicks in the opposite direction of the direction of rotation. With the right direction of rotation being clockwise when observed from the driving end the pump should kick counterclockwise when started. If this is not the case the pump should be reconnected at the control panel with two of the phase leads changing place.

ATTENTION

The pump may be run briefly only when suspended. Make sure that the pump cable does not become twisted or strained during the operation. Failure to observe caution may lead to cable damage. Prolonged dry running of pumps may damage the primary shaft seal and cause motor overheating.

Pumps of version 3 and 6 installed dry shall be controlled for direction of rotation according to the procedure above before final installation.

6.5. Pump Starting

The pumps are started from the control panel manually or automatically. Control panel specifications vary according to installation requirements and local regulations but most control panels have at least the following components:

- Mains switch and fuses
- Motor starter contactors with overload relays
- Selector switch or buttons for pump manual and automatic starting and stopping
- Circuitry for pump motor protective devices
- Level control system
- Pump on/off indicator lamps

and control functions:



6. Pump Use and Operation

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- Mains on/off
- Pump off
- Pump manual start
- Pump automatic start
- Overload relay reset

The pump is started from the control panel manually or automatically as controlled by the level control equipment.



Pump controls must always be switched off or to manual control whenever handling or servicing pumps or when personnel is entering the wet well. Pumps in automatic control mode may start unexpectedly from level control or resetting protective devices leading to pump damage or serious injury to the service personnel.

The pumps can be started manually or switched to automatic operation as required for commissioning after the opening of all valves in the suction and pressure sections of the pumping station pipework and final visual inspection.

6.6. Pump Commissioning

Pump commissioning to production follows the conclusion of the project work. Begin the procedure with a safety check of the pump installation checking all site work is completed according to specifications and cleared of debris. The function of the level control system is dry-checked against specifications to the extent possible.

Use manual operation to get all the pumps started and check their function and performance using the instrumentation installed. If necessary, portable instruments such as ammeters and voltmeters are used. The pumps are checked for unusual noise and vibrations and possible causes are established and reported or corrected.

Actual pumping station duty point should be established as accurately as possible in order to confirm that the pump operating conditions are the intended. If the installation includes a flow meter or a manometer the duty point can easily be established or picked off the pump curve. If these are not available actual pump performance can be approximated using the volumetric method. In this method the pump is timed when pumping a known quantity such as the wet well volume between start and stop level. The method is simple and offers an acceptable approximation of the volume rate of flow.

Commissioning is completed with the pumps switched to automatic operation and a final inspection of the pipework for leaks and vibrations. After it the project is ready for handing over to the owner and the pumping station is subject to regular operation and maintenance routines.

6.7. Pump Operation

Pump operation should be governed by established maintenance and check routines. Please refer to Section 7 for recommendations on pump check and maintenance schedules.

ATTENTION

Pump starting frequency may not be greater than 20 starts per hour. If started more frequently the motor windings may be damaged from overheating.

7. Pump Maintenance

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7. Pump Maintenance

Regular pump maintenance is a prerequisite for dependable long-term pump operation. With a few simple operator-performed maintenance actions the pump performance can be assured.

ATTENTION

Always read and observe the safety instructions in sections 3.10 and before beginning to work on pumps.

The operator-performed maintenance steps should be performed every 2000 hours of operation and include the following actions:

- Oil check and change if required
- Axial clearance inspection and possible adjustment
- Pump and component cleaning and visual inspection

7.1. Oil Check and Change

The volume of oil contained in the chamber between the double mechanical shaft seals is essential for the function of the pump providing lubrication for and cooling of the shaft seals.

Another intended purpose of the oil is to absorb by emulsification the minute amounts of water leaking across the lower seal into the oil chamber. By following the condition of the oil the lower seal can be monitored and scheduled for replacement before failure and damage to the pump motor will occur.

Lay the pump flat on a work bench and locate the oil plugs. Position the pump so that one of the plugs is pointing upwards. Clean the area around the oil plugs.

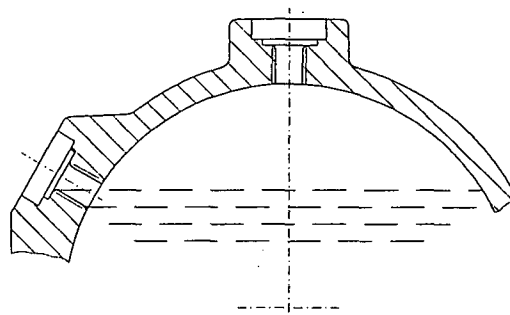


Figure 7.1 Correct oil level

Use a 24mm socket wrench to open the upper plug slowly and let possible excess pressure escape before the plug is removed. Place a clean oil trough under the pump to collect all drained oil. Open the plug pointing to the side and observe the fluid level. The escaped fluid indicates leakage over the lower mechanical seal which may be normal. Please refer to figure 7.1.

Turn the pump using a hoist and let all the fluid drain into the collecting trough. Pour a sample amount of the oil into a glass container and observe the condition of the oil using figure 7.3 for reference.

Clear oil can be reused always discard and dispose of emulsified oil. Low oil level may indicate upper seal failure and the pump should be referred to an authorised repair shop for further checks and possible repair.



Figure 7.2 Oil draining

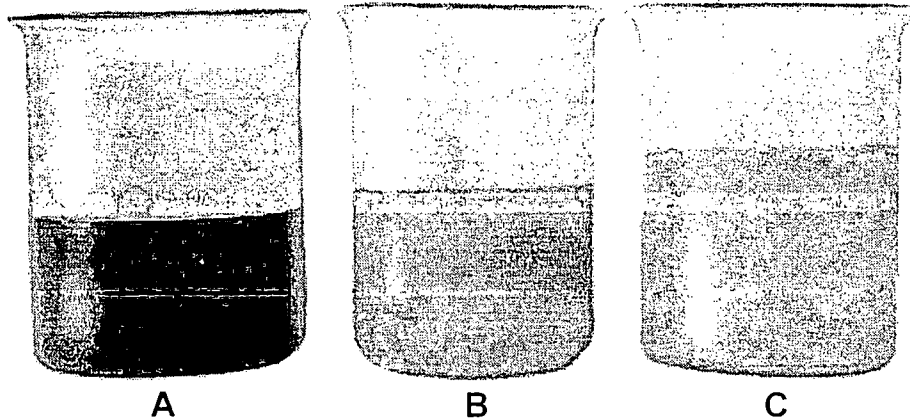


Figure 7.3 Condition of lubrication oil. Sample A: Oil in good condition. Sample B: Oil moderately emulsified. Change oil. Sample C: Excess water in oil. Change oil and check primary seal condition.

When the pump is flat on the bench the oil chamber is refilled from the top plug hole until the oil reaches the correct level. Use regular SAE 10 W 30 motor oil. Replace the O-rings, close the plugs and tighten carefully.

ATTENTION

Never lubricate the O-rings with grease. Greased O-rings may leak and allow the oil to escape from the oil chamber with consequent damage to the shaft seals.

7.2. Inspection and Adjustment of Suction Clearance

Adjustment of the impeller suction clearance is relevant for pumps with single-channel impellers only.

The correct setting value for the axial clearance is $0.7 \text{ mm} \pm 0.2 \text{ mm}$. The suction clearance should be reset if it is worn to 1.2 mm or more. The method for resetting the clearance is different for withdrawable submersible pumps (pumps version 1, 2, 4 or 5) and dry-installed pumps (pumps version 3 or 6). Both methods are described here.

For pumps with semi-axial impellers (pumps type SS), available in version 1 only, the adjustment procedure is different and described separately.

Lay the pump flat on a workbench. Locate the six screws fastening the pump casing to the motor and the three set screws. Please refer to figure 7.5. Check the clearance between impeller and casing all around the perimeter of the suction opening using a feeler gage. Turn the impeller by hand and check at several points. Please refer to figure 7.6.

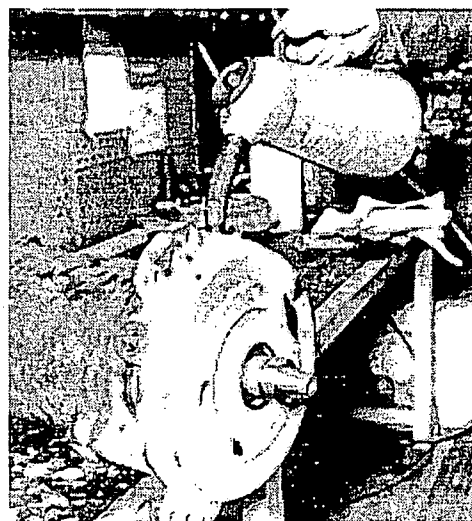


Figure 7.4 Oil filling

7. Pump Maintenance

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If the clearance needs adjustment proceed as follows. Loosen all fasteners and set screws between the pump casing and the motor. Use a mallet to tap the casing and close the clearance. Open the clearance to specified by turning the three set screws. Check that the clearance is uniform around the perimeter of the suction opening. Tighten the fastening screws and check that the clearance is stable.

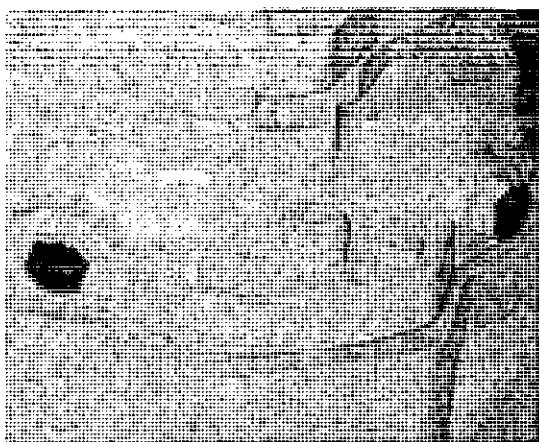


Figure 7.5 Pump casing fasteners and impeller clearance set screw.

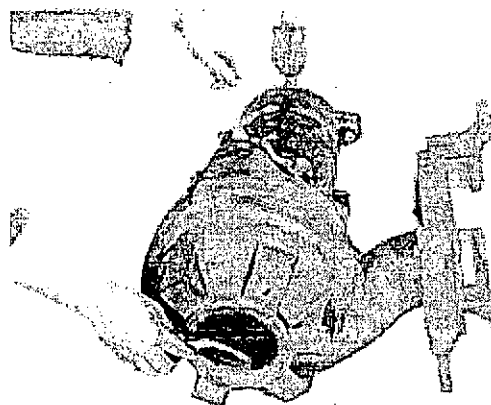


Figure 7.6 Setting impeller clearance using the set screws and feeler gages.

For dry-installed pumps the suction clearance can be inspected with the pump installed on the pump stand and connected to the pipework. Loosen all fasteners and set screws between pump casing and motor. Use a mallet to tap around the casing to break any bonding between casing and motor. Close the impeller clearance by tightening three of the fastening screws. Do not use unnecessary force. Measure and make a note of the distance X between pump casing and motor flange with feeler gages at three points next to the set screws. Please refer to Figure 7.7.

Loosen the fasteners and back up the motor $0.7 \text{ mm} \pm 0.2 \text{ mm}$ using the three set screws and the distance X as reference. Tighten all fasteners and check that the distance X at the three reference points are stable at their new set of values.

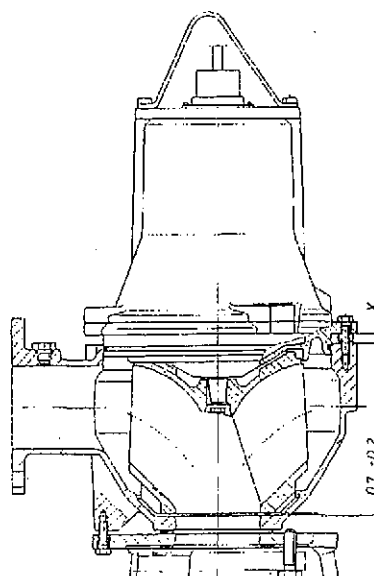


Figure 7.7 Axial clearance reference dimension X.

7.3. Pump Cleaning and Visual Inspection

A simple maintenance measure is to clean the pumps at regular intervals. The pumps may be cleaned in situ at the pumping station when withdrawn from the wet well. The pump is hosed down externally using a high pressure jet cleaner (maximum pressure 100 bar). Caked dirt on the motor must be removed to ensure good heat conductivity. A mild detergent, approved for disposal into the sewerage system may be used. The pumps may be scrubbed, using a soft brush, if necessary.



7. Pump Maintenance

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Visual inspection of the pump should include search for cracks or other external damages. The lifting handle and lifting chain should be expected for wear and corrosion. The pump cable should be inspected for cracks or lacerations in the sheath, kinks or for other damage. Visible parts of the cable inlet must be inspected for cracks and that they are firmly screwed down onto the top cover or junction box.

8. Impeller Replacement

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8. Impeller Replacement

ATTENTION	A damaged or badly worn impeller must always be replaced without delay when observed. A damaged impeller is out of balance and will cause damage or premature failure of the pump bearings. Always read and observe the safety instructions in the sections 3.10 and before beginning to work on pumps.
NOTE	Make sure before beginning to work on dry-installed pumps that all closing valves in both the suction pipework and rising main are closed and that the pump is drained.

8.1. Impeller Removal

Loosen and remove all fastening screws between pump casing and motor. Use a mallet to tap around the casing to break any bonding between casing and motor. Use a hoist to lift the pump motor out of the pump casing and place on a work bench. Clean the work area around the impeller and the impeller screw.

Loosen and remove the impeller screw. Be sure to locate and remove all washers. Please refer to the impeller specifications table below for list of components.

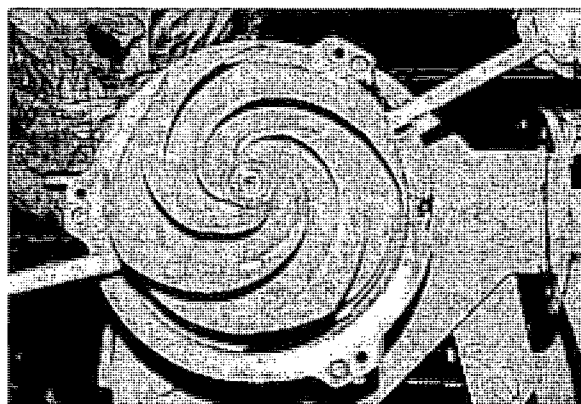


Figure 8.1 Removing vortex impeller using levers

The impeller can be removed using leverage applied behind the impeller by inserting suitable tools, such as tire irons, into clearance between impeller and motor flange. Apply the leverage evenly on both sides of the impeller. Please refer to figure 8.1. With the leverage applied apply a blow to the impeller using a soft mallet. The impeller breaks loose from the tapered shaft and can easily be removed. Remove and store the impeller key.

ATTENTION	Do not apply one-side leverage when removing impeller. One-sided force on the impeller may distort the tapered fit on the shaft end or bend the shaft.
------------------	--

For pumps with large impellers the use of an impeller puller is recommended. Use a two-clawed puller with claws long enough to reach behind the impeller upper shroud. On pumps with impeller screws screw a hex or Allen head bolt of the same dimension into the shaft end for thread protection before applying the puller. Please refer to the impeller specifications table below for list of screw dimensions. Apply the puller and tighten up until the impeller breaks loose from the tapered shaft end. Remove the protective bolt from the shaft end and remove the impeller. Remove and store impeller keys or drive pins. Please refer to figure 8.2.

Clean the shaft end and the area behind the impeller with the impeller removed from the shaft. Check the shaft end for damages or taper distortion from impeller looseness. Do not attempt to install new impeller on damaged or distorted shaft. Instead send the pump to authorised workshop for repair.

ATTENTION

Sling heavy impellers to a hoist while removing. Dropping the impeller may cause damage to the impeller or work area floor.

NOTE

For pumps with semi-axial impellers (SS pumps) the order of component removal is reversed and the impeller is removed before the pump casing. For impeller replacement the casing does not have to be removed at all.

After the impeller is removed from the shaft clean the shaft end and the area behind the impeller. Check the shaft end for damages or taper distortion from impeller looseness. Do not attempt to install new impeller on damaged or distorted shaft but send pump to authorised workshop for re-pair instead.

8.2. Impeller Mounting

Lubricate the threads (internal or external) of the shaft end using oil. The specified tightening torque for the impeller requires the threads to be lubricated to attain sufficient screw tension. Install the impeller key or drive pin. Install the new impeller onto the shaft end. Make sure that the key stays in place in keyway in shaft and impeller. Make sure that the pin recess slides home onto the drive pin where a drive pin is employed to.

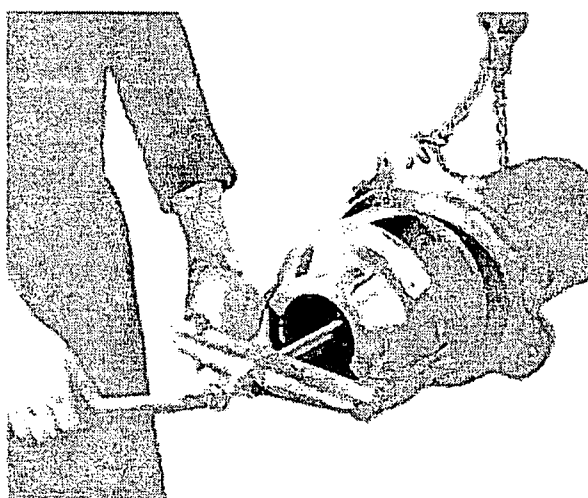


Figure 8.2 Removing single-channel impeller using puller

Install the impeller screw or nut using new locking washers where required. Tighten to prescribed fastening torque using torque wrench. Please refer to impeller screw torque table for the correct torque for your pump model. Turn the impeller by hand to make sure it rotates freely and straight. Please refer to figure 8.3.

Reinstall the pump casing in reverse order of the above. Adjust the single-channel pump's impeller suction clearance according to the instructions in section 7.2.

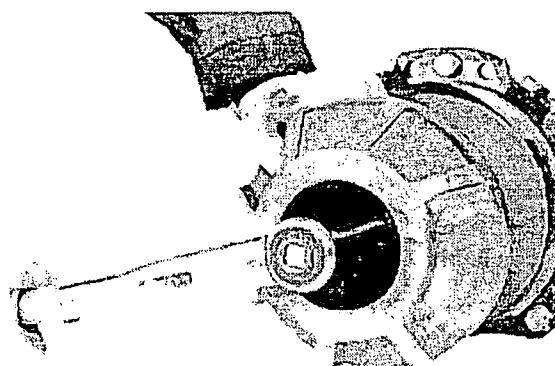


Figure 8.3 Installing impeller using torque wrench

8. Impeller Replacement

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8.3. Impeller Screw Tightening Torques

The table below contains information on the impeller fastening components for each pump covered by this manual as well as the fastening torque to be applied in each case.

Pump frame size	Screw dimension, part number	Torque, Nm	Note
50	M10, D-32437	90	Special screw
54	M12, D-32438	120	Special screw

8.4. Component Fastener Tightening Torque

The different fasteners opened in the course of the service measures described above should be tightened to specified torque upon reassembly. The torques are as follows:

Screw Dimension	Torque, Nm
M 8	20
M 10	40
M 12	70
M 16	170
M 20	330



9. Explosion-proof Pumps

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9. Explosion-proof Pumps

9.1. General

This section provides specific information for owners and operators of Sarlin submersible pumps built and certified for use in explosive environments. The range of explosion-proof pumps include the following pump types:

50 Hz				
Frame size 50			Frame size 54	
SVX 072 BH	SVX 092 BH	SVX 122 BH	S1X 134 AL	S1X 134 AM
S1X 054 L	S1X 054 M	S1X 054 H	S1X 134 AH	S2X 134 AL
S1X 074 E	S1X 074 CM	S1X 074 H	S2X 134 AE	S1X 174 AL
S1X 074 S	S1X 124 AE	S1X 124 BM	S1X 174 AM	S1X 174 AH
S1X 124 AH			S2X 174 AL	S2X 174 AE
60 Hz				
Frame size 50			Frame size 54	
SVX 092 BH	SVX 122 BH	S1X 094 BM	S1X 164 AL	S1X 164 AM
S1X 094 AH	S1X 114 AH	S1X 134 BM	S1X 164 AH	S1X 204 AL
S1X 134 AH			S1X 204 AM	S1X 204 AH

The contents of these instructions are provided as information for the pump owners and operators only and as a requirement of the certifying body. Actual repair measures on the pump motor should be referred to an authorised workshop only.

The instructions concerning the pump part of an explosion protected (ex-proof) submersible pump do not differ from the instructions for standard pumps. Consequently this instruction deals only with the structural differences, operation restrictions and special instructions of the pump motor.

ATTENTION

These instructions must be read as a general safety measure in their entirety and understood before any work on or operation of explosion-proof pumps. These instructions do not supersede the safety instructions in section 3 but constitute an complement to these and a stand-alone instruction on explosion-proof pumps. The BASEEFA Regulations governing Flameproof Submersible Motors should also be read in conjunction with these instructions.

9.2. Certification and Classification

The Sarlin explosion-proof pump motors are certified by the British Approval Services for Electrical Equipment in Flammable Atmospheres (BASEEFA) in compliance with the harmonised European Standards EN 50014 and EN 50018. The motor is certified for use in potentially explosive atmospheres

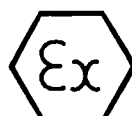
9. Explosion-proof Pumps

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GRUNDFOS
SARLIN PUMPS



requiring electrical apparatus of class dII B T3 or dII B T4. A certification marking compliance is affixed to the motor and is located on the side of the stator casing..



9.3. Certification Plate

The certification plates for class dII B T3 and dII B T4.

SARLIN	
EEx dIIB T4	
T _{amb} = -25°C-+40°C	
BAS No	Ex
TYPE	HU
Serial No	
CAUTION: Do not open any part of motor within 30 min. of disconnection!	
ZZ 287A	

SARLIN	
EEx dIIB T3	
T _{amb} = -25°C-+40°C	
BAS No	Ex
TYPE	HU
Serial No	
ZZ 287B	

SARLIN	
EEx e II T3	
VTT No	Ex
Type	HU
Ser. No	
t _E	
I _A /I _N	
ZZ 320	

The information on the plates reads as follows:

EEx	Apparatus explosion protected according to Euronorm
d	Apparatus withstands explosion pressure
II	Intended for other potentially explosive locations than mines
B	Intended for use in connection with gases of subcategory B
T3	Maximum surface temperature of the apparatus is 200 °C
T4	Maximum surface temperature of the apparatus is 135 °C
T _{amb.}	Allowable ambient temperature range is -25 °C ... +40 °C
BAS No.	Approval certificate No. EEx ---
Type HU	Motor type number HU... (Sarlin type code HU...)



Serial No

Manufacturing serial No

NOTE

When using the motor in locations requiring Temperature Class T4 the motor may not be opened until 30 minutes after de-energising. When the motors are operated at variable frequency, the Temperature Classification is of Class T3.

9.4. Motor Construction and Performance

The explosion-proof enclosure comprises the following specially-designed items:

- Motor access cover or plug
- Cable inlet
- Stator housing
- Lower bearing bracket
- Lower bearing bracket cover
- Joint between motor body and oil housing

NOTE

This enclosure may be opened by authorised personnel only.

An external ground contact is located on the top cover to ensure the connection to earth. Electrical installation must include external connection from this contact to true ground. Grounding wires must satisfy all valid electrical safety requirements. Ground wire cross section must be at least 6 mm² and less than 70 mm².

For motor characteristics please refer to section 2.2.

9.5. Motor Protection Device Circuit

The motor is provided with two separate moisture switches and the stator is provided with three thermal switches connected in series, one for each phase. In single-phase motors two thermal switches are used, one in the main and one in the auxiliary phase. Thermal switch operating temperature is not higher than 150 °C. The protection devices are connected in series in a separate circuit motor cable leads 1 and 2.

ATTENTION

The control panel starter must include circuitry for automatic disconnection of the mains supply in the event of the pump protective circuit opening.

9.6. Motor Operating Requirements

Motor modifications or other measures that include drilling, welding, fastening etc., possibly affecting or weakening the structure must not be carried out to any parts of the explosion-proof enclosure.

9. Explosion-proof Pumps

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GRUNDFOS
SARLIN PUMPS



The motor must not be opened when energised. The work on the motor, including opening and dismantling, must only be carried out by qualified personnel at a workshop authorised by the manufacturer. Plate on motor serves as reminder, refer to Figure 9.1.

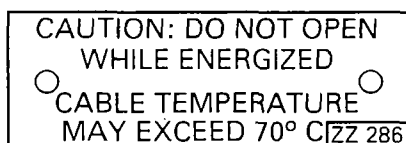


Figure 9.1 Warning plate

Overhauled and repaired motors are marked with a repair plate showing the following items:

- The repair symbol R
- Name or registered trade mark of the repairing workshop
- Workshop reference number relating to the repair
- Date of overhaul or repair

In the event of subsequent repairs the earlier plate should be replaced by a new updated one and earlier markings be recorded.

The repairing workshop is liable to keep records of performed overhauls and repairs and further records of all previous repairs, overhauls and possible modifications. Copies of the repairing workshop's detailed records should be filed by owner or operator together with the original type certificate of the explosion-proof motor in question.

9.7. Overhaul and Repair Requirements

Fasteners

Only screws complying with manufacturers specifications as to type, strength and dimensions, are allowed for fastening and securing of motor parts and components. The external fastener strength class is A2-80 or A4-80 and the internal fastener strength class is 8.8.

Wiring

Only cables approved by the manufacturer and complying with the requirements of the cable inlet as to diameter, number of leads, conductor area and sheath material, are allowed for the motor.

The compression seals (grommets) of the cable entry must be marked EExd and their aperture should correspond to the cable diameter. The corresponding cable dimension marking is stamped on the inlet or the entry device.

The cable entry device is secured to the motor cover by tightening the screws evenly in turn until the device bears against the motor cover.

Access Opening

The access openings are primarily intended for motor tightness tests in connection with overhaul. The openings may be used for inspection, should the presence of leakage water in the motor be suspected.

The prescribed time delay before opening the motor applies also to the access openings (screws).

ATTENTION

The access opening cover screw must always be locked with an original-issue Allen head locking screw M4 x 8.



Lower bearing bracket cover

In motors having a separate bearing bracket cover the flanged joint between them constitutes an explosion proof joint where the joint gap must not exceed 0.15 mm. If the cover has been opened the joint must always be checked in connection with the assembly. The joint is controlled with a 0.15 mm feeler gage which must not fit into the gap from anyone of three radial directions.

Condition of Parts

When assembling, especially the components of the explosion-proof enclosure, must be carefully checked for:

- Faultlessness of machined surfaces
- Condition of threaded holes
- Approval markings

Spare parts

Damaged parts should always be replaced by new and approved parts. Parts must not be refurbished by machining, re-tapping, welding, etc.

The components and spare parts of the explosion-proof enclosure must have the following approval markings:

Part	Item No.	Marking
Motor cover	230	Ex 1 PH or Ex 2 PH
Cable entry	236/404	Ex 1 PH or Ex 2 PH
Stator housing	302	Ex 1 PH or Ex 2 PH
Bearing bracket	213	Ex 1 PH or Ex 2 PH
Bracket cover	206	Ex 1 PH or Ex 2 PH
Oil housing (up to 5,2 kW)	257	Ex 1 or Ex 2
Rotor	201	Ex 1 or Ex 2

NOTE

Make sure before assembly that the parts carry the adequate markings.

Stator Rewinding

If a motor stator has to be rewound the directions of the manufacturer must be observed. Thermal switches and winding insulation must completely correspond to original.

ATTENTION

The thermal switches must be embedded in the windings before varnishing and curing.

Testing After Stator Rewinding

After partial or complete repair the stator should be subjected, preferably with the apparatus assembled, to the following tests:

- A. The resistance of each winding should be measured at room temperature and verified. In case of three phase windings the resistance of each phase or between line terminals should be balanced. Maximum allowable phase resistance difference is 2 %.

9. Explosion-proof Pumps

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GRUNDFOS
SARLIN PUMPS



B. Insulation resistance should be tested measuring the resistance between:

- windings - ground
- windings - windings
- windings - auxiliaries (i.e. thermal switches)
- auxiliaries - ground

A minimum test voltage of 500 V DC is recommended.

Minimum acceptable insulation resistance is a function of rated voltage, temperature, type of apparatus and whether the rewind is partial or complete. However for example, the insulation resistance should not be less than 100 M Ω at 20 °C on a completely rewound apparatus intended for use at up to 660 V.

C. A high voltage test in accordance with a relevant standard (i.e. IEC 34-1) should be conducted between:

- windings - earth
- windings - windings
- windings - auxiliaries attached to the windings

Test voltage is $2 \times U_N + 1000$ V, minimum 2000 V.

Testing After Repair

Before a repaired motor is put back into service, it should be put through the following tests:

- Motor tightness test, using the access opening
- Internal motor protection circuit function control
- Test run at normal full speed for abnormal vibrations or noise
- Testing of the earth connection between the earth lead at the control panel and the pump body

Overhauled and repaired motor should be marked with a visible plate. The marking should be permanent using corrosion-resistant plate material.



10. Troubleshooting

Page 1 (2)

10. Troubleshooting

ATTENTION

Always read and observe the safety instructions in section 3.10 and 3.11 before beginning to troubleshoot pumps.

Trouble	Possible cause	Check and remedy
Pump fails to start or stops without visible reason.	No power to motor.	Check power supply and fuses. Operate manual start and check contactor operation.
Pump fails to start or stops. Control panel indicates tripped overcurrent relay or protection devices.	Loss of one phase of power supply.	Check power supply and fuses.
	Pump momentary overloaded.	If condition not self-corrective, check for cause.
	Impeller jammed.	Check impeller and clear as necessary.
	Overcurrent relay incorrectly set.	Check and reset as necessary according to nominal current.
	Thermal switches tripped. Pump inadequately cooled.	Allow motor to cool. Ensure adequate cooling by immersion for pumps version 1 and 4.
	Moisture switch in motor tripped.	Refer to authorised repair shop.
	Motor cable damaged.	Check for visual damages. Refer to authorised repair shop.
	Fluctuating voltage.	Check voltage. Allowable deviation is +/- 5%.
Pump runs but does not deliver rated volume flow.	Pump runs backwards.	Check direction of rotation and rectify as necessary.
	Impeller loose or worn.	Check impeller and replace as necessary.
	Pump or pipework clogged.	Check and clear as necessary.
	Pump head too high.	Check by pressure gauging and redesign rising main or install other pump.
	Valves closed or clogged. Check valve not operating.	Check valve position, clean as necessary. Relocate or replace check valve.
	Air accumulated in pump casing or suction pipeline.	Remove air. Raise wet well stop level or redesign suction pipeline.
	Pumped liquid too dense.	Dilute or redesign process.
	Pump not properly connected to submersible baseplate.	Pump down wet well level, lift pump and relocate onto baseplate.
	Leaking pipework.	Check pipework for leaks and fix as necessary.
	Pump wet well flushing system inadvertently activated.	Check for function and repair as necessary.

10. Troubleshooting

Page 2 (2)



Trouble	Possible cause	Check and remedy
Pump starts but shuts off.	Clogged pump causes overload to trip.	Check and clear pump as necessary.
	Motor overheated, tripping thermal switches.	Allow pump to cool; check for cause as above.
	Insufficient liquid in wet well.	Allow wet well to fill.
	Level control failure.	Clean or reset level control equipment or replace as necessary.
Pump vibrating or emitting excessive noise.	Pump partially clogged.	Check and clear pump as necessary.
	Pump runs backwards.	Check direction of rotation and rectify as necessary.
	Pump operates outside designed operation range.	Check pump head. Redesign rising main or select other pump.
	Pump mechanical failure.	Check pump for damages. Repair or submit to authorised repair shop as necessary.
	Pump not correctly engaged to submersible baseplate.	Pump down wet well level, lift pump and relocate onto baseplate.
	Pump cavitates.	Check pump for partial suction blockage and clear as necessary. Check duty point and adjust as necessary.
	Pump stand, baseplate or guide rails not securely installed.	Check installation and tighten bolts where necessary.
Oil watery or emulsified.	Lower seal leakage.	Refer to authorised workshop.
Low oil level.	Upper seal leakage.	Refer to authorised workshop



11. Declaration of Conformity

Page 1 (1)

11. Declaration of Conformity

Oy E. Sarlin Ab
Division Pumps
Kaivokselantie 3-5
01610 Vantaa
Finland

We herewith declare that the

Sarlin Submersible Pumps, Series S, to which this declaration relates, are in conformity with the provisions in the EU Council Directive **89/392/EEC** as amended by **91/368/EEC**, **93/44/EEC** and **73/23/EEC** as amended by **93/68/EEC**, and EU Council Directive **89/336/EEC** and the following standards stipulated by said directives:

EN 292-1:1991	Safety of Machinery. Basic concepts, general principles for design. Basic terminology, methodology.
EN 292-2/5:1991	Safety of Machinery. Basic concepts, general principles for design. Technical principles and specifications.
prEN 809:1992	Pumps and Pump Units for Liquids - Safety Requirements
EN 60335-2-41	Safety of household and similar electrical appliances. Particular requirements for electrical pumps.
EN 50082-1	Electromagnetic compatibility. Generic immunity standard. Generic standard class: Residential, commercial and light industry.
EN 55014	Limits and methods of measurement of radio interference characteristics of household electrical appliances, portable tools and similar electrical apparatus.

Vantaa, Finland
20.02.1996

A handwritten signature in black ink, appearing to read "Anne Tallgren".

Anne Tallgren
Quality Manager

5.0 SCHEDULE OF SPARE PART SUPPLIERS**Refer to Drawing No Q04C12 G (Sheet 07) for all Equipment**

- Vega Australia Pty Ltd
398 The Boulevard
Kirrawee DC NSW 2232
PH: 02 9542 6662
FX: 02 9542 6665
- Multitrode Pty Ltd
Brisbane Technology Park
18 Brandi Street
Eight Mile Plains QLD 4113
PH: 07 3340 7000
FX: 07 3340 7077
- Logica CMG
349 Coronation Drive
Milton QLD 4064
PH: 07 3327 5222
FX: 07 3217 8955
- Maestro Pty Ltd
925 Macs Reef Road
Bywong ACT 2621
PH: 02 6230 3377
FX: 02 6230 3142
- Australian Utilities & Scada Technologies
36 Prince Street
Annerley QLD 4103
PH: 07 3342 7011
FX: 07 3342 7022
- Battery Specialists
6 Staple Street
Seventeen Mile Rocks QLD 4073
PH: 07 3279 2633
FX: 07 3279 3778
- Sunline Switchboards Pty Ltd
17 Duntroon Street
Brendale QLD 4500
PH: 07 3881 3433
FX: 07 3881 3611
- NHP (Terasaki) (Sprecher & Schuh)
25 Turbo Drive
Coorparoo QLD 4151
PH: 07 3891 6008
FX: 07 3891 6139

5.0 SCHEDULE OF SPARE PART SUPPLIERS (Continued)

- Alstrom Pty Ltd
35 Evans Road
Rocklea QLD 4106
PH: 07 3274 7700
FX: 07 3274 7699
- Crompton Instruments Pty Ltd
31 Brennan Street
Bellbird Park QLD 4300
PH: 1300 656 090
FX: 1300 731 331
- Energy Correction Options (Cirtec)
Unit 1/321 Kelvin Grove Road
Kelvin Grove QLD 4059
PH: 07 3356 0577
FX: 07 3356 1432
- Kraus & Naimer
22 Brookes Street
Bowen Hills QLD 4006
PH: 07 3252 8344
FX: 07 3252 1497
- Phoenix Contact Pty Ltd
36 Container Street
Tingalpa QLD 4173
PH: 07 3890 4255
FX: 07 3890 3834
- Emsby (Emotron Soft Starter)
27 Rodwell Street
Archerfield QLD 4108
PH: 07 3274 2566
FX: 07 3274 2387
- AVH Electrical Engineering Pty Ltd (Izumi)
56 Basalt Street
Geebung QLD 4034
PH: 07 3216 5769
FX: 07 3216 5902
- Savcor Art Pty Ltd (Cortec)
9 Palmer Street
Murrarie QLD 4172
PH: 07 3890 8533
FX: 07 3890 8544

5.0 SCHEDULE OF SPARE PART SUPPLIERS (Continued)

- Thorn Lighting Pty Ltd
352a Bilsen Road
Geebung QLD 4034
PH: 07 3365 3000
FX: 07 3265 1341
- Clipsal
1/919 Nudgee Rd
NUDGEE QLD 4014
PH: 07 3244 7444
FX: 07 3267 0006
- Eaton Holec (Marechal)
42-44 Manila Street
East Brisbane QLD 4169
PH: 07 3249 8700
FX: 07 3891 5603

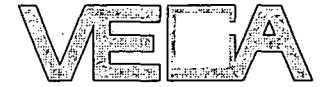
6.0 ELECTRICAL EQUIPMENT TECHNICAL INFORMATION

Included are brochures of field equipment.

Refer to Drawing No Q04C.12 G for items relevant to switchboards.



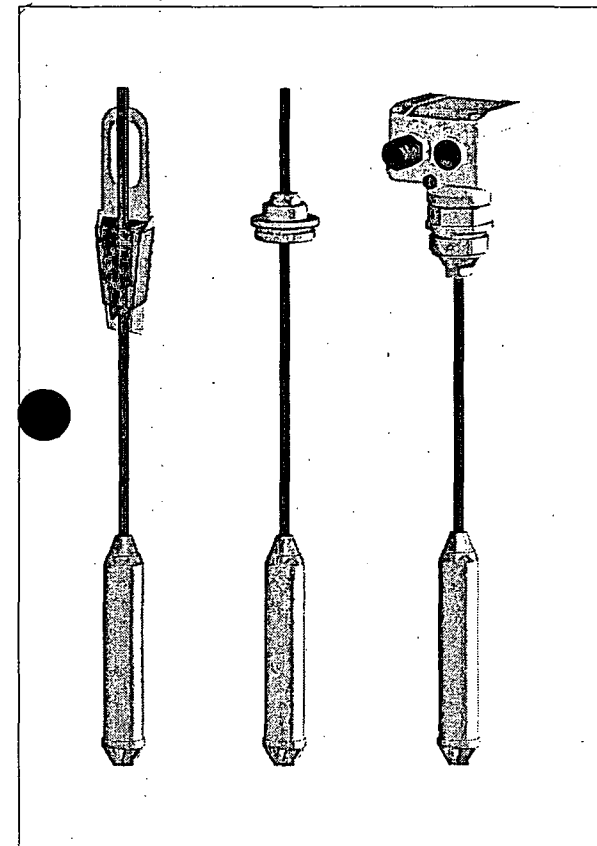
VEGA Grieshaber KG
 m Hohenstein 113
 7761 Schiltach
 Germany
 Phone 07836 50-0
 Fax 07836 50-201
 E-Mail info@de.vega.com
 www.vega.com



OrderNo: 1132950_7

Operating Instructions

VEGAWELL 72 – 4 ... 20 mA/HART®

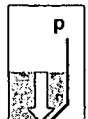


All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the latest information at the time of printing.

Technical data subject to alterations

27630-ENL030720

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1 About this document

1.1 Function

This operating instructions manual gives you all the information you need for quick set-up and safe operation of VEGAWELL 72. Please read this manual before you start set-up.

1.2 Target group

This operating instructions manual is directed to trained specialist staff. The contents of this manual should be made available to these personnel and put into practice by them.

1.3 Symbolism used



Information, tip, note

This symbol indicates helpful additional information.



Caution

This symbol informs you of a dangerous situation that could occur. Ignoring this cautionary note can impair the person and/or the instrument.



Ex applications

This symbol indicates special instructions for Ex applications.

CE conformity declaration



Konformitätserklärung

Declaration of conformity
Déclaration de conformité



VEGA Grieshaber KG
Am Hohenstein 113
77761 Schiltach

erklärt in alleiniger Verantwortung, daß das Produkt / declare under
our sole responsibility that our product / déclare sous sa seule
responsabilité que le produit

VEGAWELL 72

auf das sich diese Erklärung bezieht, mit den folgenden Normen
übereinstimmt / to which this declaration relates is in conformity
with the following standards / auquel se réfère cette déclaration
est conforme aux normes

EN 61326 : 1997 / A1 : 1998 (Klasse B)
EN 61326 : 1997 / A1 : 1998
EN 61010 – 1 : 1993

gemäß den Bestimmungen der Richtlinien / following the provision
of Directives / conformément aux dispositions des Directives

73/23 EWG
89/336 EWG

Schiltach, 16.09.2002

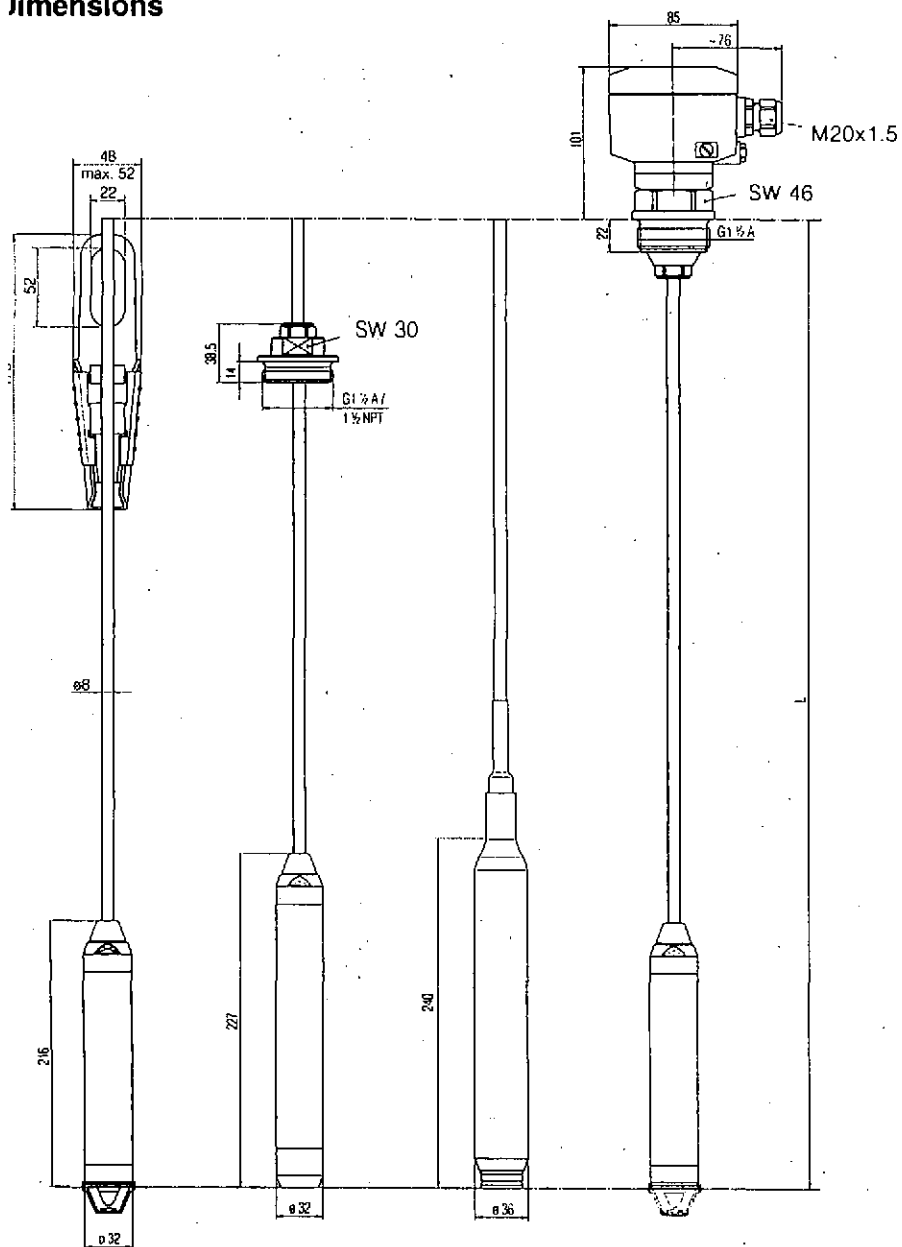
ppa. J. Fehrenbach

Josef Fehrenbach
Entwicklungsleitung

27630-EN-030729

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Dimensions



from the left side: standard version, version for deep wells, version with PE coating, standard version with housing

- **List**
The dot set in front indicates a list with no implied sequence.
- **Action**
This arrow indicates a single action.
- 1 **Sequence**
Numbers set in front indicate successive steps in a procedure.

2 For your safety

2.1 Authorised personnel

All operations described in this operating instructions manual must only be carried out by trained and authorised personnel. For safety and warranty reasons, any internal work on the instruments must only be carried out by VEGA personnel.

2.2 Appropriate use

VEGAWELL 72 is a suspension pressure transmitter for level and gauge measurement.

2.3 Warning about misuse

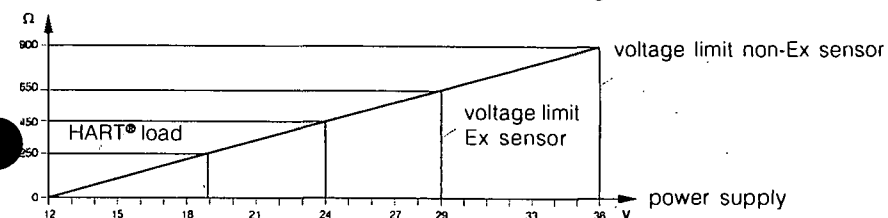
Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system parts through incorrect mounting or setting.

2.4 General safety instructions

VEGAWELL 72 is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards (e.g. the VDE regulations in Germany) as well as all prevailing safety regulations and accident prevention rules.

External energy

Power supply	12 ... 36 V DC
Permissible residual ripple	
– < 100 Hz	$U_{ss} \leq 1 \text{ V}$
– 100 Hz ... 10 kHz	$U_{ss} \leq 10 \text{ mV}$
load	see diagram



Integrated overvoltage protection

Nominal leakage current (8/20 μs)	10 kA
Min. response time	< 25 ns

Electrical protective measures

Protection	
– transmitter	IP 68 (25 bar)
– plastic housing	IP 65
– VEGADIS 12	IP 65
protection class	III
Overvoltage category	III

Approvals [®]

ATEX II 2G EEx ia IIC T6, ship approval

[®] Deviating data for Ex applications see separate safety instructions

Supplement

VEGA

VEGA

For safety

Long-term stabilityLong-term drift of the zero signal ⁶⁾ < 0.1 % per 2 years**Ambient conditions**

Ambient temperature -40 ... +85°C (PE +60°C)
 Storage and transport temperature -40 ... +100°C

Process conditions

Product temperature depending on material
 Suspension cable/Meas. cell seal

- PE/Viton	-20 ... +60°C
- PUR/Viton	-20 ... +80°C
- FEP/Kalrez	-10 ... +80°C

Calibration position upright, diaphragm points downward
 Influence of the installation position < 0.2 mbar/20 Pa
 Vibration resistance mechanical vibrations with 4 g and 5 ... 100 Hz ⁷⁾

Electromechanical data

Suspension cable

- configuration	four wires, one suspension cable one breather capillary screen braiding, foil, cover
- wire cross-section	0.5 mm ²
- wire resistance	≤ 0.036 Ohm/m
- tensile load	≥ 1.200 N
- max. length	1000 m (with VEGADIS 12: 200 m)
- min. bending radius	25 mm (with 25°C)
- diameter	approx. 8 mm
- colour	
- PE non-Ex/Ex	black/blue
- PUR non-Ex/Ex	blue/blue
- FEP non-Ex/Ex	blue/blue

cable entry plastic housing
 and external connection housing
 VEGADIS 12

- 1 x cable entry M20x1.5
(cable-ø 5 ... 9 mm)
- 1 x blind stopper M20x1.5
for cable cross-section 2.5mm²,
screen with 4 mm²

Screw terminals

According to IEC 60770-1 related to the nominal measuring range
 Tested acc. to the regulation of the German Lloyd, GL directive 2

2.5 CE conformity

VEGAWELL 72 pressure transmitter is CE conform to EMVG (89/336/EEG) and NSR (73/23/EEG) and fulfils the NAMUR recommendation NE 21.

Conformity has been judged acc. to the following standards:

- EMVG
 - Emission EN 61326: 1997/ A1: 1998 (class B)
 - Immision EN 61326: 1997/A1: 1998
- NSR EN 61010-1: 1993.

2.6 Safety instructions for Ex areas

Take note of the Ex-specific safety instructions for Ex applications. These are part of the operating instructions manual and come with Ex-approved instruments.

2.7 Environmentally responsible behaviour

Protection of the environment is one of our most important duties. That is why we have introduced an environmental management system with the goal of continuously improving company environmental protection. The environmental management system is certified acc. to DIN EN 14001.

Please help us fulfil this obligation by observing the environmental instructions in this manual.

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3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- VEGAWELL 72 pressure transmitter with suspension cable
- optional straining clamp, screwed connection or plastic housing with cable locking
- documentation
 - this operating instructions manual
 - test protocol
 - Ex-specific safety instructions (with Ex versions) and if necessary further certificates.

Components

VEGAWELL 72 consists of the following components:

- transmitter
- suspension cable

The components are available in different versions. By combining them in various ways in the order code, a great variety of instrument versions can be created (see technical data in the supplement).

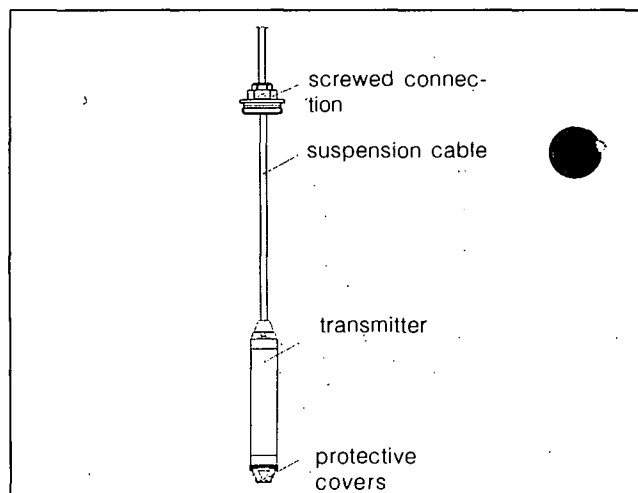


Fig. 1:
Example of a VEGAWELL 72 with screwed connection

Output variable

Output signal	4 ... 20 mA/HART®
Resolution	6 μ A
Fault signal	22 mA, 3.6 mA (adjustable)
Current limitation without fault	20.5 mA
Integration time ²⁾	0 ... 10 s, adjustable
Rise time	70 ms (ti : 0 s, 0 ... 63 %)
Fulfilled Namur recommendation	NE 43

Accuracy ³⁾

Reference conditions acc. to IEC 61298-1	
– temperature	18 ... 30°C
– relative moisture	45 ... 75 %
– air pressure	860 ... 1060 mbar (86 ... 106 kPa)
Determination of characteristics	limit point adjustment acc. to DIN 16086
Characteristics	linear

Deviation in characteristics ⁴⁾

Accuracy class	Turn down	Deviation in character
0.25	1 : 1	< 0.25 %
	up to 1 : 5	< 0.3 %
	up to 1 : 10	< 0.4 %
0.1	1 : 1	< 0.1 %
	up to 1 : 5	< 0.1 %
	up to 1 : 10	< 0.2 %

Influence of the ambient temperature

Accuracy class	Turn down	Average temperature coefficient of the zero signal ⁵⁾
0.25	1 : 1	< 0.15 %/10 K
	up to 1 : 5	< 0.225 %/10 K
	up to 1 : 10	< 0.3 %/10 K
0.1	1 : 1	< 0.05 %/10 K
	up to 1 : 5	0.075 %/10 K
	up to 1 : 10	0.1 %/10 K

²⁾ The time required by the output signal to reach 63 % of the actual height after a jump. After the triple integration time, the output signal has reached 95 % of the height.

³⁾ Similar to DIN 16086, DIN V 19259-1 and IEC 60770-1.

⁴⁾ Incl. hysteresis and repeatability relating to the nominal measuring range.

⁵⁾ In the compensated temperature range of 0 ... 80°C, reference temperature 20°C.

Supplement

Technical data

General data

Materials, wetted parts

- transmitter	stainless steel 1.4435, PVDF
- diaphragm	sapphire-ceramic® (99.9 % oxide ceramic)
- suspension cable	PE, FEP, PUR
- meas. cell seal protective cover	PA

Materials, non-wetted parts

- straining clamp	stainless steel 1.4301
- closing screw	stainless steel 1.4435
- plastic housing and external connection housing VEGADIS 12	plastic PBT (Polyester)

Weights

- basic weight	approx. 0.7 kg
- suspension cable	approx. 0.1 kg/m
- straining clamp	approx. 0.2 kg
- screwed connection	approx. 0.4 kg
- plastic housing	approx. 0.8 kg

Input variable

Zero	adjustable between -20 ... +95 % of nominal range
Span	adjustable between 3.3 ... +120 % of nominal range

Nominal measuring range (gauge/absolute)	Gauge pressure resistor	Low pressure resistance
0...0.1 bar / 0...10 kPa	15 bar / 1 500 kPa	-0.2 bar / -20 kPa
0...0.2 bar / 0...20 kPa	20 bar / 2 000 kPa	-0.4 bar / -40 kPa
0...0.4 bar / 0...40 kPa	30 bar / 3 000 kPa	-0.8 bar / -80 kPa
0...1.0 bar / 0...100 kPa	35 bar / 3 500 kPa	-1.0 bar / -100 kPa
0...2.5 bar / 0...250 kPa	50 bar / 5 000 kPa	-1.0 bar / -100 kPa
0...5.0 bar / 0...500 kPa	65 bar / 6 500 kPa	-1.0 bar / -100 kPa
0...10.0 bar / 0...1 000 kPa	90 bar / 9 000 kPa	-1.0 bar / -100 kPa
0...25.0 bar / 0...2 500 kPa	130 bar / 13 000 kPa	-1.0 bar / -100 kPa

Absolute pressure up from 0 ... 1.0 bar.

Area of application

Physical principle

3.2 Principle of operation

VEGAWELL 72 is used for level and gauge measurement in wells, basins and atmospherically open vessels, especially in drinking water and waste water treatment.

The sensor element is a CERTEC® measuring cell with a flush ceramic diaphragm. The hydrostatic pressure induces a capacitance change in the measuring cell via the ceramic diaphragm. This capacitance change is converted into a 4 ... 20 mA output signal.

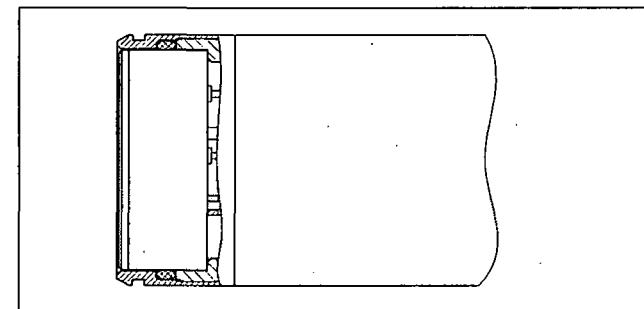


Fig. 2:
The CERTEC® measuring cell is mounted flush in the pressure transmitter

Power supply

The VEGAWELL 72 has a two-wire 4 ... 20 mA/HART® electronics requiring a power supply unit with:

- 12 ... 36 V DC (non-Ex instrument)
- 12 ... 29 V DC (Ex ia instrument).

¹⁾ For use in atmospherically closed vessels under vacuum, VEGAWELL 72 is available with absolute pressure ranges.

3.3 Adjustment

VEGAWELL 72 with 4 ... 20 mA/HART® electronics can be adjusted with three different adjustment media:

- adjustment module with external connection housing VEGADIS 12
- with PACTware™ or another adjustment software acc. to FDT/DTM standard and PC
- HART®- handheld.

The entered parameters are generally saved in VEGAWELL 72, if you adjust with VVO they can also be saved in the PC.

3.4 Storage and transport

Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test acc. to DIN 55439.

The packaging consists of environmental-friendly, recyclable cardboard. Dispose of the packing material via specialised recycling companies.

Climatic conditions

- Storage and transport temperature -50°C up to ¹⁾
- Relative humidity 20 ... 85 %.

¹⁾ See technical data, product temperature under process conditions.

8 Dismounting

8.1 Dismounting procedure

Take note of chapters 4 „Mounting“ and 5 „Connecting to power supply“ and carry out the listed steps in reverse order.

8.2 Disposal

VEGAWELL 72 consists of materials which can be recycled by specialised recycling companies. We have purposely designed the electronic modules to be easily separable. Mark the instrument as scrap and dispose of it according to government regulations.

Materials: see technical data

If you cannot dispose of the instrument properly, please contact us about disposal methods or return.

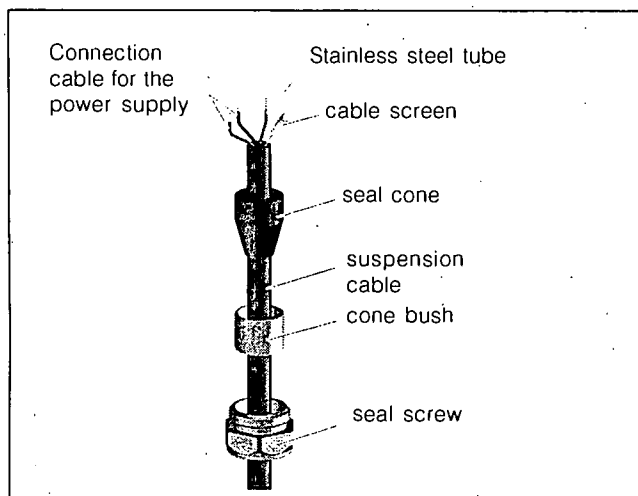


Fig. 14: Step 6 and 8

- 7 Shorten the suspension cable to the required length with a pair of pliers
- 8 Remove approx. 10 cm of cable mantle, strip approx. 1 cm insulation from wire ends, insert stainless steel tube into capillary line and fasten filter attachment
- 9 Slide seal screw, cone bush and seal cone onto the suspension cable and lead the cable into the screwed connection, lead wire ends through opening in mounting plate
- 10 Tighten screws of the mounting plate and fasten wire ends in the screw terminals:

The cable shortening is finished.

7.4 Repairing the instrument

If it is necessary to repair VEGAWELL 72, please send the instrument to the following address:
 VEGA Grieshaber KG
 Repair department
 Am Hohenstein 113
 77761 Schiltach

4 Mounting

4.1 Selecting the installation position

Keep the following points in mind when selecting the installation position:

- Lateral movements of the transmitter can cause measurement errors.
 -> Mount VEGAWELL in a calm area or in a suitable protective tube.
- The suspension cable contains a capillary tube for atmospheric pressure compensation.
 -> Lead the cable end to a dry environment or into a suitable terminal housing.



VEGA recommends VEGADIS 12 for this purpose. It contains connection terminals and a filter element for pressure compensation. For outdoor mounting, a suitable protective cover is available. The version with plastic housing includes terminals and filter elements in the plastic housing.

- The measuring cell cover prevents mechanical damage to the measuring cell. It may only be removed when the instrument is used in extremely dirty water.

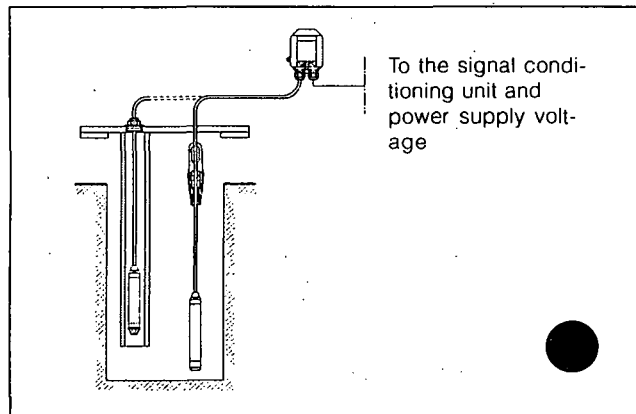


Fig. 3:
Mounting example for deep well measurement

7.3 Shortening the suspension cable

The suspension cable of all versions of VEGAWELL 72 can be shortened to any length. For the plastic housing version, proceed as follows:

- 1 Loosen cover screws and detach cover
- 2 Loosen screw terminals and remove the wire ends of the suspension cable from the screw terminals
- 3 Loosen the screws of the mounting plate and remove the mounting plate completely
- 4 Hold the hexagon on the screwed connection with spanner SW 46 and loosen seal screw SW 22

Caution:

The seal screw is protected with Loctite rosa, take note of the breakaway torque.

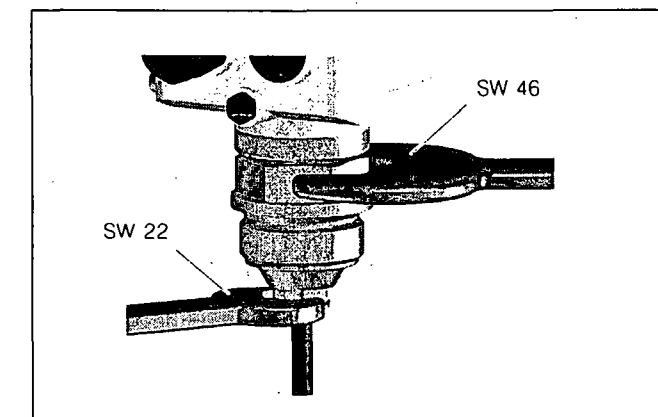


Fig. 13: Step 4

- 5 Pull out the suspension cable from the screwed connection and slide the pressure screw, the cone bush and the seal cone off the cable
- 6 Remove filter attachment and stainless steel tube from the transparent capillary line

7 Maintenance and fault rectification

7.1 Maintenance

In standard operation, VEGAWELL 72 pressure transmitter is maintenance-free.

When the instrument is being cleaned externally, care should be taken to avoid mechanical damage, especially to the diaphragm. Cleaning detergents should corrode neither the seal nor other components of VEGAWELL 72.

7.2 Fault rectification

- ? 4 ... 20 mA signal not stable
- level fluctuations
 - set integration time via VEGADIS 12 or PACTware™
 - no atmospheric pressure compensation
 - check capillaries, if necessary cut them clean
 - check pressure compensation of VEGADIS 12, if necessary clean filter element
- ? 4 ... 20 mA signal missing
- incorrect connection to power supply
 - check connection acc. to chapter 5.3 and correct if necessary acc. to chapter 5.2
 - no power supply
 - check cables for line break and repair if necessary
 - power supply voltage too low or load resistance too high
 - check and adapt if necessary



For Ex applications the regulations for the wiring of intrinsically safe circuits must be observed.

4.2 Mounting procedure with straining clamp

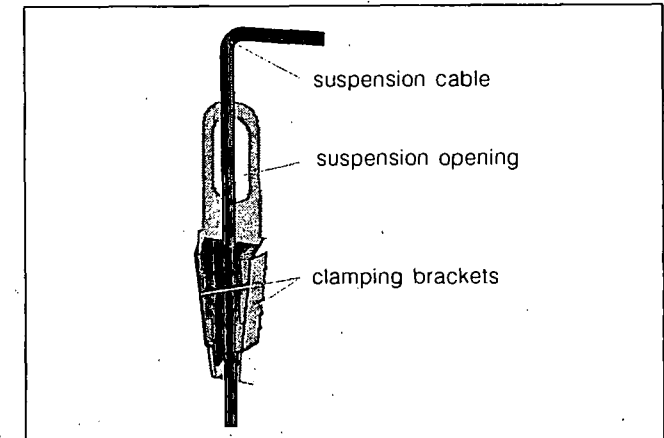


Fig. 4:
straining clamp

Mount VEGAWELL 72 with straining clamp as follows:

- 1 Hang the straining clamp on a suitable wall hook
- 2 Lower VEGAWELL to the requested measuring height
- 3 Move the clamping brackets upward and push the suspension cable between the clamping brackets
- 4 Hold the suspension cable, shift the clamping brackets downward and fix with a light blow.

Dismounting is carried out in reverse order.

4.3 Mounting procedure with screwed connection

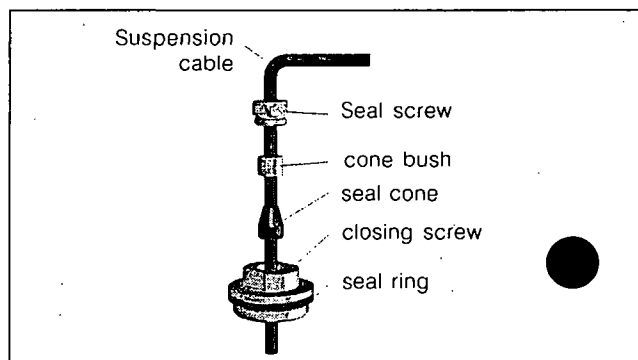


Fig. 5:
Screwed connection

Mount VEGAWELL 72 with screwed connection as follows:

- 1 Weld mounting boss G1½A or 1½ NPT into the vessel top



We recommend the following VEGA mounting accessory:

- Mounting boss G1½A of stainless steel 1.4571, article no. 2.21 993.
- 2 Lower VEGAWELL through the mounting boss to the requested height
 - 3 Slide the seal ring¹⁾ for the screwed connection over the suspension cable
 - 4 Lead the suspension cable from below through the opened screwed connection
 - 5 Slide the seal cone and cone bushing over the suspension cable, fasten manually with the seal screw
 - 6 Turn the screwed connection into the socket, fasten with SW 30, then fasten seal screw with SW 19

¹⁾ only with G1½A

Connect the PC

6.2 With PC and PACTware™

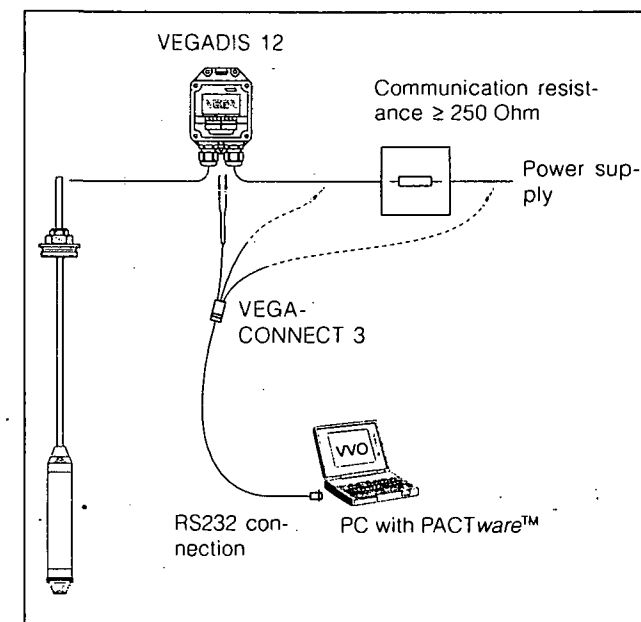


Fig. 12:
Connection of the PC to VEGADIS 12 or to the communication resistance

Required components:

- VEGAWELL 72
- PC with PACTware™
- VEGACONNECT 3
- Communication resistance ≥ 250 Ohm
- Power supply unit:

The individual setup steps are described in the online help texts of PACTware™.



Take note of the appropriate installation regulations for Ex applications.

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adjustment system

- Select the requested function with the rotary switch
- With the [+] and [-] key you set the signal current or the integration time
- Finally, the rotary switch is set to position „OPERATE“.

The set values are transferred to the EEPROM memory and remain there even in case of voltage failure.

at-up procedure

To adjust with VEGADIS 12, proceed as follows:

- 1 Open housing cover
- 2 Connect handheld multimeter to terminals 10 and 12
- 3 Beginning of the meas. range: Set rotary switch to „zero“
- 4 Empty the vessel/basin or pull out VEGAWELL completely
- 5 Set a current of 4 mA with the [+] and [-] keys
- 6 End of the meas. range: Set rotary switch to „span“
- 7 Fill the vessel/basin or lower VEGAWELL completely
- 8 Set a current of 20 mA with the [+] and [-] keys
- 9 Operation: Set the rotary switch to „OPERATE“
- 10 Close the housing cover.

The adjustment data are effective, the output current 4 ... 20 mA corresponds to the actual level.

Height correction:

- 1 Loosen seal screw with SW 19
- 2 Slide seal cone and cone bushing to the requested position on the cable
- 3 Fasten seal screw

Dismounting is carried out in reverse order.

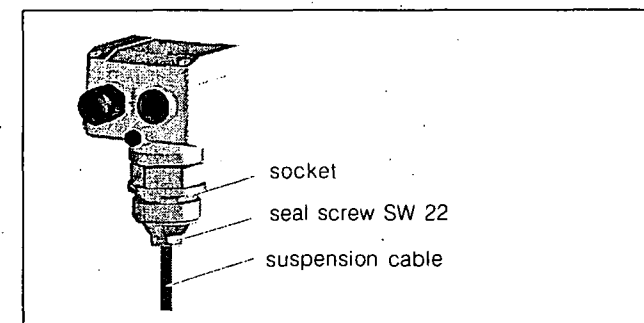
4.4 Mounting procedure with plastic housing

Fig. 6:
Plastic housing with socket G1½A

Mount VEGAWELL 72 with plastic housing as follows:

- 1 Weld mounting boss G1½A into the vessel top



We recommend the following VEGA mounting accessory:

- Mounting boss G1½A of stainless steel 1.4571, article no. 2.21993
- 2 Slide the seal ring over the screwed connection
 - 3 Slide the transmitter through the mounting boss
 - 4 Screw the mounting boss G1½A into the socket, the fasten with SW 46.

Dismounting is carried out in reverse order.

5 Connecting to power supply

5.1 Preparing the connection

Note safety instructions

Always observe the following safety instructions:

- Connect only in the complete absence of line voltage
- If overvoltages are expected, overvoltage arresters for the power supply side should be installed.



We recommend VEGA overvoltage arresters 62-36G.X.

Take note of safety instructions for Ex applications

In hazardous areas you should take note of the appropriate regulations and type approval certificates of the sensors and power supply units. The sensors must only be operated on intrinsically safe circuits. The permissible electrical values are stated in the certificate.

Select voltage supply

Provide a reliable separation between the supply circuit and the mains circuits acc. to DIN VDE 0106 part 101. The VEGA power supply units VEGATRENN 149AEx, VEGASTAB 690, VEGADIS 371 as well as all VEGAMETs meet this requirement. When using one of these instruments, protection class III is ensured for VEGAWELL 72.

Bear in mind the following factors regarding supply voltage:

- Reduction of the output voltage of the power supply unit under nominal load
- Influence of additional instruments in the circuit (see load values in Technical data).

Scope of adjustment

Adjustment elements

6 Set-up

After mounting and electrical connection, VEGAWELL 72 is ready for operation.

→ Switch on power supply

The electronics carries out a self-test for approx. 2 s. Then VEGAWELL 72 delivers a current of 4 ... 20 mA according to the actual level.

6.1 With VEGADIS 12

- zero - beginning of the measuring range
- span - end of the measuring range
- ti - integration time

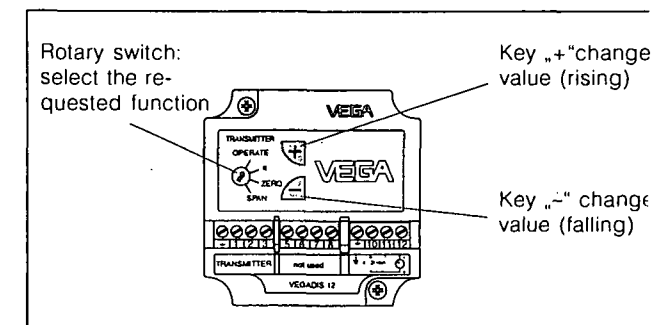


Fig. 11:
Adjustment elements of VEGADIS 12

¹⁾ VEGAWELL 72 has an integrated overvoltage protection.

Connection to power supply

VEGA

VEGA

Connection to power supply

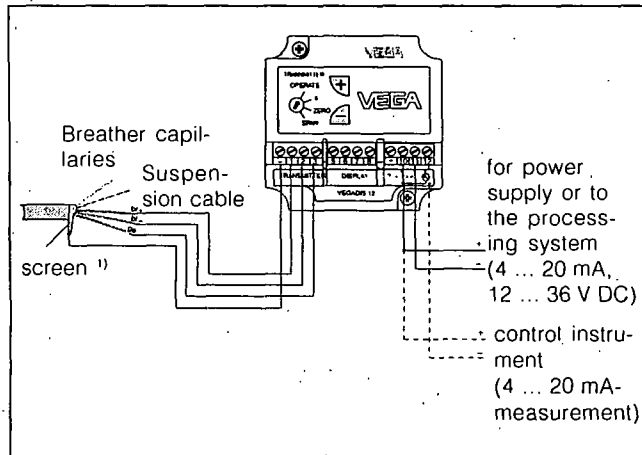
Connection via
VEGADIS 12

Fig. 9:
Terminal assignment VEGADIS 12

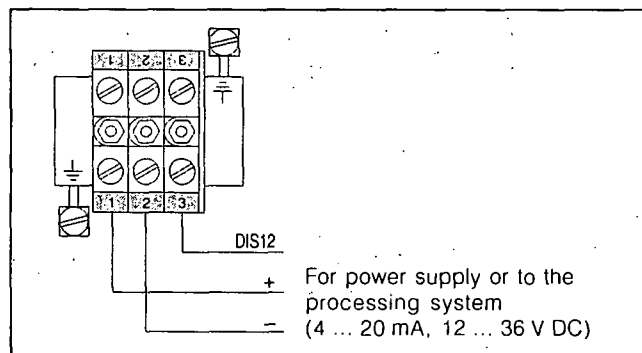
Connection via plastic
housing

Fig. 10:
Terminal assignment of the plastic housing

Select connection cable

VEGAWELL 72 is connected with standard two-wire cable. When connecting to VEGADIS 12, the cable must have an outer diameter of 5 ... 9 mm to ensure the seal effect of the cable entry.

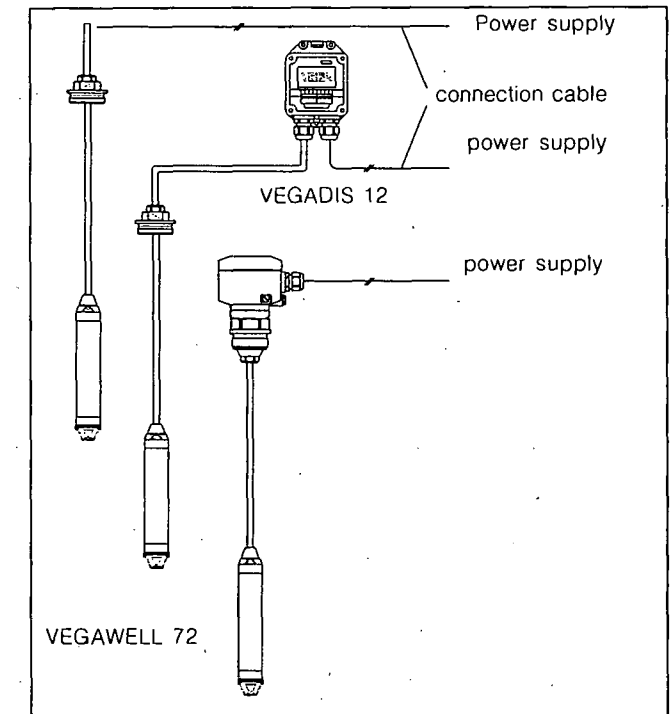


Fig. 7:
Connection to the power supply
Middle: via VEGADIS 12
Bottom: direct (with plastic housing)

If strong electromagnetic interference is expected, shielded cable is recommended. The screen should be grounded on both ends¹⁾.

Select connection
cable for Ex appli-
cations



Take note of the corresponding installation regulations for Ex applications.

¹⁾ Connect screen to + terminal. Connect ground terminal on housing exterior to ground as prescribed. The two terminals are galvanically connected.

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VEGAWELL 72-4 20 mA/HART®

VEGAWELL 72-4 20 mA/HART®

Coni in to power supply

VEGA

VEGA

5.2 Connection procedure

Direct connection to power supply

Proceed as follows:

- 1 Lay the suspension cable¹⁾ up to the terminal compartment. The bending radius must be at least 25 mm
- 2 Connect the individual wires to the terminals acc. to the wiring plan.

Connection to power supply via VEGADIS 12

Proceed as follows:

- 1 Snap VEGADIS 12 into carrier rail or screw to mounting plate
- 2 Loosen cover screws and detach cover
- 3 Lead suspension cable through the cable entry into VEGADIS 12²⁾
- 4 Loosen terminal screws with a screwdriver
- 5 Insert wire ends into the open terminals acc. to the wiring plan
- 6 Tighten terminal screws with a screwdriver
- 7 Check the hold of the wire ends in the terminals by lightly pulling on them
- 8 Tighten the compression nut of the cable entry, the seal ring must encircle the cable completely
- 9 Connect supply cable acc. to steps 3 to 8
- 10 Screw the housing cover back on

The electrical connection is finished.

Connection to power supply via plastic housing

Proceed as follows:

- 1 Loosen cover screws and detach cover
- 2 Lead the connection cable through the cable entry into the plastic housing
- 3 Loosen terminal screws with a screwdriver
- 4 Insert wire ends into the open terminals acc. to the wiring plan
- 5 Tighten terminal screws with screwdriver
- 6 Check the hold of the wire ends in the terminals by lightly pulling on them
- 7 Tighten the compression nut of the cable entry, the seal ring must encircle the cable completely
- 8 Screw the housing cover back on.

The electrical connection is finished.

Direct connection

5.3 Wiring plans

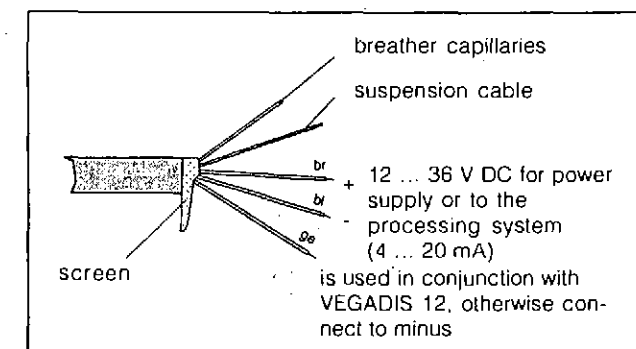


Fig. 8:
Wire assignment, suspension cable

- ¹⁾ Connect screen to the internal ground terminal. Connect ground terminal on housing exterior to ground as prescribed. The two terminals are galvanically connected
- ²⁾ The suspension cable is prepared and ready for use ex works. If the cable is shortened, fasten the type identification tag with holder back onto the cable.

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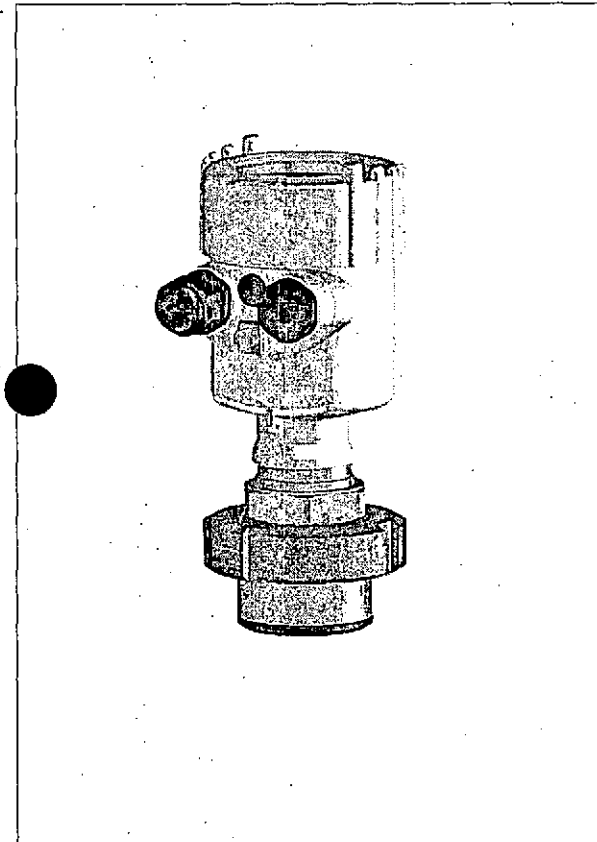
VEGA Grieshaber KG
 an Hohenstein 113
 7761 Schiltach
 Germany
 Phone (07836) 50-0
 Fax (07836) 50-201
 E-Mail info@de.vega.com
 www.vega.com



OrderNo: 1130497_1

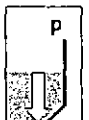
Operating Instructions

VEGABAR 64 – 4 ... 20 mA/HART®



All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.

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CE conformity declaration

CE

Konformitätserklärung

Declaration of conformity
Déclaration de conformité

VEGA

VEGA Grieshaber KG
Am Hohenstein 113
77761 Schiltach

erklärt in alleiniger Verantwortung, dass das Produkt / declare under
our sole responsibility that our product / déclare sous sa seule
responsabilité que le produit

VEGABAR 52.X*, 52.C*, 53.X*, 53.C*
VEGABAR 61.X*, 61.C*, 64.X*, 64.C*, 65.X*, 65.C*, 66.X*, 66.C*, 67.X*, 67.C*
mit Elektronik H (4...20 mA HART)

auf das sich diese Erklärung bezieht, mit den folgenden Normen
übereinstimmt / to which this declaration relates is in conformity
with the following standards / auquel se réfère cette déclaration
est conforme aux normes

EN 61326 : 1997 / (Klasse B)
EN 61328 : 1997 / A1 : 1998
EN 61010 - 1 : 2001

gemäß den Bestimmungen der Richtlinien / following the provision
of Directives / conformément aux dispositions des Directives

73/23 EWG
89/336 EWG

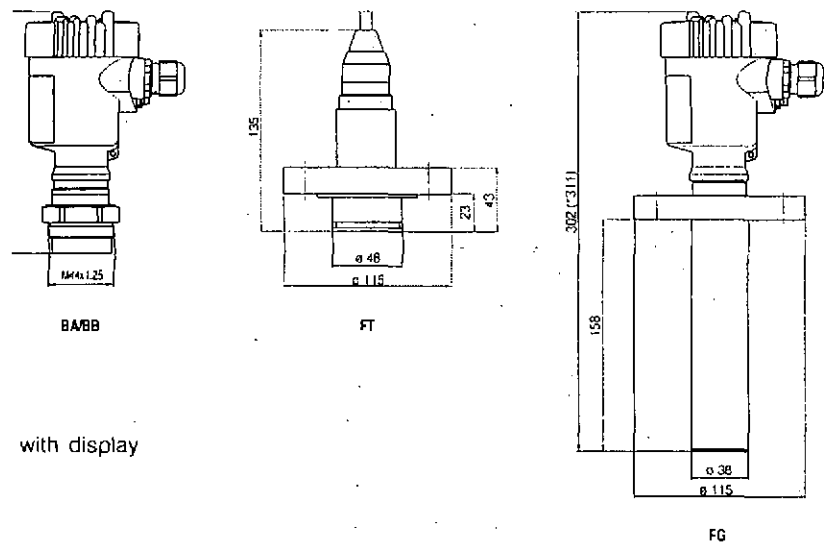
Schiltach, 07.11.2002

ppa. J. Fehrenbach
Josef Fehrenbach
Entwicklungsleitung

27525-EN-031013

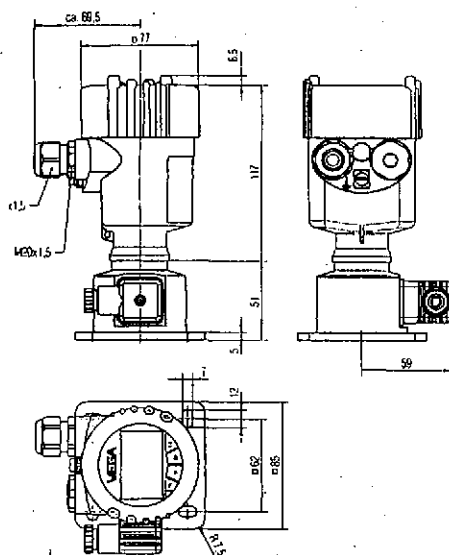
27525-EN-031013

struments with connection for the paper industry



with display

emote electronics



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1 About this document

1.1 Function

This operating instructions manual has all the information you need for quick set-up and safe operation of VEGABAR 64. Please read this manual before you start set-up.

1.2 Target group

This operating instructions manual is directed to trained personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3 Symbolism used



Information, tip, note

This symbol indicates helpful additional information.



Caution

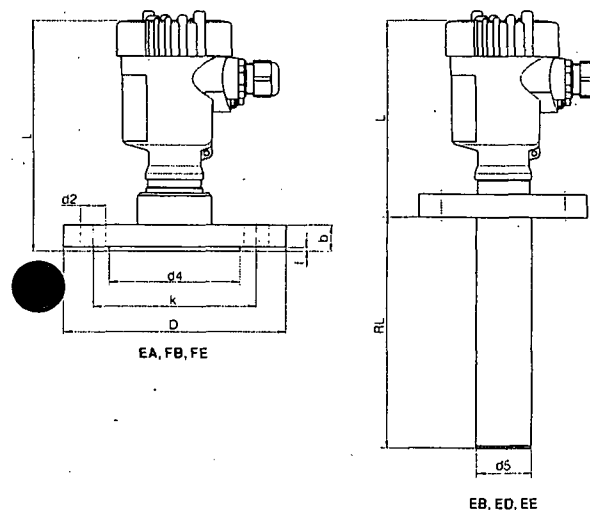
This symbol informs you of a dangerous situation that could occur. Ignoring this cautionary note can impair the person and/or the instrument.



Ex applications

This symbol indicates special instructions for Ex applications.

Instruments with flange connection



D = outer flange diameter
b = flange thickness
k = diameter of hole circle
d₂ = diameter of holes
d₄ = seal ledge diameter
d₅ = extension diameter
f = seal ledge strength
R_L = extension length

Flange connection acc. to DIN 2501, seal ledge acc. to DIN 2526 Form D

Order code	Flange Size	D	b	Hole k	No.	d ₂	Seal ledge d ₄	f	Extension R _L ¹⁾	d ₅	Length L without display	with display
EA	DN 40/PN 40	150	18	110	4	18	88	3	---	---	156	165
FB	DN 50/PN 40	165	20	125	4	18	102	3	---	---	158	167
FE	DN 80/PN 40	200	24	160	8	18	138	3	---	---	162	171
EA	DN 40/PN 40	150	18	110	4	18	88	3		38	140	149
FB	DN 50/PN 40	165	20	125	8	18	138	3		38	142	151
FE	DN 80/PN 40	200	24	160	8	18	138	3		38	146	155

Flange connection acc. to ANSI B 16.5, seal ledge RF

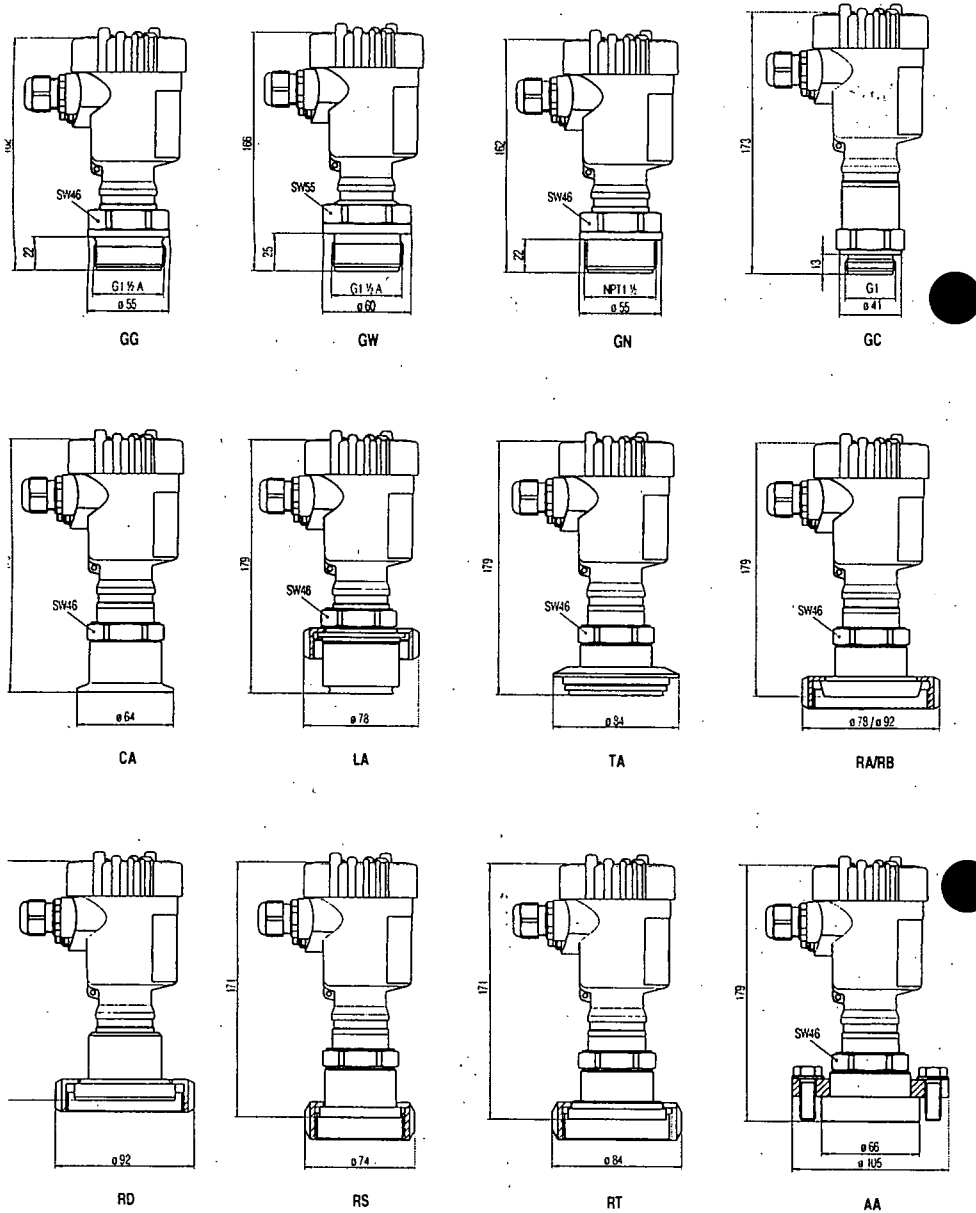
Order code	Flange Size	D	b	Holes k	No.	d ₂	Seal ledge d ₄	f	Extension R _L ¹⁾	d ₅	Length L without display	with display
FH	2" 150 lbs	152.4	19.1	120.7	4	19.1	91.9	1.6	-	-	157.1	166.1
FI	3" 150 lbs	190.5	23.9	152.4	4	19.1	127.0	1.6	-	-	161.9	170.9

¹⁾ Order-specific.

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Instruments with screwed connection



- **List**
The dot set in front indicates a list with no implied sequence.
- **Action**
This arrow indicates a single action.
- 1 **Sequence**
Numbers set in front indicate successive steps in a procedure.

2 For your safety

2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained and authorised personnel. For safety and warranty reasons, any internal work on the instruments must be carried out only by VEGA personnel.

2.2 Appropriate use

VEGABAR 64 is a pressure transmitter for level and pressure measurements.

2.3 Warning about misuse

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or setting.

2.4 General safety instructions

VEGABAR 64 is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards (e.g. the VDE regulations in Germany) as well as all prevailing safety regulations and accident prevention rules.

Electrical protective measures

Protection	
– housing	IP 66 or IP 68
– remote electronics (with IP 68 version)	IP 65
Overvoltage category	III
Protection class	II

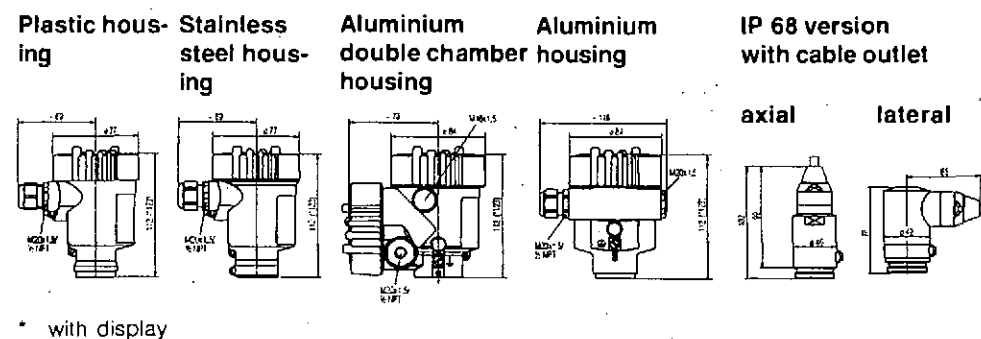
Approvals ¹³⁾



EX II 1G, 1/2G, 2G EEx ia IIC T6,
EX II 1/2G, 2G EEx d ia IIC T6, WHG, ship approvals

¹³⁾ Deviating data with Ex applications: see separate safety instructions.

Dimensions



Process conditions

Product temperature, depending on measuring cell seal ¹¹⁾

- Viton -20 ... +120°C
- EPDM -40 ... +120°C
- Kalrez Spectrum (1 h: +140°C cleaning temperature) -10 ... +120°C

Calibration position upright, diaphragm points downward

Influence of the installation position < 0.2 mbar/20 Pa

Vibration resistance mechanical vibrations with 4 g and 5 ... 100 Hz ¹²⁾

Indicating and adjustment module PLICSCOM

Power supply and data transmission through VEGABAR via sliding contacts (I²C bus)

Display LC display in full dot matrix

Adjustment elements 4 keys

Protection IP 20 (mounted in VEGABAR: IP 40)

Materials

- housing ABS
- inspection window Polyester foil

Power supply

Supply voltage

- non-Ex instrument 12 ... 36 V DC
- EEx ia instrument 12 ... 30 V DC
- Exd instrument 18 ... 36 V DC

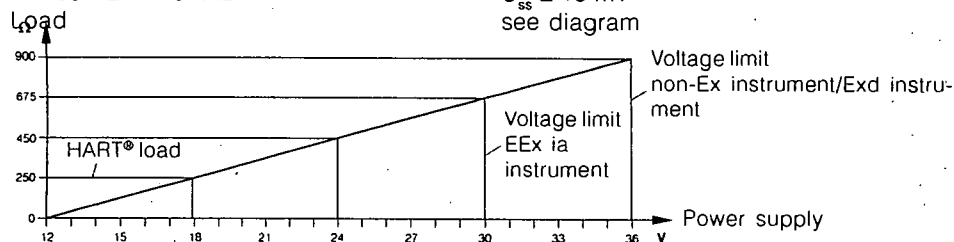
Permissible residual ripple

- < 100 Hz
- 100 Hz ... 10 kHz

$$U_{ss} \leq 1 \text{ V}$$

$$U_{ss} \leq 10 \text{ mV}$$

see diagram



With process fitting PVDF max. +100°C.
Tested acc. to the regulations of the German Lloyd; GL-directive 2.

2.5 CE conformity

VEGABAR 64 pressure transmitter is in CE conformity with EMC (89/336/EEG) and NSR (73/23/EEG) and fulfils the Namur recommendations NE 21. Conformity has been judged acc. to the following standards:

- EMC
 - Emission EN 61326: 1997 (class B)
 - Susceptibility EN 61326: 1997/A1: 1998
- NSR EN 61010-1: 2001.

VEGABAR 64 is not subject to the pressure device guideline ¹⁾.

2.6 Safety instructions for Ex areas

Take note of the Ex specific safety instructions for Ex applications. These are part of the operating instructions manual and come with Ex approved instruments.

2.7 Environmental instructions

Protection of the environment is one of our most important duties. That is why we have introduced an environment management system with the goal of continuously improving company environmental protection. The environment management system is certified acc. to DIN EN ISO 14001.

Please help us fulfil this obligation by observing the environmental instructions in this manual:

- Chapter 3.4 Storage and transport
- Chapter 9.2 Disposal.

¹⁾ Due to the flush diaphragm, no additional pressure compartment is formed.

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- VEGABAR 64 pressure transmitter
- documentation
 - this operating instructions manual
 - test protocol
 - Ex-specific safety instructions (with Ex versions) and, if necessary, further certificates.

Components

VEGABAR 64 consists of the following components:

- process connection with measuring cell
- housing with electronics
- housing cover with indicating/adjustment module (optional)

The components are available in different versions.

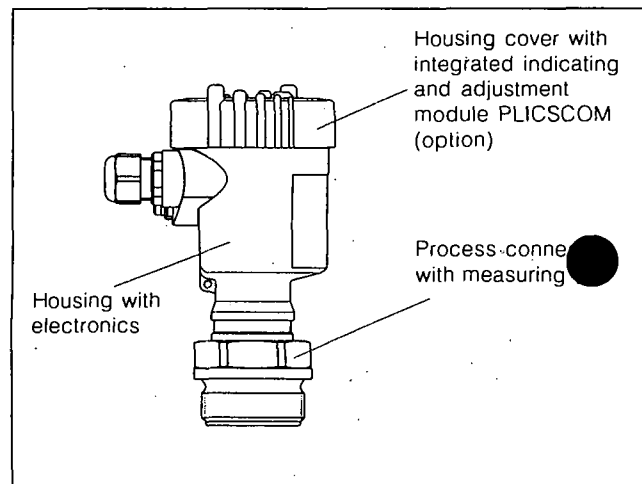


Fig. 1:
Example of a VEGABAR 64 with process fitting G1½A and plastic housing

Electromechanical data

Cable entry/plug ¹⁰⁾

- single chamber housing

- 1 x cable entry M20 x 1.5 (cable-ø 5 ... 9 mm),
- 1 x blind stopper M20 x 1.5

or:

- 1 x closing cap ½ NPT,
- 1 x blind stopper ½ NPT

or:

- 1 x plug M12 x 1,
- 1 x blind stopper M20 x 1.5
- 1 x cable entry M20 x 1.5 (cable-ø 5 ... 9 mm),
- 1 x blind stopper M20 x 1.5

or:

- 1 x closing cap ½ NPT,
- 1 x blind stopper ½ NPT

or:

- 1 x plug M12 x 1,
- 1 x blind stopper M20 x 1.5
- 1 x cable entry M20 x 1.5 (cable-ø 5 ... 9 mm),
- 1 x blind stopper M20 x 1.5

or:

- 1 x closing cap ½ NPT,
- 1 x blind stopper ½ NPT

or:

- 1 x plug M12 x 1,
- 1 x blind stopper M20 x 1.5
- tags for plug connector acc. to DIN 43650

for wire cross sections up to 2.5 mm²

- double chamber housing

- remote electronics

spring-loaded terminals

Connection cable between IP 68 instrument and remote electronics:

- max. length 180 m
- min. bending radius 2.5 mm (at 25°C)
- diameter approx. 8 mm
- colour
 - standard black
 - Ex version blue

¹⁰⁾ Depending on the version.

Supplement

VEGA

VEGA

Product description

Accuracy ⁴⁾

Reference conditions acc. to IEC 60770-1	
– temperature	18 ... 30°C
– relative humidity	45 ... 75 %
– air pressure	860 ... 1060 mbar (86 ... 106 kPa)
Determination of characteristics	limit point adjustment acc. to DIN 16086
Characteristics	linear

Deviation in characteristics ⁵⁾

Accuracy class 0.1	Turn down	Deviation in characteristics
	1 : 1	< 0.1 %
	up to 1 : 5	< 0.1 %
	up to 1 : 10	< 0.15 %
Accuracy class 0.05 ⁶⁾	Turn down	Deviation in characteristics
	1 : 1	< 0.05 %
	up to 1 : 5	< 0.05 %
	up to 1 : 10	< 0.075 %

Influence of the ambient temperature

Accuracy class 0.1	Turn down	Average temperature coefficient of the zero signal ⁸⁾
	1 : 1	0.05 %/10 K
	up to 1 : 5	0.1 %/10 K
	up to 1 : 10	0.15 %/10 K

Long-term stability

Long-term drift of the zero signal ^{5) 9)}	< 0.1 % per 2 years
---	---------------------

Ambient conditions

Ambient, storage and transport temperature	
– without PLICSCOM	-40 ... +85°C
– with PLICSCOM	-40 ... +70°C

Similar to DIN 16086, DIN V 19259-1 and IEC 60770-1.

Relating to the nominal range, incl. hysteresis and repeatability.

Only with process fitting EV, FT.

In the compensated temperature range between 0°C ... 100°C, reference temperature 20°C.

Acc. to IEC 60770-1, relating to the nominal range.

Area of application**Physical principle****Power supply****3.2 Principle of operation**

VEGABAR 64 is a pressure transmitter for use in the paper, food processing and pharmaceutical industry as well as in water/waste water applications. Depending on the version, it is used for measurement of the level, the gauge pressure, the absolute pressure or the vacuum. Measured products are gases, vapours and liquids, also those with abrasive constituents.

The actual sensor element is the CERTEC® measuring cell with a flush, abrasion resistant ceramic diaphragm. The hydrostatic pressure of the product or the process pressure effects via the ceramic diaphragm a capacitance change in the measuring cell. This capacitance change is converted into a 4 ... 20 mA/HART® signal.

VEGABAR 64 has a two-wire 4 ... 20 mA/HART® electronics requiring supply voltage:

- 12 ... 36 V DC (non Ex instrument)
- 12 ... 30 V DC (Ex ia instrument)
- 18 ... 36 V DC (Ex d instrument).

3.3 Adjustment

VEGABAR 64 can be adjusted with three different media:

- with the indicating and adjustment module PLICSCOM
- with the PC and an adjustment software acc. to FDT/DTM standard, e.g. PACTware™
- with a HART® handheld.

The entered parameters are generally saved in VEGABAR 64, when adjusting with PACTware™ and PC, also optionally in the PC.

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3.4 Storage and transport

Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test acc. to DIN 55439.

The packaging consists of environment-friendly, recyclable cardboard. Dispose of the packing material via specialised recycling companies.

Storage and transport temperature

- Storage and transport temperature -40°C up to +85°C
- Relative humidity 20 ... 85 %.

Input variable

Adjustment range of the zero/span adjustment:

- zero begin minus 50 % of the nominal range up to +95 % of the nominal range
- span -120³⁾ ... +120 % of the nominal range

Adjustment range of the min. adjustment:

- min. %-value from -10 % ... 110 % of the nominal range
- min. pressure value from -50 % ... 150 % of the nominal range

Adjustment range of the max. adjustment:

- max. %-value from -10 % ... 110 % of the nominal range
- max. pressure value from -50 % ... 150 % of the nominal range

Recommended max. turn down 1 : 30

Nominal range	Gauge pr. resistance ⁴⁾	Low pr. resistance
Gauge pressure		
0...0.1 bar / 0...10 kPa	15 bar / 1 500 kPa	-0.2 bar / -20 kPa
0...0.2 bar / 0...20 kPa	20 bar / 2 000 kPa	-0.4 bar / -40 kPa
0...0.4 bar / 0...40 kPa	30 bar / 3 000 kPa	-0.8 bar / -80 kPa
0...1.0 bar / 0...100 kPa	35 bar / 3 500 kPa	-1.0 bar / -100 kPa
0...2.5 bar / 0...250 kPa	50 bar / 5 000 kPa	-1.0 bar / -100 kPa
-1.0...0.0 bar / -100...0 kPa	35 bar / 3 500 kPa	-1.0 bar / -100 kPa
-1.0...+1.5 bar / -100...+150 kPa	50 bar / 5 000 kPa	-1.0 bar / -100 kPa
.....	65 bar / 6 500 kPa	-1.0 bar / -100 kPa
-1.0...+10.0 bar / -100...+1 000 kPa	90 bar / 9 000 kPa	-1.0 bar / -100 kPa
.....	130 bar / 13 000 kPa	-1.0 bar / -100 kPa
.....	200 bar / 20 000 kPa	-1.0 bar / -100 kPa
-1.0...+60.0 bar / -100...+6 000 kPa	300 bar / 30 000 kPa	-1.0 bar / -100 kPa
-0.05...+0.05 bar / -5...+5 kPa	15 bar / 1 500 kPa	-0.2 bar / -20 kPa
-0.1...+0.1 bar / -10...+10 kPa	20 bar / 2 000 kPa	-0.4 bar / -40 kPa
-0.2...+0.2 bar / -20...+20 kPa	30 bar / 3 000 kPa	-0.8 bar / -80 kPa
-0.5...+0.5 bar / -50...+50 kPa	35 bar / 3 500 kPa	-1.0 bar / -100 kPa
Absolute pressure		
0...1.0 bar / 0...100 kPa	35 bar / 3 500 kPa	
0...2.5 bar / 0...250 kPa	50 bar / 5 000 kPa	
0...5.0 bar / 0...500 kPa	65 bar / 6 500 kPa	
0...25.0 bar / 0...2 500 kPa	130 bar / 13 000 kPa	
0...60.0 bar / 0...6 000 kPa	300 bar / 30 000 kPa	

3) Values less than -1.0 bar cannot be adjusted.

4) With process fitting PVDF acc. to nominal pressure stage.

¹⁾ See Supplement, Technical data, Ambient conditions

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Supplement

Technical data

General data

Materials, wetted parts	
– process fitting	stainless steel 1.4435, PVDF
– diaphragm	sapphire-ceramic® (99.9 % oxiden-ceramic)
– seal	Viton, Kalrez Spectrum, EPDM
Materials, non-wetted parts	
– housing	plastic PBT (Polyester), Alu-die casting powder-coated, stainless steel 1.4435
– seal ring between housing and housing cover	NBR (Alu/stainless steel housing) silicone (plastic housing)
– inspection window in housing cover ¹⁾	Polycarbonate
– ground terminal	stainless steel 1.4571/1.4435
– connection cable between IP 68 housing and remote electronics	PUR, FEP, PE
Weight	0.8 ... 8 kg (depending on process fitting)

Output variable

Output signal	4 ... 20 mA/HART®
Resolution	1.5 µA
Fault signal	22 mA (3.6 mA), adjustable
Current limitation	22 mA
Integration time ²⁾	0 ... 999 s, adjustable
Rise time	150 ms (ti: 0 s, 0 ... 100 %)
Fulfilled Namur recommendation	NE 43

Select installation position

Weld the socket

4 Mounting

4.1 Mounting procedure

VEGABAR 64 functions in any installation position¹⁾. Select an installation position that lets you reach the instrument easily during mounting and connecting as well as later retrofitting of an adjustment module. When carrying out these operations, the housing can be rotated by 330° without the use of any tools.

To mount VEGABAR, a welded socket is necessary (dependent on the process fitting). Use components from the line of VEGA accessories:

- welded socket G1A, article no. 2.27867
- welded socket G1½A, article no. 2.21993
- welded socket Tri-Clamp 1", article no. 2.24711
- welded socket Tri-Clamp 1½", article no. 2.14140
- welded socket Tri-Clamp 2", article no. 2.10974
- welded socket, hygienic fitting with groove nut F40, article no. 2.23898
- welded socket DN 40 DIN 11851, article no. 2.10955
- welded socket DN 50 DIN 11851, article no. 2.4177
- welded socket DN 50 DIN 11864, article no. 2.25290
- welded socket DRD, article no. 2.10500
- welded socket M44x1.25, article no. 2.15986
- welded socket cone 2.1, nut M64x2, article no. 2.9875

→ Take note of the applicable welding standards (segmental welding procedure).

Version with PLICSCOM.

The interval required by the output signal to reach 63 % of the actual height after a jump of the input variable. After the triple integration time has passed, the output signal has reached 95 % of the jump height.

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Sealing/Screwing in

- 1 Use the seal attached to the appropriate process fitting:
 - thread G1A: Viton, article no. 2.28172; seal behind the thread
 - thread G1½A: Klingersil 48 x 55 x 2, article no. 2.4191; seal behind the thread
 - Tri-Clamp 1": EPDM, article no. 2.24710
 - Tri-Clamp 1½": EPDM, article no. 2.14141
 - Tri-Clamp 2": EPDM, article no. 2.10975
 - hygienic connection with groove nut: EPDM, article no. 2.17682
 - bolting DIN 11851 DN 40: NBR, article no. 2.10956
 - bolting DIN 11851 DN 50: NBR, article no. 2.4178
 - bolting DIN 11864 DN 50: article no. 2.19059
 - DRD PN 40: PTFE, article no. 2.10360
 - thread M44 x 1,25: Viton, article no. 2.10491
 - cone 2.1, nut 64x2; EPDM article no. 2.19094

–or–

Seal with a suitable, resistant seal:

- flange connections acc. to DIN/ANSI

–or–

Seal the thread with Teflon, hemp or similar resistant seal materials:

- thread 1½ NPT.

- 2 Screw VEGABAR into the welded socket by tightening the hexagon screw on the process fitting with SW 27 (spanner width 27 mm).

9 Dismounting**9.1 Dismounting procedure**

Take note of chapters "4 Mounting" and "5 Connecting to power supply" and carry out the listed steps in reverse order.

9.2 Disposal

VEGABAR 64 consists of materials which can be recycled by specialised recycling companies. We have purposely designed the electronic modules to be easily separable. Mark the instrument as scrap and dispose of it according to government regulations (electronic scrap ordinance, etc.).

Materials: see technical data

If you cannot dispose of the instrument properly, please contact us about disposal methods or return.

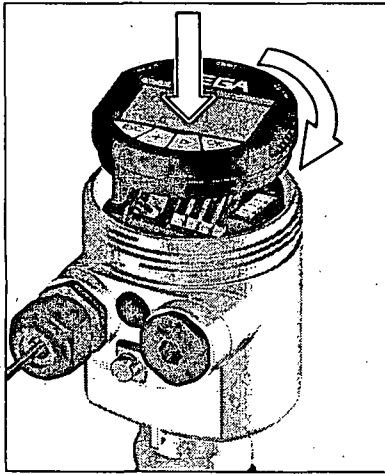


Fig. 37:
Installation of PLICSCOM

3. Press PLICSCOM lightly onto the electronics and turn it to the right until it snaps in.
4. Screw housing cover with inspection window tightly back on

Removal is carried out in reverse order.

PLICSCOM is powered by the sensor, an additional connection is not necessary.

8.4 Repairing the instrument

If it is necessary to repair VEGABAR 64, please send the instrument to the following address:

VEGA Grieshaber KG
Repair department
Am Hohenstein 113
77761 Schiltach
Germany

Protection against moisture

Protect your VEGABAR against moisture penetration.

- with horizontally installed instruments:
→ turn the housing so that the cable entry points downwards
- with vertically installed instruments:
→ lead the connection cable downward in front of the cable entry.

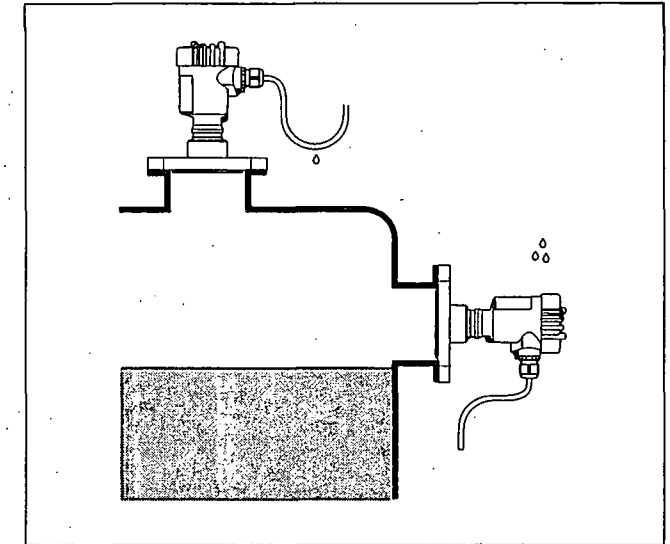


Fig. 2:
Measures against moisture penetration

Rain and condensation water can thus drain off. This applies mainly to mounting outdoors, in areas where moisture is expected (e.g. by cleaning processes) or on cooled or heated vessels.

5 Connecting to power supply

5.1 Preparing the connection

Note safety instructions

Always observe the following safety instructions:

- Connect only in the complete absence of line voltage
- If overvoltages are expected, overvoltage arresters should be installed.



We recommend VEGA overvoltage arresters ÜS-F-LB-I and ÜSB 62-36G.X.

Take note of safety instructions for Ex applications

In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units. The sensors must only be operated on intrinsically safe circuits. The permissible electrical values are stated in the certificate.

Select voltage supply

VEGABAR 64 requires a supply voltage of 12 ... 36 V DC. Power supply and current signal are transmitted via the same two-wire connection cable.

Provide a reliable separation between the supply circuit and the mains circuits acc. to DIN VDE 0106 part 101. The VEGA power supply units VEGATRENN 149AEx, VEGASTAB 690, VEGADIS 371 as well as all VEGAMETs meet this requirement. When using one of these instruments, protection class III is ensured for VEGABAR 64.

Bear in mind the following factors regarding supply voltage:

- the reduction of output voltage of the power supply unit under nominal load
- the influence of additional instruments in the circuit (see load values in Technical data).

Fault messages via PLICSCOM



In Ex applications, the regulations for the wiring of intrinsically safe circuits must be observed.

The error message appears as code in the measured value display and in all menu items. The explanatory text is displayed in the menu „Diagnosis“ in the menu item „Instrument status“:

Code	Explanatory text	Rectifying measure
E013	no measured value available	repair
E017	adjustment span too small	repeat with modified values
E036	no operable sensor software	software update, repair
E041	Hardware error	repair

Insert/remove PLICSCOM

8.3 Instrument modification

PLICSCOM can be inserted or removed at any time. An interruption of the power supply is not necessary.

To install proceed as follows:

- 1 Unscrew housing cover
- 2 Place PLICSCOM in the desired position on the electronics.



You can choose any one of four different positions (each displaced by 90°).

8 Maintenance and fault rectification

8.1 Maintenance

In normal operation, the VEGABAR 64 pressure transmitter is completely maintenance-free.

8.2 Fault rectification

Connect a hand-multimeter with a suitable measuring range acc. to the wiring plan.

Fault	Possible reason	Rectifying measure
4 ... 20 mA signal not stable	level fluctuations	set integration time via PLICSCOM or PACTware™
	no atmospheric pressure compensation	Check pressure compensation in the housing, if necessary clean filter element
4 ... 20 mA signal missing	incorrect connection to power supply	check connection acc. to chapter 5.3 and correct if necessary acc. to chapter 5.2
	no power supply	check cables for line break, repair if necessary
	power supply too low or load resistance too high	check and adapt if necessary
Current signal 22 mA or less than	electronics module or meas. cell defective	exchange instrument or return for repair

Select connection cable

VEGABAR 64 is connected with standard two-wire cable. An outer diameter of 5 ... 9 mm ensures the seal effect of the cable entry.

If strong electromagnetic interference is expected, we recommend the use of screened cable. The screen should be grounded on both ends.

Select connection cable for Ex applications



Take note of the corresponding installation regulations for Ex applications.

Checking the 4 ... 20 mA signal

Single/double chamber housing

5.2 Connection procedure

Proceed as follows:

- 1 Unscrew the housing cover
- 2 Loosen compression nut of the cable entry
- 3 Remove approx. 10 cm of the cable mantle, strip approx. 1 cm insulation from the ends of the individual wires ¹⁾
- 4 Insert the cable into the sensor through the cable entry
- 5 Lift the opening levers of the terminals with screwdriver
- 6 Insert the wire ends into the open terminals according to the wiring plan

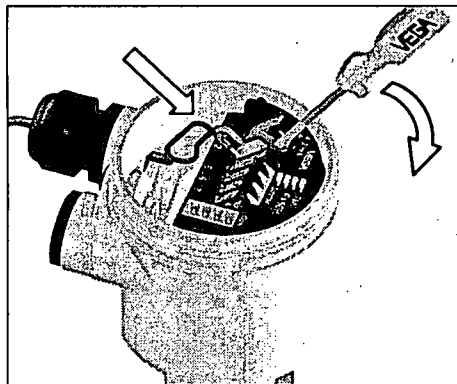


Fig. 3:
Connection steps 5 and 6

- 7 Press down the opening levers of the terminals, you will hear the terminal spring closing
- 8 Check the hold of the wires in the terminals by slightly pulling on them
- 9 Tighten the compression nut of the cable entry, the seal ring must completely encircle the cable
- 10 Screw the housing cover back on

The electrical connection is finished.

¹⁾ Use wire end ferrules.

Connecting the PC to the signal cable

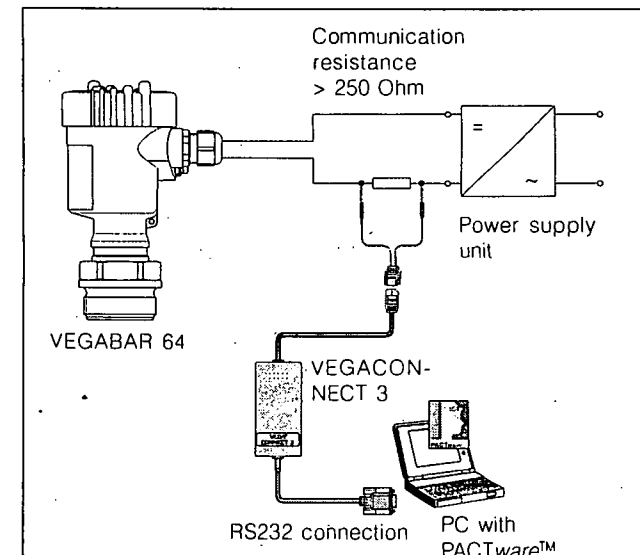


Fig. 36:
PC connected to the signal cable

Necessary components:

- VEGABAR 64
- PC with PACTware™
- VEGACONNECT 3 with adapter for HART®
- communication resistance >250 Ohm
- power supply unit

The individual set-up steps are described in the help texts of PACTware™.

7 Set-up with PACTware™ and PC

IP 68 version

7.1 Connecting the PC

Connecting the PC directly
to the sensor

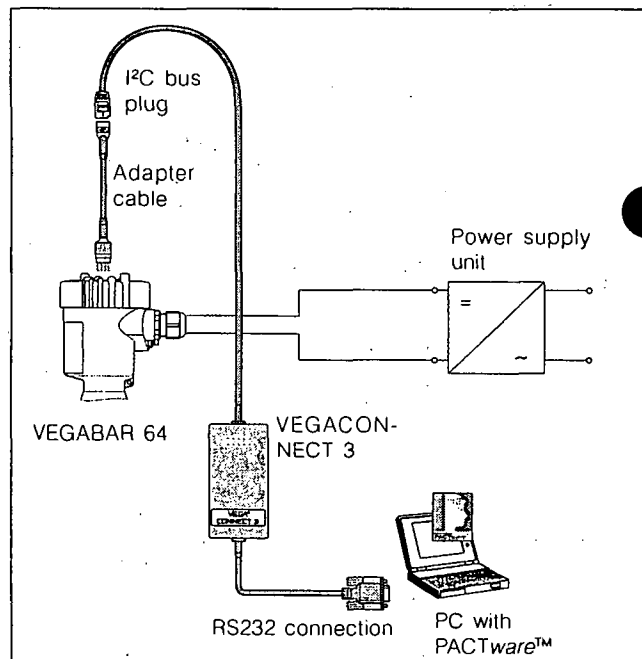


Fig. 35:
PC connected directly to the sensor

Necessary components:

- VEGABAR 64
- PC with PACTware™
- VEGACONNECT 3 with I²C bus plug and adapter cable, article no. 2.27323
- power supply unit

Proceed as follows:

- 1 Loosen screw on the rear of the plug connector
- 2 Remove plug connector and seal from the remote electronics
- 3 Lift plug insert out of the plug housing

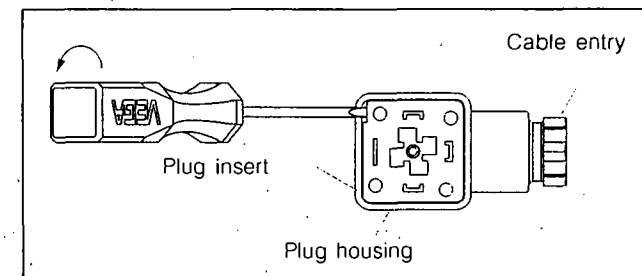


Fig. 4:
Loosen the plug insert

- 4 Loop the connection cable¹⁾ through the cable entry into the plug housing
- 5 Connect wire ends to the screw terminals acc. to the wiring plan

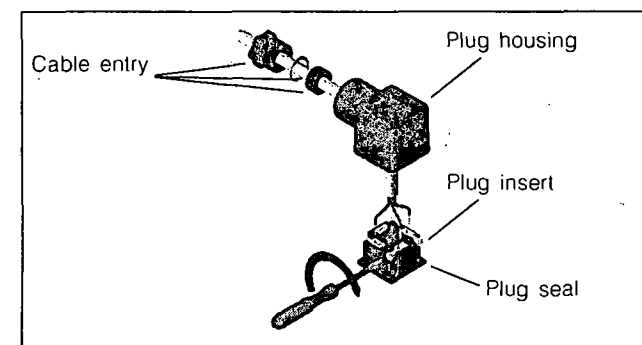


Fig. 5:
Connection to screw terminals

- 6 Snap the plug insert into the plug housing and insert the plug seal.

¹⁾ The connection cable is already preconnectioned. If necessary, shorten to the required length, cut the breather capillaries clean. Remove approx. 5 cm of the cable mantle, strip approx. 1 cm insulation from the ends of the wires. After shortening the cable, fasten the type plate again on the cable.

5.3 Wiring plans

Single chamber housing with cable entry

Overview

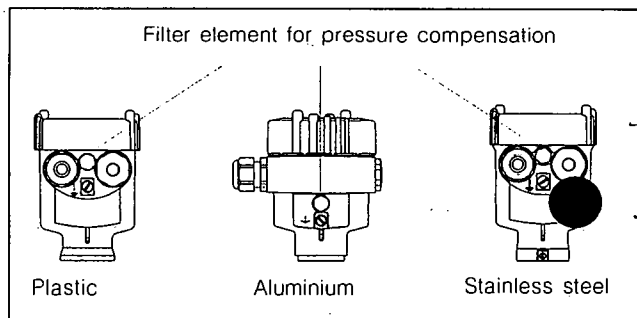


Fig. 6:
Overview of the three material versions of the single chamber housing

Top view, electronics and connection compartment

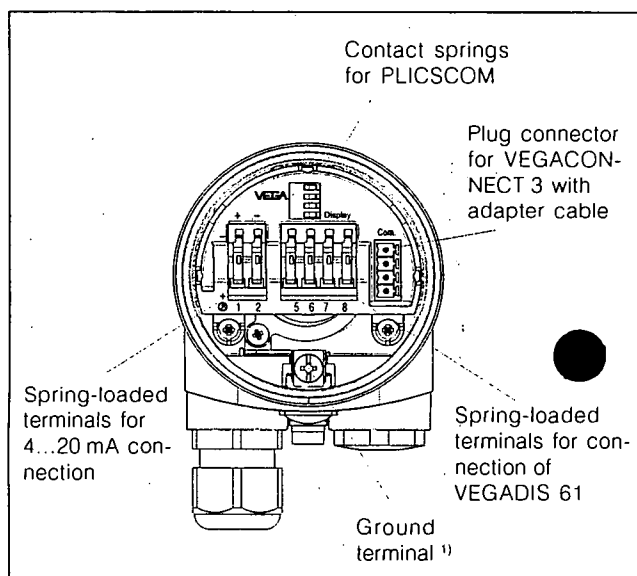
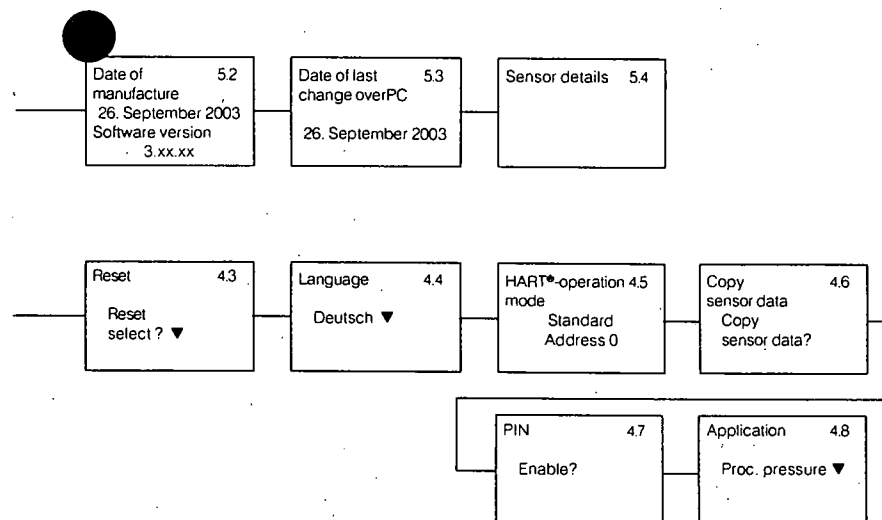


Fig. 7:
Top view of the electronics and connection compartment

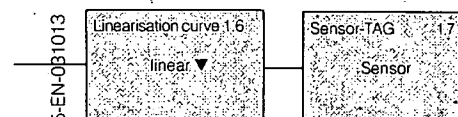
1) Connect cable screen here, connect ground terminal on the housing exterior to ground as prescribed. The two terminals are galvanically connected.



▼ Selection possibility in the menu item

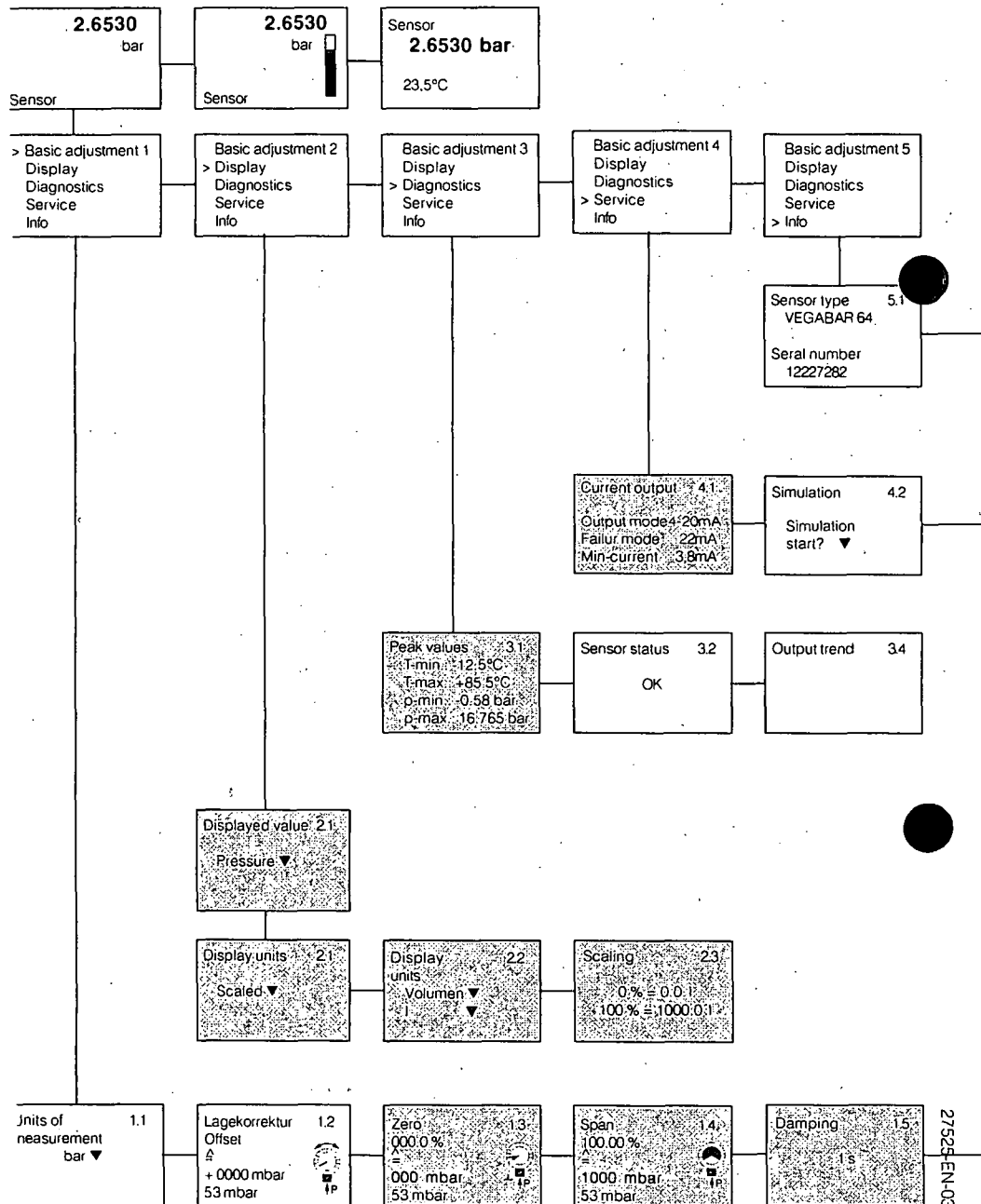
[ESC]
↕
[→] [←]
↕
[OK]

With these keys you move in the menu field

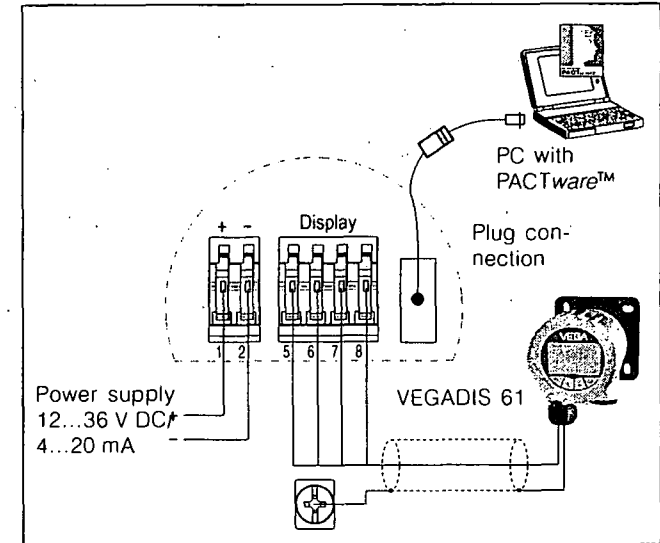


• The parameters in the menu items highlighted in grey are reset to default by activating the reset function.

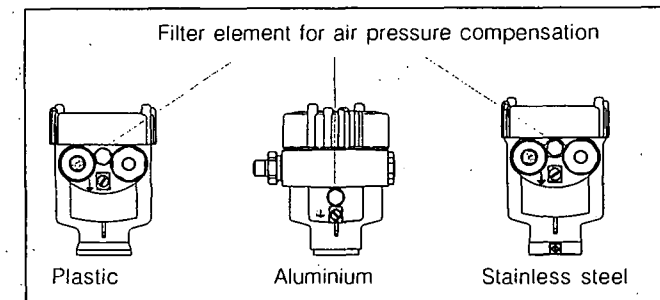
3.5 Menu schematic



Wiring plan

Fig. 8:
Wiring plan, single chamber housing

Single chamber housing with M12x1 plug

Fig. 9:
Overview of the three material versions of the single chamber housing

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Connect power supply

VEGA

VEGA

Set-up with the indicating and adjustment module PLICSCOM

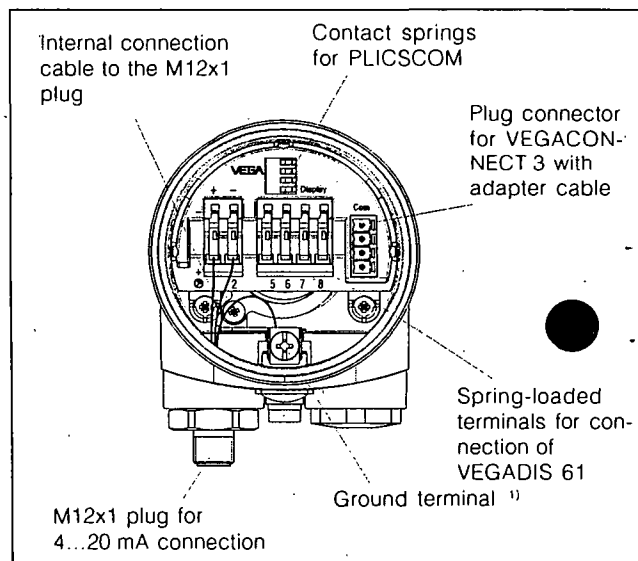
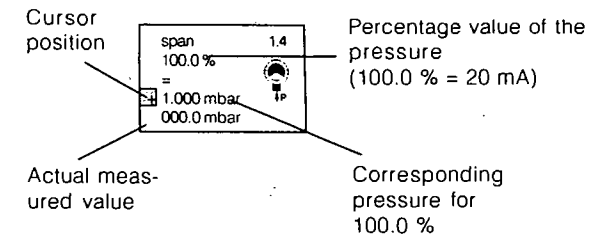
Top view, electronics and connection compartment

Fig. 10:
Top view of the electronics and connection compartment

Carrying out span adjustment

Proceed as follows:

- 1 Edit the mbar value in the menu item „span“ with [OK]:



The displayed pressure for 100 % corresponds to the nominal range of the sensor (in the above example 1.0 bar = 1000 mbar).

- 2 Set the requested mbar value with [->] and [OK]
- 3 Confirm with [OK] and move with [ESC] to the menu overview.

The span adjustment is finished.



To adjust with a filling, you simply enter the indicated actual measured value. If the adjustment ranges are exceeded, the following message is displayed „Outside parameter limits“. The editing can be interrupted with [ESC] or the indicated limit value can be accepted with [OK].

Adjustment range:

- -120 % ... +120 % of the nominal measuring range.

The set-up of VEGABAR for process pressure measurement is finished. The other menu items are described in the separate operating instructions manual of the indicating and adjustment module PLICSCOM.

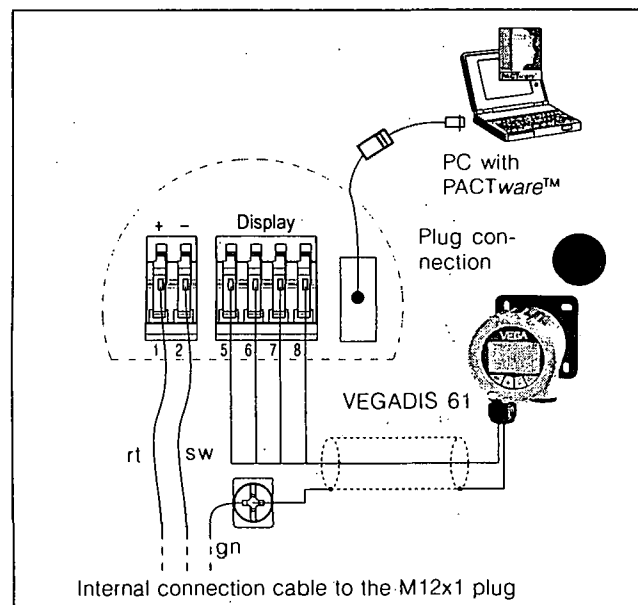
Wiring plan

Fig. 11:
Wiring plan, single chamber housing

- 1) Connect ground terminal on the housing exterior to ground as prescribed. The two terminals are galvanically connected.

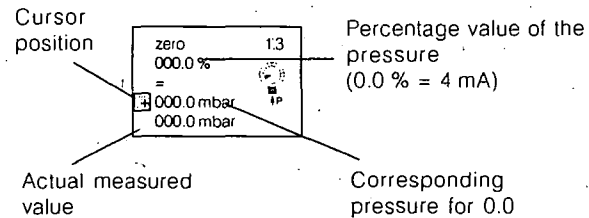
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Carrying out zero adjustment

Proceed as follows:

- 1 Edit the mbar value in the menu item „zero“ with [OK]:



- 2 Set the requested mbar value with [+] and [->]
- 3 Confirm with [OK] and move to span adjustment with [->].

The zero adjustment is finished.

The zero adjustment shifts the value of the span adjustment. The span, i.e. the difference between these values, remains. It can be max. 120 % of the nominal measuring range.



To adjust with a filling, you simply enter the indicated actual measured value. If the adjustment ranges are exceeded, the following message is displayed „Outside parameter limits“. The editing can be interrupted with [ESC] or the indicated limit value can be accepted with [OK].

Adjustment range:

- Meas. begin -50 % ... +95 % of the nominal measuring range.

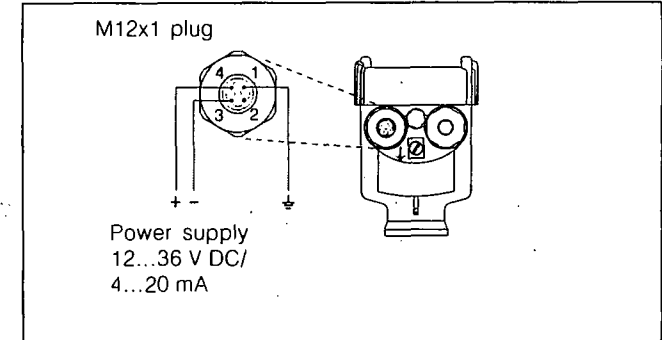
Overview

Fig. 12:
Wiring plan, single chamber housing, power supply

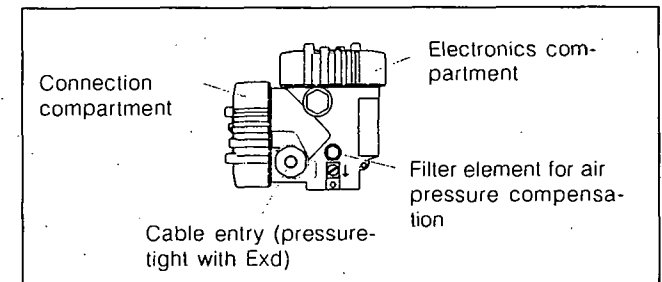
Double chamber housing with cable entry

Fig. 13:
Double chamber housing, non-Ex instrument or EExia instrument

Connect power supply

VEGA

VEGA

Set-up with the indicating and adjustment of the PLICSCOM

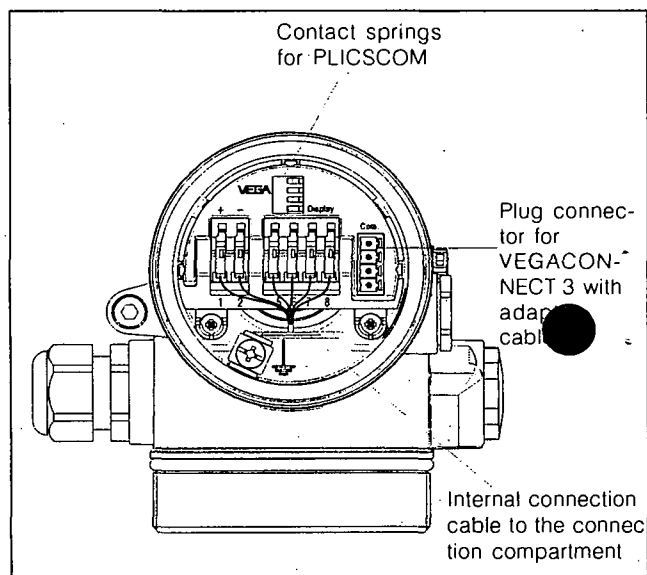
Top view, electronics compartment

Fig. 14:
Top view, electronics compartment with double chamber housing

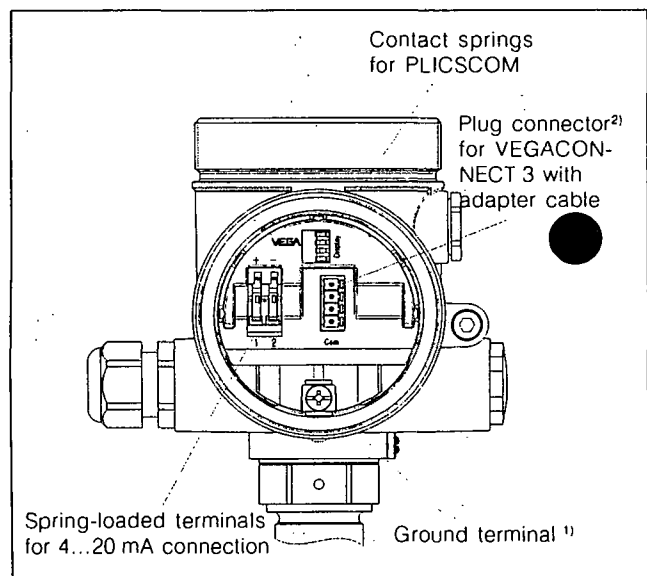
Top view, connection compartment

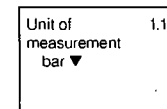
Fig. 15:
Connection compartment, double chamber housing

¹⁾ Connect ground terminal on the housing exterior to ground as prescribed. The two terminals are galvanically connected.

²⁾ Not with Exd

Carrying out position correction

- 2 Confirm the menu „Basic adjustment“ with [OK], the menu item “Unit of measurement” will be displayed:

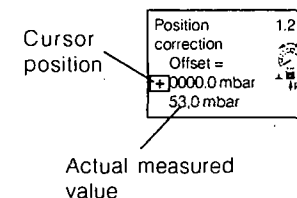


- 3 Activate the selection with [OK] and select the requested unit (in the example mbar) with [->].
- 4 Confirm with [OK] and move to position correction with [->].

The adjustment unit is now changed from bar to mbar.

Proceed as follows:

- 1 Edit the offset value in the menu item „Position correction“ with [OK]:



- 2 Set the requested offset value with [->] and [OK], e.g. the actual measured value with reciprocal sign
- 3 Confirm with [OK] and move to the min. adjustment (zero) with [->].

The actual measured value has now the requested correction (in the above example it is now 0.0 mbar), the position correction is finished.

Select application "process pressure measurement"

VEGABAR 64 is preset to application „Level measurement“. To switch over to application „Process pressure measurement“ you have to proceed as follows:

- 1 Push [OK] in the measured value display, the menu overview is displayed
- 2 Select the menu „Service“ with [->] and confirm with [OK]

```

Basic adjustment 4
Display
Diagnostics
> Service
Info
  
```

- 3 Select the menu item „Application“ with [->] and edit the selection with [OK]



Note warning: „Output can change“.

- 4 Select with [->] „OK“ and confirm with [OK]
- 5 Select „Process pressure“ from the list and confirm with [OK]

```

Unit of measurement .48
> Process pressure
Level
  
```

- 6 Move to the measured value display by pushing [ESC] twice.

Selecting the adjustment unit

Proceed as follows when switching over to another adjustment unit¹⁾ (in the example from bar to mbar):

- 1 Push [OK] in the measured value display, the menu overview will be displayed:

```

> Basic adjustment 1
Display
Diagnostics
Service
Info
  
```

¹⁾ Options: mbar, bar, psi, Pa, kPa, MPa, inHg, mmHg, inH₂O, mmH₂O.

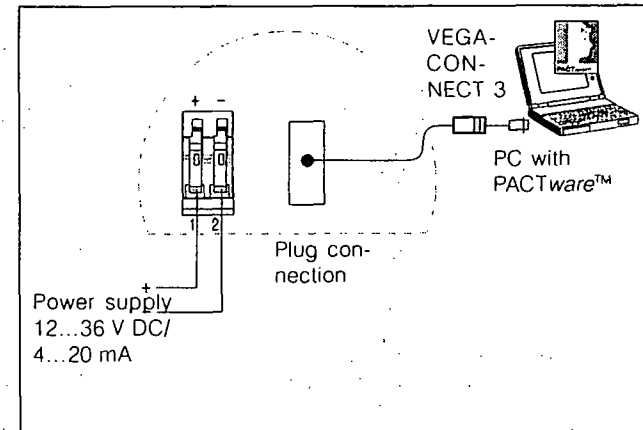
Wiring plan

Fig. 16:
Wiring plan, double chamber housing

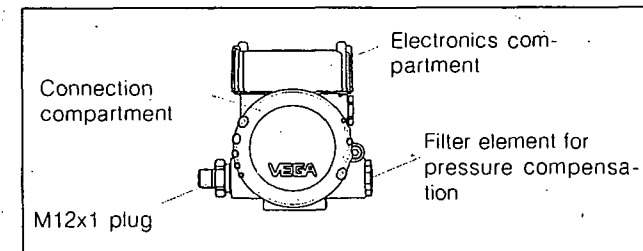
Overview**Double chamber housing with M12x1 plug**

Fig. 17:
Double chamber housing, non-Ex instrument or EExia instrument

Connect power supply

VEGA

VEGA

Set-up with the indicating and adjustment module PLICSCOM

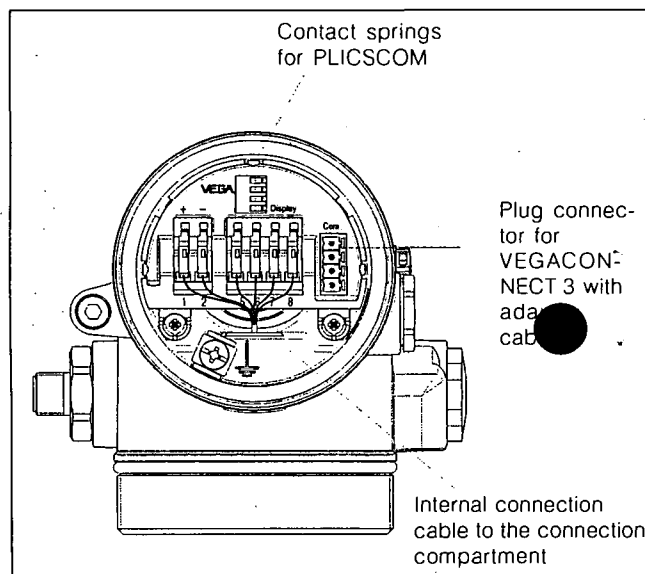
Top view, electronics compartment

Fig. 18:
Top view, electronics compartment of the double chamber housing

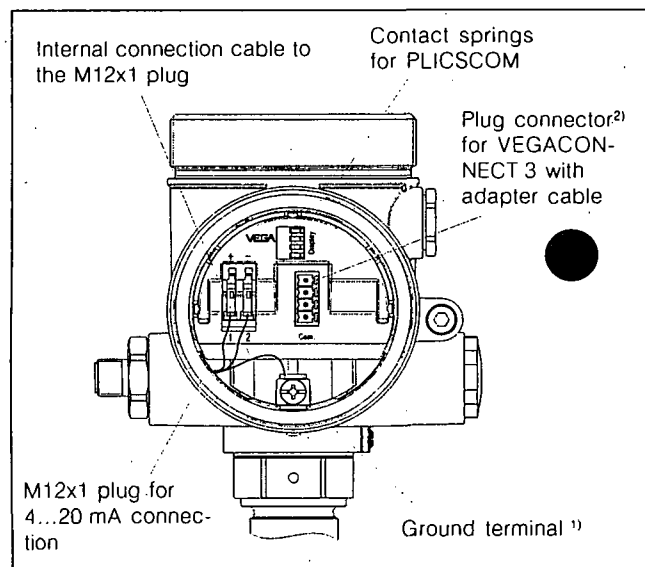
Top view, connection compartment

Fig. 19:
Connection compartment, double chamber housing
Fig. 20:

- ¹) Connect ground terminal on the housing exterior to ground as prescribed. The two terminals are galvanically connected.
²) Not with Exd

The position correction compensates the influence of the installation position or static pressure on the measurement. The position correction does not influence the adjustment values.

In the menu items "zero" and "span" you determine the measuring span of the sensor.



span	1.4	Δ 20 mA
100.0 %		
=		
2.653 bar		



zero	1.3	Δ 4 mA
000.00 %		
=		
0.053 bar		



These steps are not necessary for instruments which are already adjusted acc. to the customer's request!

These data are stated on the type label of the instrument and in the menu items of the zero/span adjustment.

PLICSCOM enables the adjustment without filling or pressure. You can carry out the settings in the workshop without the instrument having to be installed.

In the menu items "zero" and "span", the actual measured value is also displayed.

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The set-up of VEGABAR is finished. All other menu items are described in the separate operating instructions manual PLICSCOM.

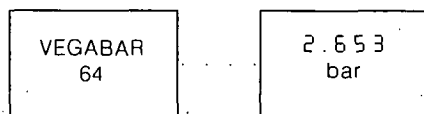
6.4 Set-up procedure, process pressure measurement

Boot phase

After VEGABAR 64 is connected to power supply, the instrument carries out a self-test:

- internal test of the electronics
- indication of the instrument type
- output current jumps to the set fault value (3.6 mA or 22 mA).

The actual measured value is then displayed and the corresponding current value between 4 ... 20 mA is outputted¹⁾.



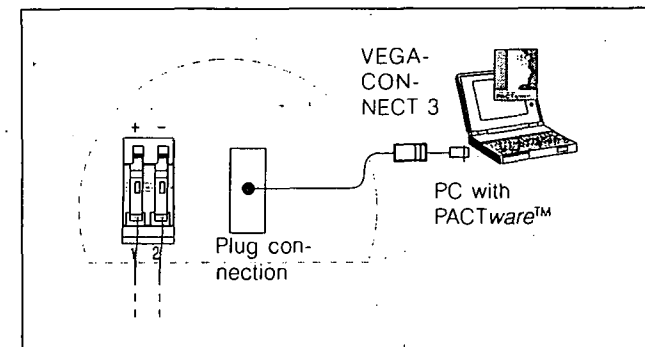
Set-up procedure for VEGABAR 64:

- 1 Select application "process pressure measurement"
- 2 Select unit of measurement
- 3 Carry out position correction
- 4 Carry out zero adjustment
- 5 Carry out span adjustment

In the menu item "units of measurement" you select the physical unit in which the adjustment should be carried out, e.g. mbar, bar, psi...

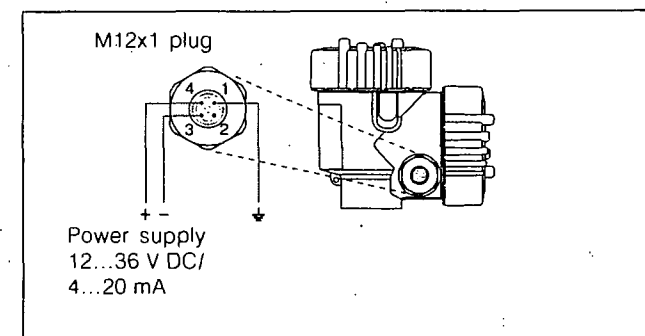
¹⁾ The values correspond to the actual level as well as the settings already carried out, e.g. default.

Wiring plan



Wiring plan, double chamber housing, peripheral instruments

Fig. 21:



Wiring plan, double chamber housing, power supply

Connect power supply

VEGA

VEGA

Set-up with the indicating and adjustment module PLICSCOM

Overview

Double chamber housing Exd

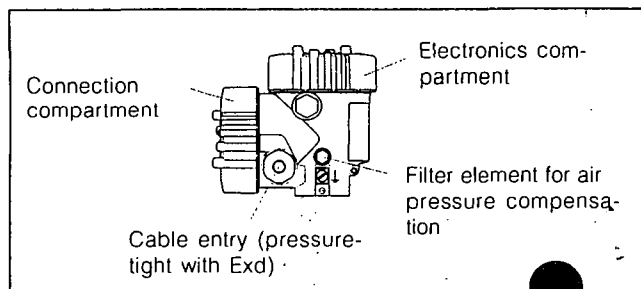


Fig. 22:
Double chamber housing, Exd instrument

Top view, electronics compartment

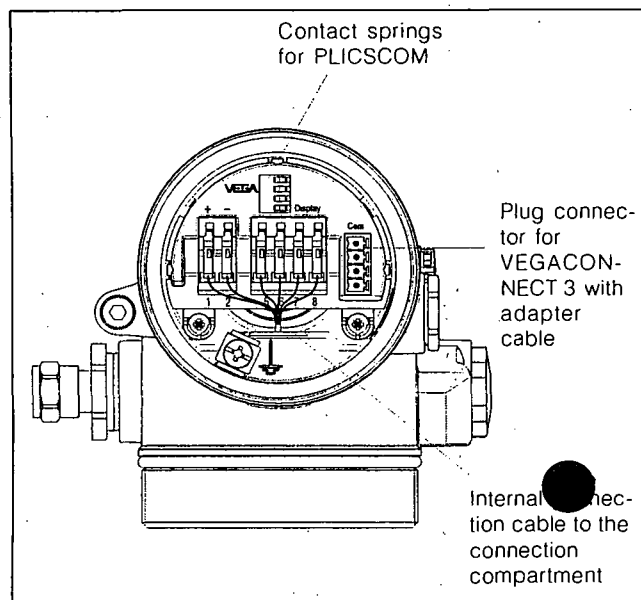
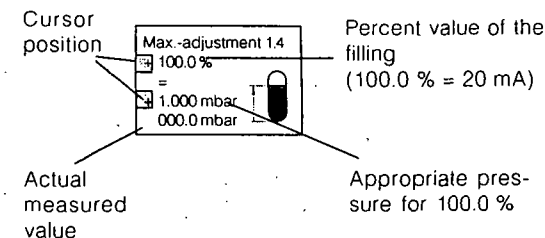


Fig. 23:
Top view of the electronics compartment with double chamber housing

Carrying out max. adjustment

Proceed as follows:

- 1 Edit the %-value in the menu item „max. adjustment“ with [OK]:



The displayed pressure for 100 % corresponds to the nominal measuring range of the sensor (in the above example 1.0 bar = 1000 mbar).

- 2 Set the requested %-value with [->] and [OK]
- 3 Confirm with [OK] and edit the requested mbar-value
- 4 Set the requested mbar-value with [+] and [->]
- 5 Confirm with [OK] and move to the menu overview with [ESC].

The max. adjustment is finished.



To adjust with a filling, you simply enter the displayed actual measured value. VEGABAR automatically calculates from the entered values (e.g. 90.0 % and 100.0 mbar) the current value for 100.0 %. If the adjustment ranges are exceeded the display indicates the message „Outside parameter limits“. Editing can be interrupted with [ESC] or the displayed limit value can be accepted with [OK].

Adjustment ranges:

- %-value of -10 % ... 110 %
- Pressure value of -50 % ... +150 % of the nominal measuring range.

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Set-up with the indicating and adjustment module PLICSCOM.

VEGA

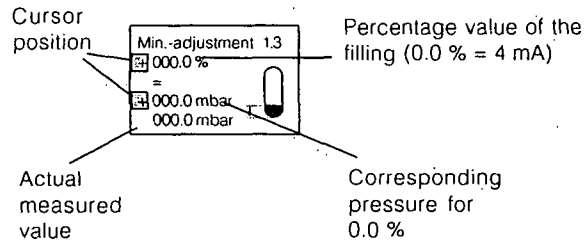
VEGA

Connecting to supply

Carrying out min. adjustment

Proceed as follows:

- 1 Edit the %-value in the menu item „Min. adjustment” and edit with [OK]:



- 2 Set the requested %-value with [+] and [->]
- 3 Confirm with [OK] and edit the requested mbar-value
- 4 Set the requested mbar-value with [+] and [->]
- 5 Confirm with [OK] and move to the max. adjustment with [->].

The min. adjustment is finished.



To adjust with a filling, you simply enter the displayed actual measured value. VEGABAR automatically calculates from the entered values (e.g. 10.0 % and 100.0 mbar) the current value for 0.0 %. If the adjustment ranges are exceeded the display indicates the message „Outside parameter limits”. Editing can be interrupted with [ESC] or the displayed limit value can be accepted with [OK].

Adjustment ranges:

- %-value of -10 % ... 110 %
- pressure value of -50 % ... +150 % of the nominal measuring range.

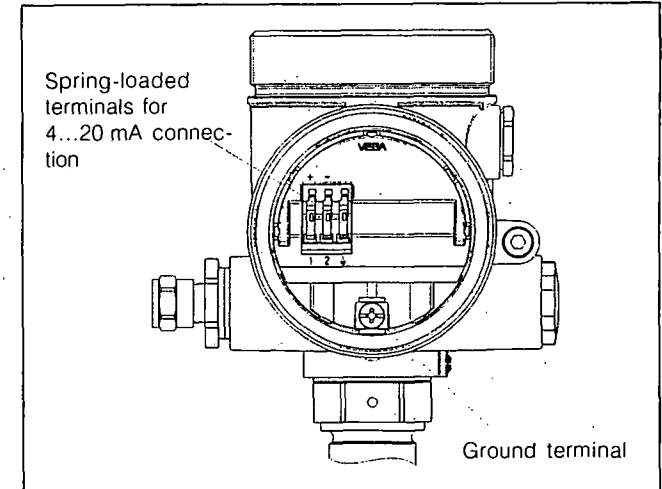
Top view connection compartment Exd ¹⁾

Fig. 24:
Connection compartment, double chamber housing Exd

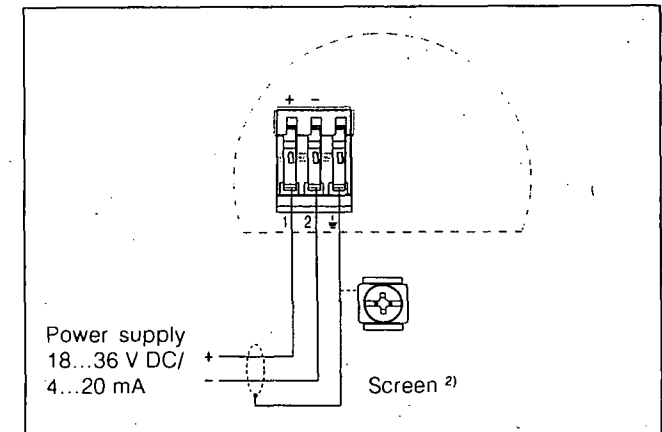
Wiring plan Exd

Fig. 25:
Wiring plan, double chamber Exd

¹⁾ In Exd, the indicating and adjustment module PLICSCOM can only be used in the electronics compartment.

²⁾ Connect screen to +-terminal or ground terminal. Ground the ground terminal on the outside of the housing acc. to regulations. The terminals are galvanically connected.

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IP 68 version with cable entry

Overview

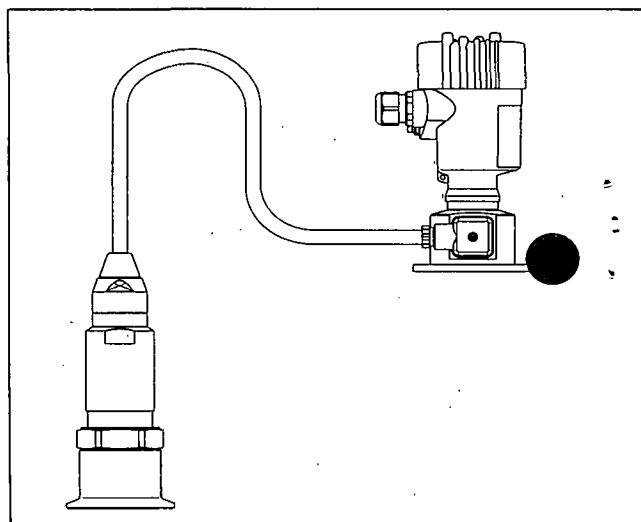


Fig. 26:
VEGABAR 64 in IP 68 version and direct cable outlet, remote electronics

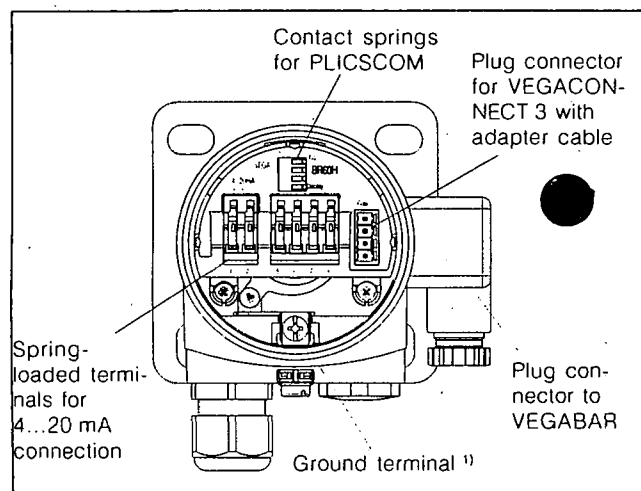


Fig. 27:
Top view to the combined electronics and connection compartment of the remote electronics

Unit of measurement	1.1
Dichteinheit	
> kg/dm ³	
pcl	

- 5 Select the requested unit, e.g. kg/dm³ with [->] and confirm with [OK], the submenu „Density” is displayed

Unit of measurement	1.1
Density	
0001.000	
> kg/dm ³	

- 6 Enter the requested density value with [->] and [+], confirm with [OK] and move to position correction with [->].

The adjustment unit is now changed from bar to m.

Carry out position correction

Proceed as follows:

- 1 Edit the offset value in the menu item „Position correction” with [OK]:

Position correction	1.2
Offset =	
+0000.0 mbar	
53.0 mbar	

actual measured value

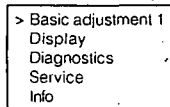
- 2 Set the requested offset value with [->] and [+], e.g. the actual measured value with reciprocal sign
- 3 Confirm with [OK] and move to the min. adjustment with [->].

The actual measured value now incorporates the requested correction (will be in the upper example 0.0 mbar), the position correction is finished.

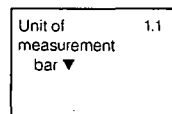
Selecting the adjustment unit/density unit

Proceed as follows when switching over to another adjustment unit¹⁾ (in the example from bar to mbar):

- 1 Push [OK] in the measured value display, the menu overview will be displayed:



- 2 Confirm the menu „Basic adjustment“ with [OK], the menu item „Unit of measurement“ will be displayed:



- 3 Activate the selection with [OK] and select the requested unit (in the example mbar) with [->].
- 4 Confirm with [OK] and move to position correction with [->].

The adjustment unit is now changed from bar to mbar.



When changing to a height unit (in the example from bar to m), it is also necessary to enter the density. Proceed as follows:

- 1 Push [OK] in the measured value display, the menu overview will be displayed.
- 2 Confirm the menu „Basic adjustment“ with [OK], the menu item „Units of measurement“ will be displayed.
- 3 Activate the selection with [OK] and select the requested unit (in the example m) with [->].
- 4 Confirm with [OK], the submenu „Density unit“ is displayed.

¹⁾ Options: mbar, bar, psi, Pa, kPa, MPa, inHg, mmHg, inH₂O, mmH₂O, m, mm, cm, ft.

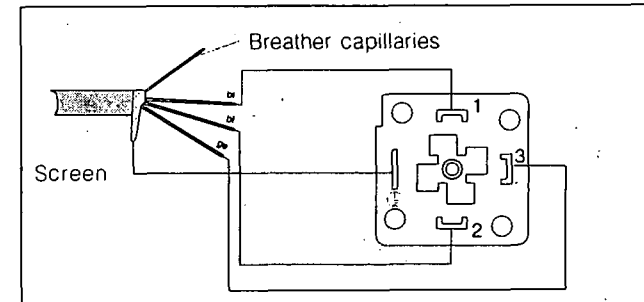
Wiring plan, plug connector remote electronics

Fig. 28:
Wiring plan, plug connector remote electronics

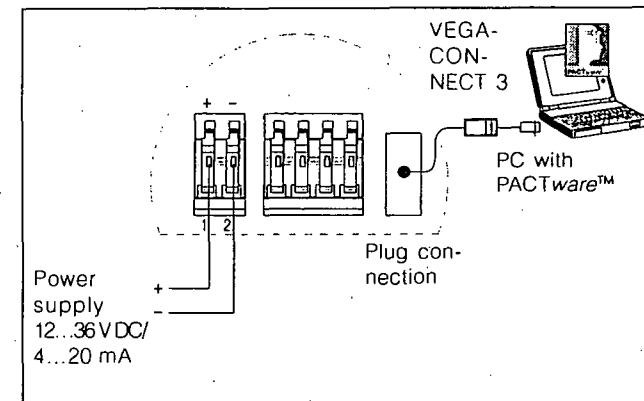
Wiring plan, remote electronics

Fig. 29:
Wiring plan, remote electronics

¹⁾ Connect ground terminal on the housing exterior to ground as prescribed. The two terminals are galvanically connected.

Connect to power supply

VEGA

VEGA

Set-up with the indicating and adjustment module PLICSCOM

Overview

IP 68 version with M12x1 plug

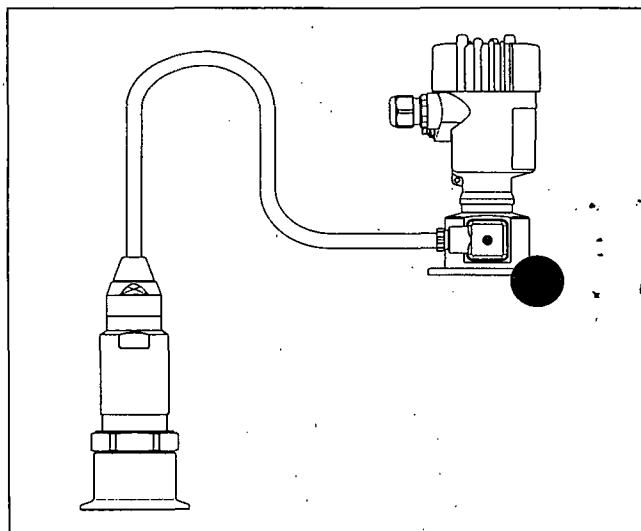


Fig. 30:
VEGABAR 64 in IP 68 version and direct cable outlet, remote electronics

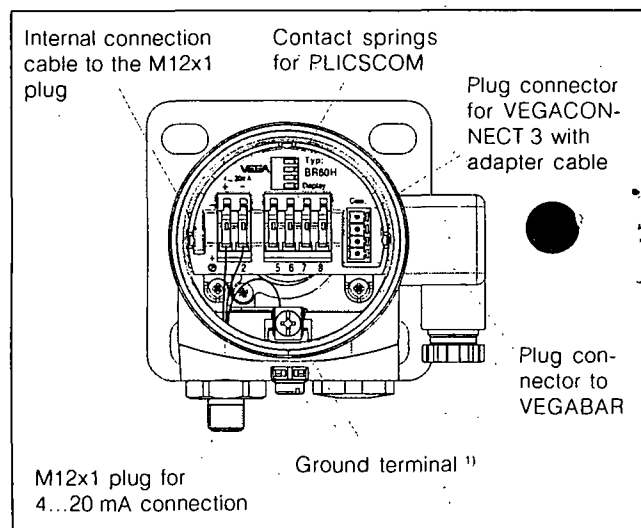
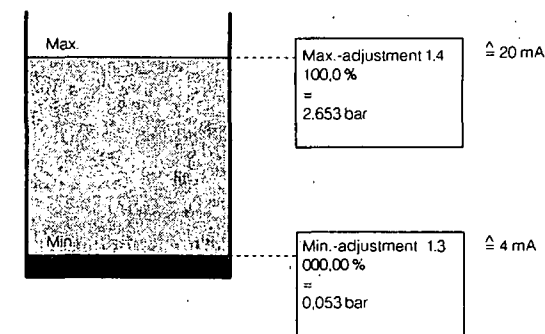


Fig. 31:
Top view of the combined electronics and connection compartment of the remote electronics.

¹⁾ Connect ground terminal on the housing exterior to ground as prescribed. The two terminals are galvanically connected.

In the menu item "units of measurement" you select the physical unit in which the adjustment should be carried out, e.g. mbar, bar, m, mm ...

The position correction compensates the influence of the installation position or a static pressure on the measurement. The position correction does not influence the adjustment values.



These steps are not necessary for instruments which are already adjusted acc. to the customer's request!

These data are stated on the type label of the instrument and in the menu items of the min./max. adjustment.

PLICSCOM enables the adjustment without filling or pressure. You can carry out the settings in the workshop without the instrument having to be installed.

In the menu items min. and max. adjustment, the actual measured value is also displayed.

Adjustment system

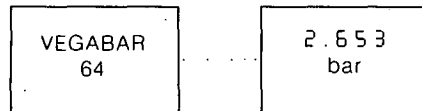
The sensor is adjusted via the four keys and display of the indicating and adjustment module PLICSCOM. The LC display indicates the individual menu items. The functions are shown in the above illustration. Approx. 10 minutes after the last key is pressed, an automatic reset to measured value display is triggered. The values not confirmed with [OK] will not be saved.

6.3 Set-up procedure, level measurement**Boot phase**

After VEGABAR 64 is connected to power supply, the instrument carries out a self-test:

- internal test of the electronics
- indication of the instrument type
- output current jumps to the set fault value (3.6 mA or 22 mA).

The actual measured value is then displayed and the corresponding current value between 4 ... 20 mA is outputted¹⁾.



Set-up procedure for VEGABAR 64:

- 1 Select unit of measurement/density unit
- 2 Carry out position correction
- 3 Carry out min. adjustment
- 4 Carry out max. adjustment

¹⁾ The values correspond to the actual level as well as the settings already carried out, e.g. default.

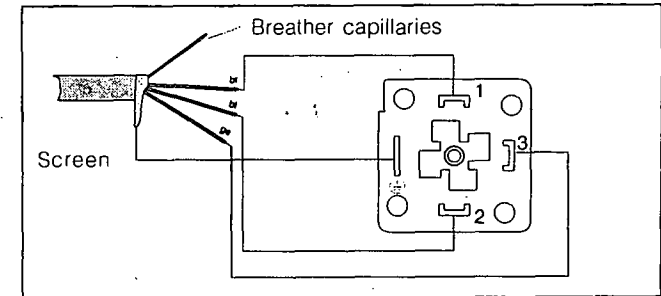
Wiring plan, plug connector, remote electronics**Wiring plan**

Fig. 32:
Wiring plan, plug connector, remote electronics

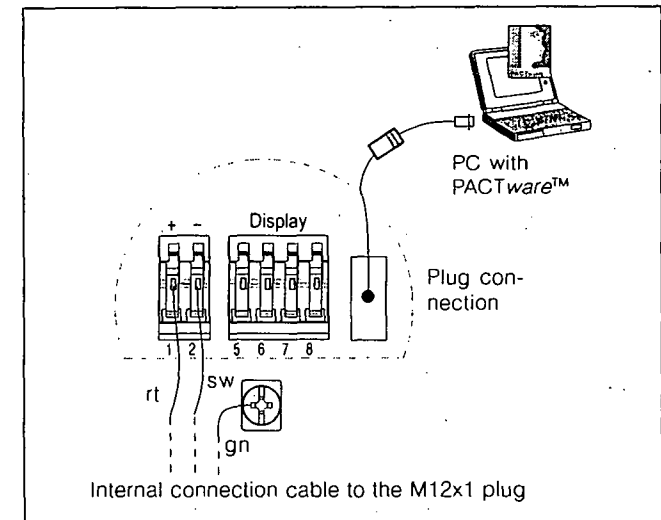


Fig. 33:
Wiring plan, remote electronics with M12x1 plug

Connect to power supply

VEGA

VEGA

Set-up with the indicating and adjustment module PLICSCOM

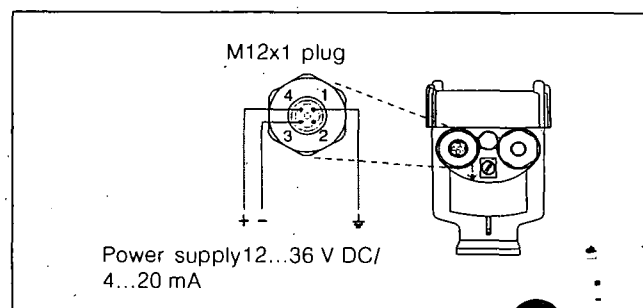


Fig. 34:
Wiring plan, single chamber housing, power supply

Function/Configuration

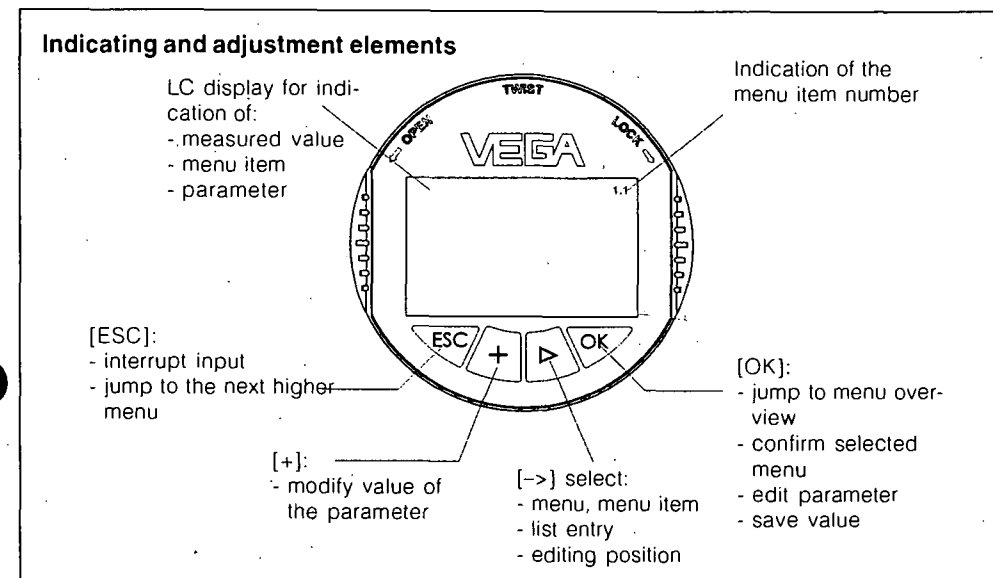
6 Set-up with the indicating and adjustment module PLICSCOM

6.1 Short description

The indicating and adjustment module PLICSCOM is used for measured value display, adjustment and diagnostics with VEGABAR 64. It is mounted into:

- the single chamber housing or
- the double chamber housing (optionally in electronics or connection compartment) or
- VEGADIS 61.

6.2 Adjustment system



Prüfzertifikat

für Druckmessumformer

Test certificate for pressure transmitters



VEGA bestätigt, dass die zur Qualitätsprüfung des Erzeugnisses eingesetzten Messmittel gültig kalibriert und auf nationale Normale der Physikalischen Technischen Bundesanstalt (PTB) rückführbar sind.
VEGA confirms that all instruments used to assure the quality of our products are calibrated and traceable to national standards of PTB (Physikalischen Technischen Bundesanstalt)

VEGA Grieshaber KG, Am Hohenstein 113, 77761 Schiltach, Tel. 0 78 36/50-0, Fax. 0 78 36/50 201

Druckmessumformer / Pressure transmitter: WELL72
Messbereich / Measuring range: 0 bis/to 1 bar rel.
 0 bis/to 100 kPa rel.
Seriennummer / Series no.: 13823629
Ausgang / Output: 4 ... 20mA, HART
Zulassungen / Approvals: OHNE

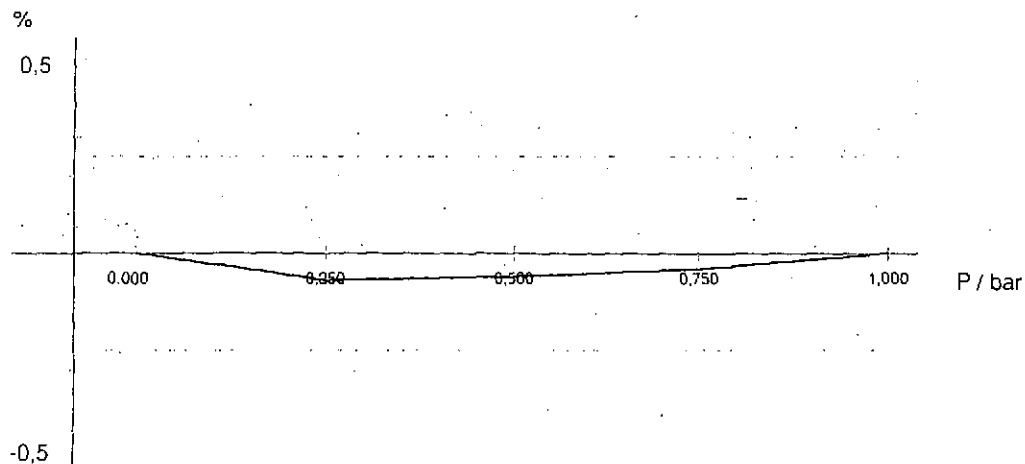
Kundennummer 44741
 Customer ID
Auftragsnummer 1130748
 Order number
Auftragsposition 1
 Order position

Kennwerte / Characteristics: 0,000 bis/to 1,000 bar rel.
 4,002 bis/to 20,006 mA

Kennliniencharakteristik / Output characteristics:

max. zul. Abweichung bezogen auf Messbereich: < 0,25 %
 / Dev. in linearity rel. to measuring range

Ref.-Druck / Ref. pressure [bar]:	0,000	0,250	0,500	0,750	1,000
Soll-Ausgang / Ideal output [mA]:	4,002	8,003	12,003	16,003	20,006
Ist-Ausgang / Real output [mA]:	4,002	7,993	11,994	15,996	20,006
Abweichung / Accuracy [%]:	0,00	-0,07	-0,06	-0,04	0,00



Temperatureinfluss

/ Temperature influence:

Temperaturfehler bei 0 bar rel.

/ Temperature accuracy at 0 bar rel.

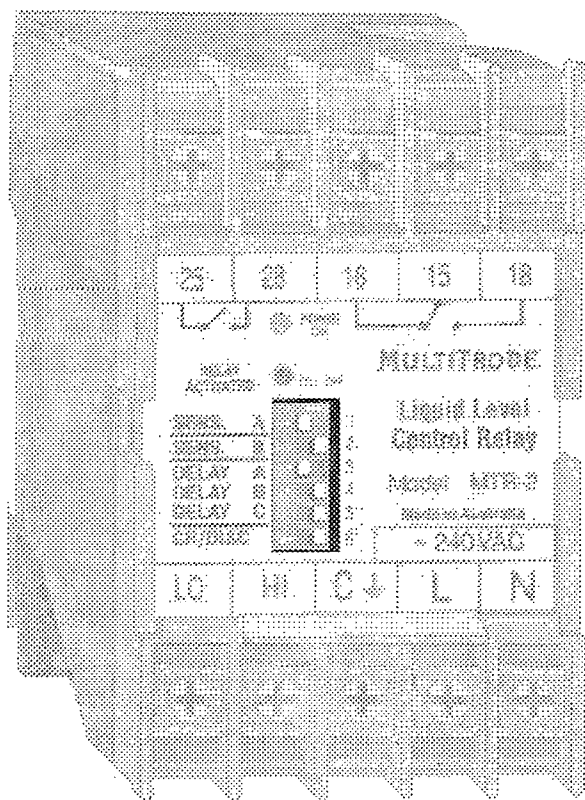
bezogen auf den Messbereich / Related to the measuring range

bei Temperatur 20 °C / Ref. temperature 20 °C

Temperatur [°C] Temperature	0	20	60	100
Ist-Ausgang [mA] Real output	4,000	4,002	3,996	4,006
Abweichung [%] Accuracy	-0,02	0,00	-0,04	0,02

Datum / Date: 09.03.2004

Unterschrift / Signature:



Controls either one pump, alarm or solenoid.

The MultiTrode MTR is a latching conductive liquid level relay. When connected to a MultiTrode probe, the MTR controls the activation and de-activation of pumps, alarms and other monitoring and control equipment.

The relay senses the liquid via a safe extra-low voltage signal 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. A single sensor may be used for alarms.

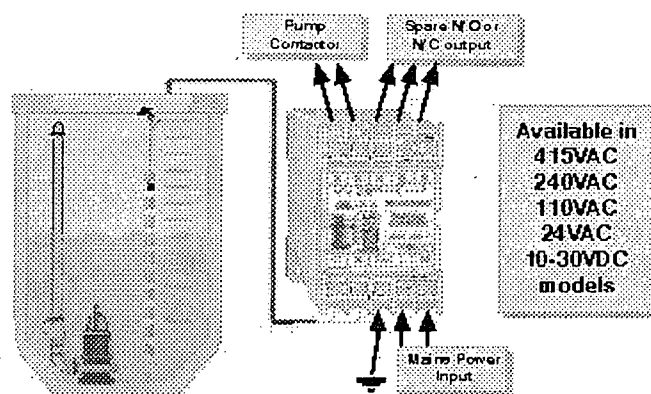
The MTR relay offers many features found in several discrete devices such as latching and time delay relays. Normally all of these devices must be installed individually. MultiTrode's MTR includes all of these features in one compact case, simplifying installation and reducing labour costs.

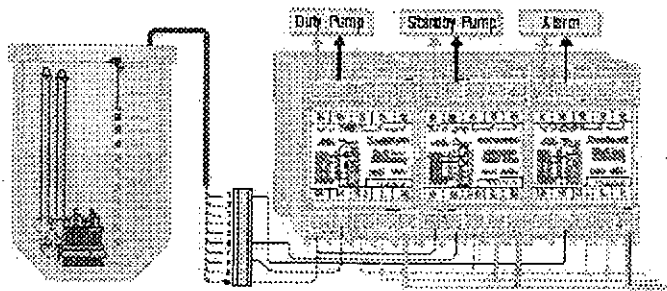
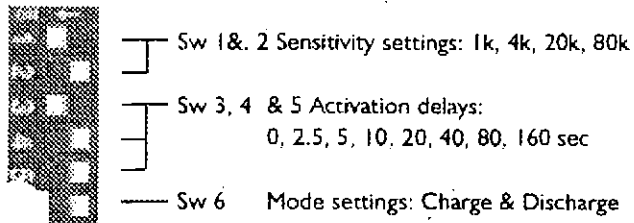
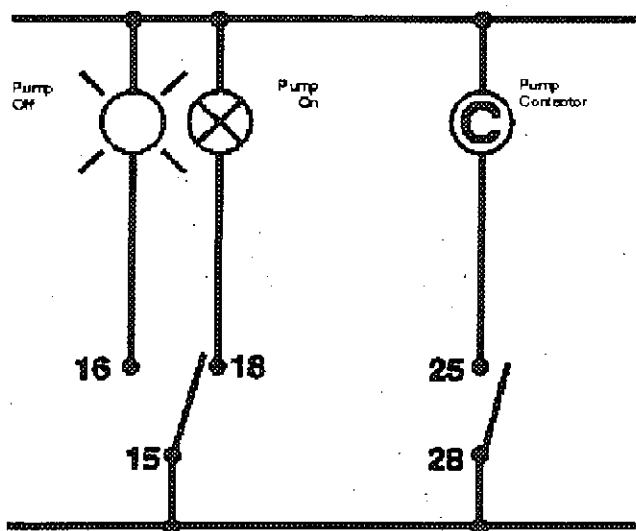
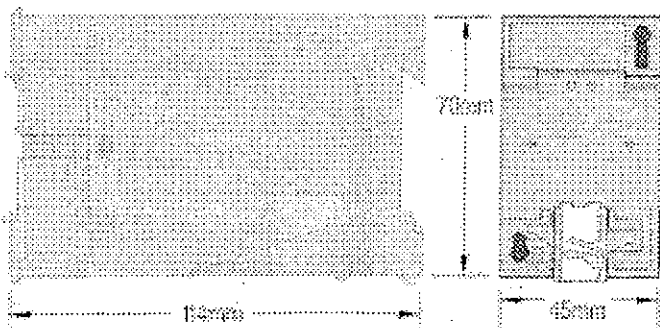
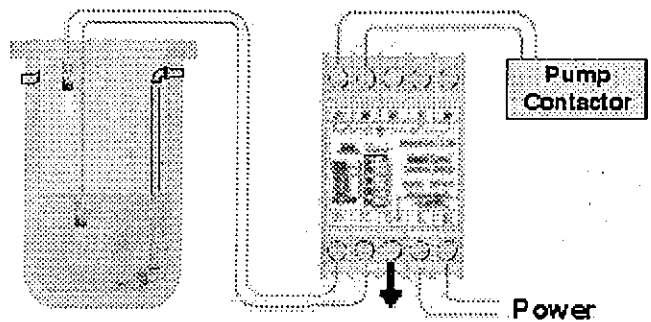
Use the MTR in any applications where level control is required, such as sumps, wells, bores, collection tanks, effluent pits, drainage ponds, pump stations, reservoirs, and large pits.

After many years of field use, the simplicity and reliability of these units is unquestionable.

- Safe, extra-low, sensing voltage: Ensures safety for operators and maintenance personnel.
- Charge or discharge: The modes of operation are selectable to either fill or empty a tank.
- Dip Switch Programmable: All settings are easily selected from the front panel. Fixed settings ensure repetition and accuracy.
- 4 Sensitivities: Enable the relay to operate effectively in a wide range of conductive liquids.
- 8 Activation Delays. Used for staggering multiple pump starts or to overcome premature activation due to wave action or turbulence.
- LED Indication. Power On (green) and Relay Activation (red) via high intensity LED indicators.
- Battery Operation. As well as 24, 110, 240 and 415VAC, the MTR Relay is also available in 10-30 VDC.
- Proven Reliability. The proven design of the relay ensures long-term reliability of the MultiTrode system.
- I.S. application Perfect for I.S. application when used with MTISB.
- DIN rail or screw mounting
- Low installed cost

SAMPLE MTR APPLICATION



SAMPLE MTR APPLICATION**DIP SWITCH SETTINGS****WIRING DIAGRAM****PHYSICAL DIMENSIONS****SAMPLE APPLICATION****PRODUCT SPECIFICATIONS****Mode of operation:**

MTR

Charge/Discharge (Fill or Empty)

Probe Inputs:

Sensor inputs	MTR : 2 / MTRA : 3
Sensor voltage	10/12VAC Nominal
Sensor current	0.8mA max. (per sensor)
Sensitivity	1k, 4k, 20k, 80k

Relay Outputs:

MTR relay output	2 contact sets : 1 N/O & 1 C/O
MTR Output delay	0, 2.5, 5, 10, 20, 40, 80, 160 sec
Relay contact rating	250 VAC 5A Resistive, 2A Inductive
Relay contact life	10 ⁴ Operations
Terminal size	2 x 2.5mm ² , #13

Display LEDs:

MTR

Power On	Pump	Alarm
Green	Red	

Physical Product:

Dimensions (mm)	72H x 45W x 114D
Mounting	DIN Rail or 2 x M4 Screws #6
Enclosure	Makrolon (self extinguishing)

Power Supply:

Supply Voltage AC	24, 110, 240, 415VAC* - 50/60Hz
Power Consumption	3.5 Watts max * (MTR only)
Supply Voltage DC	12 or 24VDC
Power Consumption	3 watts max

Environmental Range:

Centigrade	- 10° to +60°C
Fahrenheit	+14° to +140°F

**AVAILABLE MODELS**

415VAC	MTR1	n/a
240VAC	MTR2	MTRA2
110VAC	MTR3	MTRA3
24VAC	MTR4	MTRA4
24VDC	MTR5	MTRA5
12VDC	MTR6	MTRA6

Ordering Information & Example

Model	Voltage
MTRA	2

This order code is for a 240VAC MTRA.

All MultiTrode Products carry a two year warranty

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sales@multitrode.com.au

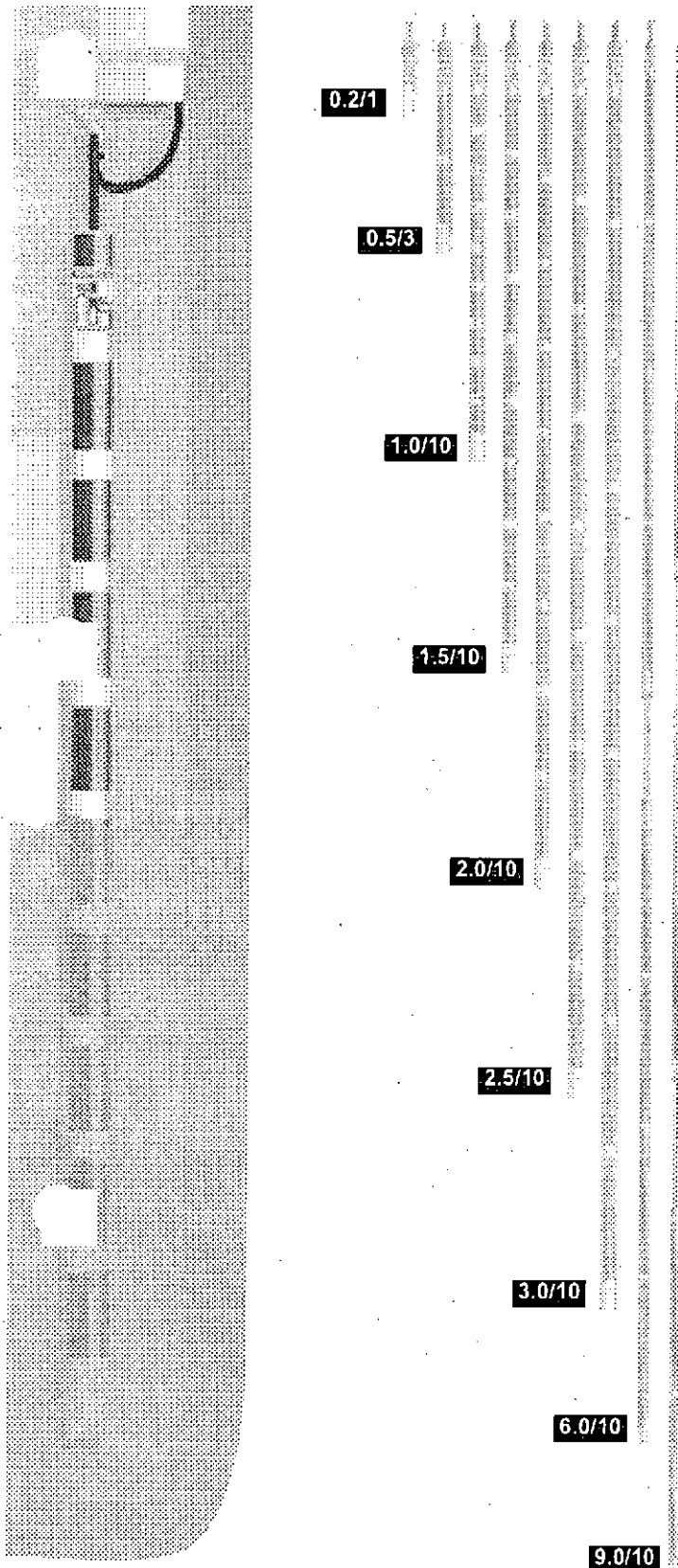
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MultiTrode Inc. - USA

6560 East Rogers Circle,
Boca Raton FL 33487
Tel: +1 561 994 8090 Fax: +1 561 994 6282
E-mail: sales@multitrode.net



The patented MultiTrode Probe has proven to be the most reliable and cost-effective liquid level control solution available.

MULTITRODE PROBES WERE SPECIFICALLY DESIGNED FOR THE ARDUOUS, TURBULENT CONDITIONS ENCOUNTERED IN WATER, SEWAGE AND INDUSTRIAL TANKS AND SUMPS.

- Low maintenance required
- Simple installation from outside of sump
- Safe, low sensing voltage
- Unaffected by fat, grease, debris and foam
- Excellent in turbulent sumps
- Positive pump cut-out (no overruns)
- Cost-savings, short and long term
- Environmentally friendly
- Intrinsically safe operation using MTISB Barrier

INSTALLATION: Probe installation is easily achieved without the need to enter the wet area. The probe is simply lowered in from the top and suspended by its own cable, using the mounting kit supplied.

FAT, GREASE, DEBRIS AND FOAM: The probe's operation is unaffected by the build up of fat, grease debris and foam, which cause systems such as floats, bubblers, pressure and ultrasonic transducers, as well as other conductive probe systems, to fail.

TURBULENCE: Turbulence does not affect the probes operation. In fact it has a beneficial cleaning effect. The rugged, streamlined construction of the probe eliminates tangling, allows for operation in confined spaces and is a perfect partner for the Flygt mix & flush valve.

SAFETY: The personal safety of operators and maintenance staff is assured, due to the extra-low sensing voltage. Eliminates the use of dangerous, high-voltage equipment, and the risk of electric shock.

POSITIVE PUMP CUT-OUT: The probe ensures pumps are turned off at the same level every time. This avoids damage due to pump over-run and the cost of additional control equipment.

COST SAVINGS: The low cost of equipment and installation makes MultiTrode one of the most economical systems available. MultiTrode's long life ensures continued cost savings, as compared to alternate forms of level control.

ENVIRONMENTALLY SAFE: MultiTrode products do not contain mercury or any other environmentally damaging contaminants.

MULTITRODE PROBES HAVE PROVEN TO BE THE MOST RELIABLE AND COST-EFFECTIVE LIQUID LEVEL CONTROL SYSTEM AVAILABLE AND WERE SPECIFICALLY DESIGNED FOR THE ARDUOUS, TURBULENT CONDITIONS ENCOUNTERED IN WATER, SEWAGE AND INDUSTRIAL TANKS AND SUMPS.

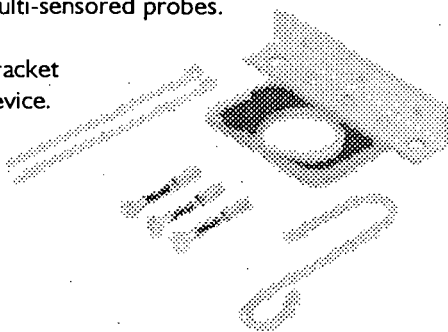
Custom-made single or multiple section probes are available with up to 25 sensors.

INSTALLATION

MTAK-I Mounting Kit (Supplied)

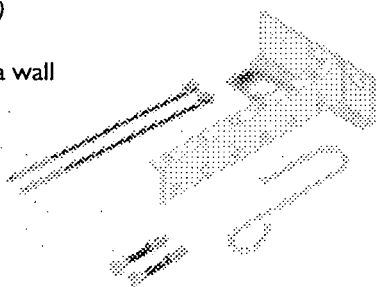
The mounting bracket is standard accessory that is supplied with all multi-sensored probes.

The MTAK-I mounting bracket has an integral cleaning device. All metal components are manufactured from stainless steel.

**MTAK2 Mounting Kit (optional extra)**

(* NOT INCLUDED AS STANDARD)

Extended mounting bracket provides up to 300mm of extra wall clearance.



SPECIFICATIONS

Materials:

Sensors:	Avesta 254 SMO High Grade Stainless Steel Alloy
Casing:	uPVC Premium Quality Extruded Tube
Cable:	PVC/PVC Multi-core, Purpose manufactured (see below)

Dimensions: 32mm diameter x specified length.

Mounting: Via the supplied suspension/cleaning bracket inside the wet well

Environmental Range:

0°C to +65°C
32°C to +149°F

Cable: Ten-core Three-core Single-core

Conductor Size	0.75mm ²	0.75mm ²	1.0mm ²
Strands/ Conductor	24	24	30
Ohms/km	25	25	20
Ohms/mile	40	40	32

*(Other multi-core cables are available for non-standard probes)

Oversheath:

Nom diameter 12mm 8mm 6.9mm

Colours: Multi cores Light blue/white
Oversheath Dark blue/Light blue

Identification:

All cores are printed: "I-ONE-I" etc.
every 200mm.

(Numbering applies to multi-core cable only).

CUSTOM PROBES

MultiTrode offers a variety of custom probes to suit your application.

Custom probes are manufactured exactly to your requirements, within the following limits.

No. of Sensors	25 max
Sensor spacing	85mm min
Section length*	3m max
Cable length	500m max

* Note. Probes over three metres in length are made in sections.

Your assistance with an application drawing, specifying cable lengths and sensor spacings will ensure prompt and accurate service. Please contact a MultiTrode sales representative for a copy of the "Custom Probe Order Form"

Custom
Sensor
Pattern
Probe

Extended
Length Probe

MultiTrode offers a wide range of standard probes.

- Single-sensor Probes are 200mm in length.
- Three-sensor Probes are 500mm in length.
- Ten-sensor Probes start from 1000mm in length, increasing in 500mm increments to a maximum of 9 metres
- Standard cable lengths for all probes are 10, 20 or 30metres

NOTE Custom probes are available (see left of page)

Ordering Examples and Information

Model Code	Probe length	Distance between sensors	Cable length	Number of sensors
	A	B	C	D
0.2/1- 10	0.2m	N/A	10m	1
0.5/3-10	0.5m	150mm	10m	3
1.0/10- 10	1m	100mm	10m	10
1.5/10-30	1.5m	150mm	30m	10
2.0/10-30	2m	200mm	30m	10
2.5/10-30	2.5m	250mm	30m	10
3.0/10-30	3m	300mm	30m	10
6.0/10-30	6m	600mm	30m	10
9.0/10-30	9m	900mm	30m	10

A = Nominal probe length

B = Distance between sensor points

C = Cable length

D = Number of sensors

Standard Probe Ordering Example

Probe Length	Sensor Points	Cable Length
2.5	10	10

This code is for a 2.5m probe with 10 sensors & 10m of cable.

All MultiTrode Products carry a full two year warranty

MultiTrode Pty Ltd Head Office

130 Kingston Road, Underwood Qld 4119
PO Box 2465, Logan City D.C. Qld 4114

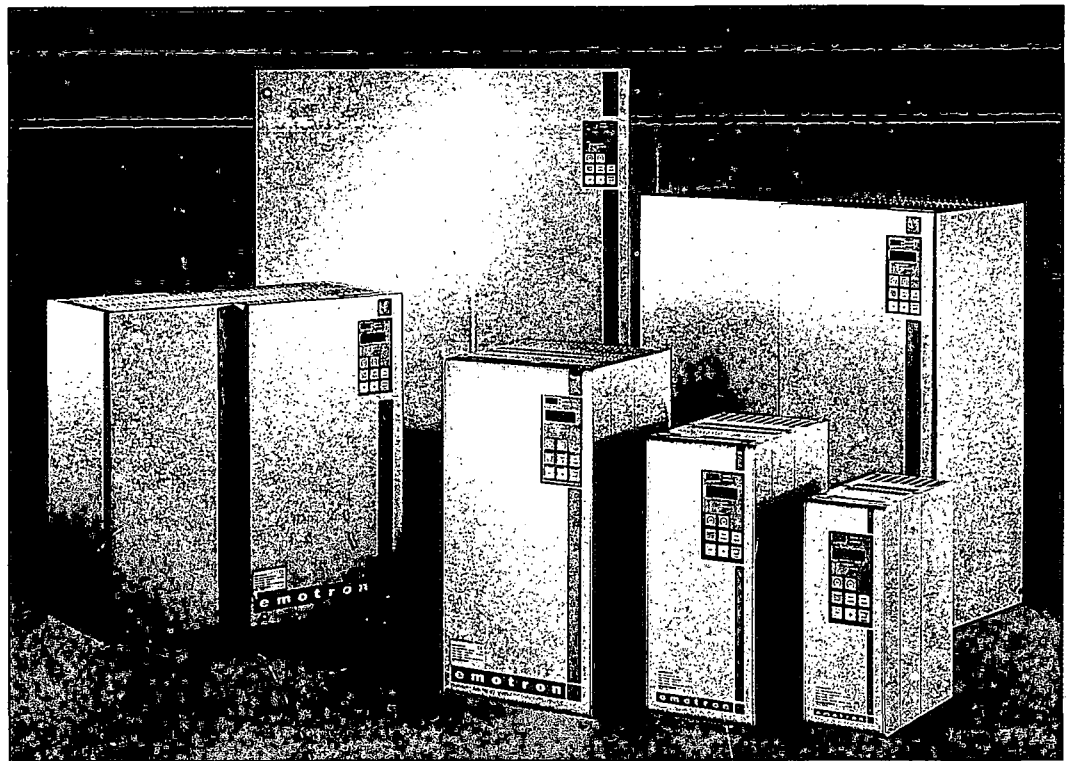
MULTITRODE

Sydney - Australia

Melbourne - Australia

MultiTrode Inc. - USA

6560 East Rogers Circle,
Boca Raton FL 33487



MSF SOFTSTARTERS

INSTRUCTION MANUAL

Valid for the following Soft starter Models:
MSF-017 to MSF-1400

SOFT STARTER MSF 045



Motor Current: 45 A	AC-53a 5.0-30 : 50-10
Motor Current: 60 A	AC-53a 3.0-30 : 50-10
Motor Voltage: 3x200-525V	50/60 Hz
Supply Voltage: 1x100-240V	50/60 Hz
Max fuse & Power rating:	See instruction manual
Enclosure: IP20	

Made in Sweden, Emotron AB

PN:01-1303-01

SN: 360453

MSF SOFT STARTER INSTRUCTION MANUAL

Document number: 01-1363-01

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Date of release: 2003-02-03

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SAFETY INSTRUCTIONS

Safety

The soft starter should be installed in a cabinet or in an electrical control room.

- The device must be installed by trained personnel.
- Disconnect all power sources before servicing.
- Always use standard commercial fuses, slow blow e.g. type gI, gG, to protect the wiring and prevent short circuiting. To protect the thyristors against short-circuit currents, superfast semiconductor fuses can be used if preferred. The normal guarantee is valid even if superfast semiconductor fuses are not used.

Operating and maintenance personnel

1. Read the whole Instruction Manual before installing and putting the equipment into operation.
2. During all work (operation, maintenance, repairs, etc.) observe the switch-off procedures given in this instruction as well as any other operating instruction for the driven machine or system. See Emergency below.
3. The operator must avoid any working methods which reduce the safety of the device.
4. The operator must do what he can to ensure that no unauthorised person is working on the device.
5. The operator must immediately report any changes to the device which reduce its safety to the user.
6. The user must undertake all necessary measures to operate the device in perfect condition only.

Installation of spare parts

We expressly point out that any spare parts and accessories not supplied by us have also not been tested or approved by us.

Installing and/or using such products can have a negative effect on the characteristics designed for your device. The manufacturer is not liable for damage arising as a result of using non-original parts and accessories.

Emergency

You can switch the device off at any time with the mains switch connected in front of the soft starter (both motor and control voltage must be switched off).

Dismantling and scrapping

The enclosure of the soft starter is made of recyclable material as aluminium, iron and plastic. Legal requirements for disposal and recycling of these materials must be complied with.

The soft starter contains a number of components demanding special treatment, as for example thyristors. The circuit board contain small amounts of tin and lead. Legal requirements for disposal and recycling of these materials must be complied with.

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1. GENERAL INFORMATION

1.1 Integrated safety systems

The device is fitted with a protection system which reacts to:

- Over temperature.
- Voltage unbalance.
- Over- and under voltage.
- Phase reversal
- Phase loss
- Motor overload protection thermal and PTC.
- Motor load monitor, protecting machine or process max or min alarm
- Starts per hour limitation

The soft starter is fitted with a connection for protective earth \perp (PE).

MSF soft starters are all enclosed IP 20, except MSF-1000 and MSF-1400 which are delivered as open chassi IP00.

1.2 Safety measures

These instructions are a constituent part of the device and must be:

- Available to competent personnel at all times.
- Read prior to installation of the device.
- Observed with regard to safety, warnings and information given.

The tasks in these instructions are described so that they can be understood by people trained in electrical engineering. Such personnel must have appropriate tools and testing instruments available. Such personnel must have been trained in safe working methods.

The safety measures laid down in DIN norm VDE 0100 must be guaranteed.

The user must obtain any general and local operating permits and meet any requirements regarding:

- Safety of personnel.
- Product disposal.
- Environmental protection.

NOTE! The safety measures must remain in force at all times. Should questions or uncertainties arise, please contact your local sales outlet.

1.3 Notes to the Instruction Manual



WARNING! Warnings are marked with a warning triangle.

Serial number

The information given in these instructions only applies to the device with the serial number given on the label on the front page. A plate with the serial number is fixed to the device.

Important

For all enquiries and spare parts orders, please quote the correct name of the device and serial number to ensure that your inquiry or order is dealt with correctly and swiftly.

NOTE! These instructions only apply to the soft starters having the serial number given on the front page, and not for all models.

1.4 How to use the Instruction Manual

This instruction manual tells you how to install and operate the MSF soft starter. Read the whole Instruction Manual before installing and putting the unit into operation. For simple start-up, read chapter 2. page 8 to chapter 3. page 10.

Once you are familiar with the soft starter, you can operate it from the keyboard by referring to the chapter 13. page 79. This chapter describes all the functions and possible setting.

1.5 Standards

The device is manufactured in accordance with these regulations.

- IEC 947-4-2
- EN 60204-1 Electrical equipment of machines, part 1, General requirements and VDE 0113.
- EN 50081-2, EMC Emission
- EN 50081-1, EMC Emission with bypass
- EN 50082-2, EMC Immunity
- GOST
- UL508

1.6 Tests in accordance with norm EN60204

Before leaving the factory, the device was subjected to the following tests:

- Through connection of earthing system;
 - a) visual inspection.
 - b) check that earthing wire is firmly connected.
- Insulation
- Voltage
- Function

1.7 Inspection at delivery

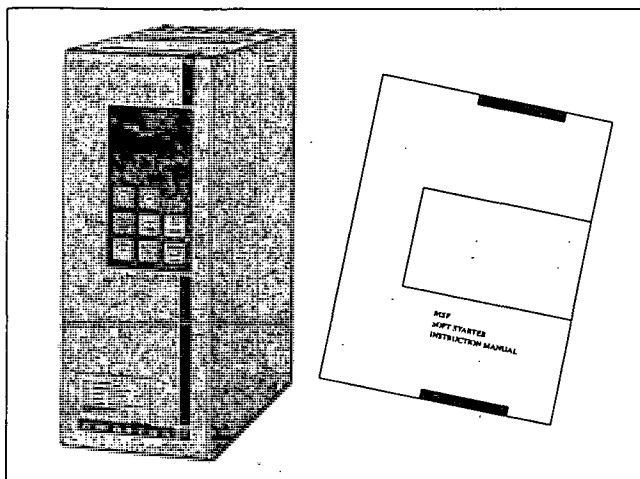


Fig. 1 Scope of delivery.

1.7.1 Transport and packing

The device is packed in a carton or plywood box for delivery. The outer packaging can be returned. The devices are carefully checked and packed before dispatch, but transport damage cannot be ruled out.

Check on receipt:

- Check that the goods are complete as listed on the delivery note, see type no. etc. on the rating plate.

Is the packaging damaged?

- Check the goods for damage (visual check).

If you have cause for complaint

If the goods have been damaged in transport:

- Contact the transport company or the supplier immediately.
- Keep the packaging (for inspection by the transport company or for returning the device).

Packaging for returning the device

- Pack the device so that it is shock-resistant.

Intermediate storage

After delivery or after it has been dismantled, the device can be stored before further use in a dry room.

1.8 Unpacking of MSF-310 and larger types

The soft starter is attached to the plywood box/loading stool by screws, and the soft starter must be unpacked as follows:

1. Open only the securing plates at the bottom of the box (bend downwards). Then lift up the box from the loading stool, both top and sides in one piece.
2. Loosen the three (3 pcs) screws on the front cover of the soft starter, down by the lower logo.
3. Push up the front cover about 20 mm so that the front cover can be removed.
4. Remove the two (2 pcs) mounting screws at the bottom of the soft starter.
5. Lift up the soft starter at the bottom about 10 mm and then push backwards about 20 mm so that the soft starter can be removed from the mounting hooks* at the top. The hooks are placed under the bottom plate and cannot be removed until the soft starter is pulled out.
6. Loosen the screws (2 pcs) for the mounting hooks and remove the hooks.
7. The hooks are used as an upper support for mounting the soft starter.

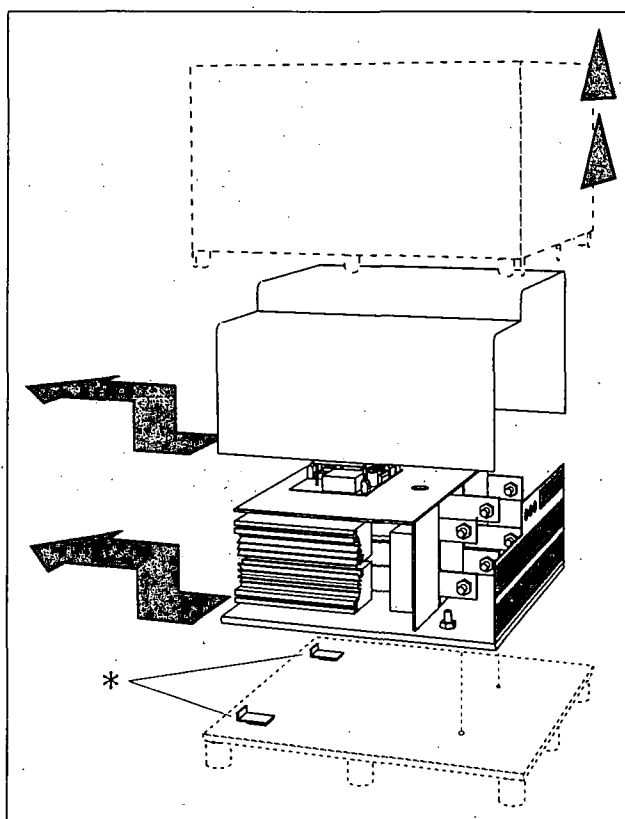
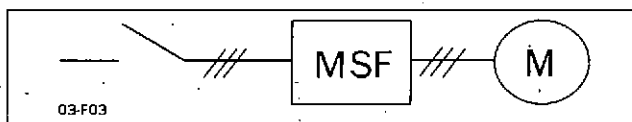


Fig. 2 Unpacking of MSF-310 and larger models.

2. DESCRIPTION

2.1 General

The MSF is installed directly between the mains and the supply cable to the motor. If a mains contactor is used it can be activated by the integrated K1 relay.



The MSF is developed for soft starting, stopping and braking three-phase motors.

There are 3 different kinds of soft starting control methods:

- **Control method 1-Phase**
The single phase controlled soft starters provide only a reduction in starting torque no control of current or torque. These starters need a main and bypass contactor as well as external motor protections. This is an open loop voltage controller. These starters are mainly in the power up to 7.5 kW.
- **Control method 2-Phase**
The two phase starters can start a motor without a mains contactor, but in that case voltage still is present at the motor when it's stopped. These starters are mainly in the power up to 22 kW.
- **Control method 3-Phase**
In the three phase Soft Starters there are different technologies:
 - Voltage control
 - Current control
 - Torque control

Voltage control

This method is the most used control method. The starter gives a smooth start but doesn't get any feedback on current or torque. The typical settings to optimize a voltage ramp are: Initial voltage, ramp time, dual ramp time.

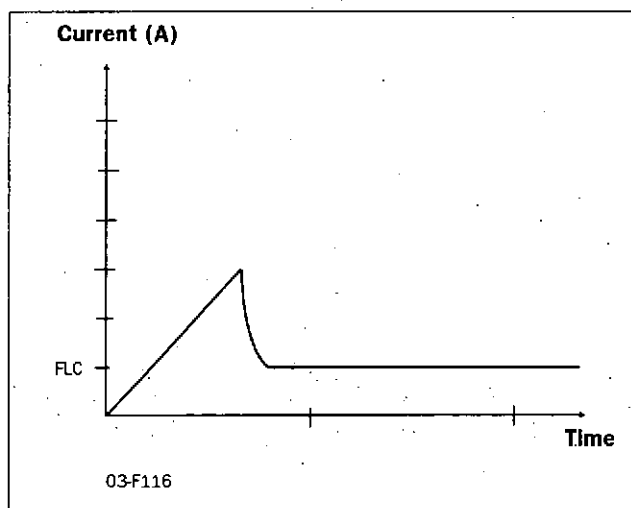


Fig. 3 Voltage control

Current control

The voltage ramp can be used with a current limit which stops the voltage ramp when the set maximum current level is reached. The maximum current level is the main setting and must be set by the user depending on the maximum current allowed for the application.

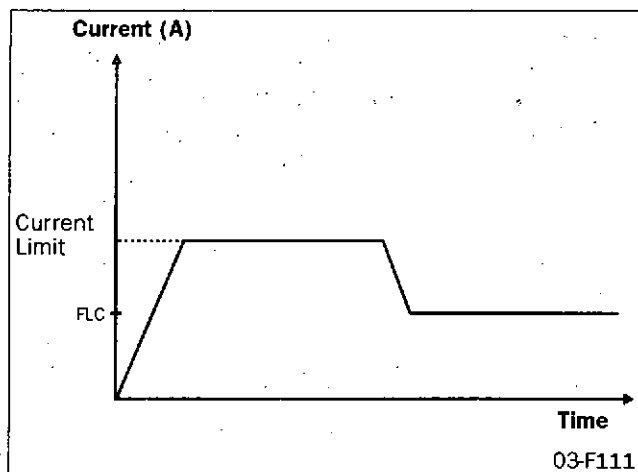


Fig. 4 Current control

Torque control

Is the most sufficient way of starting motors. Unlike voltage and current based systems the soft starter monitors the torque need and allows to start with the lowest possible current. Using a closed loop torque controller also linear ramps are possible. The voltage ramp can not hold back the motor starting torque this results in a current peak and unlinear ramps. In the current ramp there will be no peak current, but a higher current for a longer period of time during the start compared to torque control. Current starting doesn't give linear ramps. The linear ramps are very important in many applications. For an example, to stop a pump with an unlinear ramp will give water hammer. Soft starters which doesn't monitor the torque, will start and stop too fast if the load is lighter than the setting of current or ramp time.

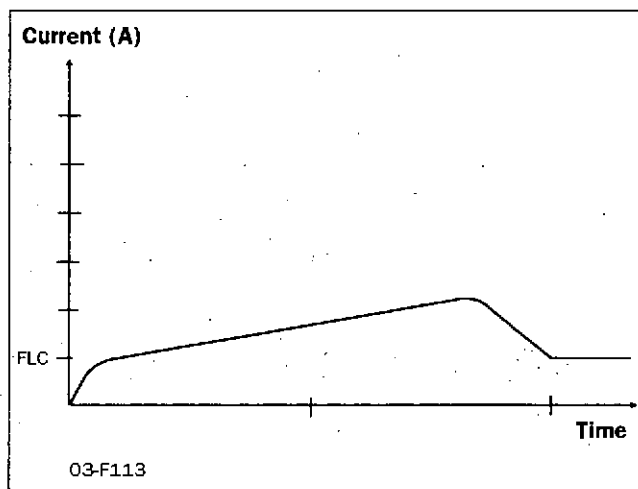


Fig. 5 Torque control

2.2 MSF control methods

MSF Soft Starters control all three phases supplied to the motor. It manages all the 3 possible starting methods where the closed loop Torque control is the most efficient way of starting and stopping motors.

2.2.1 General features

As mentioned above soft starters offer you several features and the following functions are available:

- Torque controlled start and stop
- Current limit control at start
- Application "Pump"
- External analogue input control
- Torque booster at start
- Full voltage start (D.O.L)
- Dual voltage ramp at start and stop
- Bypass
- Dynamic DC-brake or Softbrake
- Slow speed at start and stop
- Jogging forward and reverse
- Four parameter sets
- Analogue output indicating current, power or voltage
- Viewing of current, voltage, power, torque, power consumption, elapsed time etc.
- Integrated safety system acc. to § 1.1, page 6, with an alarm list.

3. HOW TO GET STARTED

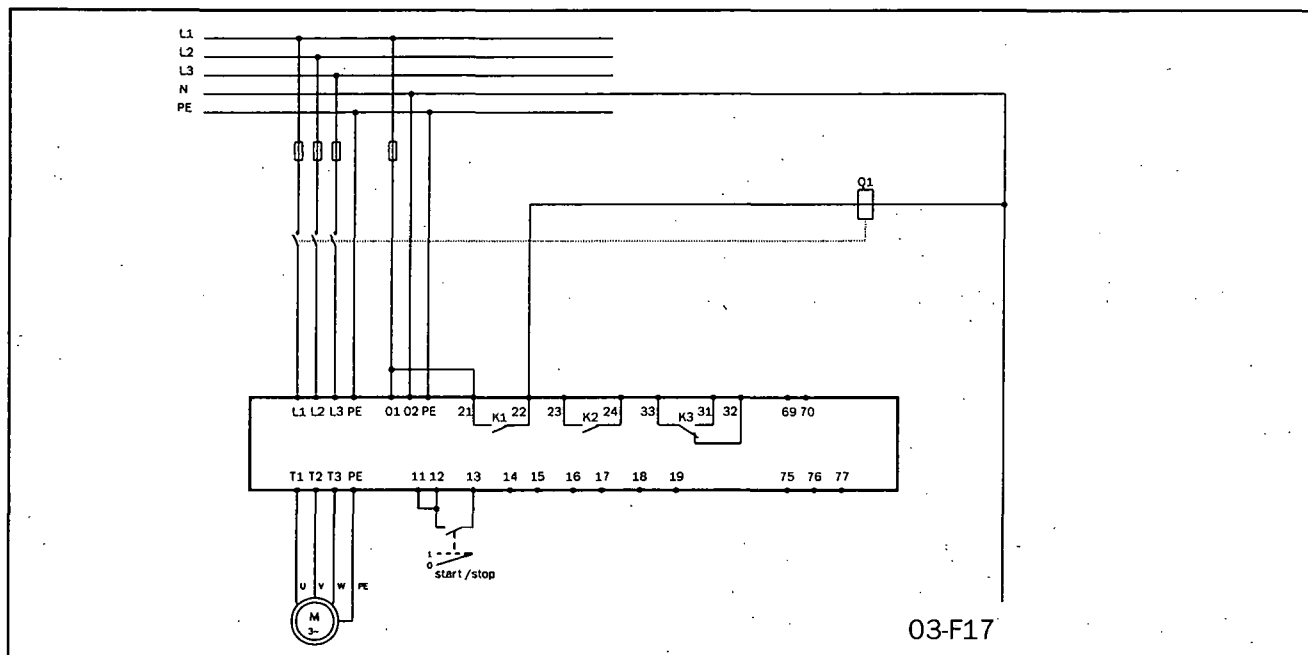


Fig. 6 Standard wiring.

This chapter describes briefly the set-up for basic soft start and soft stop by using the default "Voltage Ramp" function.



WARNING! Mounting, wiring and setting the device into operation must be carried out by properly trained personnel. Before set-up, make sure that the installation is according to chapter 6, page 24 and the Checklist below.

3.1 Checklist

- Mount the soft starter in accordance with chapter 6, page 24.
- Consider the power loss at rated current when dimensioning a cabinet; max. ambient temperature is 40°C (see chapter 12, page 74).
- Connect the motor circuit according to Fig. 6.
- Connect the protective earth.
- Connect the control voltage to terminals 01 and 02 (100 - 240 VAC or 380-500 VAC).
- Connect relay K1 (PCB terminals 21 and 22) to the contactor - the soft starter then controls the contactor.
- Connect PCB terminals 12 and 13 to, e.g., a 2-way switch (closing non-return) or a PLC, etc., to obtain control of soft start/soft stop.¹⁾
- Check that the motor and supply voltage corresponds to values on the soft starter's rating plate.
- Ensure the installation complies with the appropriate local regulations.

1) The menu 006 must be put to 01 for start/stop command from keyboard.

3.2 Main functions/Applications



WARNING! Make sure that all safety measures have been taken before switching on the supply.

Switch on the control voltage (normally 1 x 230 V), all segments in the display and the two LED's will be illuminated for a few seconds. Then the display will show menu 001. An illuminated display indicates there is supply voltage on the PCB. Check that you have mains voltage on the mains contactor or on the thyristors. The settings are carried out according to following:

The first step in the settings is to set menu 007 and 008 to "ON" to reach the main functions 020-025 and motor data 041-046.

NOTE! The main function is chosen according to the application. The tables in the applications and functions selection (table 1, page 15), gives the information to choose the proper main function.

3.3 Motor Data

Set the data, according to the motor type plate to obtain optimal settings for starting, stopping and motor protection.

NOTE! The default settings are for a standard 4-pole motor acc. to the nominal power of the soft-starter. The soft starter will run even if no specific motor data is selected, but the performance will not be optimal.

041°	
Nominal motor voltage	
4 0 0	
Default:	400 V
Range:	200-700 V

046°	
Nominal frequency	
5 0	
Default:	50 Hz
Range:	50/60 Hz

NOTE! Now go back to menu 007 and set it to "oFF" and then to menu 001.

042°	
Nominal motor current	
4 5	
Default:	Nominal current soft starter
Range:	25% - 150% of $I_{n_{soft}}$ in Amp

043°	
Nominal motor power	
2 2	
Default:	Nominal power soft starter
Range:	25% - 300% of $P_{n_{soft}}$ in kW

044°	
Nominal motor speed	
1 4 5 0	
Default:	Nominal speed soft starter
Range:	500-3600 rpm

045°	
Nominal motor cos phi	
. 8 6	
Default:	0.86
Range:	0.50-1.00

3.4 Setting of the start and stop ramps

The menu's 002 and 003 can now be set to adjust the start ramp up time and the stop ramp down time.

002°	
Start time ramp 1	
1 0	
Default:	10 sec
Range:	1-60 sec

Estimate the starting-time for the motor/machine. Set "ramp up time" at start (1-60 sec).

Key "ENTER ↵" to confirm new value.

Key "NEXT →", "PREV ←" to change menu.

004°	
Stop time ramp 1	
o F F	
Default:	oFF
Range:	oFF, 2-120 sec

Set "ramp down time" at stop (2-120 s).

"oFF" if only soft start requires.

3.5 Setting the start command

As default the start command is set for remote operation via terminal 11, 12 and 13. For easy commissioning it is possible to set the start command on the start key on the keyboards. This is set with menu 006.

006 ^o	
Selection of control mode	
<div> <div></div> <div></div> <div></div> <div>2</div> </div>	
Default:	2
Range:	1,2,3

Menu 006 must be set to 1 to be able to operate from keyboard.

NOTE! Factory default setting is remote control (2).

To start and stop from the keyboard, the "START/STOP" key is used.

To reset from the keyboard, the "ENTER ↵ / RESET" key is used. A reset can be given both when the motor is running and when the motor is stopped. A reset by the keyboard will not start or stop the motor.

3.6 Viewing the motor current

Set the display to menu 005. Now the Motor current can be viewed on the display.

005 ^o	
RMS current read-out	
<div> <div></div> <div></div> <div>0.0</div> </div>	
Default:	-
Range:	0.0-9999 Amp.

NOTE! The menu 005 can be selected at any time when the motor is running.

3.7 Starting



WARNING! Make sure that all safety measures have been taken before starting the motor in order to avoid personal injury.

Start the motor by pressing the "START/STOP" key on the keyboard or through the remote control, PCB terminal 11, 12 and 13. When the start command is given, the mains contactor will be activated by relay K1 (PCB terminal 21 and 22), and the motor then starts softly.

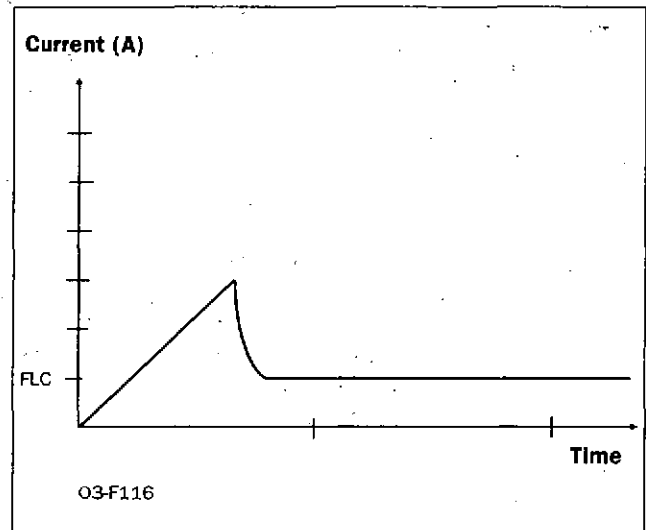


Fig. 7 Example of start ramp with main function voltage ramp.

4. APPLICATIONS AND FUNCTIONS SELECTION

This chapter is a guide to select the correct soft starter rating and the selection of the Main function and additional functions for each different application.

To make the right choice the following tools are used:

- **The norm AC53a.**
This norm helps selecting the soft starter rating with regard to duty cycle, starts per hour and maximum starting current.
- **The Application Rating List.**
With this list the soft starter rating can be selected depending on the kind of application used. The list use 2 levels of the AC53a norm. See table 1, page 15.
- **The Application Function List.**
This table gives an complete overview of most common applications and duties. For each applications the menu's that can be used are given. See table 2, page 17.
- **Function and Combination matrix.**
With these tables it is easy to see which combinations of Main and additional functions are possible, see table 3, page 19 and table 4, page 19.

4.1 Soft starter rating according to AC53a

The IEC947-4-2 standard for electronic starters defines AC53a as a norm for dimensioning of a soft starter.

The MSF soft starter is designed for continuous running. In the Applications table (table 1, page 15) two levels of AC53a are given. This is also given in the technical data tables (see chapter 12, page 74).

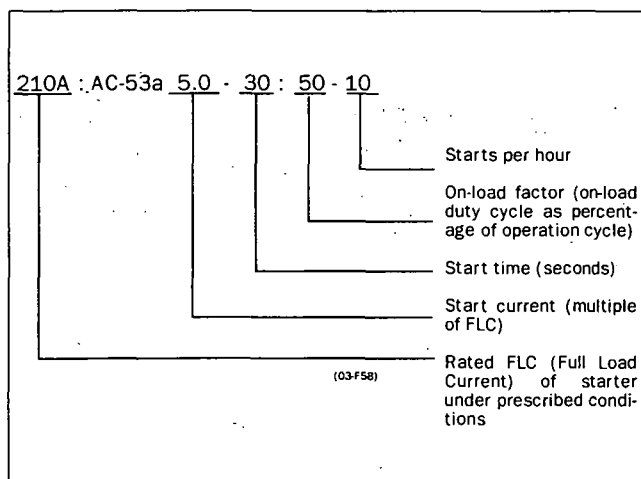


Fig. 8 Rating example AC53a.

The above example indicates a current rating of 210 Amps with a start current ratio of 5.0 x FLC (1050A) for 30 seconds with a 50% duty cycle and 10 starts per hour.

NOTE! If more than 10 starts/hour or other duty cycles are needed, please contact your supplier.

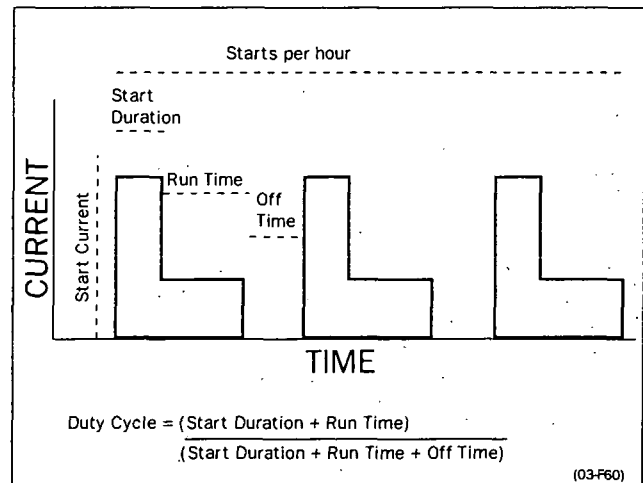


Fig. 9 Duty cycle, non bypass.

4.2 Soft starter rating according to AC53b

This norm is made for Bypass operation. Because the MSF soft starter is designed for continuous operation this norm is not used in the selection tables in this chapter.

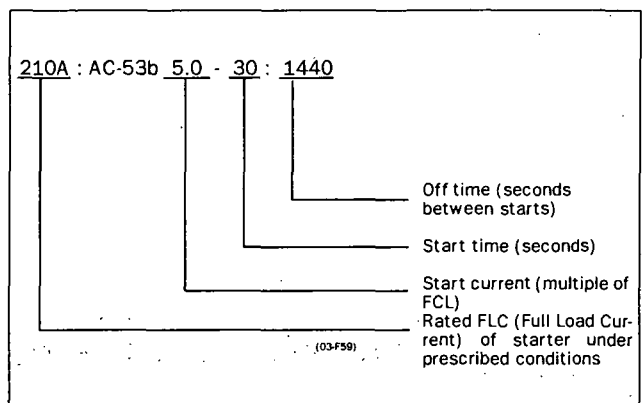


Fig. 10 Rating example AC53b.

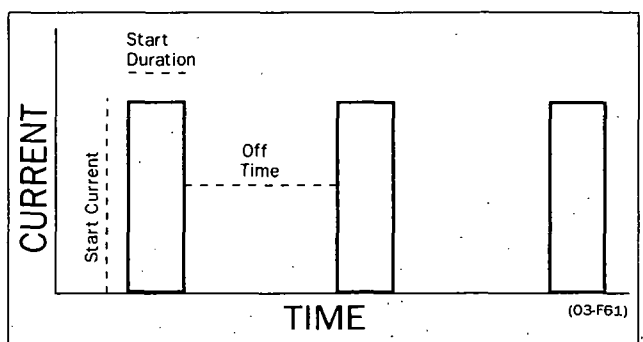


Fig. 11 Duty cycle, bypassed

The above example indicates a current rating of 210 Amps with a start current ratio of 5.0 x FLC (1050A) for 30 seconds with a 24-minute period between starts.

4.3 MSF Soft starter ratings

According to the norms AC53a and AC53b a soft starter can have many current ratings.

NOTE! Because the MSF soft starter is designed for continuous operation the norm AC53b is not used in the application rating list.

With help of the Application Rating List with typical starting currents and categories in the AC53a level (see table 1, page 15 and table 2, page 17) it is easy to select the proper soft starter rating with the application.

The Application Rating List uses two levels for the AC53a norm:

- **AC53a 5.0-30:50-10 (heavy duty)**
This level will be able to start all applications and follows directly the type number of the soft starter.
Example: MSF 370 is 370 Amps FLC and then 5 times this current in starting.
- **AC 53a 3.0-30:50-10 (normal/light duty)**
This level is for a bit lighter applications and here the MSF can manage a higher FLC.
Example: MSF 370 in this norm manage 450 Amps FLC and the 3 times this current in starting

NOTE! To compare Soft Starters It's important to ensure that not only FLC (Full Load Current) is compared but also that the operating parameters are identical.

EXAMPLE:

Roller Mill:

- This is an application for heavy duty,
- Typical starting current of 450%.
- Main function Torque ramp start (menu 25) will give the best results.
- Stop function Dynamic Brake (menu 36, selection 1) can be used.
- As well as the Slow Speed at start and stop (menu 38-40) can be used for better start and stop performance.

4.4 The Application Ratings List

Table 1 gives the Application Ratings List. With this list the rating for the soft starter and Main Function menu can be selected.

Description and use of the table:

- **Applications.**
This column gives the various applications. If the machine or application is not in this list, try to identify a similar machine or application. If in doubt please contact your supplier.
- **AC53a ratings.**
The rating according to AC53a norm is here classified in 2 ratings. The first for normal/light duty (3.0-30:50-10) and the second for heavy duty (5.0-30:50-10)
- **Typical Starting current.**
Gives the typical starting current for each application
- **Main Function menu.**
The Main Function menu is advised here.
"25;=1", means: program selection 1 in menu 25.
- **Stop function.**
Gives a possible Stop function if applicable.
"36;=1 / 38-40", means: program selection 1 in menu 36, also menus 38 to 40 can be selected.

Table 1 Applications Rating List

Applications	AC53a 3.0-30:50-10 (normal/light)	AC 53a 5.0-30:50-10 (heavy)	Typical starting current %	Main function Menu nr.	Stop function Menu nr.
General & Water					
Centrifugal Pump	x		300	22	22
Submersible Pump	x		300	22	22
Conveyor		x	300-400	25;=1	36;=1 / 38-40
Compressor: Screw	x		300	25	-
Compressor, Reciprocating	x		400	25;=1	-
Fan	x		300	25;=2	-
Mixer		x	400-450	25;=1	-
Agitator		x	400	25;=1	-
Metals & Mining					
Belt Conveyor		x	400	25;=1	36;=1 / 38-40
Dust Collector	x		350	25;=1	-
Grinder	x		300	25;=1	36;=1
Hammer Mill		x	450	25;=1	36;=2
Rock Crusher		x	400	25;=1	-
Roller Conveyor	x	x	350	25;=1	36;=1 / 38-40
Roller Mill		x	450	25;=1	36;=1 or 2
Tumbler		x	400	25;=1	-
Wire Draw Machine		x	450	25;=1	36;=1 or 2
Food Processing					
Bottle Washer	x		300	25;=2	
Centrifuge		x	400	25;=1	36;=1 or 2
Dryer		x	400	25;=2	
Mill		x	450	25;=1	36;=1 or 2
Palletiser		x	450	25;=1	
Separator		x	450	25;=1	36;=1 or 2
Slicer	x		300	25;=1	
Pulp and Paper					
Re-Pulper		x	450	25;=1	
Shredder		x	450	25;=1	
Trolley		x	450	25;=1	
Petrochemical					
Ball Mill		x	450	25;=1	
Centrifuge		x	400	25;=1	36;=1 or 2
Extruder		x	500	25;=1	
Screw Conveyor		x	400	25;=1	
Transport & Machine Tool					
Ball Mill		x	450	25;=1	
Grinder		x	350	25;=1	36;=1
Material Conveyor		x	400	25;=1	36;=1 / 38-40
Palletiser		x	450	25;=1	
Press		x	350	25;=1	
Roller Mill		x	450	25;=1	
Rotary Table		x	400	25;=1	36;=1 / 38-40
Trolley		x	450	25;=1	
Escalator		x	300-400	25;=1	
Lumber & Wood Products					
Bandsaw		x	450	25;=1	36;=1 or 2
Chipper		x	450	25;=1	36;=1 or 2
Circular Saw		x	350	25;=1	36;=1 or 2
Debarker		x	350	25;=1	36;=1 or 2
Planer		x	350	25;=1	36;=1 or 2
Sander		x	400	25;=1	36;=1 or 2

4.5 The Application Functions List

This list gives an overview of many different applications/duties and a possible solution with one of the many MSF functions.

Description and use of the table:

- **Application /Duty.**
This column gives the various applications and level of duty. If the machine or application is not in this list, try to identify a similar machine or application. If in doubt please contact your supplier.
- **Problem.**
This column describes possible problems that are familiar for this kind of application.
- **Solution MSF.**
Gives the possible solution for the problem using one of the MSF functions.
- **Menus.**
Gives the menu numbers and selection for the MSF function.
"25;=1", means: program selection 1 in menu 25.
"36;=1 / 34,35", means: program selection 1 in menu 36, menus 34 and 35 are related to this function.

Table 2 Application Function List

Application/ Duty	Problem	Solution MSF	Menus
PUMP Normal	Too fast start and stops	MSF Pump application with following start/stop features:	22
	Non linear ramps	Linear ramps without tacho.	
	Water hammer	Torque ramps for quadratic load	
	High current and peaks during starts.		
	Pump is going in wrong direction	Phase reversal alarm	88
	Dry running	Shaft power underload	96-99
	High load due to dirt in pump	Shaft power overload	92-95
COMPRESSOR Normal	Mechanical shock for compressor, motor and transmissions	Linear Torque ramp or current limit start.	25;=1 or 20,21
	Small fuses and low current available.		
	Screw compressor going in wrong direction	Phase sequence alarm	88
	Damaged compressor if liquid ammonia enters the compressor screw.	Shaft power overload	92-95
	Energy consumption due to compressor is running unloaded	Shaft power underload	96-99
CONVEYOR Normal/Heavy	Mechanical shocks for transmissions and transported goods.	Linear Torque ramp	25;=1
	Filling or unloading conveyors	Slow speed and accurate position control.	37-40,57,58
	Conveyor jammed	Shaft power overload	92-95
	Conveyor belt or chain is off but the motor is still running	Shaft power underload	96-99
	Starting after screw conveyor have stopped due to overload.	Jogging in reverse direction and then starting in forward.	
	Conveyor blocked when starting	Locked rotor function	75
FAN Normal	High starting current in end of ramps	Torque ramp for quadratic need	25;=2
	Slivering belts.		
	Fan is going in wrong direction when starting.	Catches the motor and going easy to zero speed and then starting in right direction.	
	Belt or coupling broken	Shaft power underload	96-99
	Blocked filter or closed damper.		
PLANER Heavy	High inertia load with high demands on torque and current control.	Linear Torque ramp gives linear acceleration and lowest possible starting current.	25;=1
	Need to stop quick both by emergency and production efficiency reasons.	Dynamic DC brake without Contactor for medium loads and controlled sensor less soft brake with reversing contactor for heavy loads.	36;=1,34,35 36;=2,34,35
	High speed lines	Conveyor speed set from planer shaft power analog output.	54-56
	Worn out tool	Shaft power overload	92-95
	Broken coupling	Shaft power underload	96-99
ROCK CRUSHER Heavy	High inertia	Linear Torque ramp gives linear acceleration and lowest possible starting current.	25;=1
	Heavy load when starting with material	Torque boost	30,31
	Low power if a diesel powered generator is used.		
	Wrong material in crusher	Shaft power overload	92-95
	Vibrations during stop	Dynamic DC brake without Contactor	36;=1,34,35
BANDSAW Heavy	High inertia load with high demands on torque and current control.	Linear Torque ramp gives linear acceleration and lowest possible starting current.	25;=1
	Need to stop quick both by emergency and production efficiency reasons.	Dynamic DC brake without Contactor for medium loads and controlled sensor less soft brake with reversing contactor for heavy loads.	36;=1,34,35 36;=2,34,35
	High speed lines	Conveyor speed set from band saw shaft power analog output.	54-56
	Worn out saw blade	Shaft power overload	
	Broken coupling, saw blade or belt	Shaft power underload	
CENTRIFUGE Heavy	High inertia load	Linear Torque ramp gives linear acceleration and lowest possible starting current.	25;=1
	To high load or unbalanced centrifuge	Shaft power overload	
	Controlled stop	Dynamic DC brake without Contactor for medium loads and controlled sensor less soft brake with reversing contactor for heavy loads.	36;=1,34,35 36;=2,34,35
	Need to open centrifuge in a certain position.	Braking down to slow speed and then positioning control.	37-40,57,58

Table 2 Application Function List

Application/ Duty	Problem	Solution MSF	Menus
MIXER Heavy	Different materials	Linear Torque ramp gives linear acceleration and lowest possible starting current.	25;=1
	Need to control material viscosity	Shaft power analog output	54-56
	Broken or damaged blades	Shaft power overload	92-95
		Shaft power underload	96-99
HAMMER MILL Heavy	Heavy load with high breakaway torque	Linear Torque ramp gives linear acceleration and lowest possible starting current.	25;=1
		Torque boost in beginning of ramp.	30,31
	Jamming	Shaft power overload	92-95
	Fast stop	Controlled sensor less soft brake with reversing contactor for heavy loads.	36;=2,34,35
	Motor blocked	Locked rotor function	75

EXAMPLE:

Hammer Mill:

- This is an application for heavy duty,
- Main function Torque ramp start (menu 25) will give the best results.
- Torque boost to overcome high breakaway torque (menu 30 and 31)
- Overload alarm function for jamming protection (menu 92 and 95)
- Stop function Soft Brake (menu 36, selection 2) can be used. Menu 34 and 35 to set the brake time and strength.

4.6 Function and combination matrix

Table 3 gives an overview of all possible functions and combination of functions.

1. Select function in the horizontal "Main Function" column. Only one function can be selected in this column, at a time.
2. In the vertical column "Additional Functions" you will find all possible function that can be used together with your selected main function.

Table 3 Combination matrix

Main Functions	Additional functions	Dual ramp start	Dual ramp stop	Bypass (032)	Power factor control (033)	Torque boost (030)	Jogging with keyboard/terminal	Timer controlled slow speed	External controlled slow speed	Complete protection	Parameter sets (061)	Dynamic Vector Brake (036-1)	Softbrake (036-2)
Voltage ramp start/stop (default)		X	X	X	X	X	X	X	X	X	X	X	
Torque control start/stop (menu 025)				X	X	X	X	X	X	X	X	X	
Voltage ramp with current limit (menu 020)			X	X	X	X	X	X	X	X	X	X	X
Current limit start (menu 021)			X	X	X	X	X	X	X	X	X	X	X
Pump control (menu 022)				X						X	X		
Analog input (menu 023)										X	X		
Direct on line start (menu 024)				X						X	X		

By using one parameter set, the following start/stop table is given.

NOTE! Voltage and torque ramp for starting only with softbrake.

Table 4 Start/stop combination.

START FUNCTION	STOP FUNCTION	Voltage ramp stop	Torque control stop	Pump control	Analog input	Direct on line stop	Dynamic Vector Brake	Softbrake
Voltage ramp start		X				X	X	X
Torque control start			X			X	X	X
Current limit start		X				X	X	X
Voltage ramp with current limit		X				X	X	X
Pump control				X		X		
Analog input					X	X		
Direct on line start						X		

By using different parameter sets for start and stop, it is possible to combine all start and stop functions.

4.7 Special condition

4.7.1 Small motor or low load

The minimum load current for the soft starter is 10% of the rated current of the soft starter. Except for the MSE-017 there the min. current is 2 A. Example MSE-210, rated current = 210 A. Min. Current 21 A. Please note that this is "min. load current" and not min. rated motor current.

4.7.2 Ambient temperature below 0°C

For ambient temperatures below 0°C e.g. an electrical heater must be installed in the cabinet. The soft starter can also be mounted in some other place, due to that the distance between the motor and the soft starter is not critical.

4.7.3 Phase compensation capacitor

If a phase compensation capacitor is to be used, it must be connected at the inlet of the soft starter, not between the motor and the soft starter.

4.7.4 Pole-changing contactor and two speed motor

The switching device must be connected between the output of the soft starter and the motor.

4.7.5 Shielded motor cable

It is not necessary to use shielded wires together with soft starters. This is due to the very low radiated emissions.

NOTE! The soft starter should be wired with shielded control cable to fulfill EMC regulations acc. to § 1.5, page 6.

4.7.6 Slip ring motors

Slip ring motors can not be used together with the soft starter. Unless the motor is rewinded (as a squirrel cage motor). Or keep the resistors in, please contact your supplier.

4.7.7 Pump control with soft starter and frequency inverter together

It is possible e.g. in a pump station with two or more pumps to use one frequency inverter on one pump and soft starters on each of the other pumps. The flow of the pumps can then be controlled by one common control unit.

4.7.8 Starting with counter clockwise rotating loads

It is possible to start a motor clockwise, even if the load and motor is rotating counter clockwise e.g. fans. Depending on the speed and the load "in the wrong direction" the current can be very high.

4.7.9 Running motors in parallel

When starting and running motors in parallel the total amount of the motor current must be equal or lower than the connected soft starter. Please note that it is not possible to make individual settings for each motor. The start ramp can only be set for an average starting ramp for all the connected motors. This applies that the start time may differ from motor to motor. This is also even if the motors are mechanically linked, depending on the load etc.

4.7.10 How to calculate heat dissipation in cabinets

See chapter 12, page 74 "Technical Data", "Power loss at rated motor load (I_N)", "Power consumption control card" and "Power consumption fan". For further calculations please contact your local supplier of cabinets, e.g. Rittal.

4.7.11 Insulation test on motor

When testing the motor with high voltage e.g. insulation test the soft starter must be disconnected from the motor. This is due to the fact that the thyristors will be seriously damaged by the high peak voltage.

4.7.12 Operation above 1000 m

All ratings are stated at 1000 m over sea level. If a MSF is placed for example at 3000 m it must be derated unless that the ambient temperature is lower than 40 °C and compensate for this higher pressure.

To get information about motors and drives at higher altitudes please contact your supplier to get technical information nr 151.

4.7.13 Reversing

Motor reversing is always possible. See Fig. 31 on page 34 for the advised connection of the reverse contactors.

At the moment that the mains voltage is switched on, the phase sequence is monitored by the control board. This information is used for the Phase Reverse Alarm (menu 88, see § 7.22, page 56).

However if this alarm is not used (factory default), it is also possible to have the phase reversal contactors in the input of the soft starter.

5. OPERATION OF THE SOFT STARTER

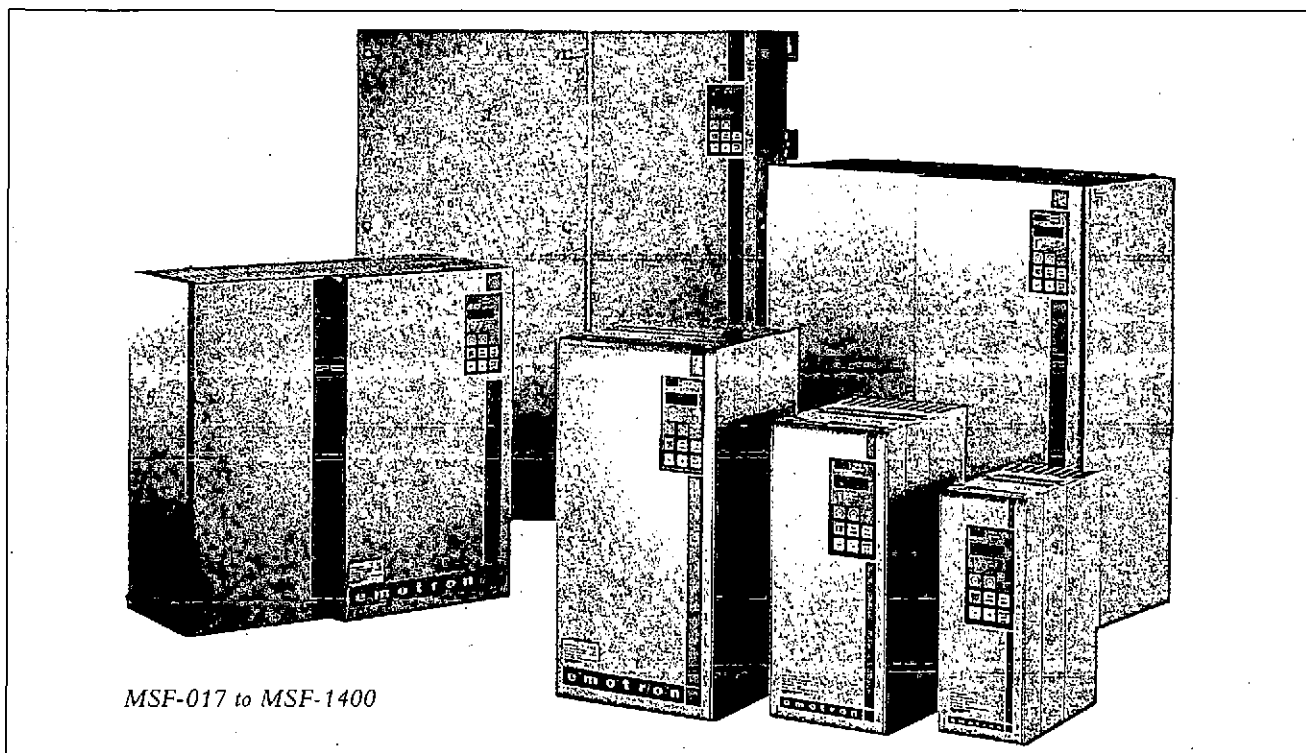


Fig. 12 MSF soft starter models.

5.1 General description of user interface



WARNING! Never operate the soft starter with removed front cover.

To obtain the required operation, a number of parameters must be set in the soft starter.

Setting/configuration is done either from the built-in keyboard or by a computer/control system through the serial interface or bus (option). Controlling the motor i.e. start/stop, selection of parameter set, is done either from the keyboard, through the remote control inputs or through the serial interface (option).

Setting



WARNING! Make sure that all safety measures have been taken before switching on the supply.

Switch on the supply (normally 1 x 230 V), all segments in the display will light up for a few seconds. Then the display will show menu 001. An illuminated display indicates there is supply voltage on the PCB.

Check that you have voltage on the mains contactor or on the thyristors. To be able to use all extended functions and optimize of the performance, program the motor data.

5.2 PPU unit

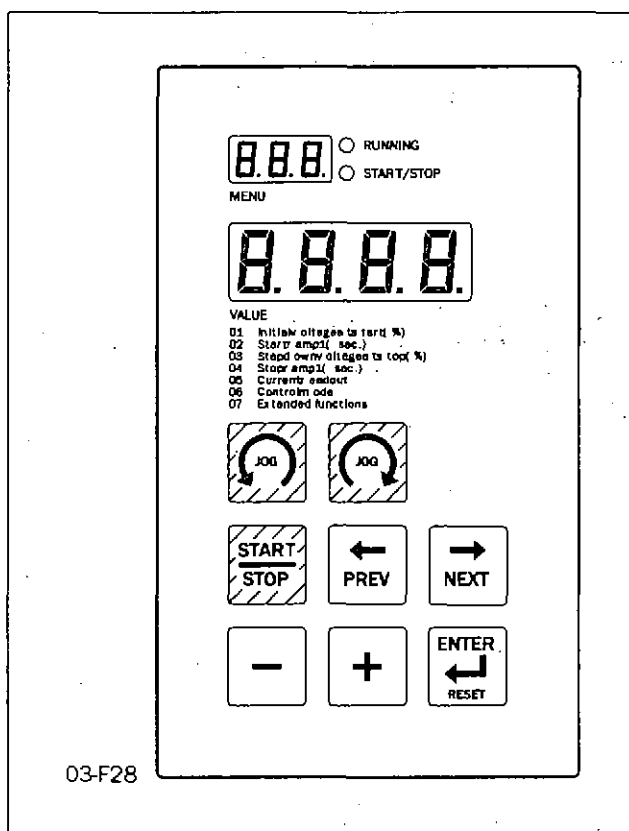


Fig. 13 PPU unit.

The programming and presentation unit (PPU) is a built-in operator panel with two light emitting diodes, three + four seven-segment LED-displays and a keyboard.

5.3 LED display

The two light emitting diodes indicates start/stop and running motor/machine. When a start command is given either from the PPU, through the serial interface (option) or through the remote control inputs, the start/stop-LED will be illuminated.

At a stop command the start/stop-LED will switch off. When the motor is running, the running-LED is flashing during ramp up and down and is illuminated continuously at full motor voltage.

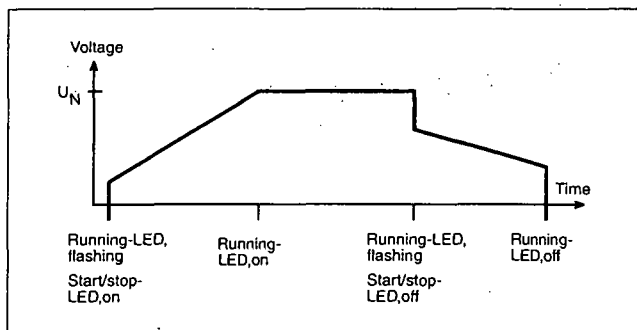


Fig. 14 LED indication at different operation situation.

5.4 The Menu Structure

The menus are organised in a simple one level structure with the possibility to limit the number of menus that are reachable by setting the value in menu 007 to "oFF" (factory setting). With this setting only the basic menus 001, 002, 003, 004, 005, 006 and 007 can be reached.

This to simplify the setting when only voltage start/stop ramps are used.

If menu 007 is in "on" and menu 008 "oFF" it is possible to reach all viewing menus and alarm lists as well.

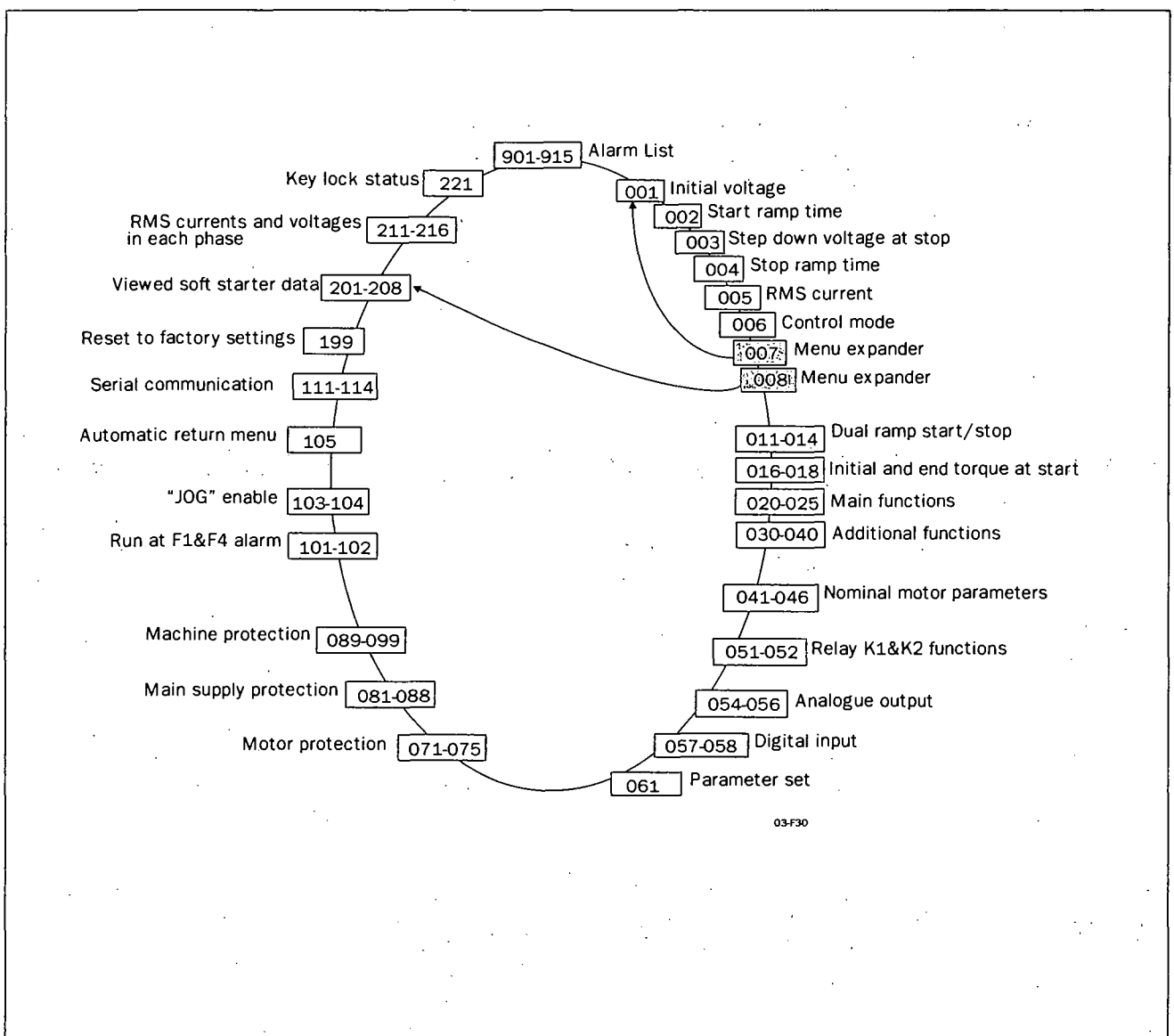


Fig. 15 Menu structure.

5.5 The keys



The function of the keyboard are based on a few simple rules. At power up menu 001 is shown automatically. Use the "NEXT →" and "PREV ←" keys to move between menus. To scroll through menu numbers, press and hold either the "NEXT →" or the "PREV ←" key. The "+" and "-" keys are used to increase respectively decrease the value of setting. The value is flashing during setting. The "ENTER ↵" key confirms the setting just made, and the value will go from flashing to stable. The "START/STOP" key is only used to start and stop the motor/machine. The  and  keys are only used for JOG from the keyboard. Please note one has to select enable in menu 103 or 104, see § 7.25, page 61.

Table 5 The keys









Start/stop motor operation.	
Display previous menu.	
Display next menu.	
Decrease value of setting.	
Increase value of setting.	
Confirm setting just made. Alarm reset.	
JOG Reverse	
JOG Forward	

Table 6 Control modes

Operation/ Set-up		Start/Stop	JOG fwd/rev	Alarm reset	Setting of parameters	
					Parameter set with external selection Menu 061=0	Parameter set with internal selection Menu 061=1-4
Control mode	Keyboard Menu 006=1	Unlocked keyboard	Keyboard	Keyboard	Keyboard	Keyboard
		Locked keyboard	_____	_____	_____	_____
Remote Menu 006=2	Unlocked keyboard	Remote	Remote	Remote and keyboard	Remote	Keyboard
		Locked keyboard	Remote	Remote	Remote	_____
Serial comm. Menu 006=3	Unlocked keyboard	Serial comm	Serial comm	Serial comm. and keyboard	_____	Serial comm
		Locked keyboard	Serial comm	Serial comm	_____	Serial comm

5.6 Keyboard lock

The keyboard can be locked to prohibit operation and parameter setting by an unauthorised. Lock keyboard by pressing both keys "NEXT →" and "ENTER ↵" for at least 2 sec. The message '- Loc' will display when locked. To unlock keyboard press the same 2 keys "NEXT →" and "ENTER ↵" for at least 2 sec. The message 'unlo' will display when unlocked.

In locked mode it is possible to view all parameters and read-out, but it is forbidden to set parameters and to operate the soft starter from the keyboard.

The message '-Loc' will display if trying to set a parameter or operate the soft starter in locked mode.

The key lock status can be read out in menu 221.

<div>221⁰</div> <div>0</div>	
<div> <div></div> <div></div> <div>n</div> <div>o</div> </div>	
Locked keyboard info	
Default:	no
Range:	no, YES
no	Keyboard is not locked
YES	Keyboard is locked

5.7 Overview of soft starter operation and parameter set-up.

Table with the possibilities to operate and set parameters in soft starter.

Control mode is selected in menu 006 and Parameter set is selected in menu 061. For the keyboard lock function, see § 7.30, page 65.

6. INSTALLATION AND CONNECTION

Mounting, wiring and setting the device into operation must be carried out by trained personnel (electricians specialised in heavy current technology):

- In accordance with the local safety regulations of the electricity supply company.
- In accordance with DIN VDE 0100 for setting up heavy current plants.

Care must be taken to ensure that personnel do not come into contact with live circuit components.



WARNING! Never operate the soft starter with removed front cover.

6.1 Installation of the soft starter in a cabinet

When installing the soft starter:

- Ensure that the cabinet will be sufficiently ventilated, after the installation.
- Keep the minimum free space, see the tables on page 25.
- Ensure that air can flow freely from the bottom to the top.

NOTE! When installing the soft starter, make sure it does not come into contact with live components. The heat generated must be dispersed via the cooling fins to prevent damage to the thyristors (free circulation of air).

MSF-017 to MSF-835 soft starters are all delivered as enclosed versions with front opening. The units have bottom entry for cables etc. see Fig. 25 on page 29 and Fig. 27 on page 31. MSF-1000 and MSF-1400 are delivered as open chassis.

NOTE! The soft starter should be wired with shielded control cable to fulfill EMC regulations acc. to § 1.5, page 6.

NOTE! For UL-approval use 75°C Copper wire only.

MSF-017 to MSF-250

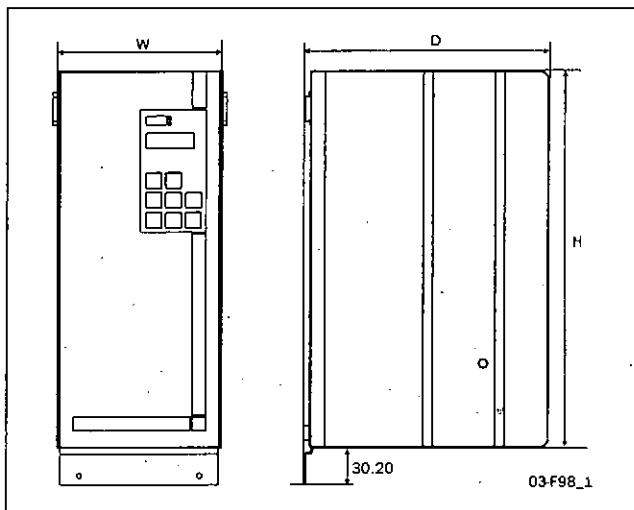


Fig. 16 MSF-017 to MSF-250 dimensions.

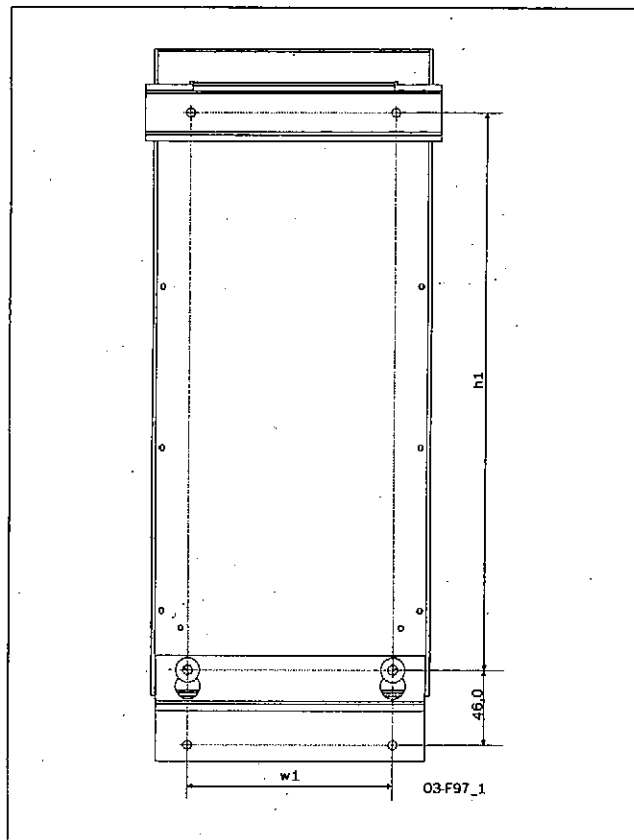


Fig. 17 Hole pattern for MSF-017 to MSF-250 (backside view).

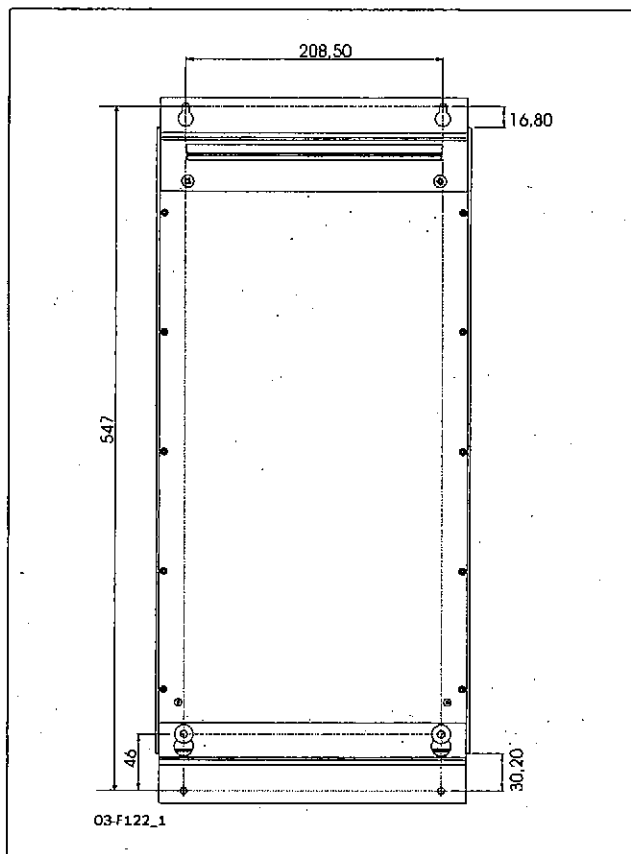


Fig. 18 Hole pattern for MSF-170 to MSF-250 with upper mounting bracket instead of DIN-rail.

MSF-017 to MSF-250

Table 7 MSF-017 to MSF-250.

MSF model	Class	Connection	Conv./ Fan	Dimension HxWxD (mm)	Hole dist. w1 (mm)	Hole dist. h1 (mm)	Diam./ screw	Weight (kg)
-017, -030	IP 20	Busbars	Convection	320x126x260	78.5	265	5.5/M5	6.7
-045, -060, -075, -085	IP 20	Busbars	Fan	320x126x260	78.5	265	5.5/M5	6.9
-110, -145	IP 20	Busbars	Fan	400x176x260	128.5	345	5.5/M5	12.0
-170, -210, -250	IP 20	Busbars	Fan	500x260x260	208.5	445	5.5/M5	20

Table 8 MSF-017 to MSF-250

MSF model	Minimum free space (mm):			Dimension Connection busbars Cu	Tightening torque for bolt (Nm)		
	above 1)	below	at side		Cable	PE-cable	Supply and PE
-017, -030, -045	100	100	0	15x4 (M6), PE (M6)	8	8	0.6
-060, -075, -085	100	100	0	15x4 (M8), PE (M6)	12	8	0.6
-110, -145	100	100	0	20x4 (M10), PE (M8)	20	12	0.6
-170, -210, -250	100	100	0	30x4 (M10), PE (M8)	20	12	0.6
1) Above: wall-soft starter or soft starter-soft starter							

MSF-310 to MSF-1400

Table 9 MSF-310 to MSF-1400 see Fig. 20 on page 26.

MSF model	Class	Connection	Conv./ Fan	Dimension HxWxD (mm)	Hole dist. w1 (mm)	Hole dist. h1 (mm)	Diam./ screw	Weight (kg)
-310	IP 20	Busbars	Fan	532x547x278	460	450	8.5/M8	42
-370, -450	IP 20	Busbars	Fan	532x547x278	460	450	8.5/M8	46
-570	IP 20	Busbars	Fan	687x640x302	550	600	8.5/M8	64
-710	IP 20	Busbars	Fan	687x640x302	550	600	8.5/M8	78
-835	IP 20	Busbars	Fan	687x640x302	550	600	8.5/M8	80
-1000, -1400	IP00	Busbar	Fan	900x875x336	Fig. 23		8.5/M8	175

Table 10 MSF-310 to MSF-1400.

MSF model	Minimum free space (mm):			Dimension Connection, busbars Al	Tightening torque for bolt (Nm)		
	above 1)	below	at side		Cable	PE-cable	Supply and PE
-310, -370, -450	100	100	0	40x8 (M12)	50	12	0.6
-570, -710, -835	100	100	0	40x10 (M12)	50	12	0.6
-1000, -1400	100	100	100	75x10 (M12)	50	12	0.6
1) Above: Wall-soft starter or soft starter-soft starter							

265
46
371

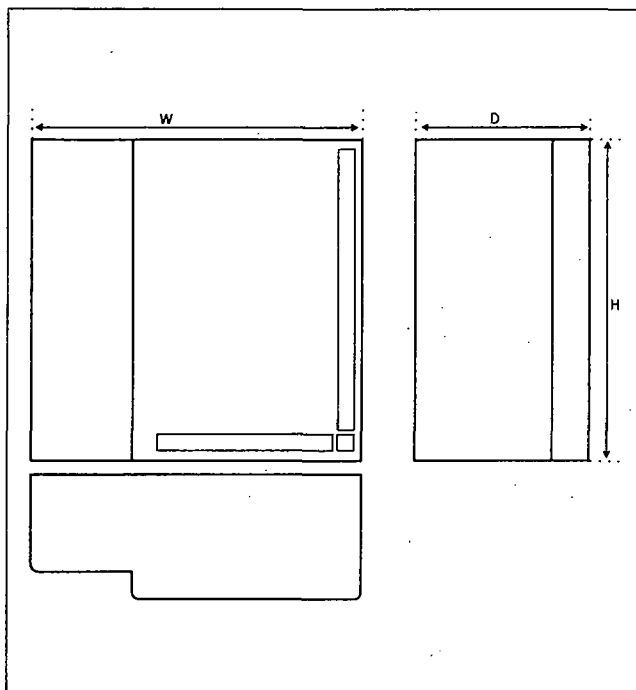


Fig. 19 MSF -310 to MSF -835.

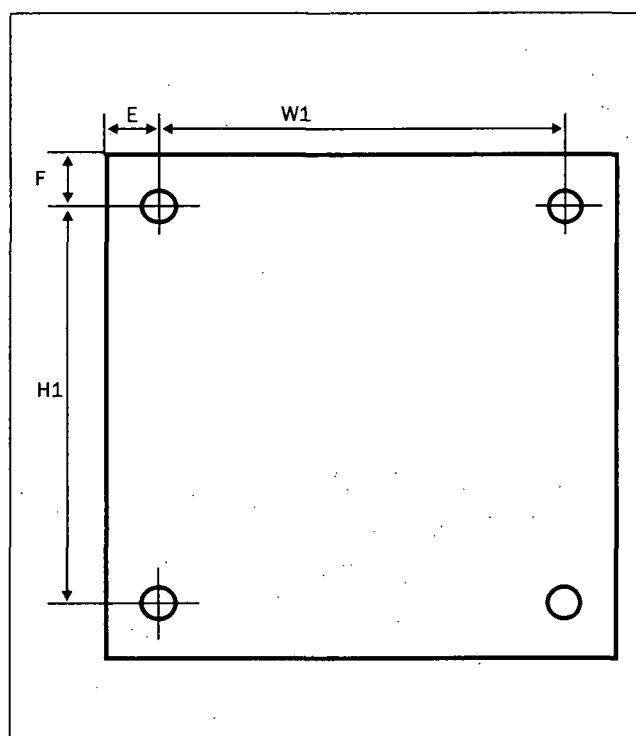


Fig. 20 Hole pattern for screw attachment, MSF-310 to MSF-835. Hole distance (mm).

MSF	e	f
-310 to -450	44	39
-570 to -835	45.5	39

Observe that the two supplied mounting hooks (see § 1.8, page 7 and Fig. 2 on page 7 must be used for mounting the soft starter as upper support (only MSF-310 to MSF-835).

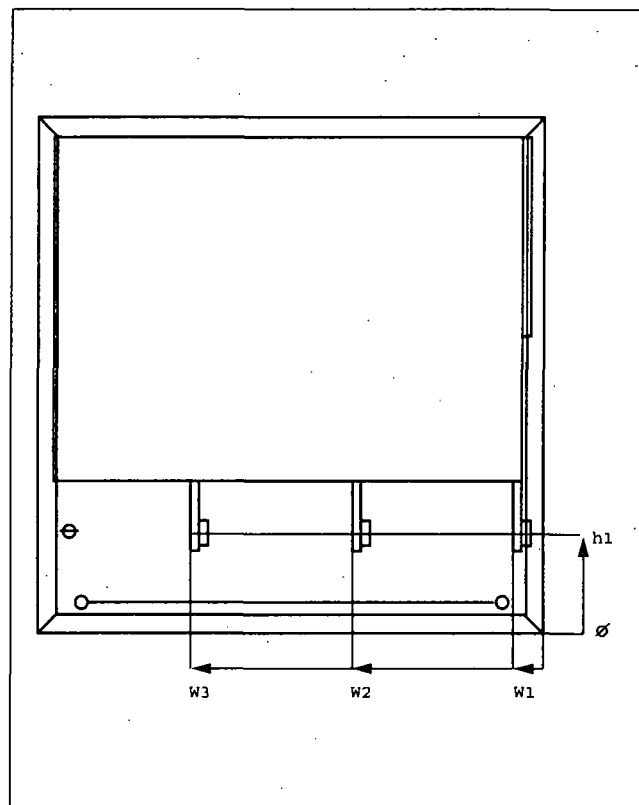


Fig. 21 Busbar distances MSF -310 to MSF -835.

Table 11 Busbar distances

MSF model	Dist. h1 (mm)	Dist. w1 (mm)	Dist. w2 (mm)	Dist. w3 (mm)
-310 to -450	104	33	206	379
-570 to -835	129	35	239.5	444
-1000 -1400		55	322.5	590.5

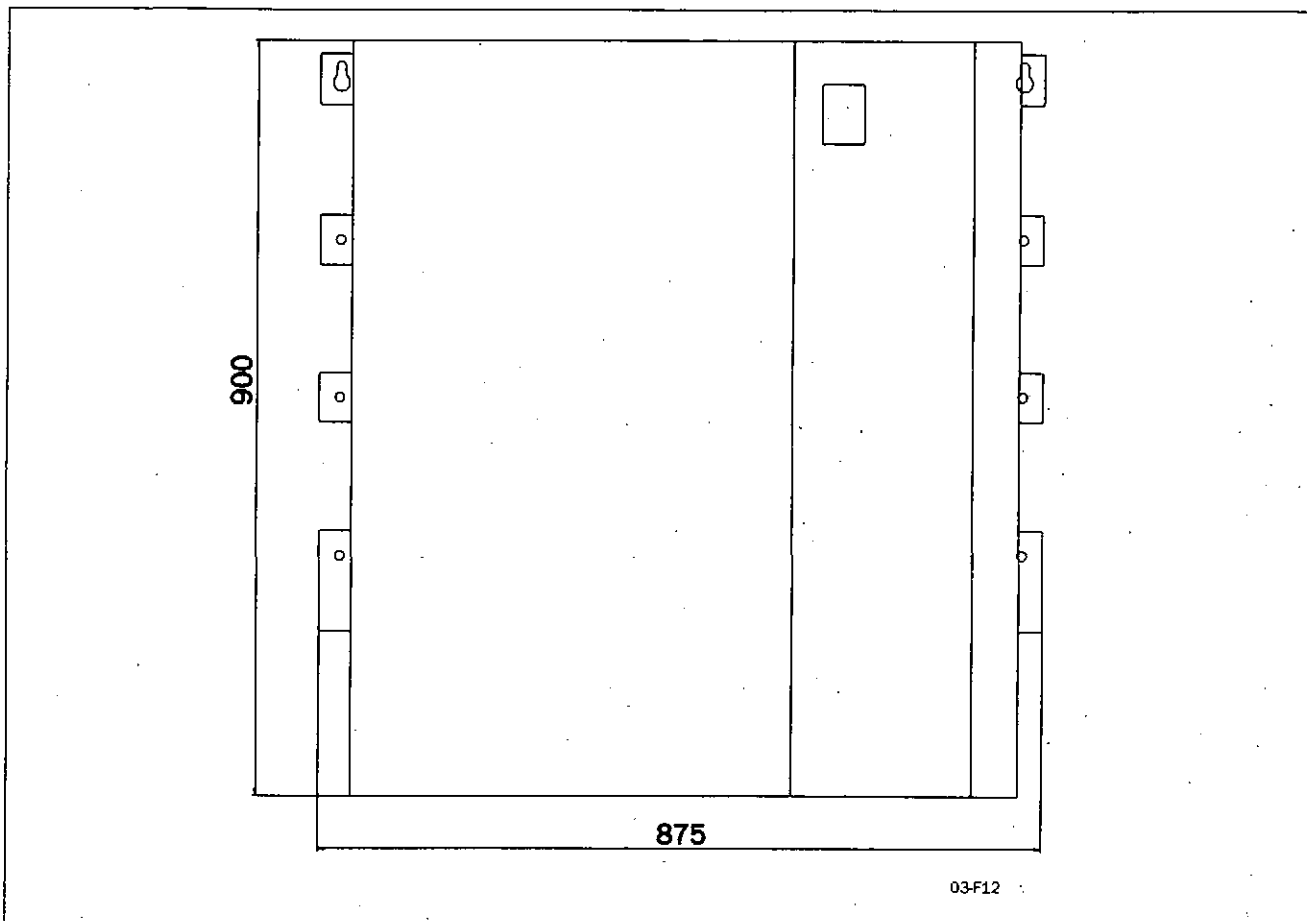


Fig. 22 MSF -1000 to -1400

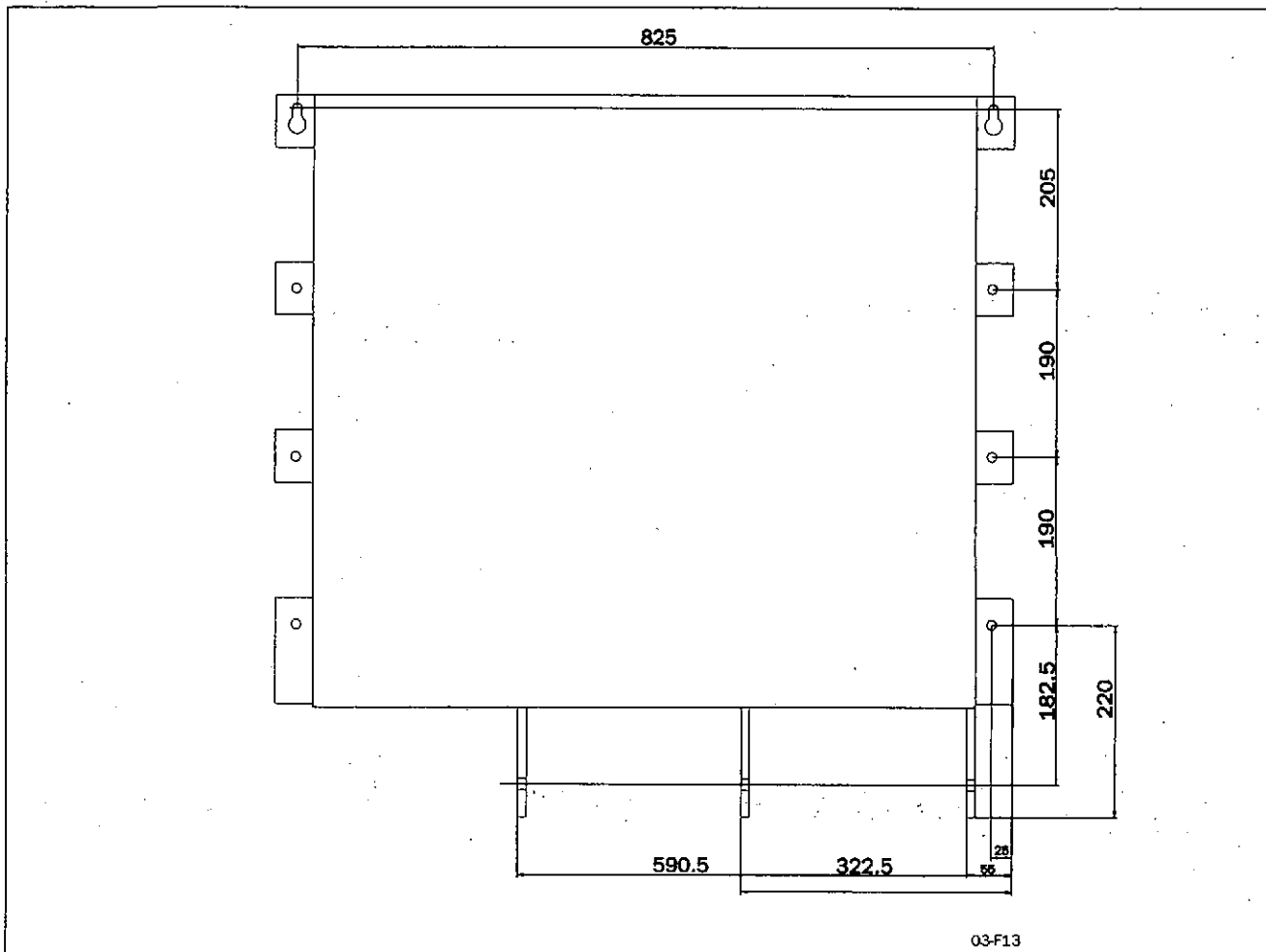


Fig. 23 Hole pattern busbar MSF -1000 to -1400.

6.2 Connections

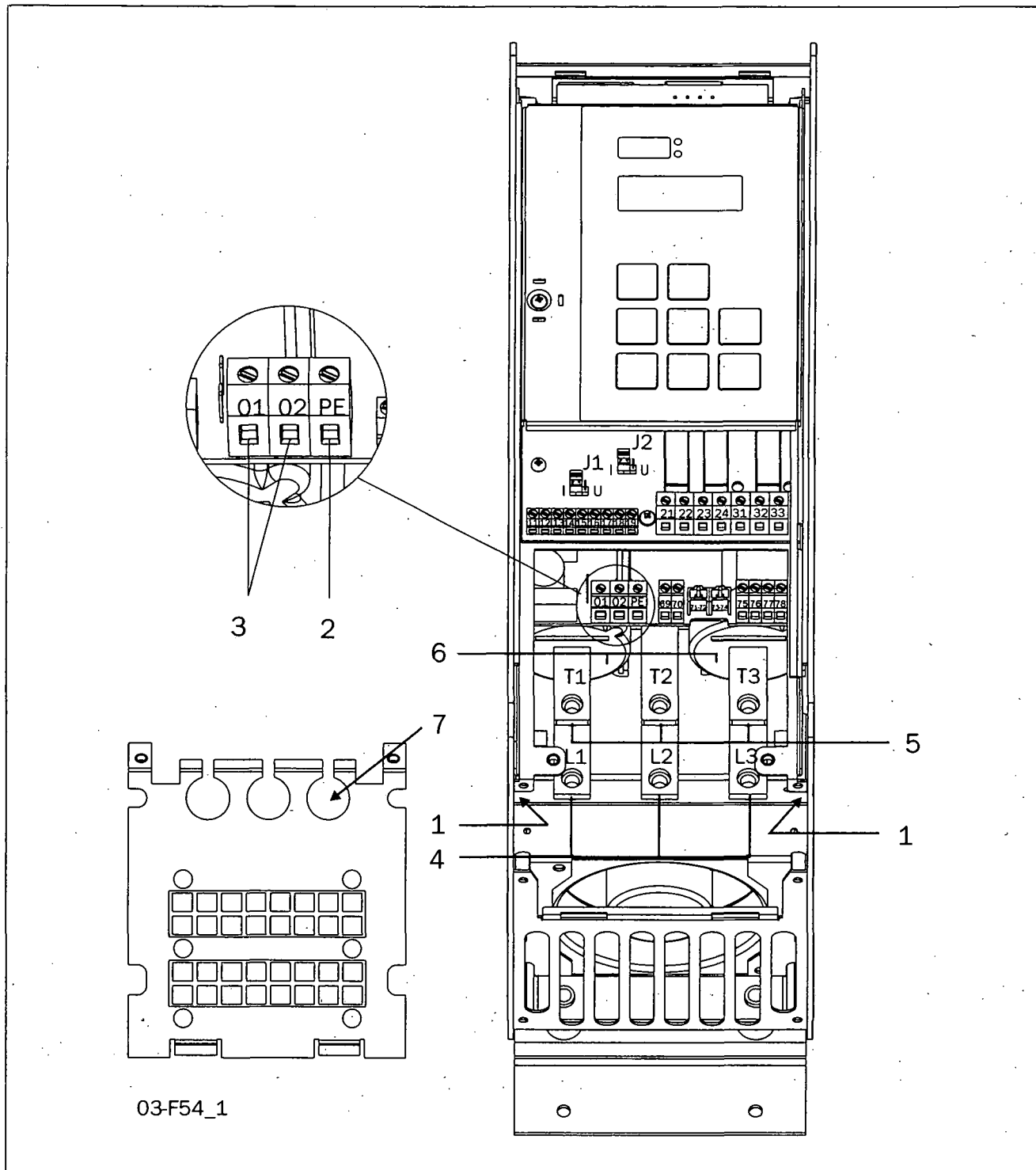


Fig. 24 Connection of MSF-017 to MSF-085.

Connection of MSF-017 to MSF-085

Device connections

1. Protective earth, \perp (PE), Mains supply, Motor (on the right and left inside of the cabinet)
2. Protective earth, \perp (PE), Control voltage
3. Control voltage connection 01, 02
4. Mains supply L1, L2, L3
5. Motor power supply T1, T2, T3
6. Current transformers (possible to mount outside for bypass see § 7.12, page 43)
7. Mounting of EMC gland for control cables

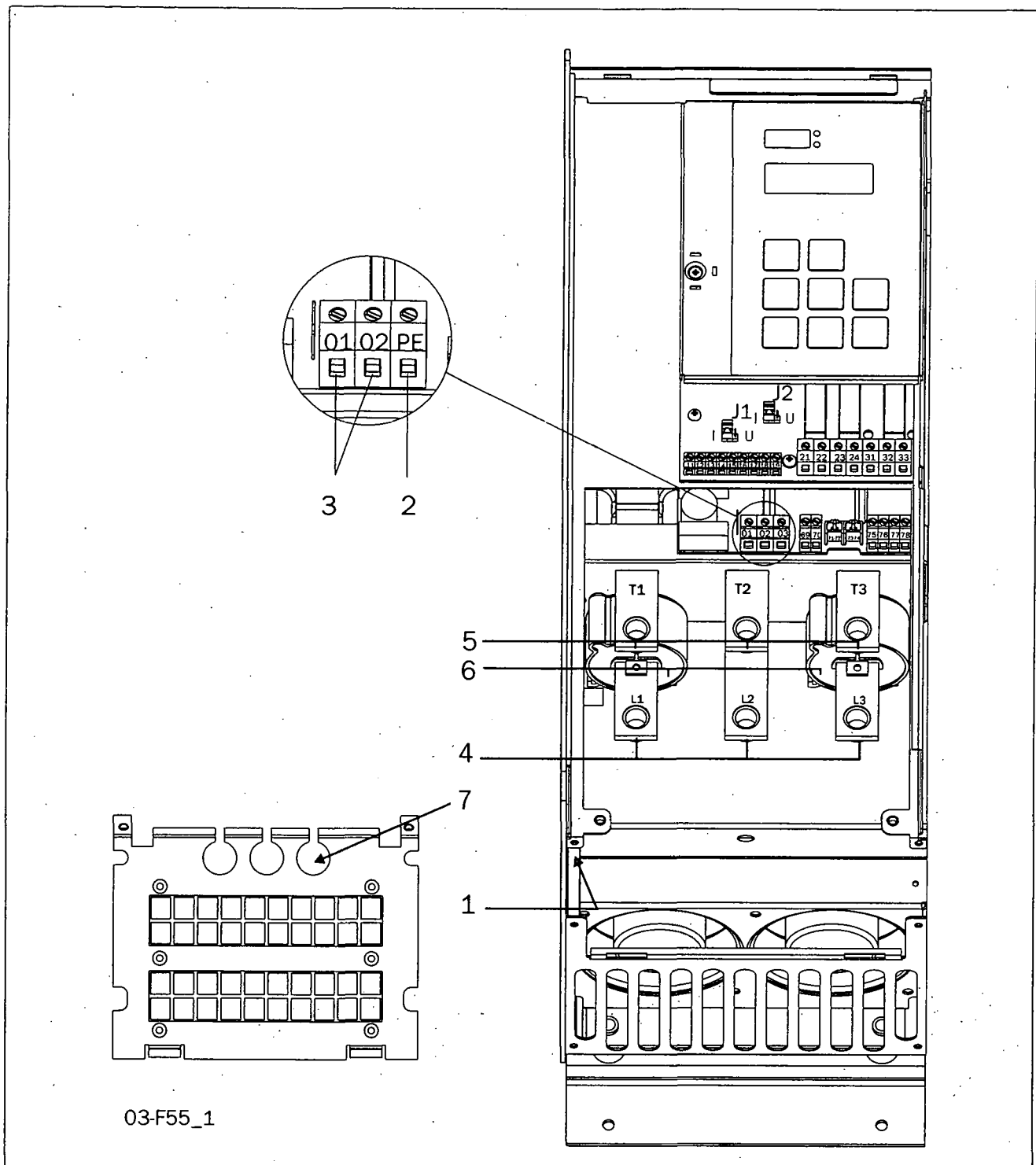


Fig. 25 Connection of MSF-110 to MSF-145.

Connection of MSF-110 to MSF-145

Device connections

1. Protective earth, \perp (PE), Mains supply, Motor (on the left inside of the cabinet)
2. Protective earth \perp (PE), Control voltage
3. Control voltage connection 01, 02
4. Mains supply L1, L2, L3
5. Motor power supply T1, T2, T3
6. Current transformers (possible to mount outside for bypass see § 7.12, page 43)
7. Mounting of EMC gland for control cables

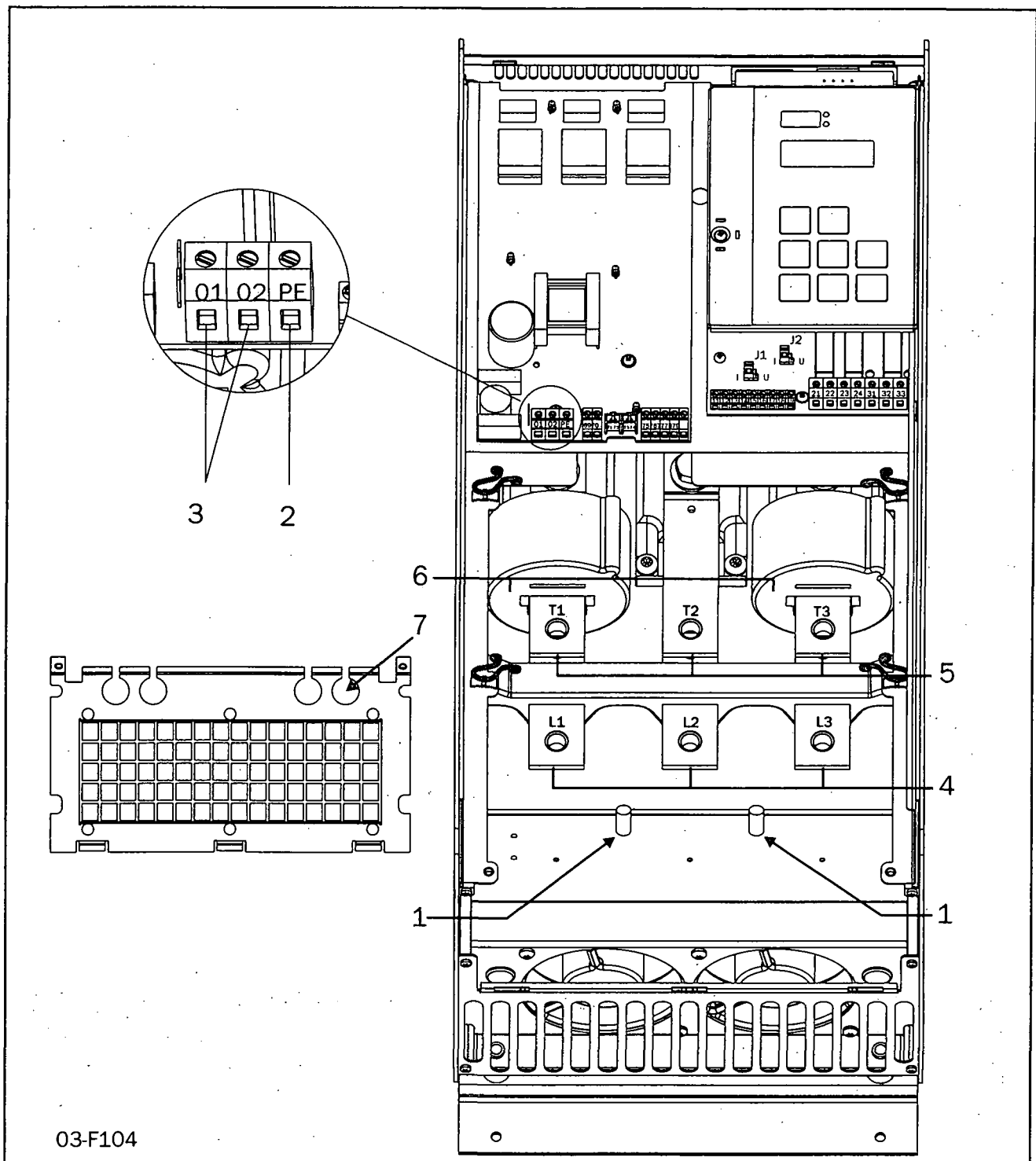


Fig. 26 Connection of MSF-170 to MSF-250

Connection of MSF-170 to MSF-250

Device connections

1. Protective earth, \perp (PE), Mains supply, Motor (on the left inside of the cabinet)
2. Protective earth \perp (PE), Control voltage
3. Control voltage connection 01, 02
4. Mains supply L1, L2, L3
5. Motor power supply T1, T2, T3
6. Current transformers (possible to mount outside for bypass see § 7.12, page 43)
7. Mounting of EMC gland for control cables

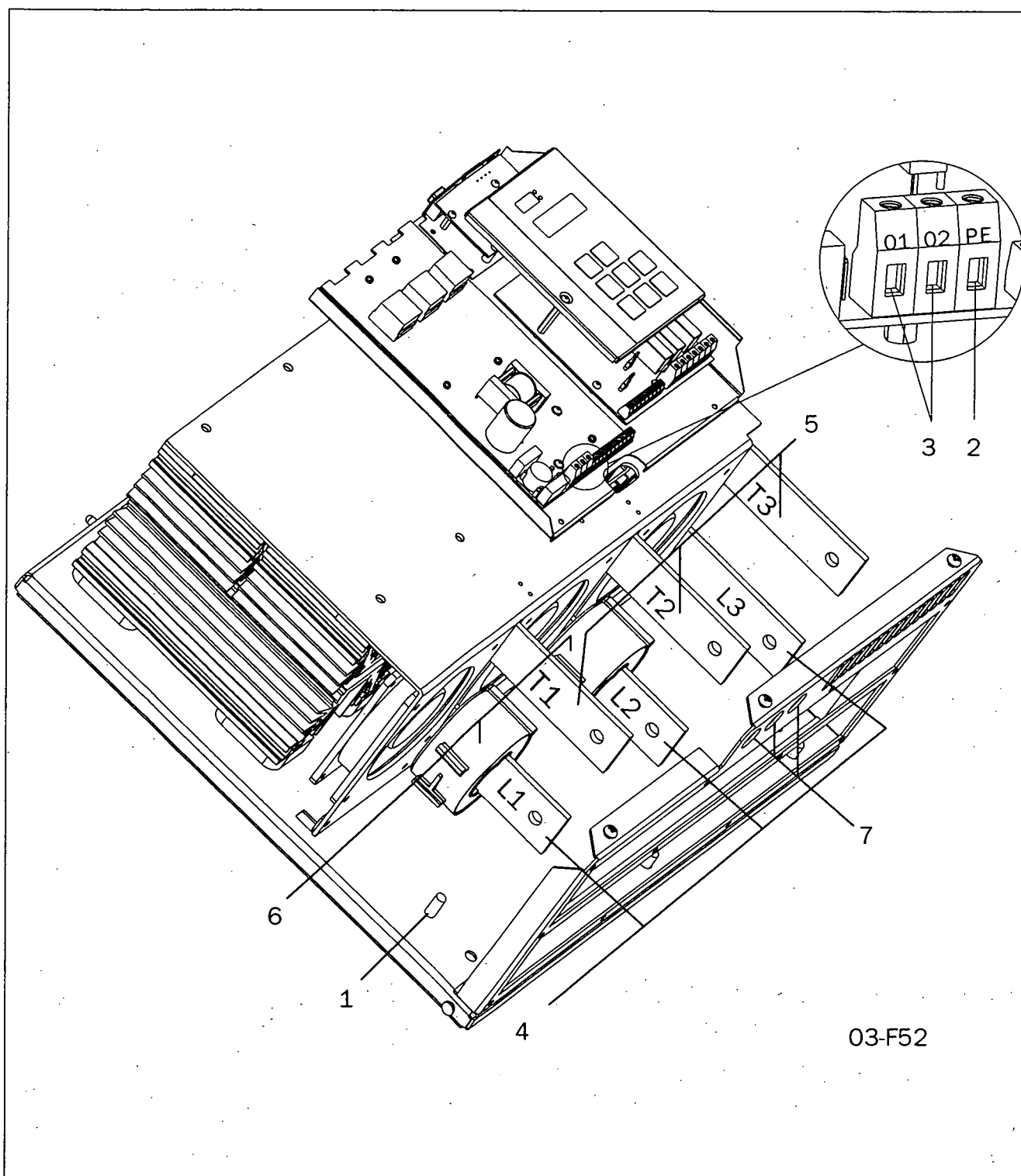


Fig. 27 Connection of MSF-170 to MSF-1400.

Connection of MSF-310 to MSF-1400

Device connections

1. Protective earth, \perp (PE), Mains supply and Motor
2. Protective earth, \perp (PE), Control voltage
3. Control voltage connection 01, 02
4. Mains supply L1, L2, L3
5. Motor power supply T1, T2, T3
6. Current transformers (possible to mount outside for bypass see § 7.12, page 43)
7. Mounting of EMC gland for control cables

6.3 Connection and setting on the PCB control card

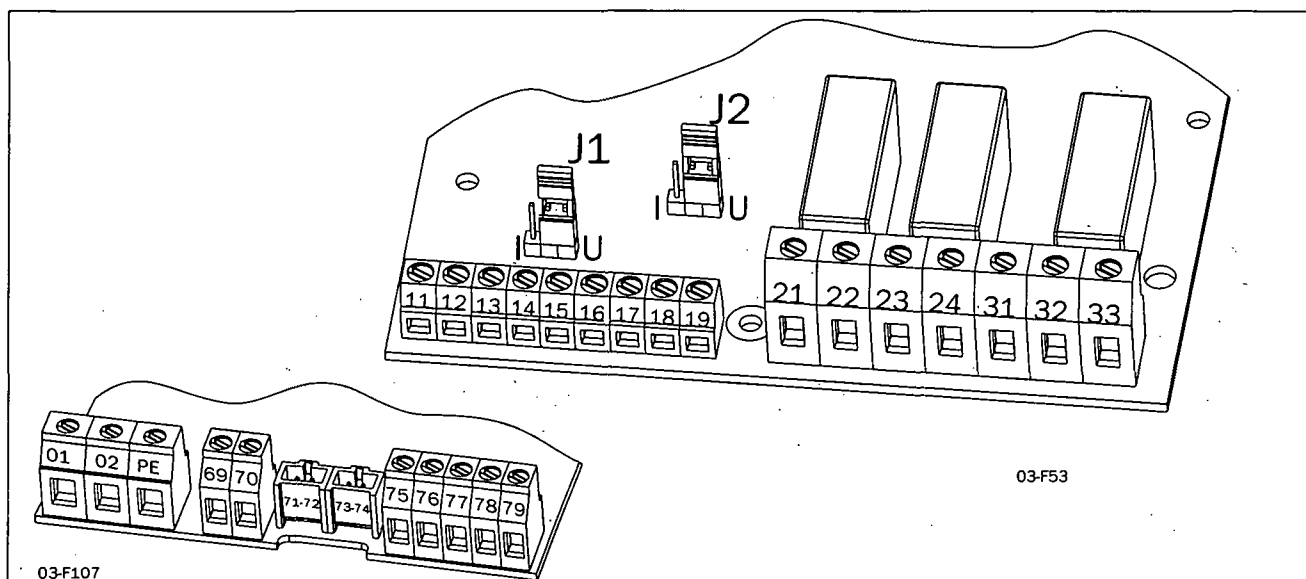


Fig. 28 Connections on the PCB, control card.

Table 12 PCB Terminals

Terminal	Function	Electrical characteristics
01	Supply voltage	100-240 VAC $\pm 10\%$ /380-500 VAC $\pm 10\%$
02		
PE	Gnd	\perp
11	Digital inputs for start/stop and reset.	0-3 V \rightarrow 0; 8-27 V \rightarrow 1. Max. 37 V for 10 sec. Impedance to 0 VDC: 2.2 k Ω .
12		
13	Supply/control voltage to PCB terminal 11 and 12, 10 k Ω potentiometer, etc.	+12 VDC $\pm 5\%$. Max. current from +12 VDC: 50mA. Short circuit proof.
14	Remote analogue input control, 0-10 V, 2-10 V, 0-20 mA and 4-20 mA/digital input.	Impedance to terminal 15 (0 VDC) voltage signal: 125 k Ω , current signal: 100 Ω
15	GND (common)	0 VDC
16	Digital inputs for selection of parameter set.	0-3 V \rightarrow 0; 8-27 V \rightarrow 1. Max. 37 V for 10 sec. Impedance to 0 VDC: 2.2 k Ω
17		
18	Supply/control voltage to PCB terminal 16 and 17, 10 k Ω potentiometer, etc.	+12 VDC $\pm 5\%$. Max. current from +12 VDC = 50mA. Short circuit proof.
19	Remote analogue output control	Analogue Output contact: 0-10V, 2-10V; min load impedance 700 Ω 0-20mA and 4-20mA; max load impedance 750 Ω
21	Programmable relay K1. Factory setting is "Operation" indication by closing terminal 21 - 22.	1-pole closing contact, 250 VAC 8A or 24 VDC 8A resistive, 250 VAC, 3A inductive.
22		
23	Programmable relay K2. Factory setting is "Full voltage" indication by closing terminal 23-24.	1-pole closing contact, 250 VAC 8A or 24 VDC 8A resistive, 250 VAC, 3A inductive.
24		
31	Alarm relay K3, closed to 33 at alarm.	1-pole change over contact, 250 VAC 8A or 24 VDC 8A resistive, 250 VAC, 3A inductive.
32	Alarm relay K3, opened at alarm.	
33	Alarm relay K3, common terminal.	
69-70	PTC Thermistor input	Alarm level 2.4 k Ω Switch back level 2.2 k Ω
71-72*	Clickson thermistor	Controlling soft starter cooling fine temperature MSF-310 - MSF-1400
73-74*	NTC thermistor	Temperature measuring of soft starter cooling fine
75	Current transformer input, cable S1 (blue)	Connection of L1 or T1 phase current transformer
76	Current transformer input, cable S1 (blue)	Connection of L3, T3 phase (MSF 017 - MSF 250) or L2, T2 phase (MSF 310 - MSF 1400)
77	Current transformer input, cable S2 (brown)	Common connection for terminal 75 and 76
78*	Fan connection	24 VDC
79*	Fan connection	0 VDC

*Internal connection, no customer use.

6.4 Minimum wiring

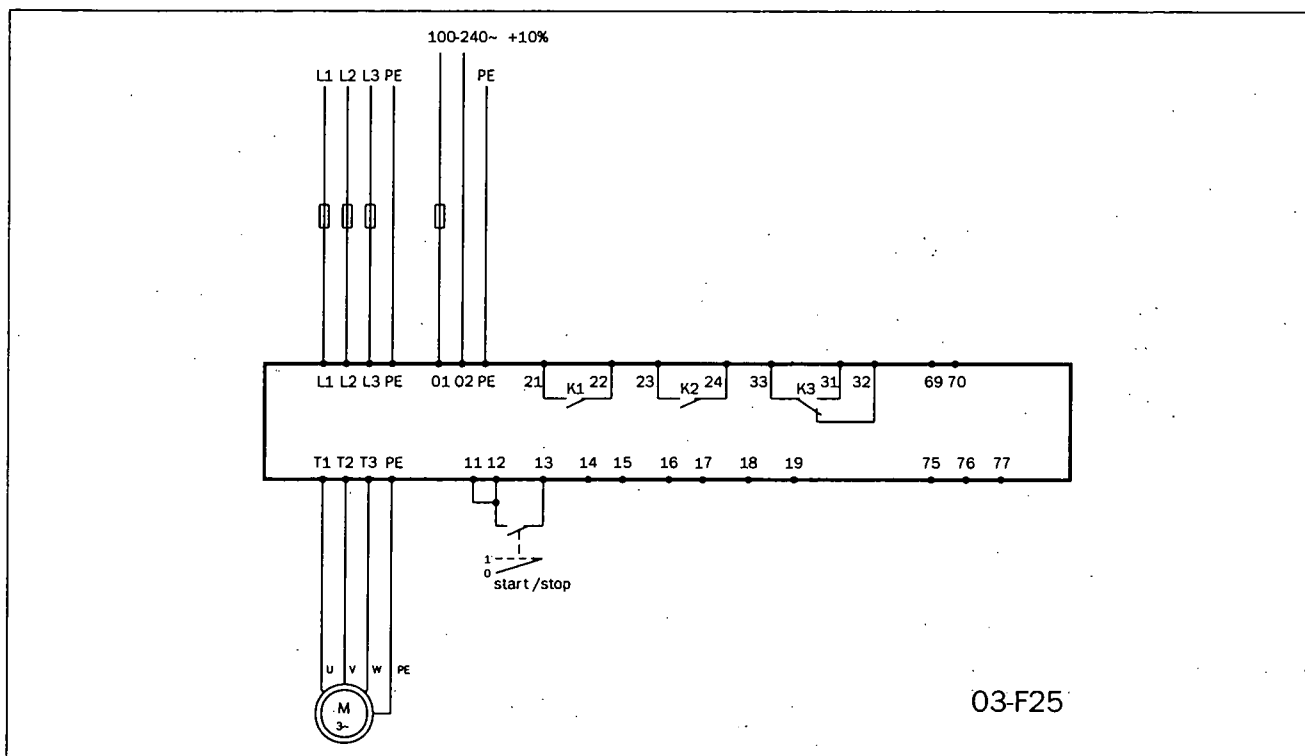


Fig. 29 Wiring circuit, "Minimum wiring".

The figure above shows the "minimum wiring". See § 6.1, page 24, for tightening torque for bolts etc.

1. Connect Protective Earth (PE) to earth screw marked \perp (PE).
2. Connect the soft starter between the 3-phase mains supply and the motor. On the soft starter the mains side is marked L1, L2 and L3 and the motor side with T1, T2 and T3.
3. Connect the control voltage (100-240 VAC) for the control card at terminal 01 and 02.
4. Connect relay K1 (terminals 21 and 22) to the control circuit.
5. Connect PCB terminal 12 and 13 (PCB terminal 11-12 must be linked) to, e.g. a 2-position switch (on/off) or a PLC, etc., to obtain control of soft start/stop. (For start/stop command from keyboard menu 006 must be set to 01).
6. Ensure the installation complies with the appropriate local regulations.

NOTE! The soft starter should be wired with shielded control cable to fulfill EMC regulations acc. to § 1.5, page 6.

NOTE! If local regulations say that a mains contactor should be used, the K1 then controls it. Always use standard commercial, slow blow fuses, e.g. type gI, gG to protect the wiring and prevent short circuiting. To protect the thyristors against short-circuit currents, superfast semiconductor fuses can be used if preferred. The normal guarantee is valid even if superfast semiconductor fuses are not used. All signal inputs and outputs are galvanically insulated from the mains supply.

6.5 Wiring examples

Fig. 30 gives an wiring example with the following functions.

- Analogue input control, see § 7.7, page 40
- Parameter set selection, see § 7.20, page 54
- Analogue output, see § 7.18, page 52
- PTC input, see § 7.21, page 55

For more information see § 6.3, page 32.

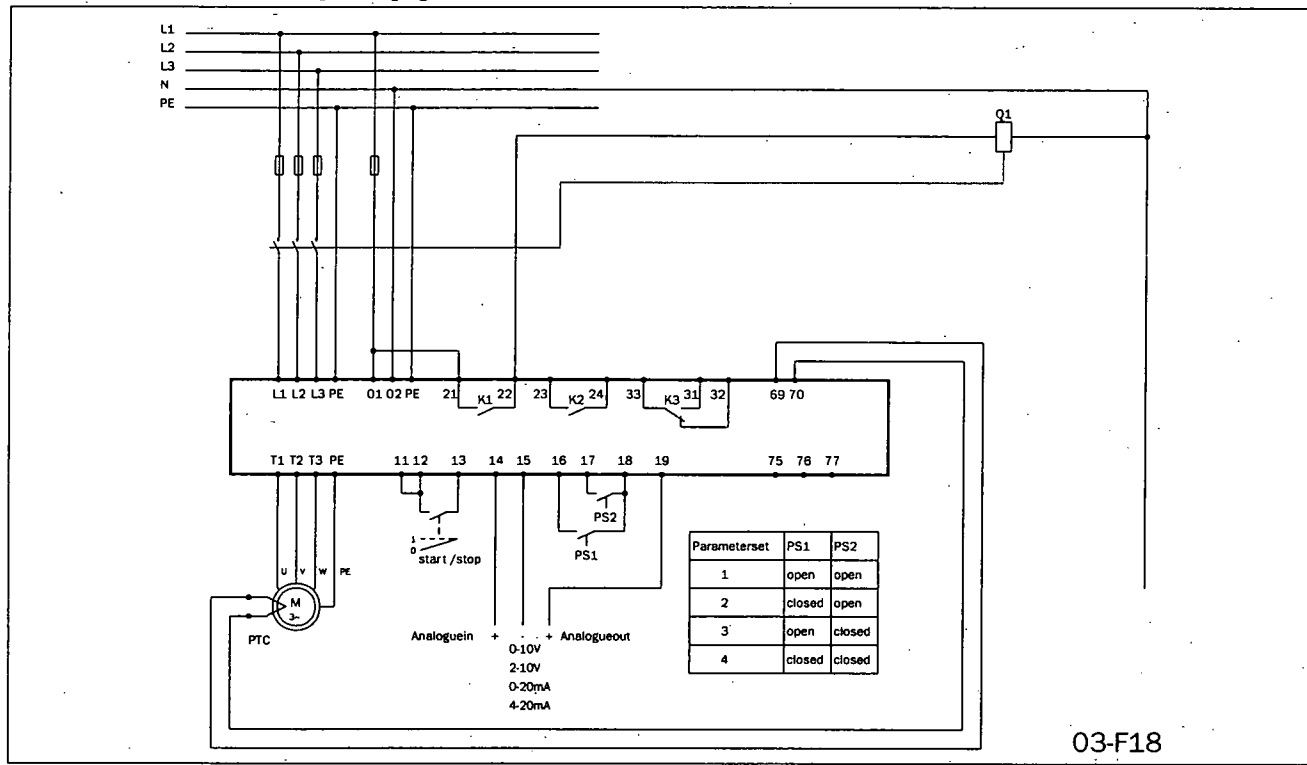


Fig. 30 Analogue input control, parameter set, analogue output and PTC input.

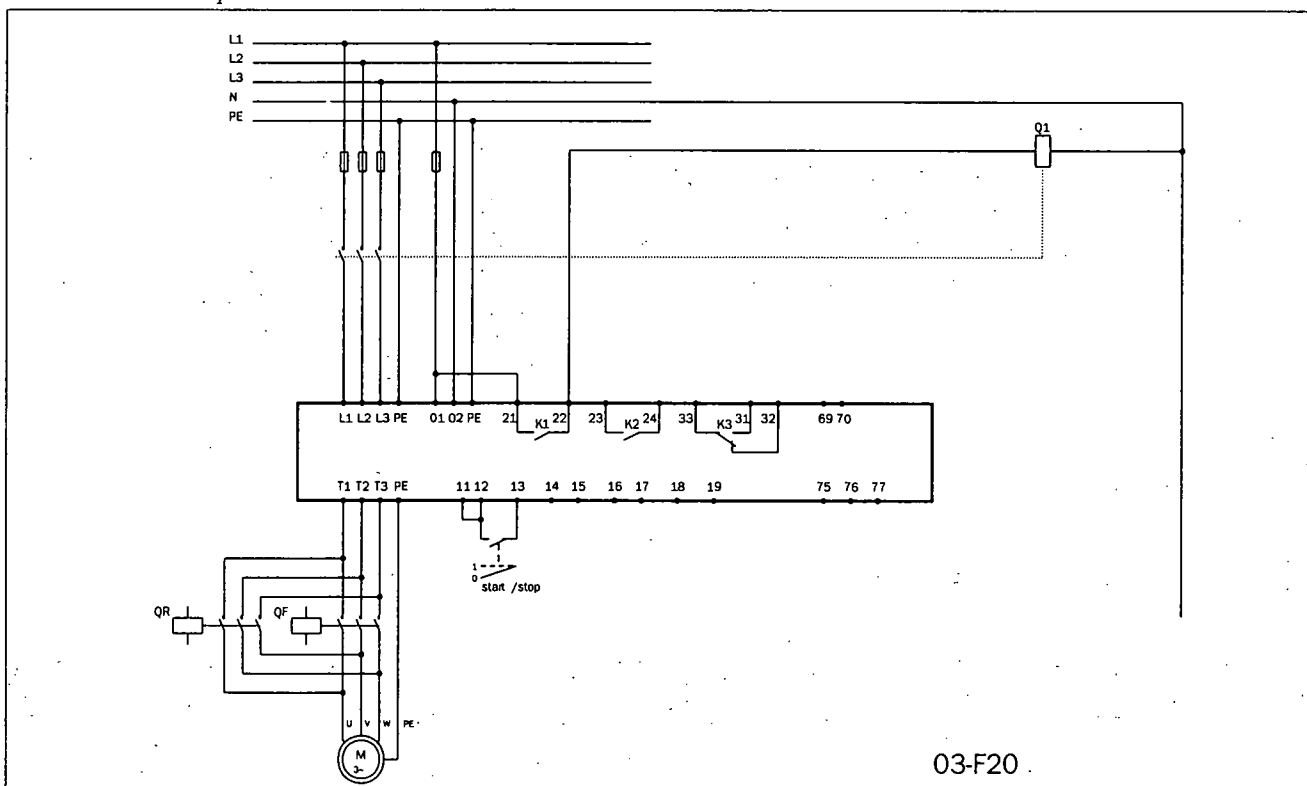


Fig. 31 Forward/reverse wiring circuit.

7. FUNCTIONAL DESCRIPTION SET-UP MENU

This chapter describes all the parameters and functions in numerical order as they appear in the MSF Table 13 gives an overview of the menus, see also Chapter 13, page 79 (set-up menu list).

Table 13 Set-up Menu overview

	Menu number	Parameter group		Menu numbers	See §
Basic functions	001-008	Basic	Ramp up/down parameters	001-005	7.1
			Start/Stop/Reset command	006	7.2
			Menu Expansion	007-008	7.3
Extended functions	011-199	Voltage control dual ramp		011-014	7.4
		Torque control parameters		016-018	7.5
		Main functions		020-025	7.6 - 7.10
		Additional functions		030-036	7.11 - 7.14
		Slow speed and Jog functions		037-040, 57-58, 103-104	7.15, 7.19, 7.25
		Motor Data Setting		041-046	7.16
		Outputs	Relays	051-052	7.17
			Analogue output	054-056	7.18
		Input	Digital input	057-058	7.19
		Parameter set selection		061	7.20
			Motor protection	071-075	7.21
			Main protection	081-088	7.22
			Application protection	089-099	7.23
			Resume alarms	101, 102	7.24
		Auto return menu		105	7.26
		Factory defaults		199	7.28
View functions	201-915	Main view		201-208	7.29
		RMS current per phase		211-213	7.29
		RMS voltage per phase		214-216	7.29
		Keyboard lock status		221	7.30
		Alarm list		901-915	7.31

7.1 Ramp up/down parameters

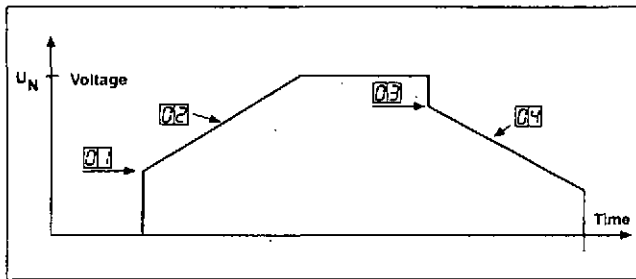


Fig. 32 Menu numbers for start/stop ramps, initial voltage at start and step down voltage at stop.

Determine the starting time for the motor/machine. When setting the ramp times for starting and stopping, initial voltage at start and step down voltage at stop, proceed as follow:

001°			
Setting the initial voltage at start ramp 1			
		3	0
Default:	30%		
Range:	25 - 90% U_n		
Set the initial voltage. Normally the factory setting, 30% of U_n , is a suitable choice.			

002°			
Setting of start ramp 1			
		1	0
Default:	10 sec		
Range:	1-60 sec		
Set "Ramp up time" at start.			

003°			
Setting of step down voltage stop ramp 1			
	1	0	0
Default:	100%		
Range:	100-40% of U_n		
Step down voltage at stop can be used to stop smoothly.			

004°			
Setting of stop ramp 1			
	0	F	F
Default:	oFF		
Range:	oFF, 2-120 sec		
oFF	Stop ramp disabled		
2-120	Set "Ramp down time" at stop		

7.1.1 RMS current [005]

005°			
RMS current			
		0.	0
Default:	—		
Range:	0.0-9999Amp		
Read-out of the RMS motor current.			

NOTE! This is the same read-out as function 201, see § 7.28, page 63.

7.2 Start/stop/reset command

Start/stop of the motor and reset of alarm is done either from the keyboard, through the remote control inputs or through the serial interface (option). The remote control inputs start/stop/reset (PCB terminals 11, 12 and 13) can be connected for 2-wire or 3-wire control.

<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;">006</div> </div>	
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> </div> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> </div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">2</div> </div> </div>	
Selection of control mode	
Default:	2
Range:	1,2,3
1	START/STOP/RESET command via the keyboard. - Press the "START/STOP" key on the keyboard to start and stop the soft starter. - Press "ENTER/RESET" key to reset a trip condition.
2	Via Remote control. START/STOP/RESET commands. The following control methods are possible: - 2-wire start/stop with automatic reset, see § 7.2.1, page 37. - 2-wire start/stop with separate reset, see § 7.2.2, page 37. - 3-wire start/stop with automatic reset at start, see § 7.2.3, page 37. WARNING! The motor will start if terminals 11, 12, 13 is in start position.
3	START/STOP/RESET commands via serial interface option. Read the operating instruction supplied with this option.

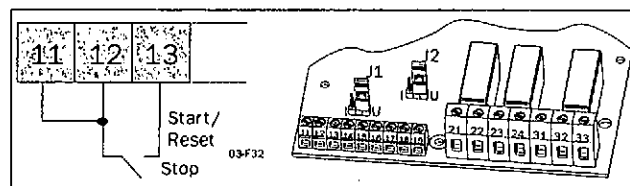
NOTE! A reset via the keyboard will not start or stop the motor.

NOTE! Factory default setting is 2, remote control.

To start and stop from the keyboard, the "START/STOP" key is used.

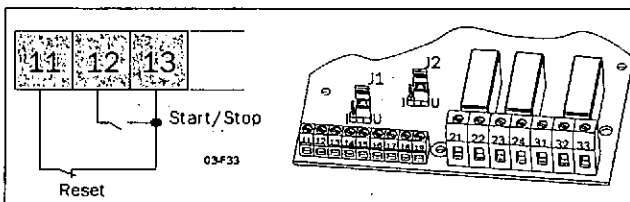
To reset from the keyboard, the "ENTER ↵ / RESET" key is used. A reset can be given both when the motor is running and when the motor is stopped. A reset from the keyboard will not start or stop the motor.

7.2.1 2-wire start/stop with automatic reset at start



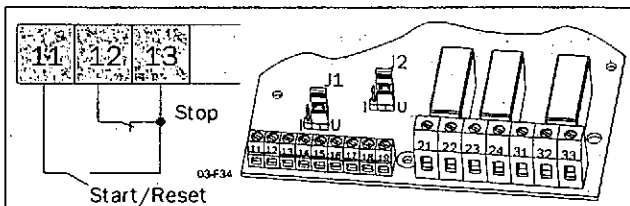
Closing PCB terminals 12 and 13, and a jumper between terminal 11 and 12, will give a start command. Opening the terminals will give a stop. If PCB terminals 12 and 13 is closed at power up a start command is given (automatic start at power up). When a start command is given there will automatically be a reset.

7.2.2 2-wire start/stop with separate reset



Closing PCB terminals 11, 12 and 13 will give a start and opening the terminals 12 and 13 will give a stop. If PCB terminals 12 and 13 are closed at power up a start command is given (automatic start at power up). When PCB terminals 11 and 13 are opened and closed again a reset is given. A reset can be given both when the motor is running and stopped and doesn't affect the start/stop.

7.2.3 3-wire start/stop with automatic reset at start.



PCB terminal 12 and 13 are normally closed and PCB terminal 11 and 13 are normally open. A start command is given by momentarily closing PCB terminal 11 and 13. To stop, PCB terminal 12 and 13 are momentarily opened.

When a start command is given there will automatically be a reset. There will not be an automatic start at power up.

7.3 Menu expansion setting.

In order to use the viewing menus and/or the extended functions menu 007 must be set to "On", then one reach read out of the viewing menus 201-915. To be able to set any extended functions in the menus 011-199 menu 008 must be set to "on" as well.

007 ^o				Selecting of extended functions and viewing functions
		o	F F	
Default:	oFF			
Range:	oFF, on			
oFF	Only function 1-7 are visible			
on	- View functions 201-915 are visible - Extended functions (menu 008) selectable			

008 ^o				Selecting of extended functions
		o	F F	
Default:	oFF			
Range:	oFF, on			
oFF	Only view function 201-915 are visible.			
on	All the function menus are visible			

NOTE! Menu 007 must be "on".

7.4 Voltage control dual ramp

To achieve even smoother ramps at start and or stop, a dual ramp can be used.

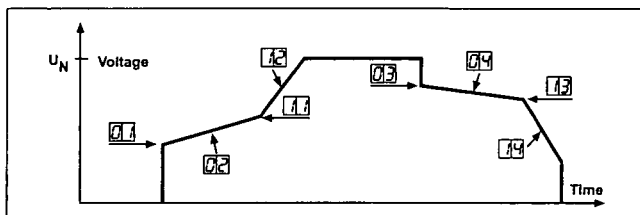


Fig. 33 Menu numbers for dual voltage ramp at start/stop, initial voltage at start and step down-voltage at stop.

The settings are carried out by beginning with the settings in menus 001-004 and 007-008 and proceed with the following steps:

<div>011^o</div>				Setting the initial voltage at start ramp 2
<div><div></div><div></div><div>9</div><div>0ⁱ</div></div>				
Default:	90%			
Range:	30-90% U_n			
Set the start voltage for start ramp 2. The initial voltage for start ramp 2 is limited to the initial voltage at start (menu 001), see § 7.1, page 36.				

012 ^o				Setting of start ramp 2
		o	F F	
Default:	oFF			
Range:	oFF, 1-60 sec			
oFF	Start ramp 2 disabled			
1-60	Set the start ramp 2 time. A dual voltage ramp is active.			

013 ^o				Setting of step down voltage in stop ramp 2
		4	0	
Default:		40%		
Range:		100-40% U _n		
Set the step down voltage for stop ramp 2. The step down voltage for stop ramp 2 is limited to the step down voltage at stop (menu 003).				

014 ^o				Setting of stop ramp time 2
		o	F F	
Default:	oFF			
Range:	oFF, 2-120 sec			
oFF	Stop ramp 2 disabled			
1-60	Set the stop ramp 2 time. A dual voltage stop ramp is active.			

7.5 Torque control parameters

See also § 7.10, page 42 and chapter 4, page 13 for more information on the Torque control setting.

016°			
Initial torque at start			
		1	0
Default:	10		
Range:	0 - 250% of Tn		
Insert initial torque at start in percent of nominal shaft torque (Tn), see chapter 13, page 79.			

017°			
End torque at start			
	1	5	0
Default:	150		
Range:	50 - 250% of Tn		
Insert end torque at start in percent of nominal shaft torque.			

018°			
End torque at stop			
			0
Default:	0		
Range:	0 - 100% of Tn		
Insert end torque at stop in percent of the nominal motor torque.			

7.6 Current limit (Main Function)

The Current Limit function is used to limit the current drawn when starting (150 - 500% of I_n). This means that current limit is only achieved during set start-up time.

Two kinds of current limit starts are available.

- **Voltage ramp with a limited current.**
If current is below set current limit, this start will act exactly as a voltage ramp start.
- **Current limit start.**
The soft starter will control the current up to set current limit immediately at start, and keep it there until the start is completed or the set start-up time expires.

See Fig. 34 Current limit.

NOTE! Make sure that nominal motor current in menu 042 is correctly inserted.

7.6.1 Voltage ramp with current limit

The settings are carried out in three steps:

1. Estimate starting-time for the motor/machine and select that time in menu 002 (see § 7.1, page 36).
2. Estimate the initial voltage and select this voltage in menu 001 (see § 7.1, page 36).
3. Set the current limit to a suitable value e.g. 300% of I_n in menu 020.

020°			
Voltage ramp with current limit at start			
	0	F	F
Default:	oFF		
Range:	oFF, 150 - 500% I_n		
oFF	Voltage Ramp mode with current limit disabled. Voltage Ramp enabled.		
150-500	Current limit level in Voltage ramp mode.		

NOTE! Only possible when Voltage Ramp mode is enabled. Menus 021-025 must be "oFF".

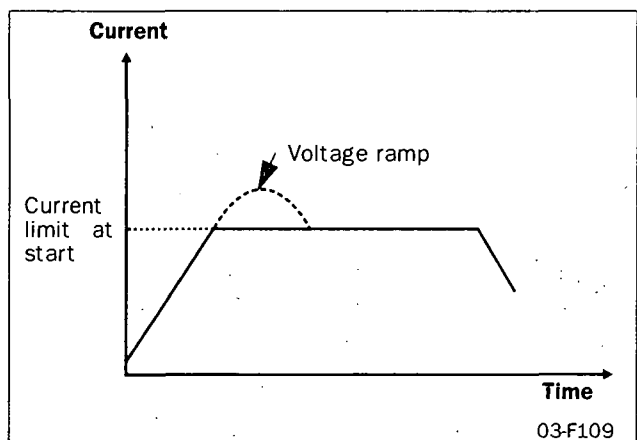


Fig. 34 Current limit

7.6.2 Current limit

The settings are carried out in two steps:

1. Estimate starting time for the motor/machine and select that time in menu 002 (see § 7.1, page 36).
2. Set the current limit to a suitable value e.g. 300% of In in menu 021.

021 ^o	
Current limit at start	
o F F	
Default:	oFF
Range:	oFF, 150 - 500% In
oFF	Current limit mode disabled. Voltage Ramp enabled.
150-500	Current limit level in current limit mode.

NOTE! Only possible when Voltage Ramp mode is enabled. Menus 020, 022-025 must be "oFF".

NOTE! Even though the current limit can be set as low as 150% of the nominal motor current value, this minimum value cannot be used generally. Considerations must be given to the starting torque and the motor before setting the appropriate current limit. "Real start time" can be longer or shorter than the set values depending on the load conditions. This applies to both current limit methods.

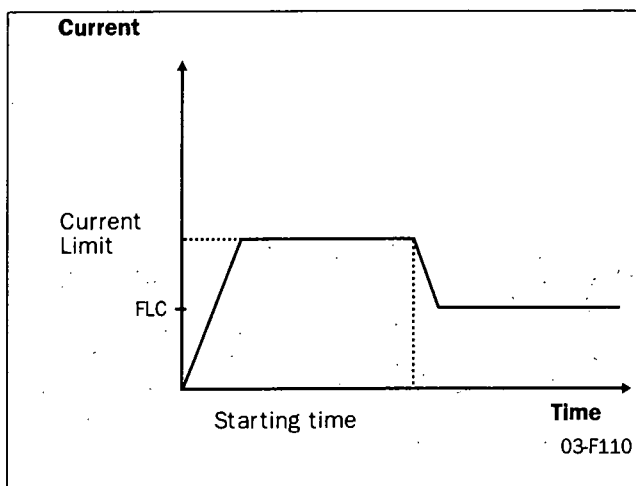


Fig. 35 Current limit

If the starting time is exceeded and the soft starter is still operating at current level, an alarm will be activated. It is possible to let the soft starter to either stop operation or to continue. Note that the current will rise uncontrolled if the operation continues (see § 7.24.2, page 61).

7.7 Pump control (Main Function)

By choosing pump control you will automatically get a stop ramp set to 15 sec. The optimising parameters for this main function are start and stop time; initial torque at start and end torque at start and stop. End torque at stop is used to let go of the pump when it's no longer producing pressure/flow, which can vary on different pumps. See Fig. 36.

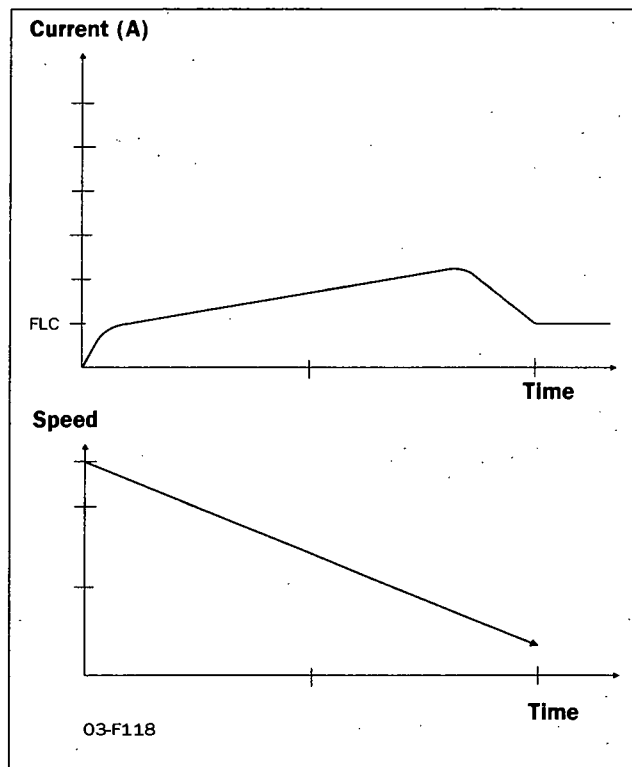


Fig. 36 Pump control

Pump application

The pump application is using Torque ramps for quadratic load. This gives lowest possible current and linear start and stop ramps. Related menus are 2, 4 (see § 7.1, page 36), 16, 17 and 18 (see § 7.5, page 39).

022 ^o	
Setting of pump control	
o F F	
Default:	oFF
Range:	oFF, on
oFF	Pump control disabled. Voltage Ramp enabled.
on	Pump control application is enabled.

NOTE! Only possible when Voltage Ramp mode is enabled. Menu 020-021, 023-025 must be "oFF".

7.8 Analogue Input Control (Main Function)

Soft starting and soft stopping can also be controlled via the Analogue Input Control (0-10 V, 2-10 V, 0-20 mA and 4-20 mA). This control makes it possible to connect optional ramp generators or regulators.

After the start command, the motor voltage is controlled through the remote analogue input.



WARNING! The remote analogue control may not be used for continuous speed regulation of standard motors. With this type of operation the increase in the temperature of the motor must be taken into consideration.

To install the analogue input control, proceed by:

1. Connect the ramp generator or regulator to terminal 14 (+) and 15 (-).

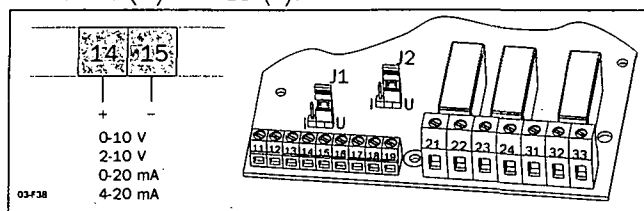


Fig. 37 Wiring for analogue input.

2. Set Jumper J1 on the PCB control card to voltage (U) or current control (I) signal position, see Fig. 38 and Fig. 24 on page 28. Factory setting is voltage (U).

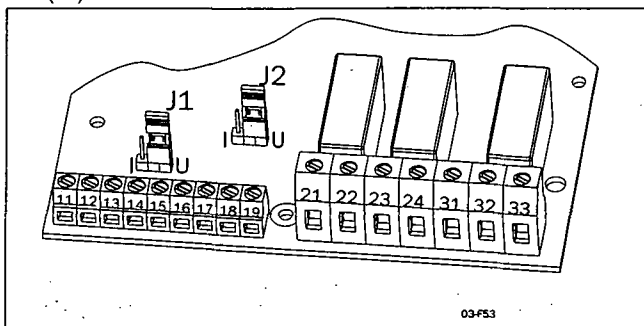


Fig. 38 Setting voltage or current for analogue input.

023				Selection of Analogue input control
	o	F	F	
Default:	oFF			
Range:	oFF, 1, 2			
oFF	Analogue input disabled. Voltage Ramp enabled.			
1	Analogue input is set for 0-10V/ 0-20mA control signal			
2	Analogue input is set for 2-10V/ 4-20mA control signal.			

NOTE! Only possible when Voltage Ramp mode is enabled. Menu 020-022, 024, 025 must be "oFF"

7.9 Full voltage start, D.O.L. (Main Function)

The motor can be accelerated as if it was connected directly to the mains. For this type of operation:

Check whether the motor can accelerate the required load (D.O.L.-start, Direct On Line start). This function can be used even with shorted thyristors.

024				Setting of D.O.L start
	o	F	F	
Default:	oFF			
Range:	oFF, on			
oFF	D.O.L. start disabled. Voltage Ramp enabled.			
on	D.O.L. start enabled			

NOTE! Only possible when Voltage Ramp mode is enabled. Menu 020-023, 025 must be "oFF".

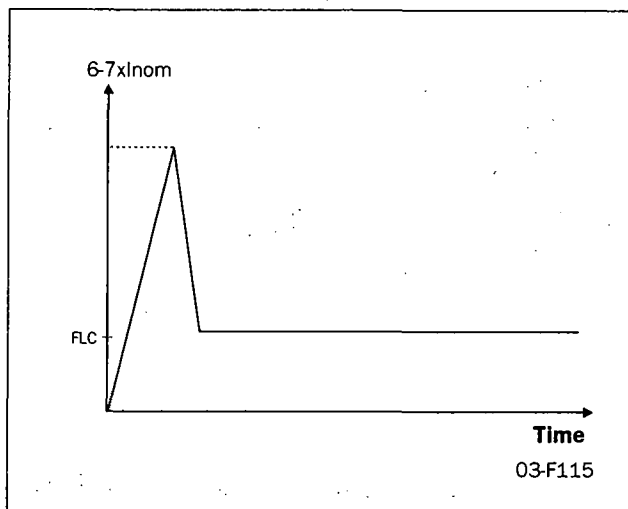


Fig. 39 Full voltage start.

7.10 Torque control (Main function)

This main function can be used to make a start according to a pre-defined torque reference curve. Two different load characteristics, linear and square, are possible to select.

At start/stop the torque controller will follow the selected characteristic.

A torque start/stop behaviour can be seen in Fig. 40.

A perfect start and stop with torque ramps have a good linearity of current. To optimise this, use the setting of initial torque (menu 16) and end torque (menu 18). See also § 7.5, page 39.

Example:

Default for initial torque is 10% so if starting a more heavy load this will result in a small current peak in beginning of ramp. By increasing this value to 30/70% the current peak will not appear.

The end torque is increased mainly if the application has a high inertial load, like planers, saws and centrifuges. A current peak will appear in the end of ramp because the load is pushing the speed more or less by itself. By increasing this level to 150-250% the current will be linear and low.

<div>025⁰₀</div>				Torque control at start/stop	
<div><div></div><div>0</div><div>F</div><div>F</div></div>					
Default:		oFF			
Range:		oFF, 1, 2			
oFF		Torque control is disabled Voltage Ramp enabled.			
1		Torque control with linear torque characteristic			
2		Torque control with square torque characteristic			

NOTE! Torque control mode is only possible when Voltage Ramp mode is enabled (menu 020-024 are "oFF").

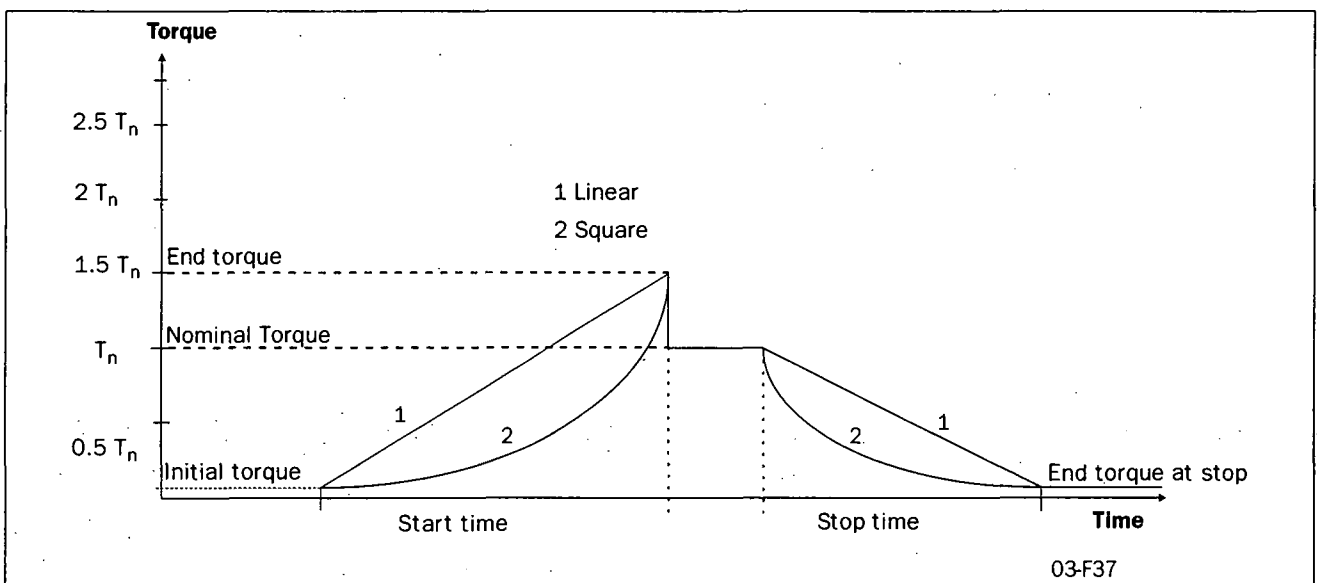


Fig. 40 Torque control at start/stop.

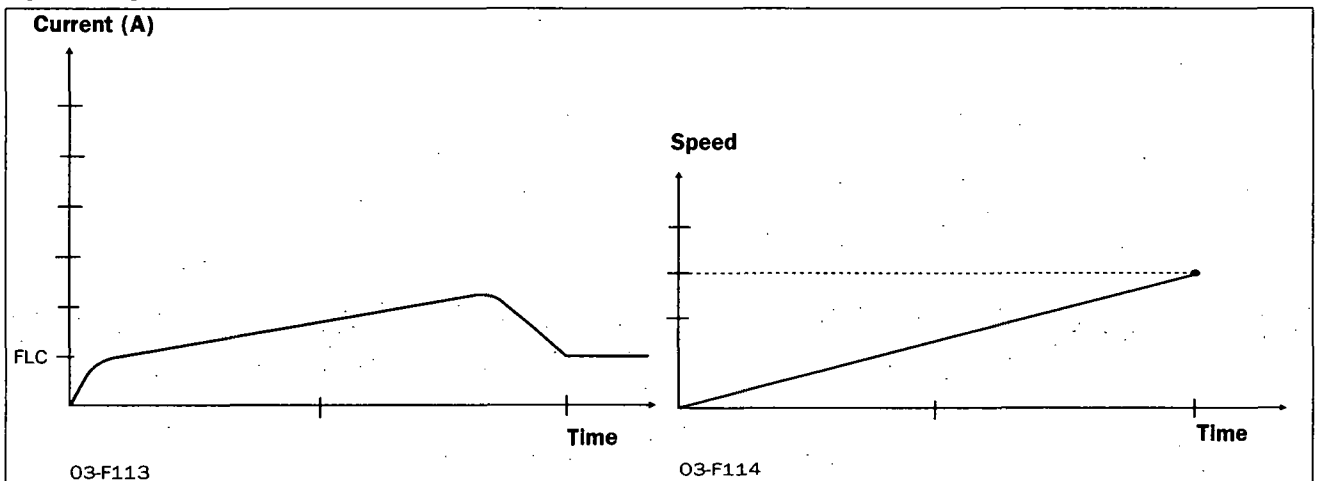


Fig. 41 Current and speed in torque control.

7.11 Torque boost

The Torque Booster enables a high torque to be obtained by providing a high current during 0.1 - 2 sec at start. This enables a soft start of the motor even if the break away torque is high at start. For example in crushing mills applications etc.

When the torque booster function has finished, starting continues according to the selected start mode.

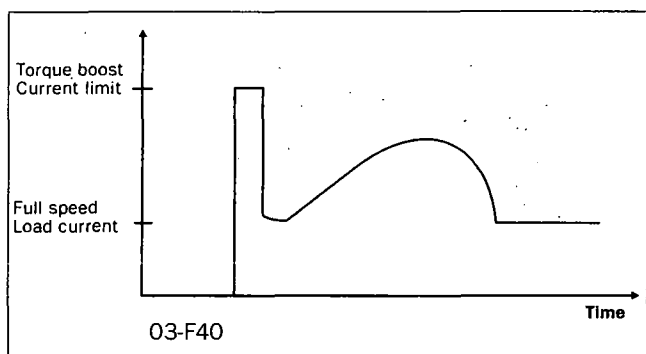


Fig. 42 The principle of the Torque Booster when starting the motor in voltage ramp mode.

See § 4.6, page 19, which main function that can be used with the torque boost.

030 ^o				Torque boost active time
		0	F F	
Default:	oFF			
Range:	oFF, 0.1 - 2 sec			
oFF	Torque boost disabled			
0.1-2.0	Set the Torque boost time.			

<div>031^o</div>				Torque boost current limit
<div><div></div><div>3</div><div>0</div><div>0</div></div>				
Default:		300		
Range:		300 - 700% of I _n		
The Torque boost current controller use selected value as the motor current reference.				

NOTE! Check whether the motor can accelerate the load with "Torque booster", without any harmful mechanical stress.

7.12 Bypass

In cases of high ambient temperatures or other reason it may sometimes be necessary to use a by-pass contactor to minimize the power loss at nominal speed (see Technical Data). By using the built-in Full Voltage Relay function an external contactor can be used to Bypass the soft starter when operating at nominal speed.

Bypass contactor can also be used if soft stop is required. Normally a Bypass contactor is not necessary as the device is designed for continues running conditions, see Fig. 29 on page 33 for wiring example.

NOTE! If one like to use the alarm functions, the extended functions or the viewing functions the 2-pcs current transformers must be mounted outside the soft start as shown in Fig. 44 and Fig. 45 on page 45. For this purpose an optional extension cable for the current transformers is available. Code No 01-2020-00.

032 ^o				Setting of Bypass
		0	F F	
Default:	oFF			
Range:	oFF, on			
oFF	Bypass disabled			
on	Bypass enabled. Program either relay K1 or K2 to function 2 to control the bypass contactor, see menu 51/52.			



CAUTION! If the current transformers are not mounted as in Fig. 43 on page 44 and § 6.2, page 28, the alarm and viewing functions will not work. Do not forget to set menu 032 to ON, otherwise there will be an F12 alarm and at the stop command will be a freewheeling stop.

For further information see chapter 6.2 page 28.

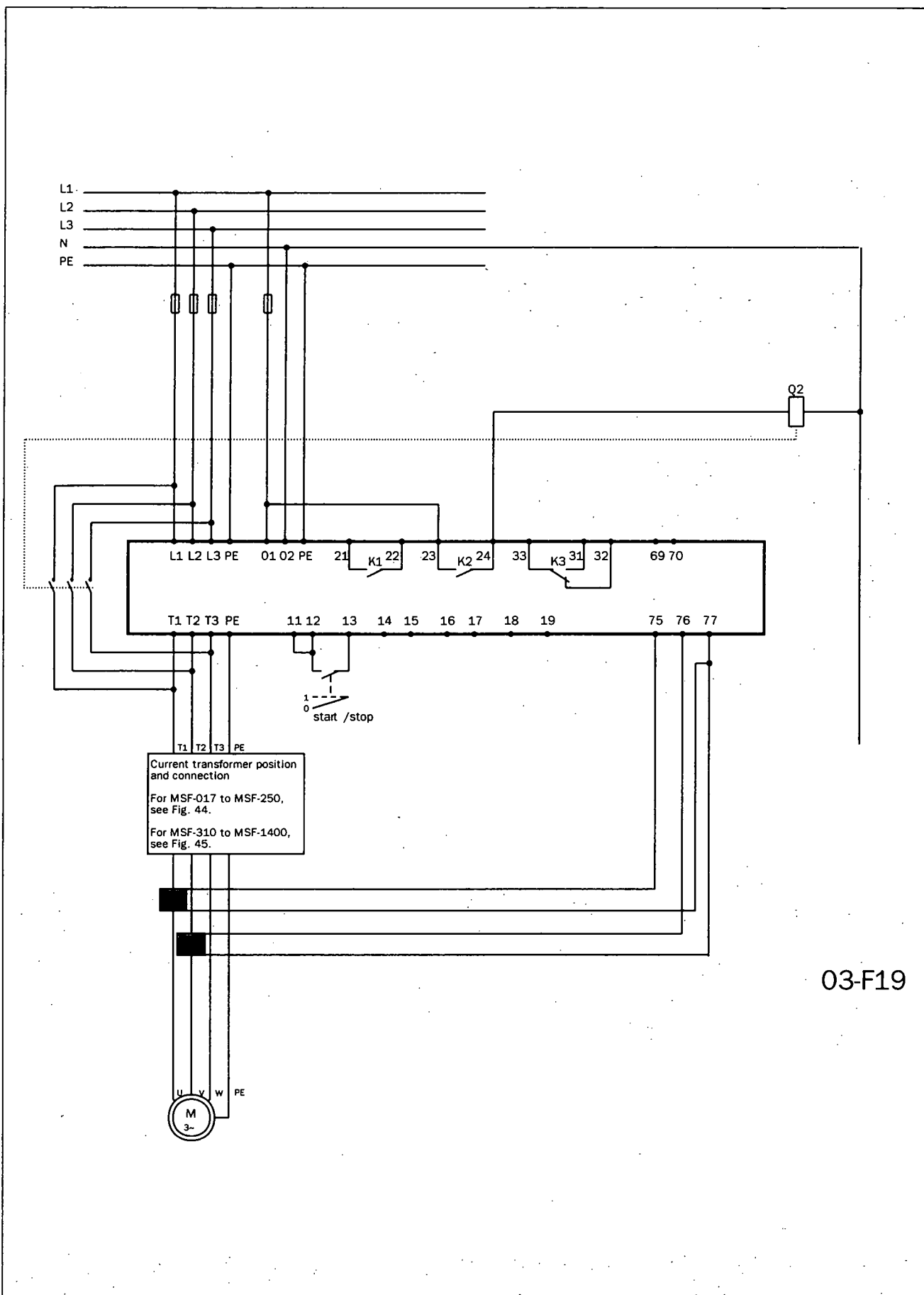


Fig. 43 Bypass wiring example MSF 310-1400.

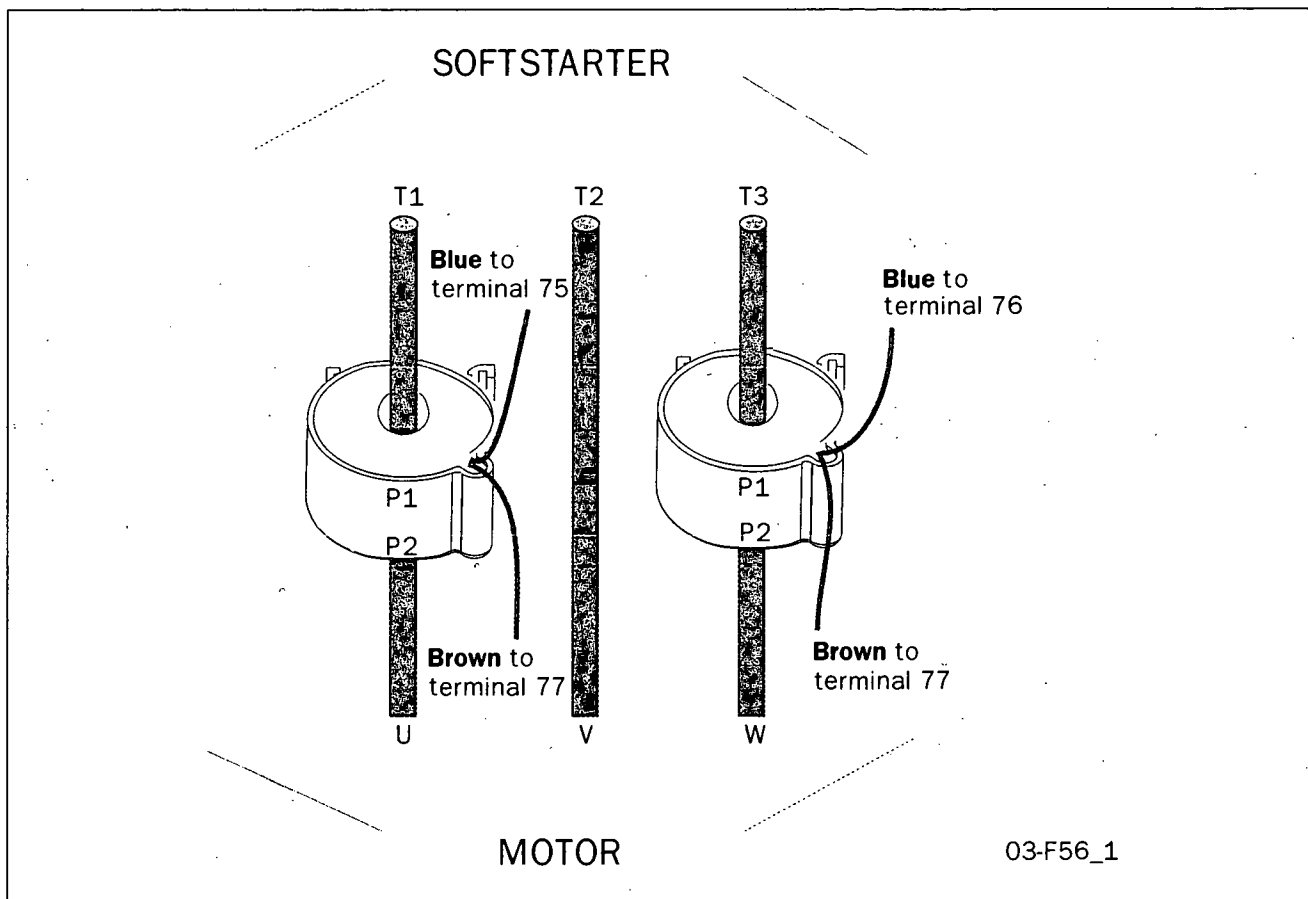


Fig. 44 Current transformer position when Bypass MSF-017 to MSF-250.

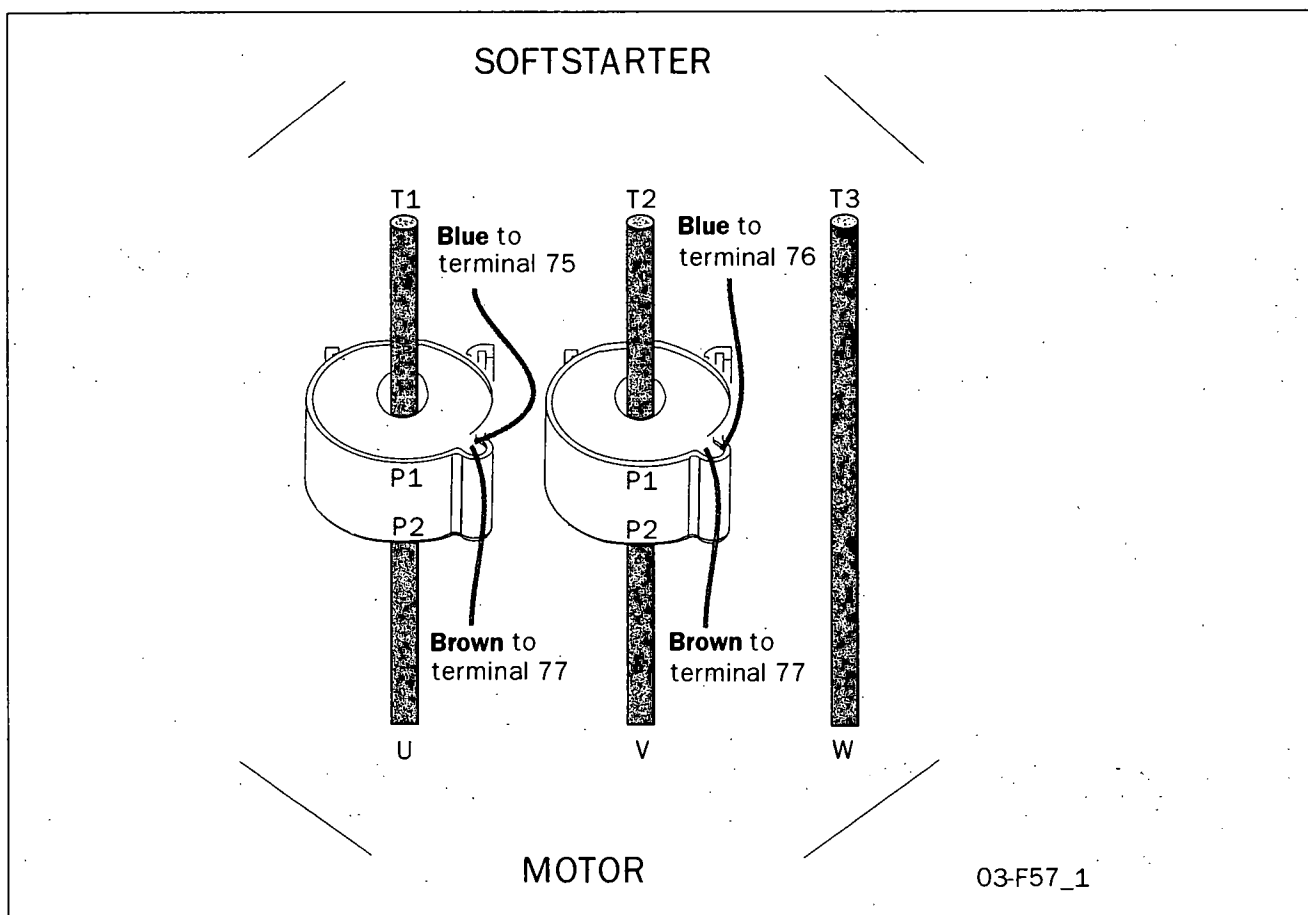


Fig. 45 Current transformer position when Bypass MSF-310 to MSF-1400.

7.13 Power Factor Control

During operation, the soft starter continuously monitors the load on the motor. Particularly when idling or when only partially loaded, it is sometimes desirable to improve the power factor. If Power factor control (PFC) is selected, the soft starter reduces the motor voltage when the load is lower. Power consumption is reduced and the degree of efficiency improved.

033		Setting of PFC
OFF		
Default:	oFF	
Range:	oFF, on	
oFF	PFC disabled	
on	PFC enabled. The Full voltage relay function does not work.	

NOTE! If the PFC is used the EMC-directive is not fulfilled.

7.14 Brake functions

There are two built in braking methods for applications where the normal stop ramp is not enough.

- **Dynamic DC-brake**
Increases the braking torque by decreasing speed.
- **Soft brake**
Gives a high torque at the start of the braking and then also increasing torque by decreasing speed.

In both methods the MSF detects when the motor is standing still, so rotating in wrong direction is avoided.

Dynamic Vector Brake

- Possible to stop motors with high inertia loads from close to synchronous speed.
- At 70% of the nominal speed a DC-brake is activated until the motor is standing still or the selected Braking Time has expired (see menu 34, next page).
- No contactor needed.
- For extra safety, the soft starter has a digital input signal for monitoring standstill so that at real motor standstill will stop the output voltage immediately (see § 7.19, page 53).

Soft brake

- Even very high inertia loads can be stopped
- The Soft brake is a controlled reversing of the motor as the MSF measures the speed during braking.
- Two contactors are needed which can be placed on the in- or output of the soft starter. On the input the first contactor is connected to relay K1 which is also used as a mains contactor.
- At 30% of the nominal speed a DC-brake is activated until the motor is standing still or the selected Braking Time has expired (menu 34, next page).

- For extra safety, the soft starter has a digital input signal for monitoring standstill. So that the output voltage is stopped immediately (see menu 57-58, § 7.19, page 53).

See Fig. 47 on page 47 for the following set-up sequence:

- Soft brake is activated if menu 36=2 and menu 34 has a time selected (see next page).
- Menu 51 and 52 are automatically set to 5 and 4 to get the correct relay functions on K1 and K2 (see § 7.17, page 51).
- Relay K1 should be used to connect a contactor for supply L1, L2, L3 to MSF or motor.
- Relay K2 is used to connect phase shifting contactor to change L1, L2 and L3 to MSF or motor.
- At start K1 is activated and connects L1, L2, L3 then the motor starts. At stop K1 opens and disconnects L1, L2, and L3 and after 1s K2 connects with the other phase sequence and the braking of the motor is active.

NOTE! Soft brake uses both programmable relays. For other functions, see also the function table in chapter 7. page 35.

NOTE! For several start/stops it is recommend to use the PTC input.



WARNING! If the Soft Brake function has been selected once and after that the Bypass function is selected, then the relay functions on K1 and K2 remain in the Soft Brake functionality. Therefore it is necessary to change the relay functions in menu 51-52 manually to the Bypass functions (see § 7.17, page 51) or reset to default in menu 199 (see § 7.28, page 63) and select the Bypass function again.

034		Braking time
OFF		
Default:	oFF	
Range:	oFF, 1 - 120 sec	
oFF	Brake function disabled	
1-120	Brake time	

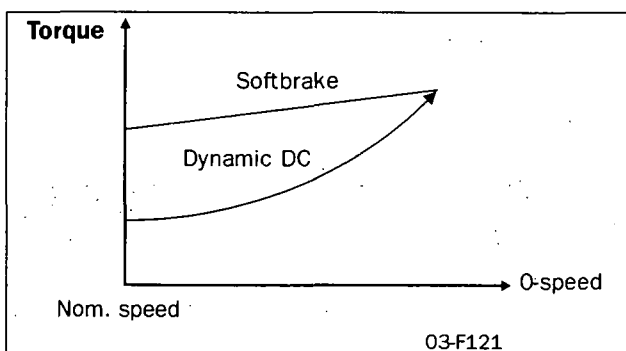


Fig. 46 Braking time

035°			
Braking Strength			
	1	0	0
Default:	100		
Range:	100 - 500%		

036°			
Brake method			
			1
Default:	1		
Range:	1, 2		
1	Dynamic vector brake, active		
2	Soft brake active		

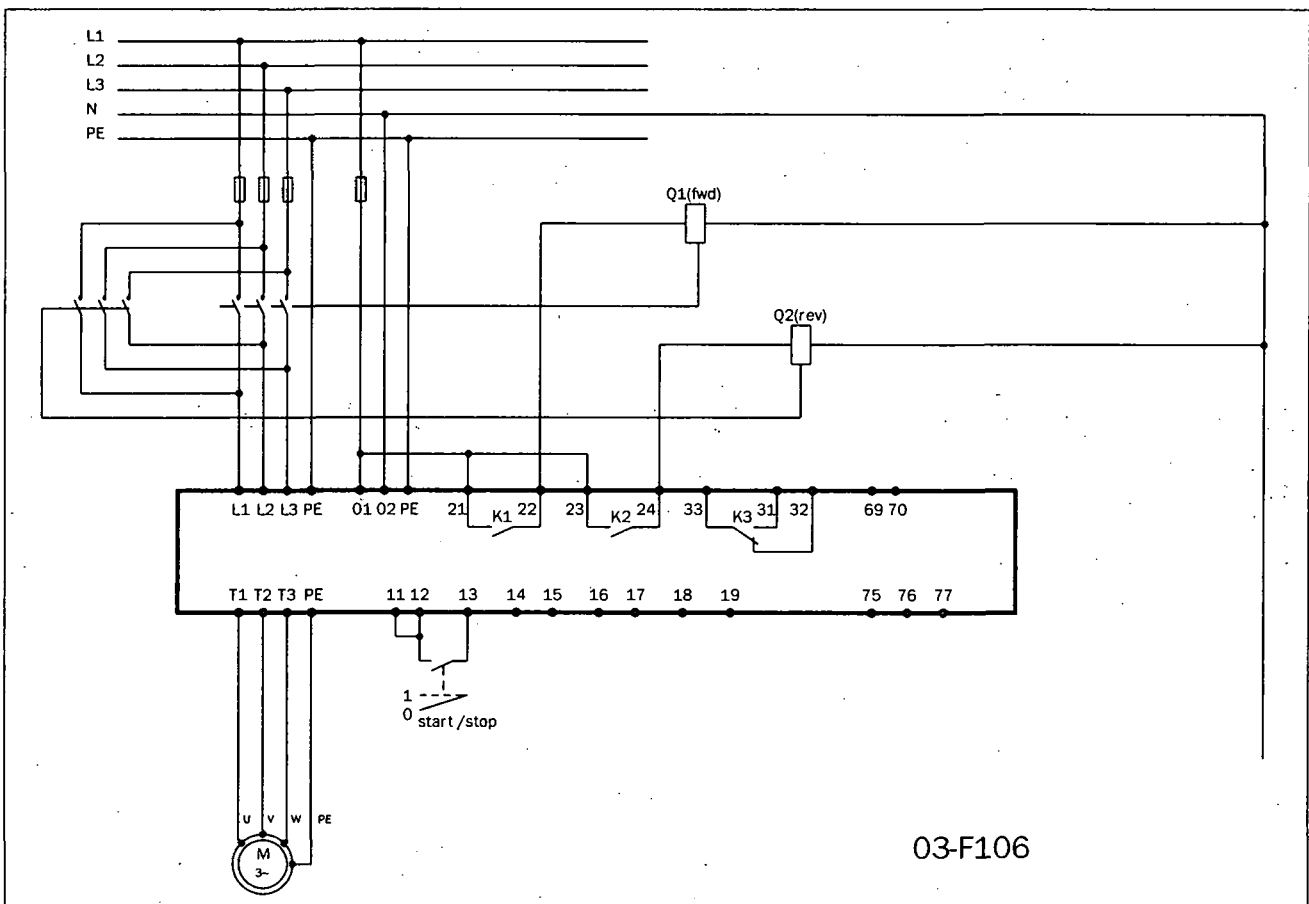


Fig. 47 Soft brake wiring example.

7.15 Slow speed and Jog functions

The soft starter is able to run the motor at a fixed slow speed for a limited period of time.

The slow speed will be about 14% of the full speed in the forward direction and 9% in the reverse direction.

The following functions are possible:

- **Slow speed controlled by an external signal.**
The digital input is used to run at slow speed at a start or stop command for a selected number of pulses (edges) generated by an external sensor (photo cell, micro switch, etc.). See § 7.19, page 53 for more instructions.
- **Slow Speed during a selected time period.**
The slow speed will be active after a stop command for a selected time period. See § 7.19, page 53 for more instructions.
- **Slow Speed using the "JOG"-commands.**
The slow Speed can be activated via the JOG keys on the keyboard or externally via the analogue input. See § 7.25, page 61 for more instructions.

7.15.1 Slow speed controlled by an external signal.

With these setting it is possible to have an external pulse or edge signal controlling the time that the Slow Speed is active either after a Start command or a Stop command or at both commands. The following menu's are involved:

Menu	Function	See page
57	Digital input selection	page 53
58	Pulse selection	page 53
37	Slow speed torque	page 49
38	Slow speed time at start	page 49
39	Slow speed time at stop	page 49
40	DC-Brake at slow speed	page 49

Installation is as follows:

1. Set the analogue input selection for Slow Speed operation. Menu 57=2. See § 7.19, page 53. See Fig. 37 on page 41 for a wiring example.
2. Select in menu 38 (see § 7.15.2, page 49) the Slow Speed at Start time. This time will now be the absolute maximum time for Slow Speed to be active after a start command, in case the external signal will not appear.
3. Select in menu 39 (see § 7.15.2, page 49) the Slow Speed at Stop time. This time will now be the absolute maximum time for Slow Speed to be active after a stop command, in case the external signal will not appear.
4. Select in menu 57 (see § 7.19, page 53) the number of edges to be ignored by the Slow Speed input, before a start or stop is executed at slow speed. The edges are generated by an external sensor (photo cell, micro switch, etc.).

The Slow Speed torque (menu 37) and DC-Brake after Slow Speed (menu 40) can be selected if needed. (see § 7.15.4, page 49).

When the number of edges exceeds or the time expire, a start according to selected main function is made.

At stop, the motor will ramp down (if selected) and DC brake (if selected) before a slow speed forward at stop will begin. Slow speed will last as long as the number of edges on the external input is below parameter value in menu 036 and the max duration time doesn't expires. When the number of edges exceeds or the time expire, a stop is made.

In Fig. 48 on page 48 the selected number of edges are 4. It is recommended to select DC-brake (see § 7.14, page 46) before a slow speed at stop if it is a high inertia load. See Fig. 29 on page 33 for wiring diagram. In case one use DC-brake, see § 7.15.4, page 49.

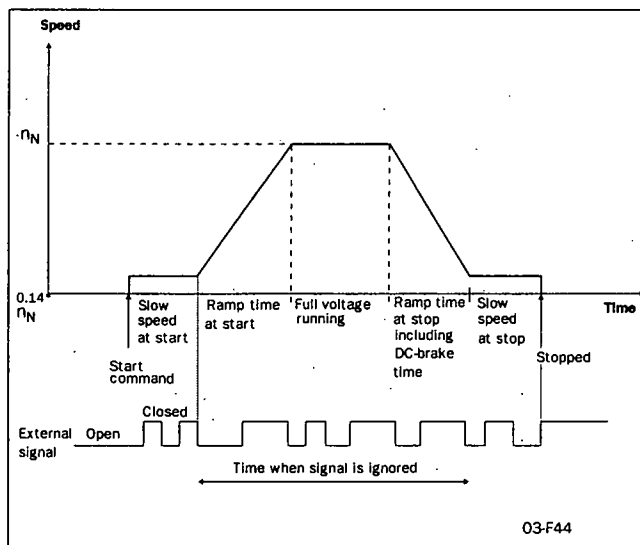


Fig. 48 Slow speed controlled by an external signal.

This additional function can be used together with most of the main functions (see § 4.6, page 19).

037		°
10		°
Slow speed torque		
Default:	10	
Range:	10-100	
Select the magnitude of the slow speed torque.		

7.15.2 Slow speed during a selected time

It is possible to have a slow speed in forward direction before a start and after a stop. The duration of the slow speed is selectable in menus 038 and 039.

It is recommended to select DC brake (see § 7.14, page 46) before a slow speed at stop if it is a high inertia load. This slow speed function is possible in all control modes, keyboard, remote and serial communication.

038 ^o			
Slow speed time at start			
o F F			
Default:	oFF		
Range:	oFF, 1 - 60 sec		
oFF	Slow speed at start is disabled		
1-60	Set slow speed time at start.		

039 ^o			
Slow speed time at stop			
o F F			
Default:	oFF		
Range:	oFF, 1 - 60 sec		
oFF	Slow speed at stop is disabled		
1-60	Set slow speed time at stop.		

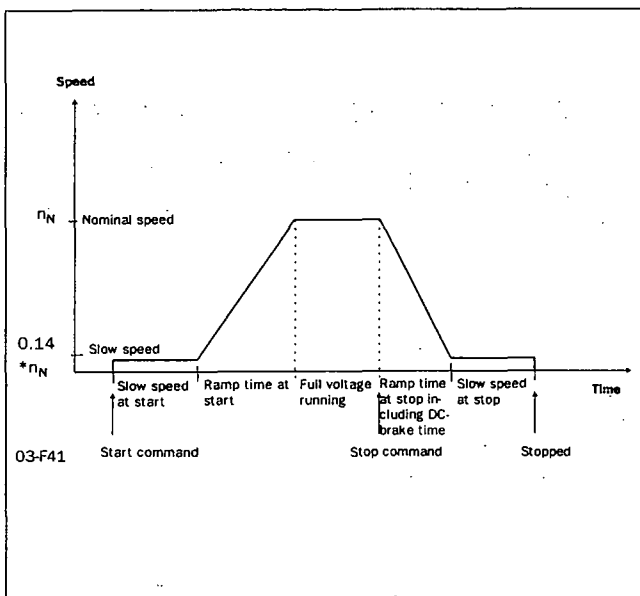


Fig. 49 Slow speed at start/stop during a selected time.

The Slow speed torque (menu 37) and the DC-Brake after Slow speed (menu 40, § 7.15.4, page 49) can be selected if needed.

7.15.3 Jog Functions

The Jog commands can be used to let the motor run at a Slow speed (forward or reverse) as long as the Jog command is active.

The Jog commands can be activated in 2 different ways:

- **Jog keys**

The Jog-Forward and Jog-reverse keys on the control panel. The keys can be programmed separate for each function. See § 7.25, page 61 for more instructions

- **External Jog command**

The external command is given via terminal 14 at the digital input. Only 1 function (forward or reverse) can be programmed to the digital input at the time. See § 7.19, page 53 for more instructions.

7.15.4 DC-brake after slow speed at stop [040]

A DC-brake after a slow speed at stop is possible to have, i.e. for a high inertia load or for a precise stop.

The current is controlled and the reference value for the normal DC-brake function is used (see § 7.15.4, page 49).

The duration for the DC-brake is possible to select.

This DC-brake function is not applied when the "JOG [F]" and "JOG [R]" keys are used.

040 ^o			
DC-Brake at slow speed			
o F F			
Default:	oFF		
Range:	oFF, 1-60		
oFF	DC-brake after slow speed at stop disabled.		
1-60	DC-brake duration time after slow speed at stop.		

7.16 Motor data setting

The first step in the settings is to set menu 007 and 008 to "on" to be able to reach the menus 041-046 and enter the motor data.

NOTE! The default factory settings are for a standard 4-pole motor acc. to the nominal current and power of the soft starter. The soft starter will run even if no specific motor data is selected, but the performance will not be optimal.

041 ^o			
Nominal motor voltage			
	4	0	0
Default:	400 V		
Range:	200-700 V		
Make sure the soft starters maximum voltage rating is suitable for chosen motor voltage.			

042 ^o			
Nominal motor current			
		1	7
Default:	Nominal soft starter current		
Range:	25% - 150% of Insoft in Amp.		

043 ^o			
Nominal motor power			
		7.	5
Default:	Nominal soft starter power		
Range:	25% - 300% of Pnsoft in kW		

044 ^o			
Nominal motor speed			
1	4	5	0
Default:	Nnsoft in rpm		
Range:	500-3600 rpm		

045 ^o			
Nominal motor cos phi			
	0.	8	6
Default:	0.86		
Range:	0.50-1.00		

046 ^o			
Nominal frequency			
		5	0
Default:	50 Hz		
Range:	50/60 Hz		

NOTE! Now go back to menu 007, 008 and set it to "off" and then to menu 001.

7.17 Programmable relay K1 and K2

The soft starter has three built-in auxiliary relays, K3 (change over contacts), is always used as an alarm relay. The other two relays, K1 and K2 (closing contacts), are programmable.

K1 and K2 can be set to either "Operation", "Full Voltage" or "Pre-alarm" indication. If DC-brake is chosen the relay K2 will be dedicated to this function.

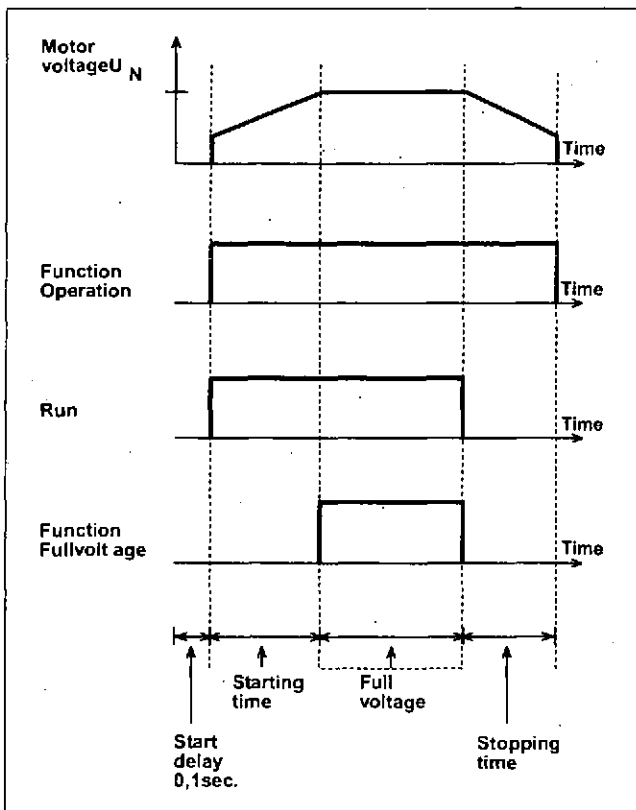


Fig. 50 Start/stop sequence and relay function "Operation" and "Full voltage".

052 ⁰	
Setting of K2 indication	
<div> <div></div> <div></div> <div></div> <div>2</div> </div>	
Default:	2
Range:	1, 2, 3, 4, 5
1	K2 is set for "Operation"
2	K2 is set for "Full Voltage"
3	K2 is set for "Power pre-alarm"
4	K2 is set for "Softbrake"
5	K2 is set for "Run"



WARNING! If the Soft Brake function has been selected once and after that the Bypass function is selected, then the relay functions on K1 and K2 remain in the Soft Brake functionality. Therefore it is necessary to change the relay functions in menu 51-52 manually to the Bypass functions (see § 7.12, page 43) or reset to default in menu 199 (see § 7.28, page 63) and select the Bypass function again.

051 ⁰	
Setting of K1 indication	
<div> <div></div> <div></div> <div></div> <div>1</div> </div>	
Default:	1
Range:	1, 2, 3, 4, 5
1	K1 is set for "Operation"
2	K1 is set for "Full Voltage"
3	K1 is set for "Power pre-alarm"
4	No function
5	K1 is set for "Run"

7.18 Analogue output

The soft starter can present current, voltage and power on an analogue output terminal, for connection to a recording instrument or a PLC. The output can be configured in 4 different ways, 0-10V, 2-10V, 0-20mA or 4-20mA. To install the instrument proceed as follows:

1. Connect the instrument to terminal 19 (+) and 15 (-).

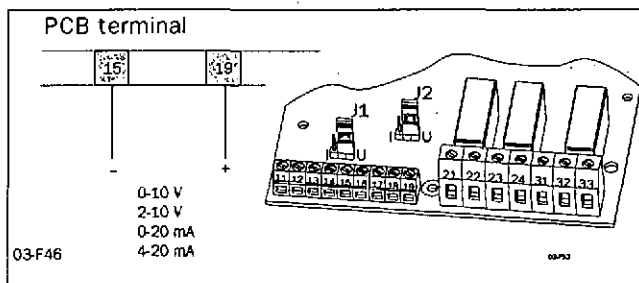


Fig. 51 Wiring for analogue output.

2. Set Jumper J2 on the PCB board to voltage (U) or current (I) signal position. Factory setting is voltage (U). See Fig. 52 on page 52 and Fig. 24 on page 28.

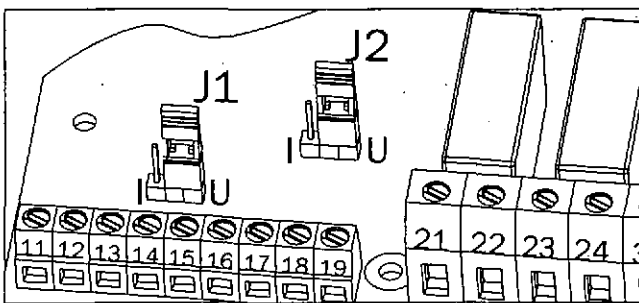


Fig. 52 Setting of current or voltage output.

3. Set the parameter in menu 054.

054 ^o	
Analogue output	
o F F	
Default:	oFF
Range:	oFF, 1, 2
oFF	Analogue output is disabled
1	Analogue output is set to 0-10V/0-20mA
2	Analogue output is set to 0-10V/4-20mA

4. Choose a read-out value in menu 055

055 ^o	
Analogue output value	
1	
Default:	1
Range:	1, 2, 3
1	RMS current, default range 0-5xI _n
2	Line input RMS voltage, default range 0-720V
3	Output shaft power, default range 0-2xP _n

5. Set analogue output gain to adjust the range of chosen analogue output value in menu 056.

056 ^o	
Analogue output gain	
1 0 0	
Default:	100%
Range:	5-150%

Example on settings:

Set value	I _{scale}	U _{scale}	P _{scale}
100%	0-5xI _n	0-720V	0-2xP _n
50%	0-2.5xI _n	0-360V	0-P _n

7.19 Digital input selection

The analogue input can be used as a digital input. This is programmed in Menu 57. There are 4 different functions:

- Rotation sensor input for braking functions. See § 7.14, page 46.
- Slow speed external controlled. See § 7.15.1, page 48.
- Jog functions forward or reverse enabled. See § 7.25, page 61.

Fig. 53 shows how to set the input for voltage or current control, with jumper J1 the control board. The default setting for J1 is voltage control.

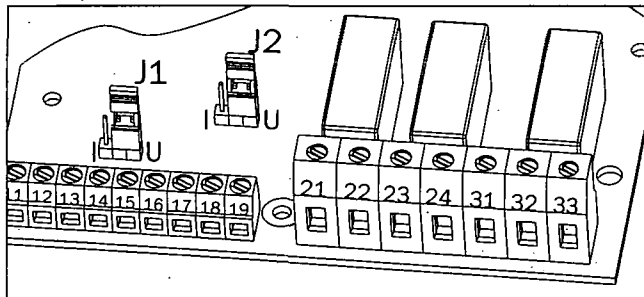


Fig. 53 Setting of J1 for current or voltage control.

Fig. 54 shows a wiring example for the analogue input as it is used for digital input.

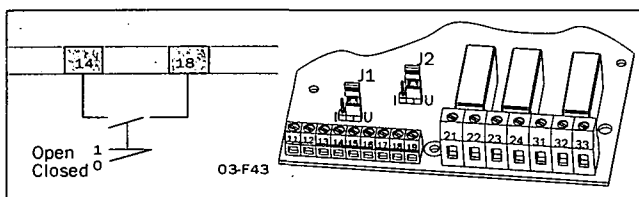


Fig. 54 Wiring for slow speed external input.

NOTE! If the Main Function Analogue control is programmed (see § 7.8, page 41) the analogue input can not be used for digital signal input. The menu 57 is then automatically set to OFF.

057°	
Digital input selection	
OFF	
Default:	oFF
Range:	oFF, 1-4
oFF	No digital input control
1	Rotation sensor for brake functions
2	Slow speed function
3	Jog forward command
4	Jog reverse command

NOTE! Jog forward, reverse has to be enabled, see § 7.25, page 61.

Depending on the selection made in menu 57, menu 58 is used to program the number of the edges. The edges can be generated by an external sensor (photo cell, micro switch etc.).

058°	
Digital input pulses	
1	
Default:	1
Range:	1-100
If Menu 57=1. A positive or negative edge at analogue input from a rotation sensor will give a signal to stop the braking voltage.	
If Menu 57=2 The number of edges to be ignored by the slow speed input, before a start or stop is executed at slow speed.	

7.20 Parameter Set

Parameter Set, an important function which can be handy when using one soft starter to switch in and start different motors, or working under variable load conditions. For example; starting and stopping conveyor belts with different weight on the goods from time to time.

For sets of parameters can be controlled either from the keyboard, the external control inputs or the serial interface (option). Up to 51 different parameters can be set for each Parameter Set.

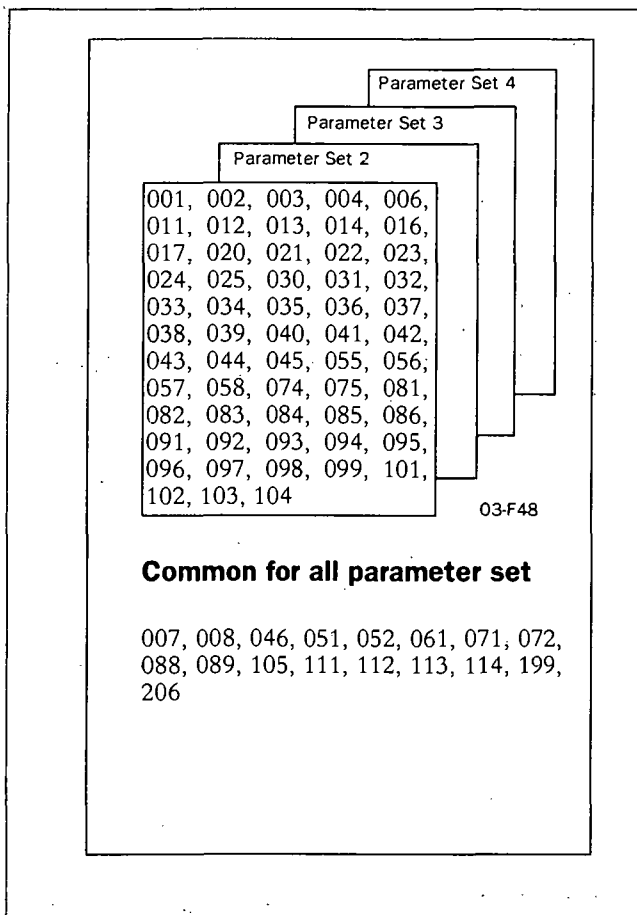


Fig. 55 Parameter overview

When 'Parameter set' in menu 061 is set to 0 (external selection), only parameters in menu 006 (Control mode) and 061 (Parameter set) can be changed. All other parameters are not allowed to change.

It is possible to change parameter set at stop and at full voltage running.

061 ⁰	
Parameter set	
Default:	1
Range:	0, 1, 2, 3, 4
0	Parameter set are selected by the external input 16 and 17 (see below).
1, 2, 3, 4	Selection of parameter set 1-4.

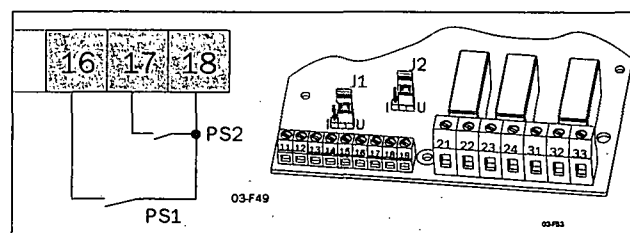


Fig. 56 Connection of external control inputs.

Parameter Set	PS1 (16-18)	PS2 (17-18)
1	Open	Open
2	Closed	Open
3	Open	Closed
4	Closed	Closed

7.21 Motor protection, overload (F2 alarm)

In many cases it is convenient to have a complete starter. The soft starter have a possibility to use either an input PTC signal from the motor, an internal thermal model of the motor for thermal protection or both together at the same time. Slight overload for long time and several overloads of short duration will be detected with both methods.

071 ^o	
Motor PTC input	
no	
Default:	no
Range:	no, YES
no	Motor PTC input is disabled
YES	Motor PTC input is activated: - Connect the PTC to terminals 69 and 70, see table 12; page 32 and § Fig. 30, page 34. - A hot motor will give an F2 alarm. The alarm can only be resetted after cooling down of the motor.

NOTE! Open terminals will give an F2 alarm immediately. Make sure the PTC is always connected or the terminals are shorted.

NOTE! The internal motor thermal protection will still generate an alarm if it is not selected OFF.

072 ^o	
Internal motor thermal protection	
10	
Default:	10
Range:	oFF, 2-40 sec
oFF	Internal motor protection is disabled.
2-40	Selection of the thermal curve according to Fig. 57 - Check that menu 042 is set to the proper motor current (see § 7.16, page 50). - If the current exceeds the 100% level an F2 alarm is activated. - The motor model thermal capacity must cool down to 95% before reset can be accepted. - Used thermal capacity in menu 073 in § 7.21, page 55.

NOTE! If 'Bypass' is used check that the current transformers are placed and connected correctly (see Fig. 43 on page 44).



CAUTION! Used thermal capacity is set to 0 if the control board loses its supply (terminal 01 and 02). This means that the internal thermal model starts with a 'cold' motor, which perhaps in reality is not the case. This means that the motor can be overheated.

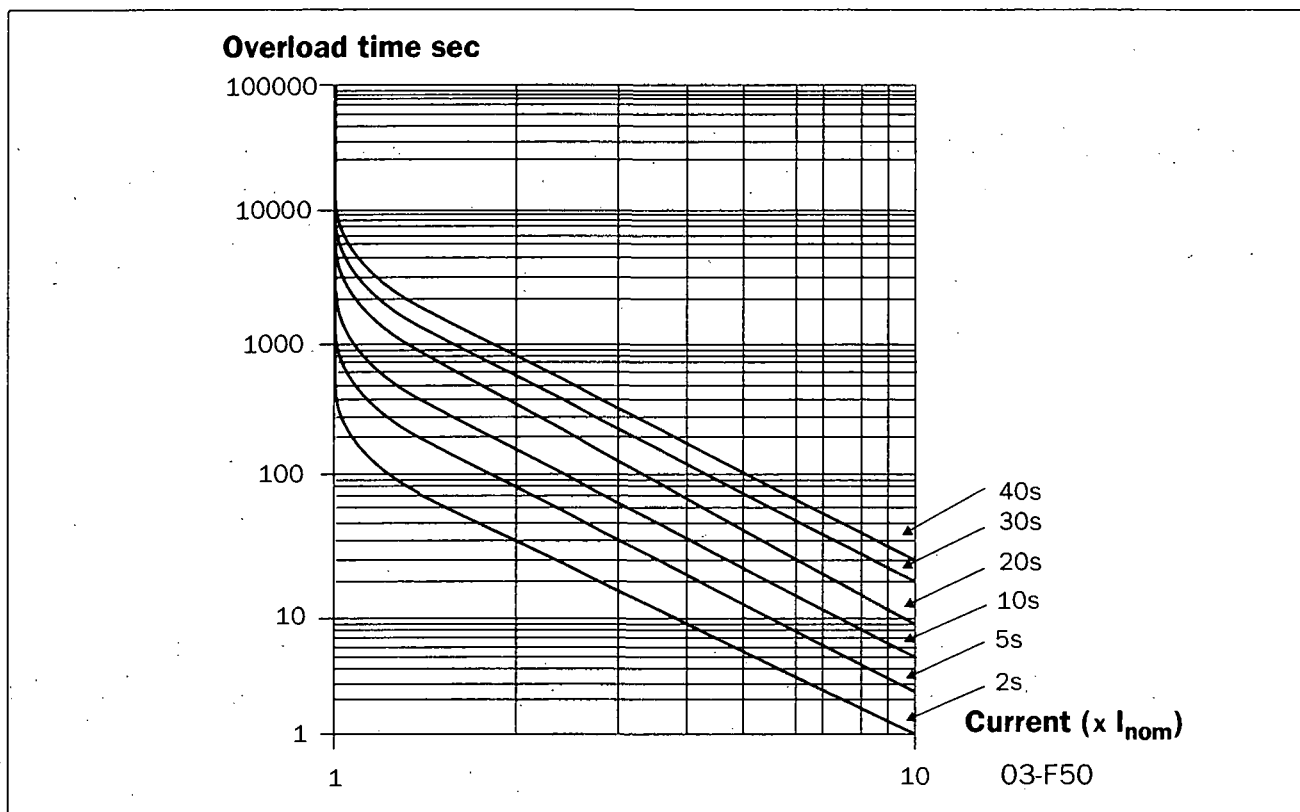


Fig. 57 The thermal curve

7.22 Mains protection

073°	
Used thermal capacity	
<div> <div></div> <div></div> <div></div> <div>0</div> </div>	
Default:	-
Range:	0-150%
Read-out of the used thermal capacity. If menu 072 'Internal motor thermal protection' is selected OFF, the capacity is shown as if the default class 10 was selected.	

081°	
Voltage unbalance alarm	
<div> <div></div> <div></div> <div>1</div> <div>0</div> </div>	
Default:	10
Range:	2 -25% U_n
Insert limit in % of nominal motor voltage. Max unbalance in voltage between the 3 input phases is compared with the selected value. This is a category 2 alarm.	

074°	
Starts per hour limitation	
<div> <div></div> <div>o</div> <div>F</div> <div>F</div> </div>	
Default:	oFF
Range:	oFF, 1-99/hour
oFF	Starts per hour limitation is disabled.
1-99	Sets the start per hour limitation alarm. If the selected number is exceeded, alarm F11 occurs.

082°	
Response delay voltage unbalance alarm	
<div> <div></div> <div>o</div> <div>F</div> <div>F</div> </div>	
Default:	oFF
Range:	oFF, 1-60 sec
oFF	Unbalance voltage alarm is disabled
1-60	Set the response delay time for unbalanced voltage alarm F8.

075°	
Locked rotor alarm	
<div> <div></div> <div>o</div> <div>F</div> <div>F</div> </div>	
Default:	oFF
Range:	oFF, 1.0-10.0 sec
oFF	Locked rotor alarm is disabled
1.0-10.0	An F5 alarm is given when the rotor locks. The alarm is active during starting and running.

083°	
Over voltage alarm	
<div> <div></div> <div>1</div> <div>1</div> <div>5</div> </div>	
Default:	115
Range:	100 -150% U_n
Insert limit in % of nominal motor voltage. Max voltage of the 3 input phases is compared with the selected value. This is a category 2 alarm.	

084°	
Response delay over voltage alarm	
<div> <div></div> <div>o</div> <div>F</div> <div>F</div> </div>	
Default:	oFF
Range:	oFF, 1-60 sec
oFF	Overvoltage alarm is disabled
1-60	Set the response delay time for over voltage alarm F9.

7.23 Application protection (load monitor)

7.23.1 Load monitor max and min/protection (F6 and F7 alarms)

MSF has a built in load monitor based on the output shaftpower. This is a unique and important function which enables protection of machines and processes driven by the motor connected to the soft starter. Both a Min and Max limit is possible to select.

In combination with the pre-alarm function, see § 7.23.2, page 58, this create a powerful protection. An auto set function is also included for an automatic setting of the alarm limits. A start-up delay time can be selected to avoid undesired alarms at start-up, see Fig. 58 on page 60.

NOTE! The load monitor alarms are all disabled during a stop ramp.

085 ^o	
Under voltage alarm	
o F F	
Default:	85
Range:	75-100 U _n
Insert limit in % of nominal motor voltage. Min voltage of the 3 input phases is compared with the selected value. This is a category 2 alarm.	

086 ^o	
Response delay under voltage alarm	
o F F	
Default:	oFF
Range:	oFF, 1-60 sec
oFF	Under voltage alarm is disabled
1-60	Set the response delay time for under voltage alarm F10

087 ^o	
Phase sequence	
- - - -	
Default:	-
Range:	L123, L321
L123 is the direct phase sequence. L321 is the reverse phase sequence.	

088 ^o	
Phase reversal alarm	
o F F	
Default:	oFF
Range:	oFF, on
oFF	Phase reversal alarm is disabled
on	Sets the phase reversal Alarm. - Switch on the power supply first. The phase sequence is stored as the correct sequence. - Sets the menu 088 to "on". - Any reversal of phase sequence will cause alarm F16.

NOTE! The actual phase sequence can be viewed in menu 87.

089 ^o	
Auto set power limits	
n o	
Default:	no
Range:	no, YES
no	Auto set is disabled
YES	Auto set is activated if ENTER is pressed.

090 ^o	
Output shaftpower in %	
o	
Default:	-
Range:	0-200%
Measured output shaftpower in % of nominal motor power.	

NOTE! System must be in full voltage running before an auto set is permitted.

The actual power is regarded as 1.00xPact.

The set levels are:

Power max alarm limit[092]:	1.15xP actual
Power max pre-alarm limit[094]:	1.10xP actual
Power min pre-alarm limit[096]:	0.90xP actual
Power min alarm limit[098]:	0.85xP actual

A successful auto set shows a message 'Set' for 3 s and if something goes wrong a message 'no' will be showed.

091°	
Start delay power limits	
10	
Default:	10 sec
Range:	1-250 sec
From start command during selected delay time, all power load monitor alarms and pre-alarms are disabled.	

092°	
Max power alarm limit	
115	
Default:	115
Range:	5-200% Pn
Insert limit in % of nominal motor power. The actual power in % of nominal motor power, could be read out in menu 090. If output shaft power exceeds selected limit, an F6-alarm occurs after the response delay time. The 'Auto set' function in menu 089, affect this limit even if the alarm is set "oFF" in menu 093. This is a category 1 alarm.	

093°	
Response delay max alarm	
oFF	
Default:	oFF
Range:	oFF, 0.1-25.0 sec
oFF	Max Alarm is disabled.
0.1-25.0	Sets the response delay of the Max Alarm level.

7.23.2 Pre-alarm

It could be useful to know if the load is changing towards a load alarm limit. It is possible to insert both a Max and Min pre-alarm limit based on the motor output shaft power. If the load exceeds one of these limits, a pre-alarm condition occurs.

It should be noted that it is not normal alarms. They will not be inserted in the alarm list, not activating the alarm relay output, not displayed on the display and they will not stop operation. But it is possible to activate relay K1 or K2 if a pre-alarm condition occurs. To have pre-alarm status on any of these relays, select value 3 in menu 051 or 052 (see § 7.17, page 51).

A start-up delay time can be selected in menu 091 to avoid undesired pre-alarms at start-up. Note that this time is also shared with power Max and Min alarms.

NOTE! The pre-alarm status is always available on the serial communication.

094°	
Max power pre-alarm limit	
110	
Default:	110
Range:	5 -200% Pn
Insert limit in % of nominal motor power. The actual power in % of nominal motor power, could be read out in menu 090. If output shaft power exceeds selected limit, a pre-alarm occurs after the response delay time. The 'Auto set' function in menu 089, affect selected limit even if the pre-alarm is set "oFF" in menu 095.	

095°	
Max pre-alarm response delay	
oFF	
Default:	oFF
Range:	oFF, 0.1 - 25.0 sec
oFF	Max Pre-Alarm is disabled.
0.1-25.0	Sets the response delay of the Max Pre-Alarm level.

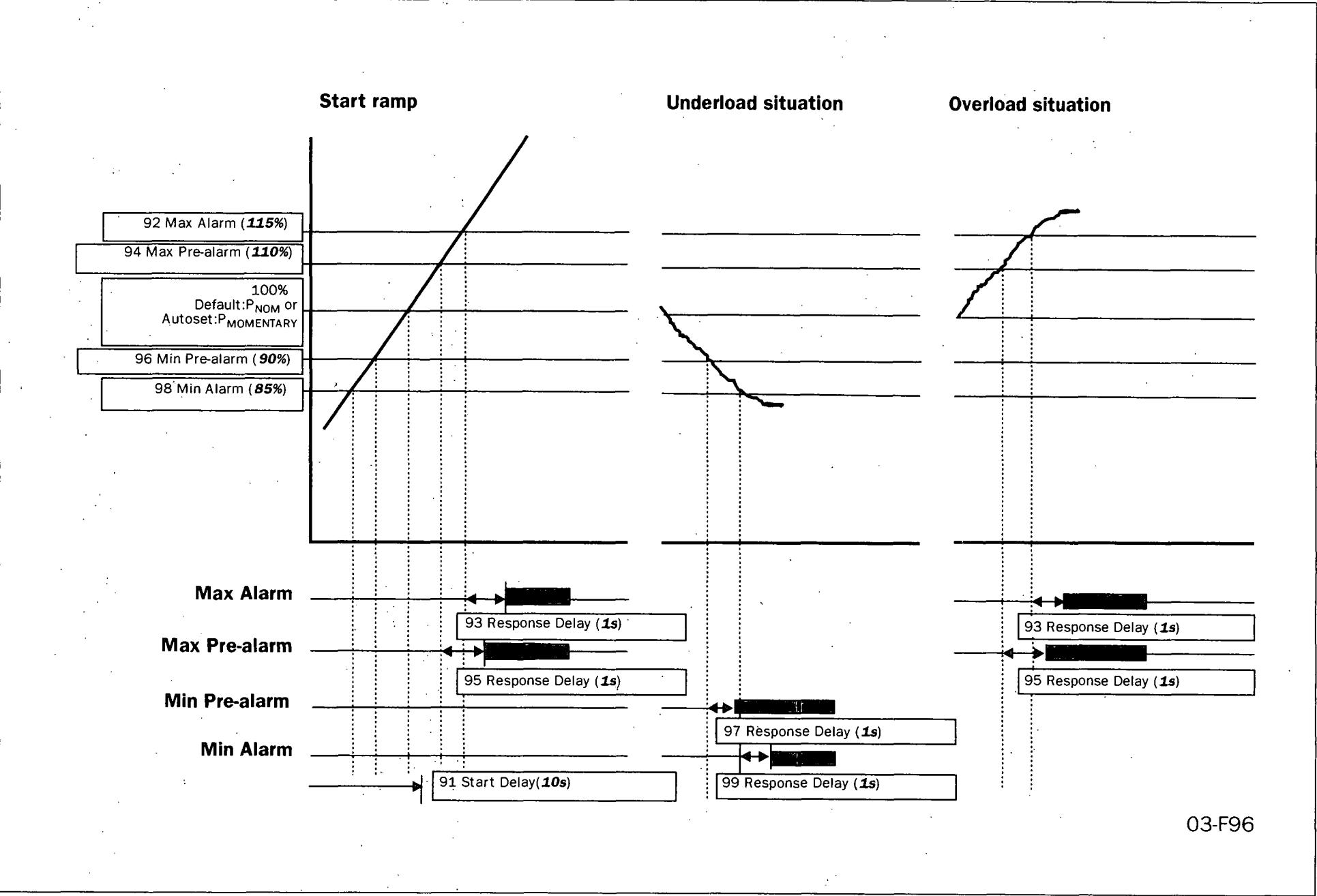
096°					
Min power pre-alarm limit					
<table border="1"> <tr> <td></td> <td></td> <td>9</td> <td>0</td> </tr> </table>				9	0
		9	0		
Default:	90%				
Range:	5 -200% Pn				
<p>Insert limit in % of nominal motor power. The actual power in % of nominal motor power, could be read out in menu 090. If output shaft power goes below selected limit, a pre-alarm occurs after the response delay time. The 'Auto set' function in menu 089, affect selected limit even if the pre-alarm is set "oFF" in menu 097.</p>					

099°					
Min alarm response delay					
<table border="1"> <tr> <td></td> <td>o</td> <td>F</td> <td>F</td> </tr> </table>			o	F	F
	o	F	F		
Default:	oFF				
Range:	oFF, 0.1-25.0 sec				
oFF	Min Alarm is disabled				
0.1-25.0	Sets the response delay of the Min Alarm level. The Min alarm is disabled during a stop ramp down.				

097°					
Min pre-alarm response delay					
<table border="1"> <tr> <td></td> <td>o</td> <td>F</td> <td>F</td> </tr> </table>			o	F	F
	o	F	F		
Default:	oFF				
Range:	oFF, 0.1 - 25.0 sec				
oFF	Min Pre-Alarm is disabled.				
0.1-25.0	Sets the response delay of the Min Pre-Alarm level. The Min Pre-alarm is disabled during a stop ramp down.				

098°					
Min power alarm limit					
<table border="1"> <tr> <td></td> <td></td> <td>8</td> <td>5</td> </tr> </table>				8	5
		8	5		
Default:	85				
Range:	5-200% Pn				
<p>Insert limit in % of nominal motor power. The actual power in % of nominal motor power, could be read out in menu 090. If output shaft power goes below selected limit, an F7-alarm occurs after the response delay time. The 'Auto set' function in menu 089, affect this limit even if the alarm is set 'oFF' in menu 099. This is a category 1 alarm.</p>					

Fig. 58 Load monitor alarm functions.



7.24 Resume alarms

7.24.1 Phase input failure F1

- **Multiple phase failure.**
Shorter failure than 100ms is ignored. If failure duration time is between 100 ms and 2 s, operation is temporary stopped and a soft start is made if the failure disappears before 2 s. If failure duration time is longer than 2 s, an F1 alarm is given in cat. 2.
- **Single phase failure.**
During start up (acceleration) the behaviour is like multiple phase failure below. When full voltage running there is a possibility to select the behaviour.

101 ^o	
Run at single phase loss	
n o	
Default:	no
Range:	no, YES
no	Soft starter trips if a single phase loss is detected. Alarm F1 (category 2) will appear after 2 sec.
YES	Soft starter continues to run after a single phase loss. - Alarm F1 appears after 2 sec. - If the loose phase is reconnect the alarm is reset automatically. - If running on 2 phases, a stop command will give a Direct on line stop (freewheel)

7.24.2 Run at current limit time-out F4

In modes 'Current limit at start' and 'Voltage ramp with current limit at start' an alarm is activated if still operating at current limit level when selected ramp time exceeds. If an alarm occurs there is a possibility to select the behaviour.

102 ^o	
Run at current limit time-out	
n o	
Default:	no
Range:	no, YES
no	Soft starter trips if the current limit time-out is exceeded. Alarm F4 (category 2) appears.
YES	Soft starter continues to run after the current limit time-out has exceeded: - Alarm F4 appears - The current is no longer controlled and the soft starters ramps up to full voltage with a 6s ramp time. - Reset the alarm with either ENTER/RESET key or by giving a stop command.

7.25 Slow speed with JOG

Slow speed with "JOG" is possible from the "JOG" keys, but also from terminals, see menu 57 page 53 and serial comm. The "JOG" is ignored if the soft starter is running. The slow speed "JOG" function has to be enabled for both forward and reverse directions in menus 103 and 104, see below.

NOTE! The enable functions is for all control modes.

103 ^o	
JOG forward enable	
o F F	
Default:	oFF
Range:	oFF, on
oFF	JOG forward disabled
on	JOG forward enabled

104 ^o	
JOG reverse enable	
o F F	
Default:	oFF
Range:	oFF, on
oFF	JOG reverse disabled
on	JOG reverse enabled

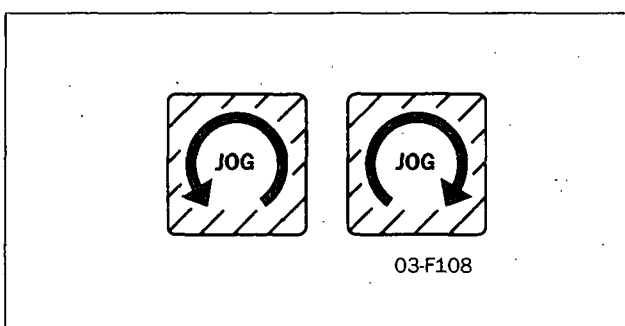


Fig. 59 The 2 Jog keys.

7.26 Automatic return menu

Often it is desirable to have a specific menu on the display during operation, i.e. RMS current or power consumption. The Automatic return menu function gives the possibility to select any menu in the menu system.

The menu selected will come up on the display after 60 sec. if no keyboard activity. The alarm messages (F1-F16) have a priority over menu 105 (as they have for all menus).

105 ^o			
<div> <div></div> <div>o</div> <div>F</div> <div>F</div> </div> Automatic return menu			
Default:	oFF		
Range:	oFF, 1-999		
1-999	Pressing "+" / "-" will lead through the menu system.		

7.27 Communication option, related Parameters

The following parameters have to be set-up:

- Unit address.
- Baud rate.
- Parity
- Behaviour when contact broken.

Setting up the communication parameter must be made in local 'Keyboard control' mode. See § 7.2, page 37.

111 ^o			
<div> <div></div> <div></div> <div></div> <div>1</div> </div> Serial comm unit address			
Default:	1		
Range:	1-247		
This parameter will select the unit address.			

112 ^o			
<div> <div></div> <div></div> <div>9.</div> <div>6</div> </div> Serial comm baudrate			
Default:	9.6		
Range:	2.4, 4.8, 9.6, 19.2, 38.4 kBaud		
This parameter will select the baudrate.			

113 ^o			
<div> <div></div> <div></div> <div></div> <div>0</div> </div> Serial comm parity			
Default:	0		
Range:	0.1		
This parameter will select the parity.			
0 No parity.			
1 Even parity.			

Serial comm. broken alarm

If control mode is 'Serial comm. control' and no contact is established or contact is broken the Soft starter consider the contact to be broken after 15 sec, the soft starter can act in three different ways:

- 1 Continue without any action at all.
- 2 Stop and alarm after 15 sec.
- 3 Continue and alarm after 15 sec.

If an alarm occurs, it is automatically reset if the communication is re-established. It is also possible to reset the alarm from the soft starter keyboard.

114 ^o			
<div> <div></div> <div></div> <div></div> <div>1</div> </div> Serial comm. contact interrupted			
Default:	1		
Range:	oFF, 1, 2		
This parameter will control the behaviour in the soft starter when the serial comm. is interrupted.			
oFF No alarm and continue operation.			
1 Alarm and stop operation.			
2 Alarm and continue operation.			

7.28 Reset to factory setting [199]

When selecting reset to factory settings:

- All parameters in all parameter sets will have default factory settings.
- Menu 001 will appear on the display.
- Note that the alarm list, the power consumption and the operation time will **not** have default settings.

199 ^o			
Reset to factory settings			
n o			
Default:	no		
Range:	no, YES		
no	No reset		
YES	Reset all functions to the factory defaults incl. all 4 Parameter Sets.		

NOTE! Reset to factory settings is not allowed at run.

7.29 View operation

General

The soft start includes as standard a numerous metering functions which eliminates the need of additional transducers and meters.

Measured values

- Current RMS 3-phase current and per phase
- Voltage RMS 3-phase voltage and per phase
- Output shaft power /torque kW/Nm
- Power factor
- Power consumption in kWh
- Operation time in hours

Viewing of the measured values

After setting motor data and extended functions one can set menu 008 in oFF and will then automatically move to menu 201, the first menu viewing the measured values and thus eliminate to scroll through menu 011 to menu 199.

201 ^o			
RMS current			
0.0			
Default:	-		
Range:	0.0 - 9999Amp		
Read-out of the RMS motor current.			

NOTE! This is the same read-out as menu 005 see § 7.1.1, page 36.

202 ^o			
RMS main voltage			
0.0			
Default:	-		
Range:	0-720V		
The RMS input main voltage.			

203 ^o			
Output motor shaftpower			
0.0			
Default:	-		
Range:	-9999 -+9999kW		
Viewing will show negative value if generator mode.			

204 ^o			
Power factor			
0.0			
Default:	-		
Range:	0.00-1		
View the actual power factor.			

NOTE! The power factor viewing will not work at bypass even if the current transformers are mounted outside the soft start.

205 ^o			
Total power consumption			
0.0 0 0			
Default:	-		
Range:	0.000 -2000MWh		
View the total power consumption.			

206 ^o	
Reset of power consumption	
no	
Default:	no
Range:	no, YES
no	No reset of power consumption.
YES	Reset power consumption in menu 205 to 0.000.

212 ^o	
RMS current in phase L2	
0.0	
Default:	-
Range:	0.0 - 9999Amp
View the current in phase L2.	

207 ^o	
Motor shaft torque	
0.0	
Default:	-
Range:	-9999 - + 9999Nm
Viewing will show negative value if generator mode.	

213 ^o	
RMS current in phase L3	
0.0	
Default:	-
Range:	0.0 - 9999Amp
View the current in phase L3.	

208 ^o	
Operation time	
0.0	
Default:	-
Range:	Hours
Operation time is calculated when the soft starter is in RUN mode. After 9999 hours the display will show two values.	
Example: 12467 hours shows 1 1 sec 2467 5sec	

214 ^o	
Main voltage L1-L2	
0	
Default:	-
Range:	0-720V
View main voltage L1-L2.	

211 ^o	
RMS current in phase L1	
0.0	
Default:	-
Range:	0.0 - 9999Amp
View the current in phase L1.	

215 ^o	
Main voltage L1-L3	
0	
Default:	-
Range:	0 - 720V
View main voltage L1-L3.	

216 ^o	
Main voltage L2-L3	
0	
Default:	-
Range:	0 - 720V
View main voltage L2-L3.	

7.30 Keyboard lock

The keyboard can be locked to prohibit operation and parameter setting by an unauthorised. Lock keyboard by pressing both keys "NEXT →" and "ENTER ←" for at least 2 sec. The message '- Loc' will display when locked. To unlock keyboard press the same 2 keys "NEXT →" and "ENTER ←" for at least 2 sec. The message 'unlo' will display when unlocked.

In locked mode it is possible to view all parameters and read-out, but it is forbidden to set parameters and to operate the soft starter from the keyboard.

The message '-Loc' will display if trying to set a parameter or operate the soft starter in locked mode.

The key lock status can be read out in menu 221.

221°	
Locked keyboard info	
no	
Default:	no
Range:	no, YES
no	Keyboard is not locked
YES	Keyboard is locked

7.31 Alarm list

The alarm list is generated automatically. It shows the latest 15 alarms (F1 - F16). The alarm list can be useful when tracing a failure in the soft starter or its control circuit. Press key "NEXT →" or "PREV ←" to reach the alarm list in menus 901-915 (menu 007 has to be ON).

901°	
Alarm	
F 1	
Default:	-
Range:	F1-F16
View actual alarm	

8. PROTECTION AND ALARM

The soft starter is equipped with a protection system for the motor, the machine and for the soft starter itself.

Three categories of alarm are available:

Category 1

Alarm that stops the motor and need a separate reset before a new start can be accepted.

Category 2

Alarm that stops the motor and accepts a new start command without any separate reset.

Category 3

Alarm that continues to run the motor.

All alarm, except pre-alarm, will activate the alarm relay output K3, flash a red fault number on the display and it will also be placed in the alarm list. As long as the alarm is active, the display is locked in the alarm indication.

The relay output K3 can be used in the control circuit for actions needed when alarm occurs.

If more than one alarm is active, it is the last alarm that is presented on the display.

8.1 Alarm description

8.1.1 Alarm with stop and requiring a separate reset

Operation will stop for a category 1 alarm. A separate reset is needed before a new start command is accepted. It is possible to reset from keyboard (pushing "ENTER/RESET") regardless of selected control mode. It is also possible to reset the alarm from the actual control mode (i.e. if control mode is serial communication, a reset is possible to do from serial communication).

A reset is accepted first when the alarm source goes back to normal.

When a reset is made, the alarm relay output K3 is deactivated, the alarm indication on the display disappear and the original menu shows.

After a reset is made the system is ready for a new start command.

8.1.2 Alarm with stop and requiring only a new start command

Operation will stop for a category 2 alarm. A restart can be done and at the same time the alarm relay output K3 is deactivated, the alarm indication on the display disappear and the original menu shows.

It is still possible to reset the alarm in the same way as for category 1 alarms (see 8.1.1), if a start is not required at the time.

8.1.3 Alarm with continue run

Operation will continue run for a category 3 alarm. Some different reset behaviour is possible (see remarks for the specific alarms in § 8.2, page 67).

- Automatic reset when the alarm source goes back to normal.
- Automatic reset when a stop command is given.
- Manual reset during run.

When the reset occurs, the alarm relay output K3 is deactivated, the alarm indication on the display disappear and the original menu shows.

8.2 Alarm overview

Display indication	Protective function	Alarm category	Remark
F1	Phase input failure.	Cat 3. Run with auto reset.	Single phase failure when full voltage running if menu 101 'Run at phase loss' = YES. If the fault phase comes back, an automatic reset is made.
		Cat 2. Stop with reset in start.	Multiple phase failure or single phase failure when not full voltage running or if menu 101 'Run at phase loss' = no.
F2	Motor protection, overload.	Cat 1. Stop with manual reset.	If menu 071 'Motor PTC input' = YES, cool down the motor. If menu 071 'Motor PTC input' = no, the internal model has to 'cool' down.
F3	Soft start overheated	Cat 1. Stop with manual reset.	If not cooled down, a reset will not be accepted.
F4	Full speed not reached at set current limit and start time.	If menu 102 'Run at current limit time-out' = no. Cat 2. Stop with reset in start.	The current limit start is not completed.
		If menu 102 'Run at current limit time-out' = YES. Cat 3. Run with manual reset.	When start time expired, a 6 sec ramp is used to reach full voltage, without control of the current. Reset the alarm with either a manual reset or a stop command.
F5	Locked rotor.	Cat 1. Stop with manual reset.	Motor and/or machine protection.
F6	Above max power limit.	Cat 1. Stop with manual reset.	Machine protection.
F7	Below min power limit.	Cat 1. Stop with manual reset.	Machine protection.
F8	Voltage unbalance.	Cat 2. Stop with reset in start.	Motor protection.
F9	Over voltage.	Cat 2. Stop with reset in start.	Motor protection.
F10	Under voltage.	Cat 2. Stop with reset in start.	Motor protection.
F11	Starts / hour exceeded.	Cat 2. Stop with reset in start.	Motor and/or machine protection.
F12	Shorted thyristor.	Cat 3. Run with manual reset.	When stop command comes, the stop will be a 'Direct On Line' stop, and the soft starter will be resetted. After this fault it is possible to start only in 'Direct On Line' mode. One or more thyristors probably damaged.
F13	Open thyristor.	Cat 1. Stop with manual reset.	One or more thyristors probably damaged.
F14	Motor terminal open.	Cat 1. Stop with manual reset.	Motor not correctly connected.
F15	Serial communication broken.	If menu 114 Serial comm. contact broken = 1. Cat 2. Stop with reset in start.	Serial communication broken will stop operation. Run from keyboard if necessary.
		If menu 114 Serial comm. contact broken = 2. Cat 3. Run with auto reset.	Serial communication broken will not stop operation. Stop from keyboard if necessary.
F16	Phase reversal alarm.	Cat 1. Stop with manual reset.	Incorrect phase order on main voltage input.

9. TROUBLE SHOOTING

9.1 Fault, cause and solution

Observation	Fault indication	Cause	Solution
The display is not illuminated.	None	No control voltage.	Switch on the control voltage.
The motor does not run.	F1 (Phase input failure)	Fuse defective. No mains supply.	Renew the fuse. Switch the main supply on.
	F2 (Motor protection, overload)	Perhaps PTC connection. Perhaps incorrect nominal motor current inserted (menu 042).	Check the PTC input if PTC protection is used. If internal protection is used, perhaps an other class could be used (menu 072). Cool down the motor and make a reset.
	F3 (Soft start overheated)	Ambient temperature too high. soft starter duty cycle exceeded. Perhaps fan failure.	Check ventilation of cabinet. Check the size of the cabinet. Clean the cooling fins. If the fan(s) is not working correct, contact your local MSF sales outlet.
	F4 (Full speed not reached at set current limit and start time)	Current limit parameters are perhaps not matched to the load and motor.	Increase the starting time and/or the current limit level.
	F5 (Locked rotor)	Something stuck in the machine or perhaps motor bearing failure.	Check the machine and motor bearings. Perhaps the alarm delay time can be set longer (menu 075).
	F6 (Above max power limit)	Overload	Over load. Check the machine. Perhaps the alarm delay time can be set longer (menu 093).
	F7 (Below min power limit)	Underload	Under load. Check the machine. Perhaps the alarm delay time can be set longer (menu 099).
	F8 (Voltage unbalance)	Main supply voltage unbalance.	Check mains supply.
	F9 (Over voltage)	Main supply over voltage.	Check mains supply.
	F10 (Under voltage)	Main supply under voltage.	Check mains supply.
	F11 (Starts / hour exceeded)	Number of starts exceeded according to menu 074.	Wait and make a new start. Perhaps the number of starts / hour could be increased in menu 074.
	F13 (Open thyristor)	Perhaps a damaged thyristor.	Make a reset and a restart. If the same alarm appears immediately, contact your local MSF sales outlet.
	F14 (Motor terminal open)	Open motor contact, cable or motor winding.	If the fault is not found, reset the alarm and inspect the alarm list. If alarm F12 is found, a thyristor is probably shorted. Make a restart. If alarm F14 appears immediately, contact your local MSF sales outlet.

Observation	Fault indication	Cause	Solution
The motor does not run.	F15 (Serial communication broken)	Serial communication broken.	Make a reset and try to establish contact. Check contacts, cables and option board. Verify - System address (menu 111). - Baudrate (menu 112). - Parity (menu 113). If the fault is not found, run the motor with keyboard control if urgent (set menu 006 to "1"). See also manual for serial communication.
	F16 (Phase reversal)	Incorrect phase sequence on main supply.	Switch L2 and L3 input phases.
	-----	Start command comes perhaps from incorrect control source. (I.e. start from keyboard when remote control is selected).	Give start command from correct source (menu 006).
	-Loc	System in keyboard lock.	Unlock keyboard by pressing the keys 'NEXT' and 'ENTER' for at least 3 sec.
The motor is running but an alarm is given.	F1 (Phase input failure)	Failure in one phase. Perhaps fuse defective.	Check fuses and mains supply. Deselect 'Run at single phase input failure' in menu 101, if stop is desired at single phase loss.
	F4 (Full speed not reached at set current limit and start time)	Current limit parameters are perhaps not matched to the load and motor.	Increase the starting time and/or the current limit level. Deselect 'Run at current limit time-out' in menu 102, if stop is desired at current limit time-out.
	F12 (Shorted thyristor)	Perhaps a damaged thyristor.	When stop command is given, a free wheel stop is made. Make a reset and a restart. If alarm F14 appears immediately, contact your local MSF sales outlet. If it is urgent to start the motor, set soft starter in 'Direct On Line' (menu 024). It is possible to start in this mode.
		By pass contactor is used but menu 032 'Bypass' is not set to "on".	Set menu 032 'Bypass' to "on".
	F15 (Serial communication broken)	Serial communication broken.	Make a reset and try to establish contact. Check contacts, cables and option board. Verify - System address (menu 111). - Baudrate (menu 112). - Parity (menu 113). If the fault is not found, run the motor with keyboard control if urgent, see also manual for serial communication.

Observation	Fault indication	Cause	Solution
The motor jerks etc.	When starting, motor reaches full speed but it jerks or vibrates.	If 'Torque control' or 'Pump control' is selected, it is necessary to input motor data into the system.	Input nominal motor data in menus 041-046. Select the proper load characteristic in menu 025. Select a correct initial- and end torque at start in menus 016 and 017. If 'Bypass' is selected, check that the current transformers are correct connected.
		Starting time too short.	Increase starting time.
		Starting voltage incorrectly set.	Adjust starting voltage.
		Motor too small in relation to rated current of soft starter.	Use a smaller model of the soft starter.
		Motor too large in relation to load of soft starter.	Use larger model of soft starter.
		Starting voltage not set correctly	Readjust the start ramp. Select the current limit function.
	Starting or stopping time too long, soft does not work.	Ramp times not set correctly.	Readjust the start and/or stop ramp time.
		Motor too large or too small in relation to load.	Change to another motor size.
The monitor function does not work.	No alarm or pre-alarm	It is necessary to input nominal motor data for this function. Incorrect alarm levels.	Input nominal motor data in menus 041-046. Adjust alarm levels in menus 091 - 099. If 'Bypass' is selected, check that the current transformers are correct connected.
Unexplainable alarm.	F5, F6, F7, F8, F9, F10	Alarm delay time is to short.	Adjust the response delay times for the alarms in menus 075, 082, 084, 086, 093 and 099.
The system seems locked in an alarm.	F2 (Motor protection, overload)	PTC input terminal could be open. Motor could still be too warm. If internal motor protection is used, the cooling in the internal model take some time.	PTC input terminal should be short circuit if not used. Wait until motor PTC gives an OK (not overheated) signal. Wait until the internal cooling is done. Try to reset the alarm after a while.
	F3 (Soft start overheated)	Ambient temperature too high. Perhaps fan failure.	Check that cables from power part are connected in terminals 073, 074, 071 and 072. MSF-017 to MSF-145 should have a short circuit between 071 and 072. Check also that the fan(s) is rotating.
Parameter will not be accepted.	----	If the menu number is one of 020 - 025, only one can be selected. In other words only one main mode is possible at a time.	Deselect the other main mode before selecting the new one.
		If menu 061, 'Parameter set' is set to "0", the system is in a remote parameter selection mode. It is now impossible to change most of the parameters.	Set the menu 061, 'Parameter set' to a value between "1" - "4" and then it is possible to change any parameter.
		During acceleration, deceleration, slow speed, DC brake and Power factor control mode, it is impossible to change parameters.	Set parameters during stop or full voltage running.
		If control source is serial comm., it is impossible to change parameters from keyboard and vice versa.	Change parameters from the actual control source.
		Some menus include only read out values and not parameters.	Read-out values can not be altered. In table 13, page 35, read-out menus has '—' in the factory setting column.
	-Loc	Keyboard is locked.	Unlock keyboard by pressing the keys 'NEXT' and 'ENTER' for at least 3 sec.

10. MAINTENANCE

In general the soft starter is maintenance free. There are however some things which should be checked regularly. Especially if the surroundings are dusty the unit should be cleaned regularly.



WARNING! Do not touch parts inside the enclosure of the unit when the control and motor voltage is switched on.

Regular maintenance

- Check that nothing in the soft starter has been damaged by vibration (loose screws or connections).
- Check external wiring, connections and control signals. Tighten terminal screws and busbar bolts if necessary.
- Check that PCB boards, thyristors and cooling fin are free from dust. Clean with compressed air if necessary. Make sure the PCB boards and thyristors are undamaged.
- Check for signs of overheating (changes in colour on PCB boards, oxidation of solder points etc.). Check that the temperature is within permissible limits.
- Check that the cooling fan/s permit free air flow. Clean any external air filters if necessary.

In the event of fault or if a fault cannot be cured by using the fault-tracing table in chapter 9. page 68.

11. OPTIONS

The following options are available. Please contact your supplier for more detailed information.

11.1 Serial communication

For serial communication the MODBUS RTU (RS232/RS485) option card is available order number: 01-1733-00.

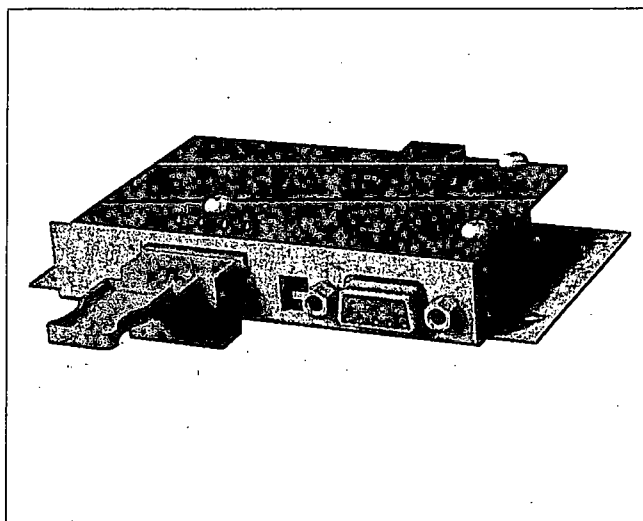


Fig. 60 Option RS232/485

11.2 Field bus systems

Various option cards are available for the following bus systems:

- PROFIBUS DP order number: 01-1734-01
- Device NET, order number: 01-1736-01
- LONWORKS: 01-1737-01
- FIP IO: 01-1738-01
- INTERBUS-S: 01-1735-01

Each system has its own card. The option is delivered with an instruction manual containing all the details for the set-up of the card and the protocol for programming.

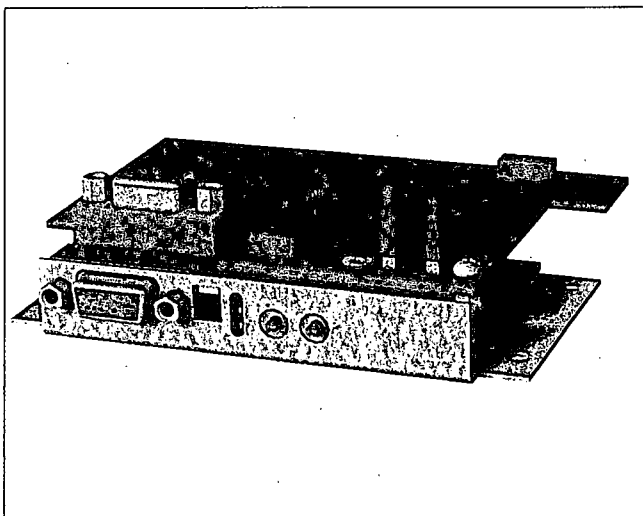


Fig. 61 Option Profibus

11.3 External PPU.

The external PPU option is used to move the PPU (keyboard) from the soft starter to the front of a panel door or control cabinet.

The maximum distance between the soft starter and the external PPU is 3 m.

The option can be factory mounted (01-2138-01) or it can be built in later (01-2138-00). For both versions instruction / data sheet are available.

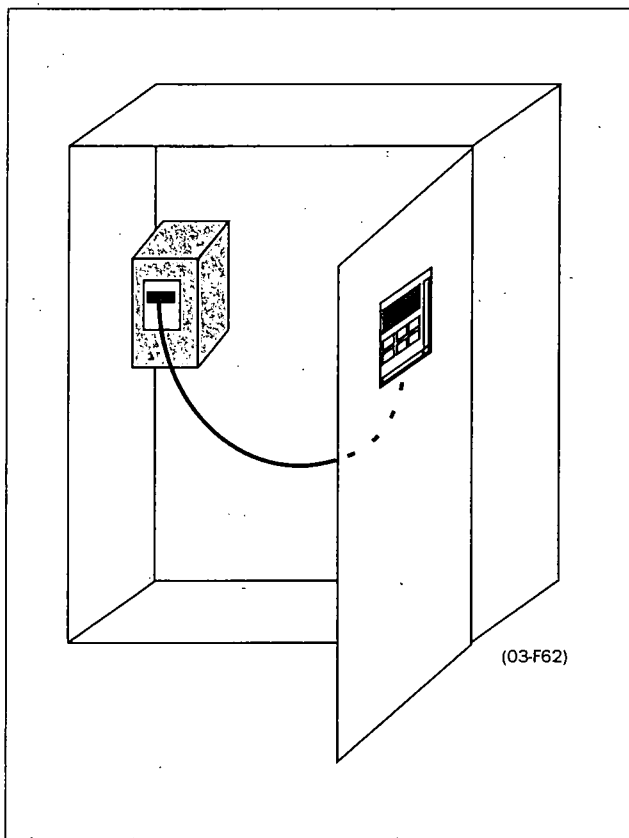


Fig. 62 Shows an example of the External PPU after it has been built in.

11.3.1 Cable kit for external current transformers

This kit is used for the bypass function, to connect the external current transformers more easily. order number: 01-2020-00.

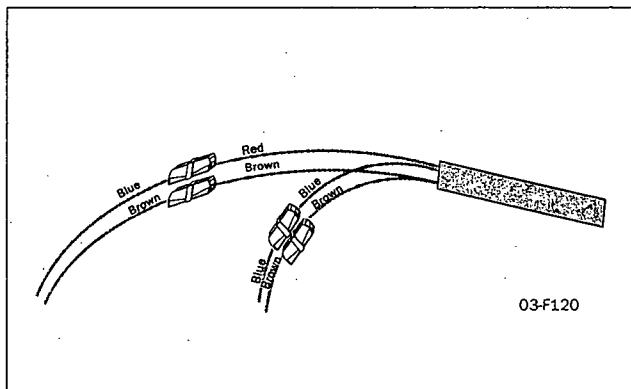


Fig. 63 Cable kit

11.4 Terminal clamp

Data: Single cables, Cu or Al

Cables 95-300 mm²

MSF type Cu Cable 310

Bolt for connection to busbar M10

Dimensions in mm 33x84x47 mm

Order No. single 9350

Data: Parallel cables, Cu or Al

Cables 2x95-300 mm²

MSF type and Cu Cable 310 to -835

Bolt for connection to busbar M10

Dimensions in mm 35x87x65

Order No. parallel 9351

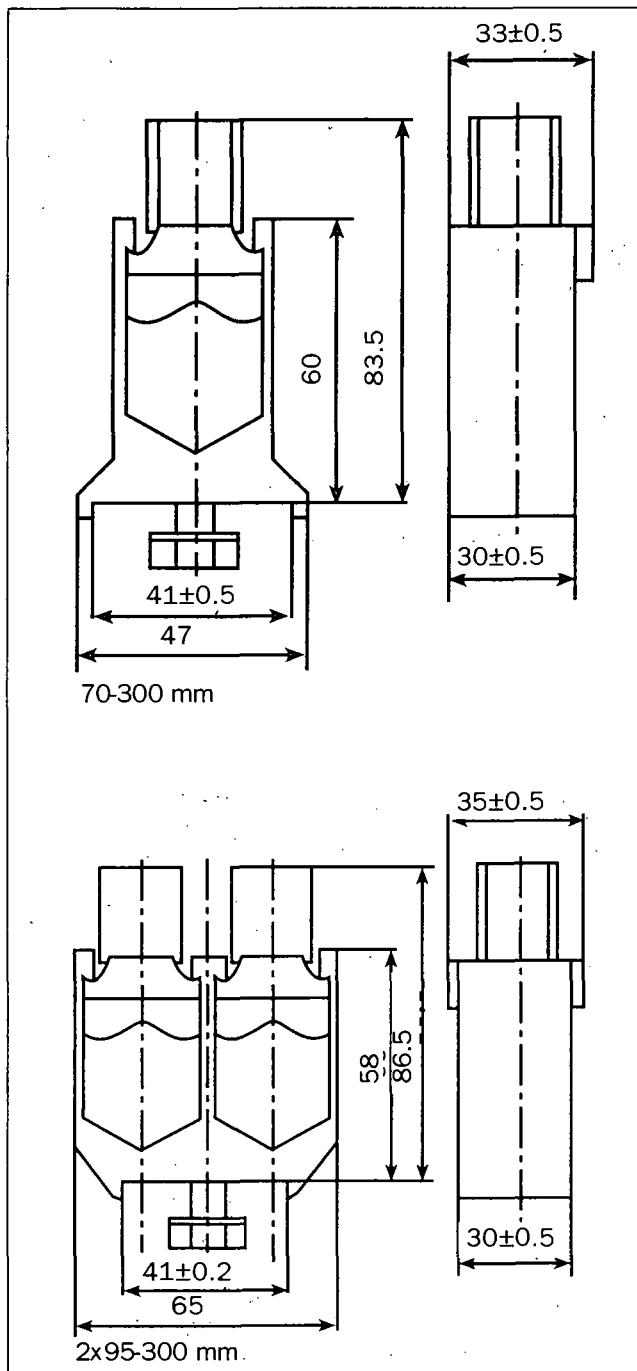


Fig. 64 The terminal clamp.

12. TECHNICAL DATA

3x200–525 V 50/60 Hz Model	MSF-017		MSF-030		MSF-045		MSF-060	
Soft starter rating according to AC35a, see chapter 4, page 13	5.0-30:50-10 heavy	3.0-30:50-10 normal/light	5.0-30:50-10 heavy	3.0-30:50-10 normal/light	5.0-30:50-10 heavy	3.0-30:50-10 normal/light	5.0-30:50-10 heavy	3.0-30:50-10 normal/light
Rated current of soft starter (A)	17	22	30	37	45	60	60	72
Recommended motor size (kW) for 400 V	7.5	11	15	18.5	22	30	30	37
Recommended motor size (kW) for 525 V	11	15	18.5	22	30	37	37	45
Order number: supply voltage (100-240V)	01-1301-01		01-1302-01		01-1303-01		01-1304-01	
Order number: supply voltage (380-500V)	01-1301-02		01-1302-02		01-1303-02		01-1304-02	
3x200-690V 50/60Hz Model	MSF-017		MSF-030		MSF-045		MSF-060	
Rated current of soft starter (A)	17	22	30	37	45	60	60	72
Motor power for 690V	15	18.5	22	30	37	55	55	75*
Order number: supply voltage (100-240V)	01-1321-01		01-1322-01		01-1323-01		01-1324-01	
Order number: supply voltage (380-500V)	01-1321-02		01-1322-02		01-1323-02		01-1324-02	
Electrical Data								
Recommended wiring fuse (A) 1)	25/50	32	35/80	50	50/125	80	63/160	100
Semi-conductor fuses, if required	80 A		125 A		160 A		200 A	
Power loss at rated motor load (W)	50	70	90	120	140	180	180	215
Power consumption control card	20 VA		20 VA		25 VA		25 VA	
Mechanical Data								
Dimensions in mm HxWxD	320x126x260		320x126x260		320x126x260		320x126x260	
Mounting position (Vertical/Horizontal)	Vertical		Vertical		Vert. or Horiz.		Vert. or Horiz.	
Weight (kg)	6.7		6.7		6.9		6.9	
Connection busbars Cu, (bolt)	15x4 (M6)		15x4 (M6)		15x4 (M6)		15x4 (M8)	
Cooling system	Convection		Convection		Fan		Fan	
General Electrical Data								
Number of fully controlled phases	3							
Voltage tolerance control	Control +/- 10%							
Voltage tolerance motor	Motor 200-525 +/- 10%/200-690 + 5%, -10%							
Recommended fuse for control card (A)	Max 10 A							
Frequency	50/60 Hz							
Frequency tolerance	+/- 10%							
Relay contacts	3 x 8A, 250 V resistive load, 3A 250VAC inductive (PF=0.4)							
Type of protection/Insulation								
Type of casing protection	IP 20							
Other General Data								
Ambient temperatures								
In operation	0 - 40 °C							
Max. e.g. at 80% IN	50 °C							
In storage	(-25) - (+70) °C							
Relative air humidity	95%, non-condensing							
Max. altitude without derating	(See separate: Technical information 151) 1000 m							
Norms/Standards, Conform to:	IEC 947-4-2, EN 292, EN 60204-1, UL508							
EMC, Emission	EN 50081-2, (EN 50081-1 with bypass contactor)							
EMC, Immunity	EN 50082-2							
1) Recommended wiring fuses for: Heavy (first column): ramp/direct start Normal/Light (second column): ramp start								
NOTE! Short circuit withstand MSF017-060 5000 rms A when used with K5 or RK5 fuses.								

* 2-pole motor

3x200–525 V 50/60 Hz Model	MSF-075		MSF-085		MSF-110		MSF-145	
Soft starter rating according to AC35a, see chapter 4, page 13	5.0-30:50-10 heavy	3.0-30:50-10 normal/light	5.0-30:50-10 heavy	3.0-30:50-10 normal/light	5.0-30:50-10 heavy	3.0-30:50-10 normal/light	5.0-30:50-10 heavy	3.0-30:50-10 normal/light
Rated current of soft starter (A)	75	85	85	96	110	134	145	156
Recommended motor size (kW) for 400 V	37	45	45	55*	55	75	75	
Recommended motor size (kW) for 525 V	45	55	55	75*	75	90	90	110
Order number for supply voltage (100-240 V)	01-1305-01		01-1306-01		01-1307-01		01-1308-01	
Order number for supply voltage (380-550 V)	01-1305-02		01-1306-02		01-1307-02		01-1308-02	
3x200–690 V 50/60 Hz Model	MSF-075		MSF-085		MSF-110		MSF-145	
Rated current of soft starter (A)	75	85	85	90	110	134	145	156
Motor power for 690V	55	75	75	90	90	110	132	160*
Order number for supply voltage (100-240 V)	01-1325-01		01-1326-01		01-1327-01		01-1328-01	
Order number for supply voltage (380-550 V)	01-1325-02		01-1326-02		01-1327-02		01-1328-02	
Electrical Data								
Recommended wiring fuse (A) 1)	80/200	100	100/250	125	125/315	180	160/400	200
Semi-conductor fuses, if required	250 A		315 A		350 A		450 A	
Power loss at rated motor load (W)	230	260	260	290	330	400	440	470
Power consumption control card	25 VA		25 VA		25 VA		25 VA	
Mechanical Data								
Dimensions in mm HxWxD	320x126x260		320x126x260		400x176x260		400x176x260	
Mounting position (Vertical/Horizontal)	Vert. or Horiz.		Vert. or Horiz.		Vert. or Horiz.		Vert. or Horiz.	
Weight (kg)	6.9		6.9		12		12	
Connection, busbars Cu, (bolt)	15x4 (M8)		15x4 (M8)		20x4 (M10)		20x4 (M10)	
Cooling system	Fan		Fan		Fan		Fan	
General Electrical Data								
Number of fully controlled phases	3							
Voltage tolerance control	Control +/- 10%							
Voltage tolerance motor	Motor 200-525 +/- 10%/200-690 + 5%, -10%							
Recommended fuse for control card (A)	Max 10 A							
Frequency	50/60 Hz							
Frequency tolerance	+/- 10%							
Relay contacts	8A, 250 V resistive load, 3A, 250 V inductive load (PF=0.4)							
Type of protection/Insulation								
Type of casing protection	IP 20							
Other General Data								
Ambient temperatures In operation	0 - 40 °C							
Max. e.g. at 80% I _N	50 °C							
In storage	(-25) - (+70) °C							
Relative air humidity	95%, non-condensing							
Max. altitude without derating	(See separate: Technical information 151) 1000 m							
Norms/Standards, Conform to:	IEC 947-4-2, EN 292, EN 60204-1, UL508							
EMC, Emission	EN 50081-2, (EN 50081-1 with bypass contactor)							
EMC, Immunity	EN 50082-2							
1) Recommended wiring fuses for: Heavy (first column): ramp/direct start Normal/Light (second column): ramp start								
NOTE! Short circuit withstand MSF075-145 10000 rms A when used with K5 or RK5 fuses.								

* 2-pole motor

3x200–525 V 50/60 Hz Model	MSF-170		MSF-210		MSF-250		MSF-310		MSF-370	
Soft starter rating according to AC35a, see chapter 4. page 13	5.0-30: 50-10 heavy	3.0-30: 50-10 normal/light	5.0-30: 50-10 heavy	3.0-30: 50-10 normal/light	5.0-30: 50-10 heavy	3.0-30: 50-10 normal/light	5.0-30: 50-10 heavy	3.0-30: 50-10 normal/light	5.0-30: 50-10 heavy	3.0-30: 50-10 normal/light
Rated current of soft starter (A)	170	210	210	250	250	262	310	370	370	450
Recommended motor size (kW) for 400 V	90	110	110	132	132	160*	160	200	200	250
Recommended motor size (kW) for 525 V	110	132	132	160	160	200*	200	250	250	315
Order no. for supply voltage (100-240V)	01-1309-11		01-1310-11		01-1311-11		01-1312-01		01-1313-01	
Order no. for supply voltage (380-550V)	01-1309-12		01-1310-12		01-1311-12		01-1312-02		01-1313-02	
3x200–690 V 50/60 Hz Model	MSF-170		MSF-210		MSF-250		MSF-310		MSF-370	
Rated current of soft starter (A)	170	210	210	250	250	262	310	370	370	450
Motor power for 690 V	160	200	200	250	250	250	315	355	355	400
Order no. for supply voltage (100-240V)	01-1329-01		01-1330-01		01-1331-01		01-1332-01		01-1333-01	
Order no. for supply voltage (380-550V)	01-1329-02		01-1330-02		01-1331-02		01-1332-02		01-1333-02	
Electrical Data										
Recommended wiring fuse (A) 1)	200/400	200	250/400	315	250/500	315	315/630	400	400/800	500
Semi-conductor fuses, if required	700 A		700 A		700 A		800 A		1000 A	
Power loss at rated motor load (W)	510	630	630	750	750 W		930	1100	1100	1535
Power consumption control card	35 VA		35 VA		35 VA		35 VA		35 VA	
Mechanical Data										
Dimensions mm HxWxD incl. brackets	500x260x260		500x260x260		500x260x260		532x547x278		532x547x278	
Mounting position (Vertical/Horizontal)	Vert. or Horiz.		Vert. or Horiz.		Vert. or Horiz.		Vert. or Horiz.		Vert. or Horiz.	
Weight (kg)	20		20		20		42		46	
Connection, Busbars Al/Cu (bolt)	30x4 (M10)		30x4 (M10)		30x4 (M10)		40x8 (M12)		40x8 (M12)	
Cooling system	Fan		Fan		Fan		Fan		Fan	
General Electrical Data										
Number of fully controlled phases	3									
Voltage tolerance control	Control +/- 10%									
Voltage tolerance motor	Motor 200-525 +/- 10%/200-690 + 5%, -10%									
Recommended fuse for control card (A)	Max 10 A									
Frequency	50/60 Hz									
Frequency tolerance	+/- 10%									
Relay contacts	8A, 250 V resistive load, 3A, 250 V inductive load (PF=0.4)									
Type of protection/Insulation										
Type of casing protection	IP 20									
Other General Data										
Ambient temperatures In operation	0 - 40 °C									
Max. e.g. at 80% I _N	50 °C									
In storage	(-25) - (+70) °C									
Relative air humidity	95%, non-condensing									
Max. altitude without derating	(See separate: Technical information 151) 1000 m									
Norms/Standards, Conform to:	IEC 947-4-2, EN 292, EN 60204-1, (UL508, only MSF-170 to MSF-250)									
EMC, Emission	EN 50081-2, (EN 50081-1 with bypass contactor)									
EMC, Immunity	EN 50082-2									
1) Recommended wiring fuses for:	Heavy (first column): ramp/direct start Normal/Light (second column): ramp start									
NOTE! Short circuit withstand MSF170-250 18000 rms A when used with K5 or RK5 fuses.										

★ 2-pole motor

3x200-525V 50/60Hz Model	MSF-450		MSF-570		MSF-710		MSF-835		MSF-1000		MSF-1400	
Soft starter rating according to AC35a, see chapter 4, page 13	5.0-30: 50-10 heavy	3.0-30: 50-10 normal/light	5.0-30: 50-10 heavy	3.0-30: 50-10 normal/light	5.0-30: 50-10 heavy	3.0-30: 50-10 normal/light	5.0-30: 50-10 heavy	3.0-30: 50-10 normal/light	5.0-30: 50-10 heavy	3.0-30: 50-10 normal/light	5.0-30: 50-10 heavy	3.0-30: 50-10 normal/light
Rated current of soft starter (A)	450	549	570	710	710	835	835	960	1000	1125	1400	1650
Recommended motor size (kW) for 400 V	250	315	315	400	400	450	450	560	560	630	800	930
Recommended motor size (kW) for 525 V	315	400	400	500	500	560	600	630	660	710	1000	1250
Order no. for supply voltage (100-240V)	01-1341-01		01-1315-01		01-1316-01		01-1317-01		01-1318-01		01-1319-01	
Order no. for supply voltage (380-550V)	01-1314-02		01-1315-02		01-1316-02		01-1317-02		01-1318-02		01-1319-02	
3x200-690V 50/60Hz Model	MSF-450		MSF-570		MSF-710		MSF-835		MSF-1000		MSF-1400	
Rated current of soft starter (A)	450	549	570	640	710	835	835	880	1000	1125	1400	1524
Motor power for 690 V	400	560	560	630	710	800	800		1000	1120	1400	1600
Order no. for supply voltage (100-240V)	01-1334-01		01-1335-01		01-1336-01		01-1337-01		01-1338-01		01-1339-01	
Order no. for supply voltage (380-550V)	01-1334-02		01-1335-02		01-1336-02		01-1337-02		01-1338-02		01-1339-02	
Electrical Data												
Recommended wiring fuse (A 1)	500/1 k	630	630/1 k	800	800/1 k	1 k	1 k/1.2 k	1 k	1k/1.4 k	1.2 k	1.4 k/1.8 k	1.8 k
Semi-conductor fuses, if required	1250 A		1250 A		1800 A		2500 A		3200 A		4000 A	
Power loss at rated motor load (W)	1400	1730	1700	2100	2100	2500	2500	2875	3000	3375	4200	4950
Power consumption control card	35 VA		35 VA		35 VA		35 VA		35 VA		35 VA	
Mechanical Data												
Dimensions mm HxWxD incl. brackets	532x547x278		687x640x302		687x640x302		687x640x302		900x875x336		900x875x336	
Mounting position (Vertical/Horizontal)	Vert. or Horiz.		Vert. or Horiz.		Vert. or Horiz.		Vert. or Horiz.		Vert. or Horiz.		Vert. or Horiz.	
Weight (kg)	46		64		78		80		175		175	
Connection, Busbars At (bolt)	40x8 (M12)		40x10 (M12)		40x10 (M12)		40x10 (M12)		75x10 (M12)		75x10 (M12)	
Cooling system	Fan		Fan		Fan		Fan		Fan		Fan	
General Electrical Data												
Number of fully controlled phases	3											
Voltage tolerance control	Control +/- 10%											
Voltage tolerance motor	Motor 200-525 +/- 10%/200-690 + 5%, -10%											
Recommended fuse for control card (A)	Max 10 A											
Frequency	50/60 Hz											
Frequency tolerance	+/- 10%											
Relay contacts	8A, 250 V resistive load, 3A, 250 V inductive load (PF=0.4)											
Type of protection/insulation												
Type of casing protection	IP 20								IP00			
Other General Data												
Ambient temperatures In operation	0 - 40 °C											
Max. e.g. at 80% I _N	50 °C											
In storage	{-25} - {+70} °C											
Relative air humidity	95%, non-condensing											
Max. altitude without derating	(See separate: Technical information 151) 1000 m											
Norms/Standards, Conform to:	IEC 947-4-2, EN 292, EN 60204-1											
EMC, Emission	EN 50081-2, (EN 50081-1 with bypass contactor)											
EMC, Immunity	EN 50082-2											
1) Recommended wiring fuses for:	Heavy (first column): ramp/direct start Normal/Light (second column): ramp start											

Semi-conductor fuses

Always use standard commercial fuses to protect the wiring and prevent short circuiting. To protect the thyristors against short-circuit currents, superfast semiconductor fuses can be used if preferred (e.g. Bussmann type FWP or similar, see table below).

The normal guarantee is valid even if superfast semiconductor fuses are not used.

Type	FWP Bussmann fuse	
	A	I^2t (fuse) x 1000
MSF-017	80	2.4
MSF-030	125	7.3
MSF-045	150	11.7
MSF-060	200	22
MSF-075	250	42.5
MSF-085	300	71.2
MSF-110	350	95.6
MSF-145	450	137
MSF-170B	700	300
MSF-210B	700	300
MSF-250B	800	450
MSF-310	800	450
MSF-370	1000	600
MSF-450	1200	2100
MSF-570	1400	2700
MSF-710	1800	5300
MSF-835	2000	
MSF-1000	2500	
MSF-1400	3500	

13. SET-UP MENU LIST

Menu number	Function/Parameter	Range	Par.set	Factory setting	Value	Page
001	Initial voltage at start	25 - 90% of U	1 - 4	30		page 36
002	Start time ramp 1	1 - 60 sec	1 - 4	10		page 36
003	Step down voltage at stop	100 - 40% U	1 - 4	100		page 36
004	Stop time ramp 1	oFF, 2 - 120 sec	1 - 4	oFF		page 36
005	Current	0.0 - 9999 Amp	—	—		page 36
006	Control mode	1, 2, 3	1 - 4	2		page 37
007	Extended functions & metering	oFF, on	—	oFF		page 38
008	Extended functions	oFF, on	—	oFF		page 38
011	Initial voltage start ramp 2	30 - 90% U	1 - 4	90		page 38
012	Start time ramp 2	oFF, 1 - 60 sec	1 - 4	oFF		page 38
013	Step down voltage stop ramp 2	100 - 40% U	1 - 4	40		page 38
014	Stop time ramp 2	oFF, 2 - 120 sec	1 - 4	oFF		page 38
016	Initial torque at start	0 - 250% T _n	1 - 4	10		page 39
017	End torque at start	50 - 250% T _n	1 - 4	150		page 39
018	End torque at stop	0-100% T _n	1 - 4	0		page 39
020	Voltage ramp with current limit at start	oFF, 150 - 500% I _n	1 - 4	oFF		page 39
021	Current limit at start	oFF, 150 - 500% I _n	1 - 4	oFF		page 40
022	Pump control	oFF, on	1 - 4	oFF		page 40
023	Remote analogue control	oFF, 1, 2	1 - 4	oFF		page 41
024	Full voltage start D.O.L	oFF, on	1 - 4	oFF		page 41
025	Torque control	oFF, 1, 2	1 - 4	oFF		page 42
030	Torque boost active time	oFF, 0.1 - 2.0 sec	1 - 4	oFF		page 43
031	Torque boost current limit	300 - 700% I _n	1 - 4	300		page 43
032	Bypass	oFF, on	1 - 4	oFF		page 43
033	Power Factor Control PFC	oFF, on	1 - 4	oFF		page 46
034	Brake active time	oFF, 1 - 120 sec	1 - 4	oFF		page 47
035	Braking strength	100 - 500%	1 - 4	100		page 47
036	Braking methods	1, 2	1 - 4	1		page 47
037	Slow speed torque	10 - 100	1 - 4	10		page 49
038	Slow speed time at start	oFF, 1 - 60 sec	1 - 4	oFF		page 49
039	Slow speed time at stop	oFF, 1 - 60 sec	1 - 4	oFF		page 49
040	DC-Brake at slow speed	oFF, 1-60 sec	1 - 4	oFF		page 49
041	Nominal motor voltage	200 - 700 V	1 - 4	400		page 50
042	Nominal motor current	25-150% I _{nsoft} in Amp	1 - 4	I _{nsoft} in Amp		page 50
043	Nominal motor power	25 - 300% of P _{nsoft} in kW	1 - 4	P _{nsoft} in kW		page 50
044	Nominal speed	500 - 3600 rpm	1 - 4	N _{nsoft} in rpm		page 50
045	Nominal power factor	0.50 - 1.00	1 - 4	0.86		page 50
046	Nominal frequency	50, 60 Hz	—	50		page 50

Menu number	Function/Parameter	Range	Par.set	Factory setting	Value	Page
051	Programmable relay K1	1, 2, 3, (4), 5		1		page 51
052	Programmable relay K2	1, 2, 3, 4, 5	—	2		page 51
054	Analogue output	oFF, 1, 2	1 - 4	oFF		page 52
055	Analogue output value	1, 2, 3	1 - 4	1		page 52
056	Scaling analogue output	5 - 150%	1 - 4	100		page 52
057	Digital input selection	oFF, 1, 2, 3, 4	1 - 4	oFF		page 53
058	Digital input pulses	1-100	1 - 4	1		page 53
061	Parameter set	0, 1, 2, 3, 4	—	1		page 54
071	Motor PTC input	no, YES	—	no		page 55
072	Internal motor thermal protection class	oFF, 2 - 40 sec	—	10		page 55
073	Used thermal capacity	0 - 150%	—	—		page 55
074	Starts per hour limitation	oFF, 1 - 99/hour	1 - 4	oFF		page 55
075	Locked rotor alarm	oFF, 1.0 - 10.0 sec	1 - 4	oFF		page 55
081	Voltage unbalance alarm	2 - 25% U_n	1 - 4	10		page 56
082	Response delay voltage unbalance alarm	oFF, 1 - 60 sec	1 - 4	oFF		page 56
083	Over voltage alarm	100 - 150% U_n	1 - 4	115		page 56
084	Response delay over voltage alarm	oFF, 1 - 60 sec	1 - 4	oFF		page 56
085	Under voltage alarm	75 - 100% U_n	1 - 4	85		page 57
086	Response delay under voltage alarm	oFF, 1 - 60 sec	1 - 4	oFF		page 57
087	Phase sequence	L123, L321	—	—		page 57
088	Phase reversal alarm	oFF, on	—	oFF		page 57
089	Auto set power limits	no, YES	—	no		page 57
090	Output shaft power	0.0 - 200.0% P_n	—	—		page 57
091	Start delay power limits	1 - 250 sec	1 - 4	10		page 58
092	Max power alarm limit	5 - 200% P_n	1 - 4	115		page 58
093	Max alarm response delay	oFF, 0.1 - 25.0 sec	1 - 4	oFF		page 58
094	Max power pre-alarm limit	5 - 200% P_n	1 - 4	110		page 58
095	Max pre-alarm response delay	oFF, 0.1 - 25.0 sec	1 - 4	oFF		page 58
096	Min pre-alarm power limit	5 - 200% P_n	1 - 4	90		page 58
097	Min pre-alarm response delay	oFF, 0.1 - 25.0 sec	1 - 4	oFF		page 59
098	Min power alarm limit	5 - 200% P_n	1 - 4	85		page 59
099	Min alarm response delay	oFF, 0.1 - 25.0 sec	1 - 4	oFF		page 59
101	Run at single phase input failure	no, YES	1 - 4	no		page 61
102	Run at current limit time-out	no, YES	1 - 4	no		page 61
103	Jog forward enable	oFF, on	1 - 4	oFF		page 61
104	Jog reverse enable	oFF, on	1 - 4	oFF		page 61
105	Automatic return menu	oFF, 1-999	—	oFF		page 62
111	Serial comm. unit address	1 - 247	—	1		page 62
112	Serial comm. baudrate	2.4 - 38.4 kBaud	—	9.6		page 62

Menu number	Function/Parameter	Range	Par.set	Factory setting	Value	Page
113	Serial comm. parity	0, 1	—	0		page 62
114	Serial comm. contact broken	oFF, 1, 2	—	1		page 62
199	Reset to factory settings	no, YES	—	no		page 63
201	Current	0.0 - 9999 Amp	—	—		page 63
202	Line main voltage	0 - 720 V	—	—		page 63
203	Output shaft power	-9999 - 9999 kW	—	—		page 63
204	Power factor	0.00 - 1.00	—	—		page 63
205	Power consumption	0.000 - 2000 MWh	—	—		page 63
206	Reset power consumption	no, YES	—	no		page 64
207	Shaft torque	-9999 - 9999 Nm	—	—		page 64
208	Operation time	Hours	—	—		page 64
211	Current phase L1	0.0 - 9999 Amp	—	—		page 64
212	Current phase L2	0.0 - 9999 Amp	—	—		page 64
213	Current phase L3	0.0 - 9999 Amp	—	—		page 64
214	Line main voltage L1 - L2	0 - 720 V	—	—		page 64
215	Line main voltage L1 - L3	0 - 720 V	—	—		page 64
216	Line main voltage L2 - L3	0 - 720 V	—	—		page 64
221	Locked keyboard info	no, YES	—	no		page 65
901	Alarm list, Latest error	F1 - F16	—	—		page 65
902-915	Alarm list, Older error in chronological order	F1 - F16	—	—		page 65

Explanation of units:

- U Input line voltage
- Un Nominal motor voltage.
- In Nominal motor current.
- Pn Nominal motor power.
- Nn Nominal motor speed.
- Tn Nominal shaft torque.
- Insoft Nominal current soft starter.
- Pnsoft Nominal power soft starter.
- Nnsoft Nominal speed soft starter.

Calculation shaft torque

$$T_n = \frac{P_n}{\left(\frac{N_n}{60} \times 2\pi\right)}$$

NOTE! The six main functions for motor control, menus 020–025, can only be selected one at a time.

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7.0 SWITCHBOARD WORKS TEST RESULTS

SUNLINE	Form No.	ISSUE	Revision	Date
QA TEST BOOKLET	8	B	1	17 June 2003

Q.A. TEST SHEET BOOKLET.

PROJECT: TRINITY GREENS ESTATE STAGE 1

SWITCHBOARD

TITLE: PUMP PANEL SWITCHBOARD

JOB NO: Q04C12

CLIENT: JOHN GOSS PROJECTS (DEEP GEM)

DRAWING NO:

REVISION NO:

LEGEND

P = Pass

F = Fail

R = Reinspect

Refer notes/comments

— greater than

< = less than

$\mu\text{m} = \text{m} \times 10^{-6} = \text{micron}$

ITEM 1. - SHEETMETAL

ITEM 2. - PAINTING/POWDER COATING

ITEM 3. - ELECTRICAL INSPECTION

ITEM 4. - ELECTRICAL TEST

ITEM 5. - ELECTRICAL TEST CONT.

ITEM 6. - PRE DELIVERY CHECK SHEET

ITEM 7. - PRE DELIVERY CHECK SHEET CONT.

SUNLINE	Form No.	ISSUE	Revision	Date
QA TEST BOOKLET	8	B	1	17 June 2003

1 - SHEETMETAL.

JOB NUMBER Q04C12		DATE:			
ITEM NO.	I & T.P. DESCRIPTION	PASS	FAIL	REINSPECT	COMMENTS
1.	Is layout in accordance with as built drawings.	/			
2.	Are all dimensions in accordance with drawings (+ or - 1%).	/			
3.	Are all folds within guidelines or specification.	/			
4.	Are all partitions within guidelines or specification.	/			
5.	Are all partitions fixed and welded securely.	/			
	Are access holes in partitions located correctly.	/			
7.	Is segregation in accordance with relevant standard or as agreed.	/			
8.	Are all external and internal welds satisfactory.	/			
9.	Are all external welds ground off smooth.	/			
10.	Are all doors, covers & escutcheons fitted with nominated number of hinges.	/			
11.	Are all doors, covers and escutcheons hung correctly.	/			
12.	Are all equipment cutouts made in accordance with requirements.	/			
13.	Are all edges, holes and cutouts de burrod.	/			
14.	Are all mounting angles and supports installed and secure.	/			
15.	Are all gear trays correctly positioned and fixed.	/			
16.	Has cable access been provided for equipment connection.	/			
17.	Is lifting provision provided.	/			
18.	Are schedule holders fitted if required.	/			
19.	Is fabrication material in accordance with drawings.	/			
	Is gauge of material in accordance with drawings.	/			
21.	Is base required to be galvanised.	/			
22.	Has base been fitted.	/			

Fabrication by: _____ (name)

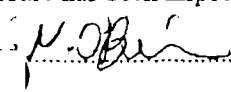
_____ (name)

COMMENTS:

BUILT BY CT SHEETMETAL.

HOLD POINT No.1

Enclosure has been inspected and is approved for powder coating.

Signed:  Date: _____

SUNLINE	Form No.	ISSUE	Revision	Date
QA TEST BOOKLET	8	B	1	17 June 2003

2 - PAINTING/ POWDER COATING.

JOB NUMBER: Q04C12		DATE:				
ITEM NO.	I & T.P. DESCRIPTION	PASS		FAIL		REINSPECT
		Criteria		Criteria		
1.	Is a paint colour code specified.		✓			
2.	Has paint colour code specified been met.		✓			
3.	Is surface coating thickness within tolerance.	> 60µm	✓	< 60µm		
	Has the final finished coat any blemishes.	NO	✓			
5.	If blemishes exist do they require rework.	N/A	✓			
6.	Is an independent inspection required.	YES	✓			
7.	Is switchboard ready to proceed for electrical fitout.	YES	✓			
8.	Final colour - external. <i>MIST GREEN</i>		✓			
9.	Final colour - internal. <i>MIST GREEN</i>		✓			

Powder-coat by: _____ (company name)

COMMENTS

HOLD POINT No.2

Paint finish has been inspected and is approved for electrical fit-out.

Signed Date

SUNLINE	Form No.	ISSUE	Revision	Date
QA TEST BOOKLET	8	B	1	17 June 2003

3 - ELECTRICAL INSPECTION.

JOB NUMBER: Q04C12		DATE:			
ITEM NO.	I & T.P. DESCRIPTION	PASS	FAIL	REINSPECT	COMMENTS
1	Is all equipment laid out as required.	✓			
2	Is all equipment installed as per drawings.	✓			
3	Is all equipment requiring future adjustment accessible.	✓			
4	Are all busbars aligned correctly.	N/A			
5	Are busbars supported in accordance with type test, where required.	N/A			
6	Are busbar clearances between phases & to earth in accordance to type test or AS3000.	N/A			
	Are all busbar connections tight.	N/A			
8	Is all equipment labelled.	✓			
9	Are labels straight & in accordance with label schedule (if required).	✓			
10	Does neutral bar make provision for all circuits including spares..	✓			
11	Does neutral bar have large enough terminations.	✓			
12	Does earth bar make provision for all circuits including spares.	✓			
13	Does earth bar have large enough terminations.	✓			
14	Are all fuse cartridges fitted & of the correct rating.	✓			
15	Are all line and load labels fitted (if required).	✓			
16	Is all cabling adequately sized and supported.	✓			
17	Are all door and escutcheons hung correctly.	✓			
18	Are all locks keyed alike where required.	✓			
19	Are shrouds fitted where required.	✓			
20	Have all drawings been marked up & returned to drawing office for final as-built issue.	✓			

Electrical work by: SCOTT (name)

(name)

(name)

COMMENTS:

HOLD POINT No. 3

Switchboard assembly has been inspected and is approved for electrical testing.

Signed: DMorg Date 27.9.04

SUNLINE	Form No.	ISSUE	Revision	Date
QA TEST BOOKLET	8	B	1	17 June 2003

5 - ELECTRICAL TESTS (CONT.)

JOB NUMBER : Q04C12		DATE:			
ITEM NO.	I & T.P. DESCRIPTION				
4.	FUNCTIONAL TESTS.	PASS	FAIL	REINSPECT	COMMENTS
	Are all control switches, circuit breakers, fuses, combined fuse switches installed and operable.	✓			
	Are all control circuits functioning.	✓			
	Is all switchgear mechanically functional.	✓			
	Do mechanical interlocks and key interlocks function correctly (if applicable)	✓			
5.	LOGIC TESTS (AS APPLICABLE)	PASS	FAIL	REINSPECT	COMMENTS
	Have all circuits been Point to Point tested (Prior to Power being applied).	✓			
	Have all PLC Digital Inputs been Simulated and Verified	✓			
	Have all PLC Digital Outputs been Simulated (ie lamps, buzzers etc bridged to power) and Verified.	✓			
	Have all Transducer outputs been Simulated and Verified	✓			
	Have all BMS, SCADA or Telemetry contacts been checked for correct operation.	✓			
	Are all Client supplied controllers/meters the correct Operating Voltage.	✓			
	Have all Client supplied controllers/meters been wired as per supplied information.	✓			
6.	CURRENT INJECTION TESTS (IF APPLICABLE).	PASS	FAIL	REINSPECT	COMMENTS
	Are C/T ratios, Class and output VA correct	✓			
	Is C/T polarity correct, primary and secondary.	✓			
	Does the full scale reading of the ammeter match the C/T ratio.	✓			
	Does kWh meter disc operate in correct direction	✓			
	Does protection equipment tested, function correctly.	✓			
	Has instrument wiring been checked by primary injection.	✓			

MOTOR CONVERTER TEST

COMMENTS:

Insulation tester: 1000V DC Kyoritsu Cat No. 0885542
 High Potential test: 2000V 50Hz Sunline test bench
 Primary current injection test: 0 – 800A Sunline test bench

HOLD POINT No. 4

Testing has been completed successfully and switchboard assembly is approved for pre delivery inspection

Signed  Date 27/9/04

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8.0 ELECTRICAL DRAWINGS

Drawing No	Sheet No	Drawing Title
Q04C12		Drawing List
Q04C12A	01	Power Distribution Schematic Diagram
Q04C12B	02	Pump 01 Schematic Diagram
Q04C12C	03	Pump 02 Schematic Design
Q04C12D	04	Common Controls & Alarm Schematic Diagram
Q04C12E	05	PLC/RTU Schema
Q04C12F	06	PLC/TRU Termination Diagram
Q04C12G	07	Equipment List
Q04C12H	08	Cable Schedule
Q04C12J	09	Switchboard Label Schedule
Q04C12K	10	Switchboard General Arrangement
Q04C12L	11	Switchboard Construction Notes
Q04C12M	12	Switchboard Construction Detail
Q04C12N	13	RAG Reduction Tube for the Vega Level Probe

TRINITY WAY - SP304
SUBMERSIBLE SEWAGE PUMP STATION
ELECTRICAL DRAWINGS

ELECTRICAL DRAWING LIST			
Sheet No.	DRAWING NUMBER	REV.	TITLE
	Q04C12	2	DRAWING INDEX
01	Q04C12A	2	POWER DISTRIBUTION SCHEMATIC DIAGRAM
02	Q04C12B	1	PUMP 01 SCHEMATIC DIAGRAM
03	Q04C12C	1	PUMP 02 SCHEMATIC DIAGRAM
04	Q04C12D	2	COMMON CONTROL & ALARMS SCHEMATIC DIAGRAM
05	Q04C12E	3	PLC/RTU SCHEMATIC DIAGRAM
06	Q04C12F	3	PLC/RTU TERMINATION DIAGRAM
07	Q04C12G	3	EQUIPMENT LIST
08	Q04C12H	1	CABLE SCHEDULE
09	Q04C12J	3	SWITCHBOARD LABEL SCHEDULE
10	Q04C12K	1	SWITCHBOARD GENERAL ARRANGEMENT
11	Q04C12L	1	SWITCHBOARD CONSTRUCTION NOTES
12	Q04C12M	1	SWITCHBOARD CONSTRUCTION DETAILS
13	Q04C12N	1	RAG REDUCTION TUBE FOR THE VEGA LEVEL PROBE
	TBA		SITE LAYOUT

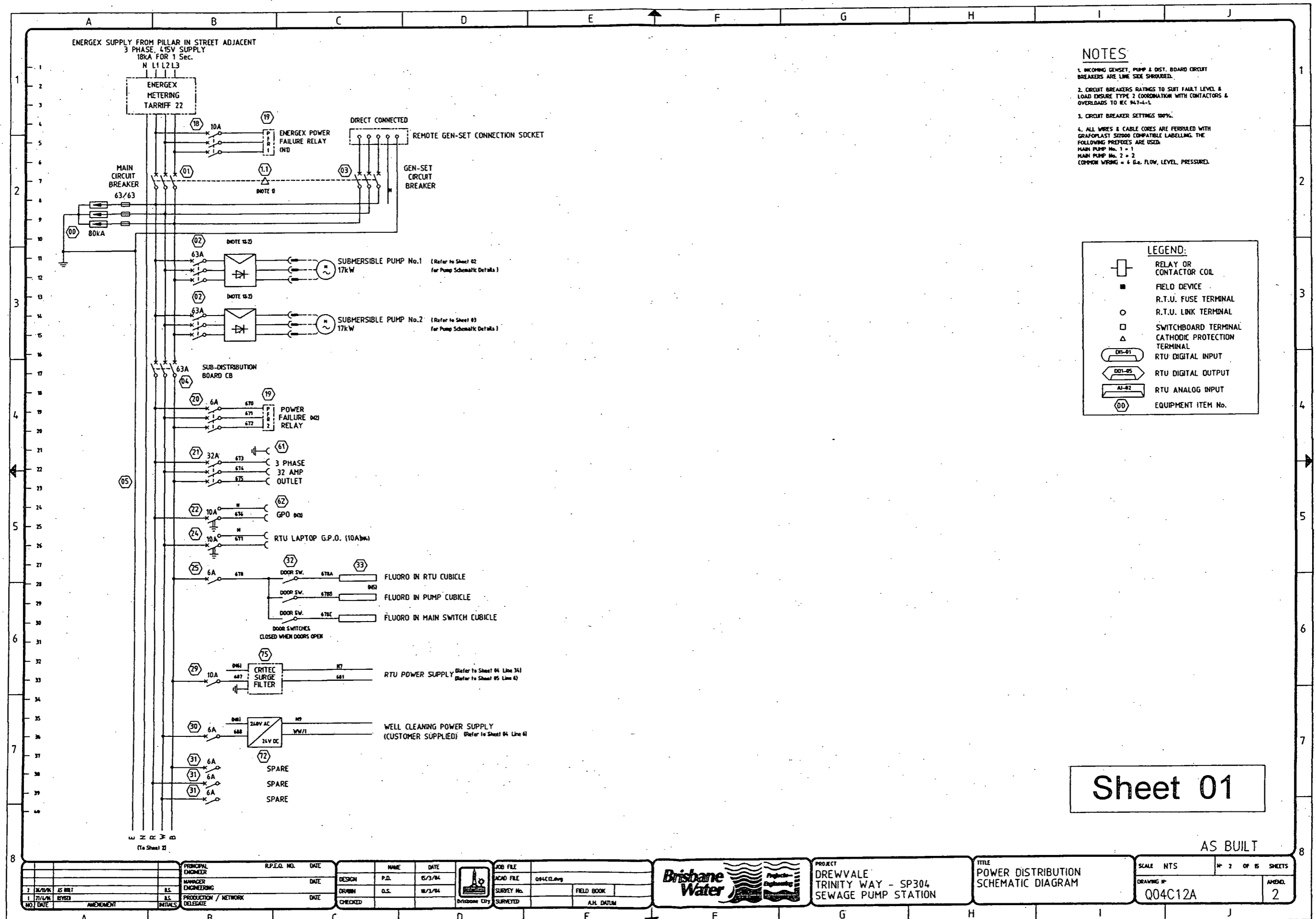
AS BUILT	
PRINCIPAL ENGINEER	
R.P.E.O. NO. DATE	
MANAGER ENGINEERING	
DATE	
DESIGN P.D. 05/3/04	
DRAWN D.S. 18/3/04	
CHECKED	
DATE	
PRODUCTION / NETWORK DELEGATE	
INITIALS	
NO. DATE	
AMENDMENT	
DATE	
AMEND.	
2	

JOB FILE	
ACAD FILE Q04C12.DWG	
SURVEY No.	
FIELD BOOK	
A.H. DATUM	

PROJECT	
DREWVALE	
TRINITY WAY - SP304	
SEWAGE PUMP STATION	

TITLE	
ELECTRICAL DRAWINGS	
DRAWING LIST	
DRAWING NO.	
Q04C12	
AMEND.	
2	

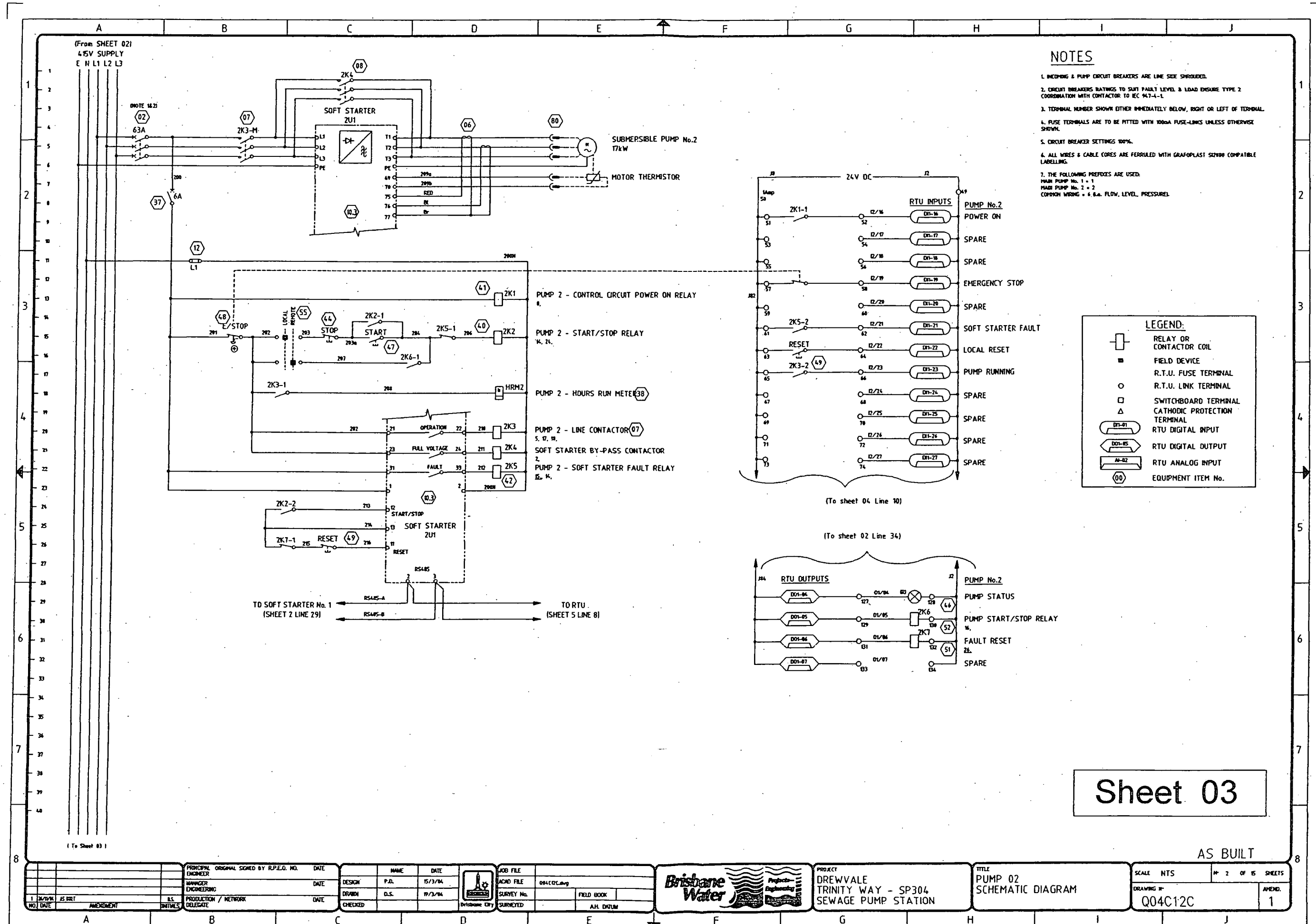
SCALE NTS	
1 OF 15 SHEETS	



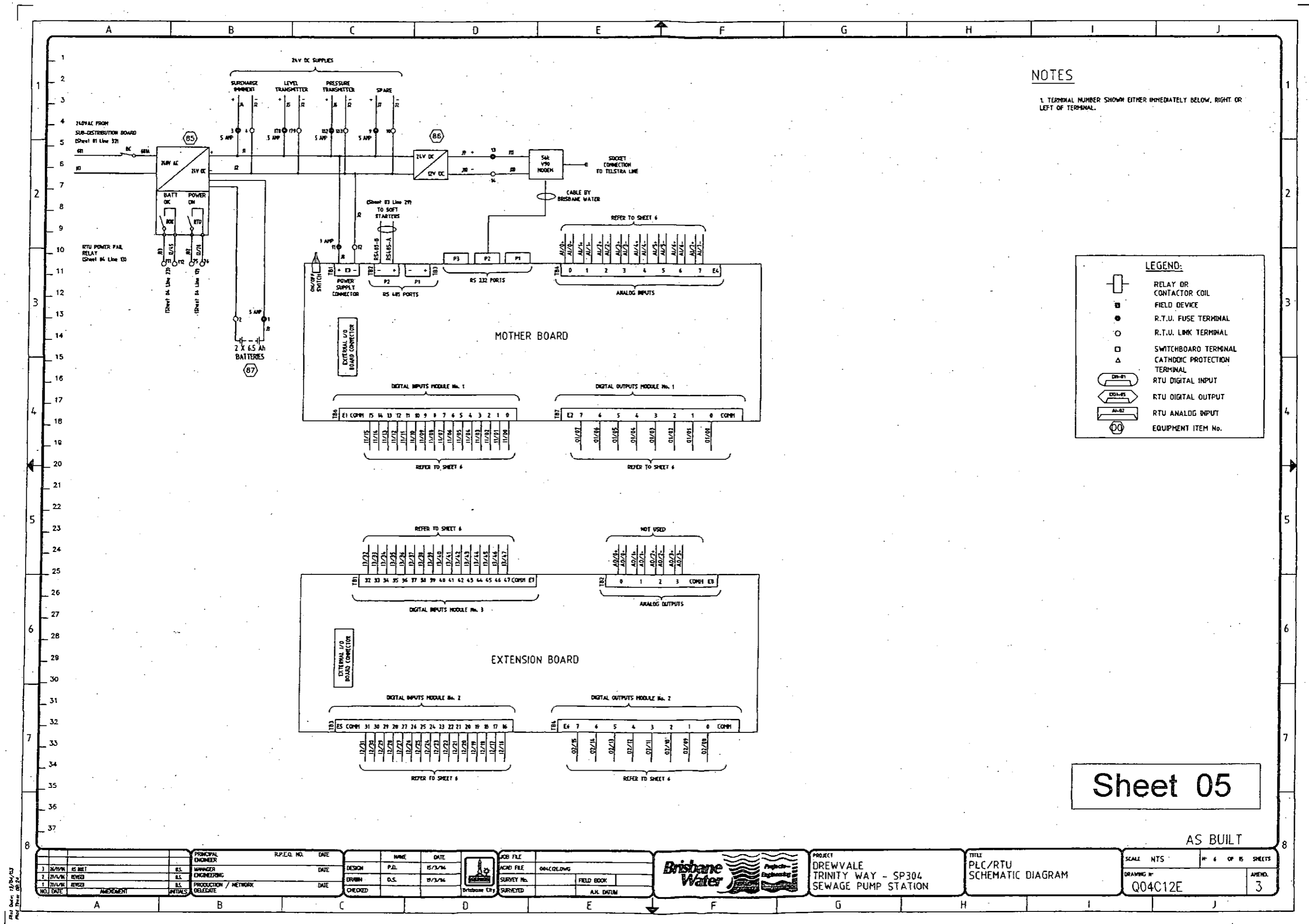
Sheet 02

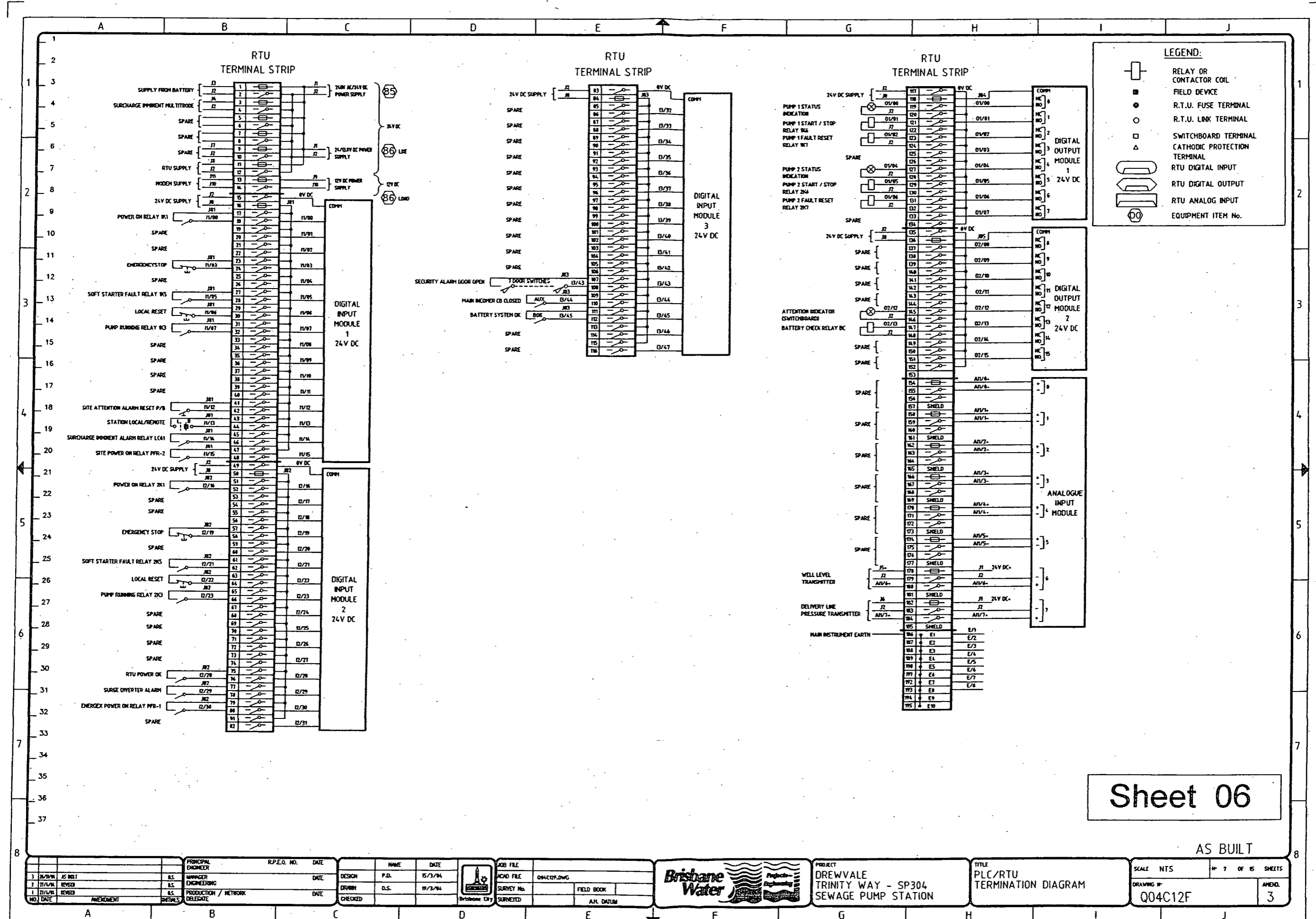
AS BUILT

SCALE	NTS	N° 2 OF 15 SHEETS
DRAWING N°		AMEND.
Q04C12B		1









A		B		C		D		E		F		G		H		I		J	
ITEM No	QTY	DESCRIPTION	MANUFACTURER	CATALOGUE No	REMARKS			ITEM No	QTY	DESCRIPTION	MANUFACTURER	CATALOGUE No	REMARKS						
1	3	SURGE INVERTER	CHITEC	ITS-88-45-277				51	2	PUMP FAULT RESET RELAY	IZUMI	IK2B-U-24VDC							
10.1	1	SURGE INVERTER ALARM RELAY	CHITEC	ITS-AR				52	2	PUMP START/STOP RELAY	IZUMI	IK2B-U-24VDC							
11	1	MAIN CIRCUIT BREAKER - SHROUD	TERASAKI	XT500A/25 + UZL0000000 + UZ0000000				53	1	SURCHARGE ALARM RELAY	MULTITRONE	MTB-5							
10.1	1	MAIN C.B. MECHANICAL INTERLOCK	TERASAKI/MIP	BASE PLATE + UZ0000000				54	1	SURCHARGE PROBE	MULTITRONE	IL2/1-B							
12	2	PUMP CIRCUIT BREAKER - SHROUD	TERASAKI	XT500A/10 + XT0000000				55	1	STATION CONTROL SELECTOR SW.	KRAUS & NAIMER	CA03-43N-440							
13	1	GEN SET CB	TERASAKI	XT500A/25 + UZL0000000 + UZ0000000				56	1	SITE ATTENTION RESET	SPECHER & SONH	OSP-F43LX10							
14	1	SUB-DISTRIBUTION BOARD CB	TERASAKI	DT0000000				57		NOT USED									
15	1	SUB-DISTRIBUTION BOARD CLASS	TERASAKI	CD-3-10/10-3				58		NOT USED									
16	1	CURRENT TRANSFORMERS INCLUDING CABLE KIT RT-702-80	ENDOTRON	TO SUIT MSF-485				59	1	SITE ATTENTION ALARM INDICATOR	SPECHER & SONH	OSP-PL5 + DS-3MLA (AMBER, 24V)							
17	2	PUMP CONTACTORS	SPECHER & SONH	CA7-43, (SEE NOTE 2, SHY 2)				60		NOT USED									
18	2	PUMP SOFT STARTER RT-PASS CONTACTOR	SPECHER & SONH	CA7-43				61	1	3 PHASE OUTLET	CLIPSAL	S4SH50LE							
19		NOT USED						62	1	1 PHASE OUTLET	CLIPSAL	ISY + 980 IS40000							
10.1	2	EXTERNAL KEYPAD KIT	ENDOTRON	81-708-88				63	1	DIS. BD. NEUTRAL LINK	CLIPSAL	DP4620B							
10.2	2	CT CABLE KIT	ENDOTRON	81-708-88				64	1	DIS. BD. EARTH LINK	CLIPSAL	DP4620B							
10.3	2	PUMP SOFT STARTER *	ENDOTRON	MSF-485 + MODBUS RTU SERIAL COMMS CARD				65		SWITCHBOARD TERMINALS	PHOENIX								
12	2	PUMP NEUTRAL CABLE	ALSTON	KS20H (WHITE)				65.1	16	ANALOGUE DISCONNECT	PHOENIX	UK-5							
12A	2	PUMP NEUTRAL LINK	ALSTON	COPPER LINK				65.2	16	END PLATE	PHOENIX	TO SUIT UK-5							
13	3	SURGE INVERTER FUSES	MIP	32AMP 63MS MOTOR START				65.3	20	FUSE TERMINAL	PHOENIX	UK-5 BEST							
14		NOT USED						65.4	20	END PLATE	PHOENIX	TO SUIT UK-5 BEST							
10.1		NOT USED						65.5	20	FUSE CARTRIDGE	PHOENIX	FUSE 70x50mm							
15		NOT USED						65.6	16.1	DISCONNECT TERMINAL	PHOENIX	UK-5							
16.1		NOT USED						65.7	5	END PLATE	PHOENIX	TO SUIT UK-5							
16.2		NOT USED						65.8	9	END STOP	PHOENIX	TO SUIT UK-5							
16.3		NOT USED						66	1	MAIN NEUTRAL LINK	CLIPSAL	ZOLAF3							
16.4		NOT USED						67	1	MAIN EARTH LINK	CLIPSAL	ZOLAF3							
16		NOT USED						68	1	INSTRUMENTATION EARTH LINK	CLIPSAL	DP4620B							
17		NOT USED						69		NOT USED									
18	1	PHASE FAILURE CIRCUIT BREAKER	TERASAKI	DT0000000				70	1	CORROSION INHIBITOR	CHITEC	VPC-100 OR 101							
19	2	PHASE FAILURE RELAY	COMPTON INSTRUMENTS	251-PSM				71		NOT USED									
20	1	PHASE FAILURE CIRCUIT BREAKER	TERASAKI	DT0000000				72		WELL CLEANER POWER SUPPLY									
21	1	3 PHASE OUTLET CIRCUIT BREAKER	TERASAKI	DT0000000				73		NOT USED									
22	1	1 PHASE OUTLET CIRCUIT BREAKER	TERASAKI	XT500A/10				74		NOT USED									
23		NOT USED						75	1	RTU SURGE REACTION FILTER	CHITEC	TF-88A-24V							
24	1	RTU LAP-TOP 630 CIRCUIT BREAKER	TERASAKI	DT0000000				76	1	GENERATOR CONNECTION SOCKET	HEWLETT	W3P - 125 AMP 3 PH WALL SOCKET							
25	1	SV/NO FLUID CIRCUIT BREAKER	TERASAKI	DT0000000				77	1	BATTERY ENCLOSURE	NETWORK	DWG 001-23 DETAIL 1							
26		NOT USED						78	1	BATTERY VENT	PERKINS	VB054							
27		NOT USED						79	1	RTU LAPTOP 630A	CLIPSAL	IS / 449 / 449A							
28		NOT USED						80	2	DECONTACTOR	PARCEAL	DS4 (3WAYS + 3WAY002)							
29	1	RTU CIRCUIT BREAKER	TERASAKI	DT0000000				81	2	ANGLE ADAPTOR	PARCEAL	DS4 (3WAYS + 3WAY002)							
30	1	WELL CLEANING CIRCUIT BREAKER	TERASAKI	DT0000000				82	2	PLUG TOP	PARCEAL								
31	3	SPARE CIRCUIT BREAKERS	TERASAKI	DT0000000				83		NOT USED									
32	1	SV/NO DOOR MICRO SWITCHES	CANISO	SP002				84	1	RTU BATTERY CHECK RELAY	IZUMI	IK2B-U-24VDC							
33	3	SV/NO 6V INTERNAL FLUID LIGHTS	THORN	80400				85	1	RTU POWER SUPPLY 24VDC	INNOVATIVE ENERGIES	SI0250-24V							
34	1	WELL LEVEL INDICATOR	COMPTON INSTRUMENTS	244-88G-86-P-SR 1-28mA, 0-100%, ADJ RED POINTER				86	1	MODERN POWER SUPPLY 12V DC	AUSTRIALIAN UTILITIES & SEADA TECHNOLOGIES	SD-50A-D 12V DC/12V DC							
35	1	PRESSURE TRANSMITTER	VEGA	06A				87	2	BATTERY	THYASA	NP1-12							
36	1	WELL LEVEL ADJUSTMENT UNIT	VEGA	VEGA DS12				88		NOT USED									
36.1	1	WELL LEVEL TRANSMITTER	VEGA	VEGAWELL 72				89		NOT USED									
36.2	1	BAG REDUCTION TUBE						90	1	TELEMETRY UNIT	MTS	MO331EA/770-771							
37	2	PUMP CONTROL CIRCUIT BREAKER	TERASAKI	DT0000000				91	1	MODERN	MAESTRO P/L	MODERN 50A 110V							
38	2	PUMP HOURS RUN METER	MIP	AN043H				92		NOT USED									
39		NOT USED						93		NOT USED									
40	2	PUMP START/STOP RELAY	IZUMI	IK2B-U-24VDC				94		NOT USED									
41	2	CONTROL CIRCUIT ON RELAY	IZUMI	IK2B-U-24VDC				95		NOT USED									
42	2	PUMP FAULT RELAY	IZUMI	IK2B-U-24VDC				96		NOT USED									
43		NOT USED																	
44	2	PUMP STOP PUSH BUTTON	SPECHER & SONH	OSP-F43LX01															
45		NOT USED																	
46	2	PUMP STATUS INDICATOR	SPECHER & SONH	OSP-PL4 + DS-3MLA (RED, 24V)															
47	2	PUMP START PUSH BUTTON	SPECHER & SONH	OSP-F43LX01															
48	2	PUMP EMERG STOP PUSH BUTTON	SPECHER & SONH	OSP-HTS3430H/11															
49	2	PUMP RESET PUSH BUTTON	SPECHER & SONH	OSP-F43LX01															
50		NOT USED																	

NOTES

1. CATALOG No. TO SUIT RATING OF PUMP STATION.
2. CATALOG No. TO SUIT RATING OF PUMP FOR NORMAL SOFT STARTED DUTY.

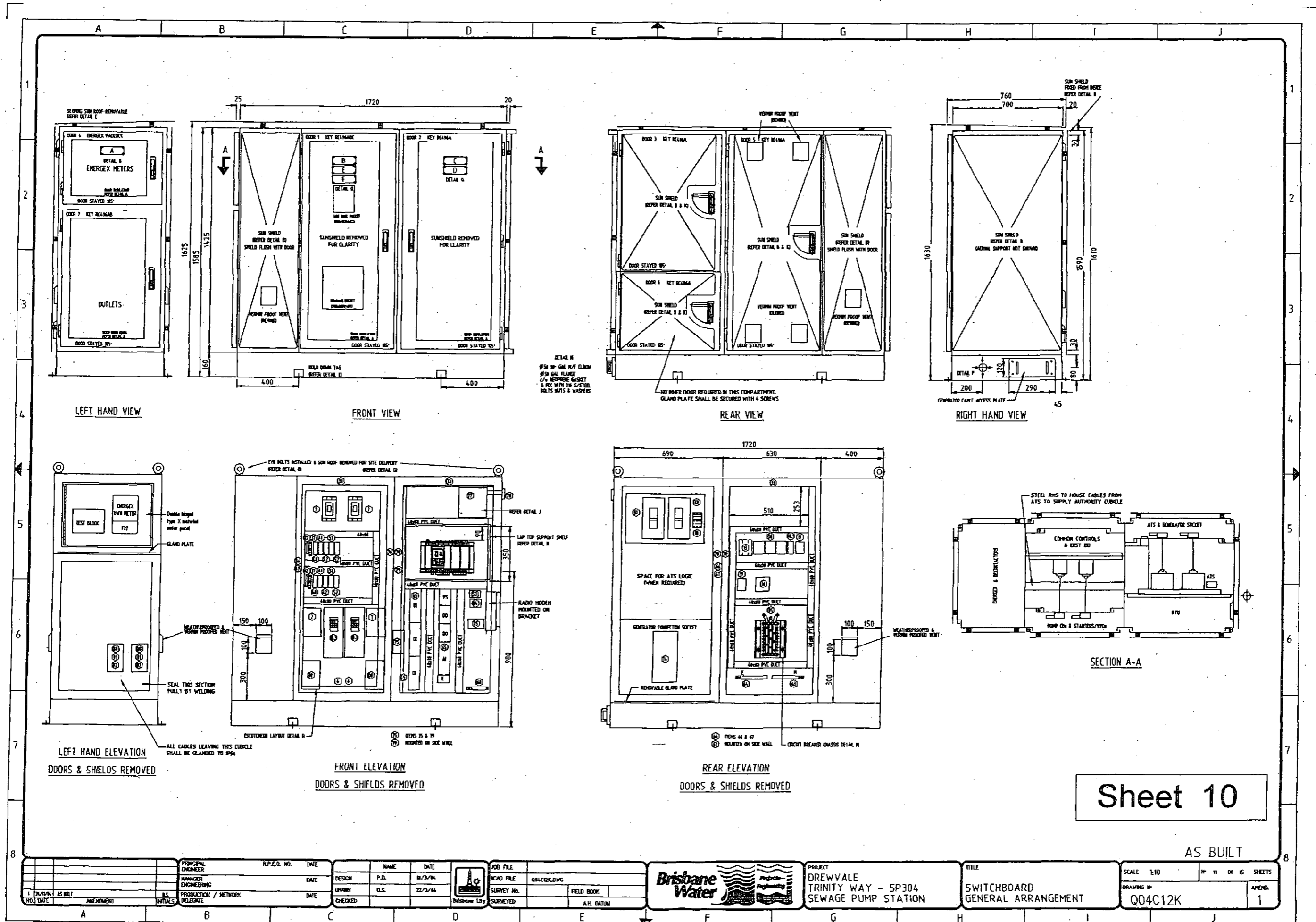
Sheet 07

AS BUILT

3 26/1/04 AS BUILT		B.S. MANAGER		R.P.O. NO. DATE		NAME DATE		JOB FILE		PROJECT		TITLE		SCALE NTS		# OF 15 SHEETS	
2 17/1/04 REVISD		B.S. ENGINEERING		DATE		P.D. 15/3/04		ACAD FILE		DREWVALE TRINITY WAY - SP304		EQUIPMENT LIST		DRAWING NO. Q04C12G		3	
1 26/3/04 REVISD		B.S. PRODUCTION / NETWORK		DATE		D.S. 19/3/04		SURVEY No.		SEWAGE PUMP STATION							
NO. DATE		AMENDMENT		INITIALS		CHECKED		A.H. DATUM									

[illegible]

ITEM No	DESCRIPTION	LABEL 1	LABEL 2 IF NECESSARY	TEXT HEIGHT	MATERIAL / COLOUR	CORRECTLY INSTALLED	ITEM No	DESCRIPTION	LABEL 1	LABEL 2 IF NECESSARY	TEXT HEIGHT	MATERIAL / COLOUR	CORRECTLY INSTALLED
40	SWITCH OVER	MAIN SWITCH		4mm	TRAFOLYTE W/B/V		40	PUMP STOP PUSH BUTTON	PUMP EMERGENCY STOP		4mm	TRAFOLYTE W/B/V	
41	MAIN CIRCUIT BREAKER	PUMP No 1 PUMP No 2		4mm	TRAFOLYTE W/B/V		41	PUMP RESET PUSH BUTTON	FAULT RESET		4mm	TRAFOLYTE W/B/V	
42	PUMP CIRCUIT BREAKER	PUMP No 1 PUMP No 2		4mm	TRAFOLYTE W/B/V		42						
43	PUMP SOFT STARTER	PUMP No 1 PUMP No 2		4mm	TRAFOLYTE W/B/V		43						
44	SUB-DISTRIBUTION BOARD (D)	SUB-DISTRIBUTION BOARD F.M.		4mm	TRAFOLYTE W/B/V		44	PUMP START/STOP RELAY	RTU		4mm	TRAFOLYTE W/B/V	
44.1				4mm	TRAFOLYTE W/B/V		44.1				4mm	TRAFOLYTE W/B/V	
44.2				4mm	TRAFOLYTE W/B/V		44.2				4mm	TRAFOLYTE W/B/V	
45				4mm	TRAFOLYTE W/B/V		45	PUMP CONTROL SELECTOR SW.	STATION CONTROL LOCAL REVERSE SITE ATTENTION ALARM RESET		4mm	TRAFOLYTE W/B/V	
46	CURRENT TRANSFORMER	CURRENT TRANSFORMER		4mm	TRAFOLYTE W/B/V		46	SITE ATTENTION RESET			4mm	TRAFOLYTE W/B/V	
46.1				4mm	TRAFOLYTE W/B/V		46.1				4mm	TRAFOLYTE W/B/V	
47	PUMP CONTACTOR	NO CONTACTOR		4mm	TRAFOLYTE W/B/V		47				4mm	TRAFOLYTE W/B/V	
47.1				4mm	TRAFOLYTE W/B/V		47.1				4mm	TRAFOLYTE W/B/V	
47.2				4mm	TRAFOLYTE W/B/V		47.2				4mm	TRAFOLYTE W/B/V	
47.3				4mm	TRAFOLYTE W/B/V		47.3				4mm	TRAFOLYTE W/B/V	
48	BY-PASS CONTACTOR	NO BY-PASS CONTACTOR		4mm	TRAFOLYTE W/B/V		48	3 PHASE OUTLET	3 Ø OUTLET		4mm	TRAFOLYTE W/B/V	
49				4mm	TRAFOLYTE W/B/V		49	1 PHASE OUTLET	1 Ø OUTLET		4mm	TRAFOLYTE W/B/V	
50	SOFT STARTER	SOFT STARTER R/S 1V NORMAL DUTY		4mm	TRAFOLYTE W/B/V		50	NEUTRAL LINK	NEUTRAL		4mm	TRAFOLYTE W/B/V	
51				4mm	TRAFOLYTE W/B/V		51	EARTH LINK	EARTH		4mm	TRAFOLYTE W/B/V	
52	PUMP M/LINK	PUMP No 1 M/LINK		4mm	TRAFOLYTE W/B/V		52				4mm	TRAFOLYTE W/B/V	
52.1				4mm	TRAFOLYTE W/B/V		52.1				4mm	TRAFOLYTE W/B/V	
52.2				4mm	TRAFOLYTE W/B/V		52.2				4mm	TRAFOLYTE W/B/V	
53				4mm	TRAFOLYTE W/B/V		53				4mm	TRAFOLYTE W/B/V	
54	INSTRUMENT FUSES	F1 2/20A		4mm	TRAFOLYTE W/B/V		54				4mm	TRAFOLYTE W/B/V	
54.1				4mm	TRAFOLYTE W/B/V		54.1				4mm	TRAFOLYTE W/B/V	
54.2				4mm	TRAFOLYTE W/B/V		54.2				4mm	TRAFOLYTE W/B/V	
54.3				4mm	TRAFOLYTE W/B/V		54.3				4mm	TRAFOLYTE W/B/V	
54.4				4mm	TRAFOLYTE W/B/V		54.4				4mm	TRAFOLYTE W/B/V	
54.5				4mm	TRAFOLYTE W/B/V		54.5				4mm	TRAFOLYTE W/B/V	
54.6				4mm	TRAFOLYTE W/B/V		54.6				4mm	TRAFOLYTE W/B/V	
54.7				4mm	TRAFOLYTE W/B/V		54.7				4mm	TRAFOLYTE W/B/V	
54.8				4mm	TRAFOLYTE W/B/V		54.8				4mm	TRAFOLYTE W/B/V	
54.9				4mm	TRAFOLYTE W/B/V		54.9				4mm	TRAFOLYTE W/B/V	
55				4mm	TRAFOLYTE W/B/V		55				4mm	TRAFOLYTE W/B/V	
56				4mm	TRAFOLYTE W/B/V		56				4mm	TRAFOLYTE W/B/V	
57				4mm	TRAFOLYTE W/B/V		57				4mm	TRAFOLYTE W/B/V	
58				4mm	TRAFOLYTE W/B/V		58				4mm	TRAFOLYTE W/B/V	
59				4mm	TRAFOLYTE W/B/V		59				4mm	TRAFOLYTE W/B/V	
60				4mm	TRAFOLYTE W/B/V		60				4mm	TRAFOLYTE W/B/V	
61				4mm	TRAFOLYTE W/B/V		61				4mm	TRAFOLYTE W/B/V	
62				4mm	TRAFOLYTE W/B/V		62				4mm	TRAFOLYTE W/B/V	
63				4mm	TRAFOLYTE W/B/V		63				4mm	TRAFOLYTE W/B/V	
64				4mm	TRAFOLYTE W/B/V		64				4mm	TRAFOLYTE W/B/V	
65				4mm	TRAFOLYTE W/B/V		65				4mm	TRAFOLYTE W/B/V	
66				4mm	TRAFOLYTE W/B/V		66				4mm	TRAFOLYTE W/B/V	
67				4mm	TRAFOLYTE W/B/V		67				4mm	TRAFOLYTE W/B/V	
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71				4mm	TRAFOLYTE W/B/V		71				4mm	TRAFOLYTE W/B/V	
72				4mm	TRAFOLYTE W/B/V		72				4mm	TRAFOLYTE W/B/V	
73				4mm	TRAFOLYTE W/B/V		73				4mm	TRAFOLYTE W/B/V	
74				4mm	TRAFOLYTE W/B/V		74				4mm	TRAFOLYTE W/B/V	
75				4mm	TRAFOLYTE W/B/V		75				4mm	TRAFOLYTE W/B/V	
76				4mm	TRAFOLYTE W/B/V		76				4mm	TRAFOLYTE W/B/V	
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79				4mm	TRAFOLYTE W/B/V		79				4mm	TRAFOLYTE W/B/V	
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81				4mm	TRAFOLYTE W/B/V		81				4mm	TRAFOLYTE W/B/V	
82				4mm	TRAFOLYTE W/B/V		82				4mm	TRAFOLYTE W/B/V	
83				4mm	TRAFOLYTE W/B/V		83				4mm	TRAFOLYTE W/B/V	
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88				4mm	TRAFOLYTE W/B/V		88				4mm	TRAFOLYTE W/B/V	
89				4mm	TRAFOLYTE W/B/V		89				4mm	TRAFOLYTE W/B/V	
90				4mm	TRAFOLYTE W/B/V		90				4mm	TRAFOLYTE W/B/V	
91				4mm	TRAFOLYTE W/B/V		91				4mm	TRAFOLYTE W/B/V	
92				4mm	TRAFOLYTE W/B/V		92				4mm	TRAFOLYTE W/B/V	
93				4mm	TRAFOLYTE W/B/V		93				4mm	TRAFOLYTE W/B/V	
94				4mm	TRAFOLYTE W/B/V		94				4mm	TRAFOLYTE W/B/V	
95				4mm	TRAFOLYTE W/B/V		95				4mm	TRAFOLYTE W/B/V	
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108				4mm	TRAFOLYTE W/B/V		108				4mm	TRAFOLYTE W/B/V	
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110				4mm	TRAFOLYTE W/B/V		110				4mm	TRAFOLYTE W/B/V	
111				4mm	TRAFOLYTE W/B/V		111				4mm	TRAFOLYTE W/B/V	
112				4mm	TRAFOLYTE W/B/V		112				4mm	TRAFOLYTE W/B/V	
113				4mm	TRAFOLYTE W/B/V		113				4mm	TRAFOLYTE W/B/V	
114				4mm	TRAFOLYTE W/B/V		114				4mm	TRAFOLYTE W/B/V	
115				4mm	TRAFOLYTE W/B/V		115				4mm	TRAFOLYTE W/B/V	
116				4mm	TRAFOLYTE W/B/V		116				4mm	TRAFOLYTE W/B/V	
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122				4mm	TRAFOLYTE W/B/V		122				4mm	TRAFOLYTE W/B/V	
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131				4mm	TRAFOLYTE W/B/V		131				4mm	TRAFOLYTE W/B/V	
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146				4mm	TRAFOLYTE W/B/V		146				4mm	TRAFOLYTE W/B/V	
147				4mm	TRAFOLYTE W/B/V		147				4mm	TRAFOLYTE W/B/V	
148				4mm									



CONSTRUCTION

Cable construction 3mm Marine grade Aluminium (5251).
 Plinth construction 160x60 channel 6061 T6 Grade Aluminium.
 Falded, "Pulse MIG" & "TIG" welded with all visible seams and joints fully welded, free from splatter and ground smooth where needed.
 External doors and covers fitted with Emko 1011-207 self grip seal.
 "D" Handles fitted where indicated on the drawings.
 M6 Earth studs fixed to the interior of all doors and hinged escutcheons and on adjacent cubicle interior surfaces.
 Door stiffeners, door stays, cable straps, and document holders etc fitted where shown on the drawings.
 Lift-off covers and mounting panels fixed with M8 studs & chrome arm nuts.
 Gland plates manufactured from 6mm Bakelite.
 Gland plate openings reinforced with 25x6mm flat aluminium bar.
 Gland plate seals attached to cubicle not gland plate.
 Gland plate fixings are NOT more than 150 mm apart (refer Detail F)
 Hinges Selectrix 18-B45B.
 Star washers fitted under all hinge screws.
 Locks Doors 1-5, 7
 Selectrix 1807 - PSC01 handle
 Selectrix 1807-U123 3pt cam
 Lockwood 71 Barrel Lock
 Emko 1049-U3 roller rod
 Key Codes RC496A, RC496AB, RC496ABC refer to each door for clarification.
 Lock Door 6
 Selectrix 1807-PSC01 handle
 Selectrix 1807-U123 3pt cam
 Emko 1049-U3 roller rod
 EMEREX Lockwood No234B brass pin handle padlock.
 Hinged escutcheons fixed with Emko 1/4 turn 1000-UW2.
OPERATING PARAMETERS
 Standard AS 3439.1
 Current & Frequency AC 50Hz
 Rated Operational Voltage Ue 415 VAC
 Rated Insulation Voltage Ui 660 V
 Rated Auxiliary Voltage 24 VDC / 240 VAC
 Rated Current (Main Bus) 400 AMPS
 Short Circuit Current Isc 35 kA
 Duration of Isc 1 sec
 Degree of Protection IP 55 to AS 1939
 Measure of Protection by barriers and enclosures
 Service Conditions Outdoors
 Mass Not exceeding 2000kg
 Form 1
 Earthing System TN-S
PAINING
 Aluminium Surface Preparation.
 Finish smooth all exposed welds, clean, descale, and degrease all surfaces.
 Surfaces pretreatment in accordance with AS 1580 & AS 3715 using Novax LF acid etch cleaner, Novacoat 12 conversion coating, & clean water rinses.
 Apply DULUX ALPHATECH 3000 powder coat to manufacturer's recommendations.
 CUBICLE & EXTERNAL COMPONENTS :- DULUX Mist Green (36648) matt finish.
 INTERIOR ITEMS (mounting panels, escutcheons, etc) :- DULUX Bright White (32166)
 Minimum Dry Film Thickness all surfaces 50 microns.

WIRING

All wiring to be PVC V90 HT 0.6/1kV Grade with tinned conductor.
 Control and instrumentation wiring has flexible copper conductors, and is colour coded as detailed below, numbered each end, and terminated by the use of appropriate pre-insulated crimp lugs.
 Power wiring to be minimum 2.5sqmm stranded copper conductors, phase colour coded as detailed below.
 Low level instrumentation signals & 4-20mA signals wired in shielded pair minimum size 0.5sqmm. Earthed at one end only.
 Earth cables minimum 2.5sqmm flexible.
 Doors and hinged escutcheons bonded with 4sqmm flexible earth strap.
 Wire numbering will be equal to Gratiplast 52000 system.
 Wire numbers are readable left to right, bottom to top as shown.

COLOUR CODE		
Phase wiring (A,B & C)	Red, White, Blue	2.5sqmm (min)
Potential Metering (240/415 VAC)	Red, White, Blue, Black	1.5sqmm
Current Metering (Secondary)	Red, White, Blue, Grey	2.5sqmm
240 VAC Control Active	Red	1.5sqmm
240 VAC Neutral	Black	1.5sqmm
24 V ELV Positive	Orange	1.5sqmm
24 V ELV Negative	Violet	1.5sqmm
24 V RTU Positive	Orange	0.5sqmm
24 V RTU Negative	Violet	0.5sqmm
RTU Wiring	Grey	0.5sqmm
Intrinsically safe wiring	Blue	1.5sqmm
Earth	Green/Yellow	2.5sqmm (min)
Door & Escutcheon Earth Bonds	Green/Yellow	4 sqmm

Internal labels W/B/W engraved Traffylite to label schedule.
 Warning labels R/W/R engraved Traffylite.

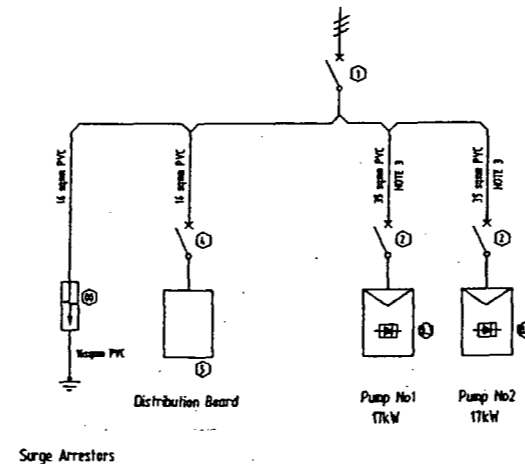
Main switch labels	Material B/W/B
COMPARTMENT labels	Material W/B/W
Warning labels	Material R/W/R
Other labels	Material W/B/W

Internal labels secured by M3 chrome plated metal threads.
 Labels obstructed by switchboard wiring are relocated to adjacent duct lid.
 The duct lid is secured by a single cable tie at one corner.
 External labels secured by M3 316 stainless steel metal threads.

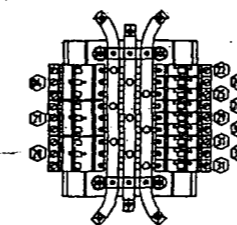
LABE	TEXT	TEXT HEIGHT	PART TELL LETTERING	DIMENSIONS	QUANTITY
A	SUPPLY AUTHORITY METER PANEL	8mm	Black	300x20	1
B	SPRING	2mm	Black	50x25	1
C	WARNING THIS SITE IS MONITORED BY NETWORK CONTROL. PLEASE INFORM THE OPERATOR BEFORE ISOLATING PUMPS OR STATION.	8mm	Black	250x100	1
D	PLEASE CHECK THAT THE PUMPS ARE IN REMOTE MODE BEFORE LEAVING SITE.	8mm	Black	200x40	1
E	DANGER 415V	8mm	Red	40x65	1
F	ELECTRONIC SOFT STARTERS No.1 & No.2	8mm	Black	300x25	1

External labels 100 316 grade stainless steel. Fixed with M3 316 stainless steel metal threads.

DETAIL Q
(EXTERNAL STAINLESS STEEL LABEL DETAIL)



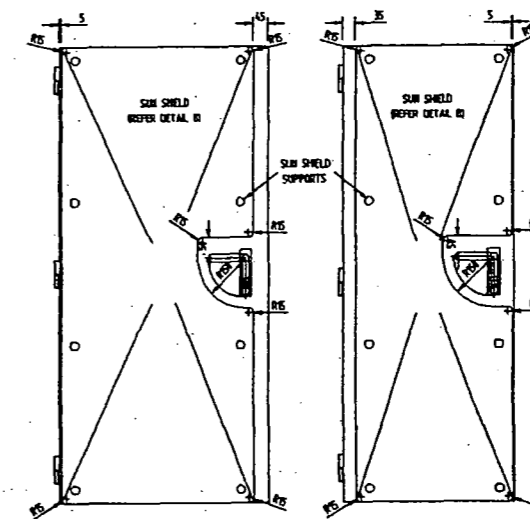
POWER WIRING DETAIL



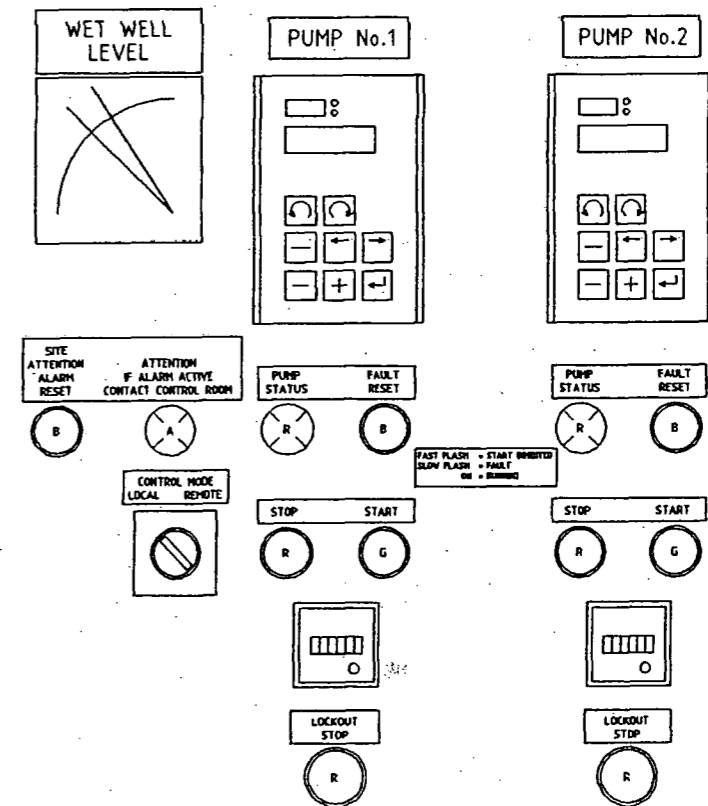
DETAIL M
SUB-DISTRIBUTION BOARD ARRANGEMENT

NOTES

1. ADD CORRECT PUMP No.
2. ADD CORRECT PUMP RATINGS.
3. ADD CORRECT WIRE SIZE.



DETAIL K
(DOOR SUN SHIELD DETAIL)





TYPICAL ESCUTCHEON LAYOUT

PUMPS INTERLOCKED

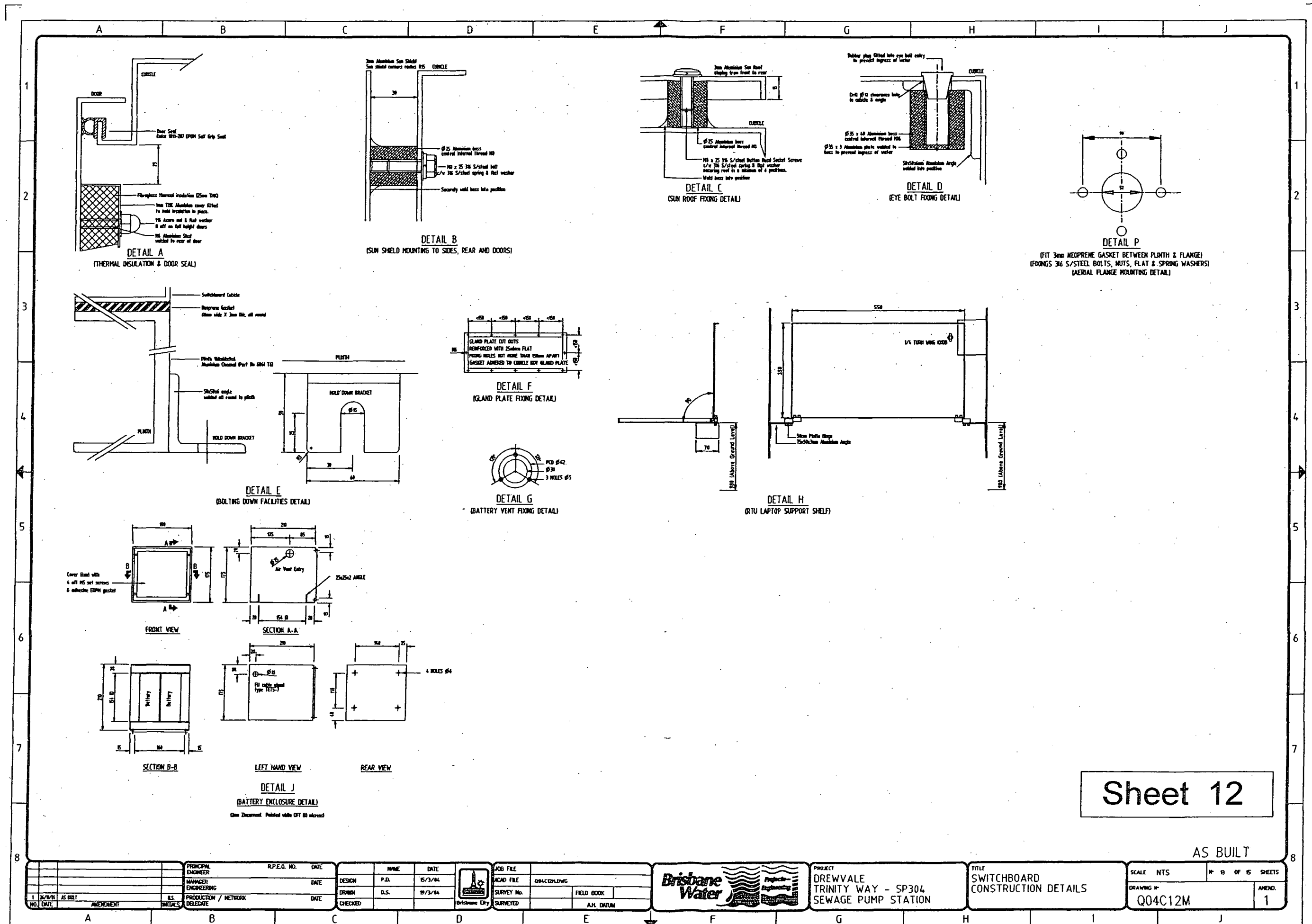
TRINITY GREEN	
ACTUAL SURCHARGE	17%
SURCHARGE MOMENT	17%
START DUTY PUMP	17%
STOP DUTY PUMP	17%
LEVEL PROBE LENGTH	17%
LEVEL PROBE RANGE	17%

Sheet 11

AS BUILT

				PRINCIPAL ENGINEER		ORIGINAL SIGNED BY R.P.E.O. NO.		DATE		NAME		DATE				JOB FILE		ACNO FILE		Q04C12L01G				PROJECT		DREWVALE TRINITY WAY - SP304 SEWAGE PUMP STATION		TITLE		SWITCHBOARD CONSTRUCTION NOTES		SCALE NTS		N° 12 OF 15 SHEETS		DRAWING N°		Q04C12L		AMEND.		1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
				MANAGER				DATE		DESIGN		P.D.		5/3/14																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											

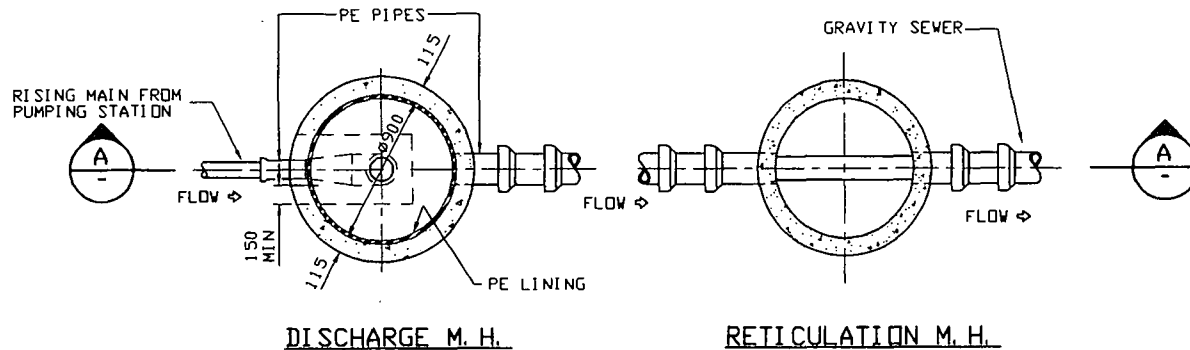
Rev Date 01/06/03
 Rev Time 12:41



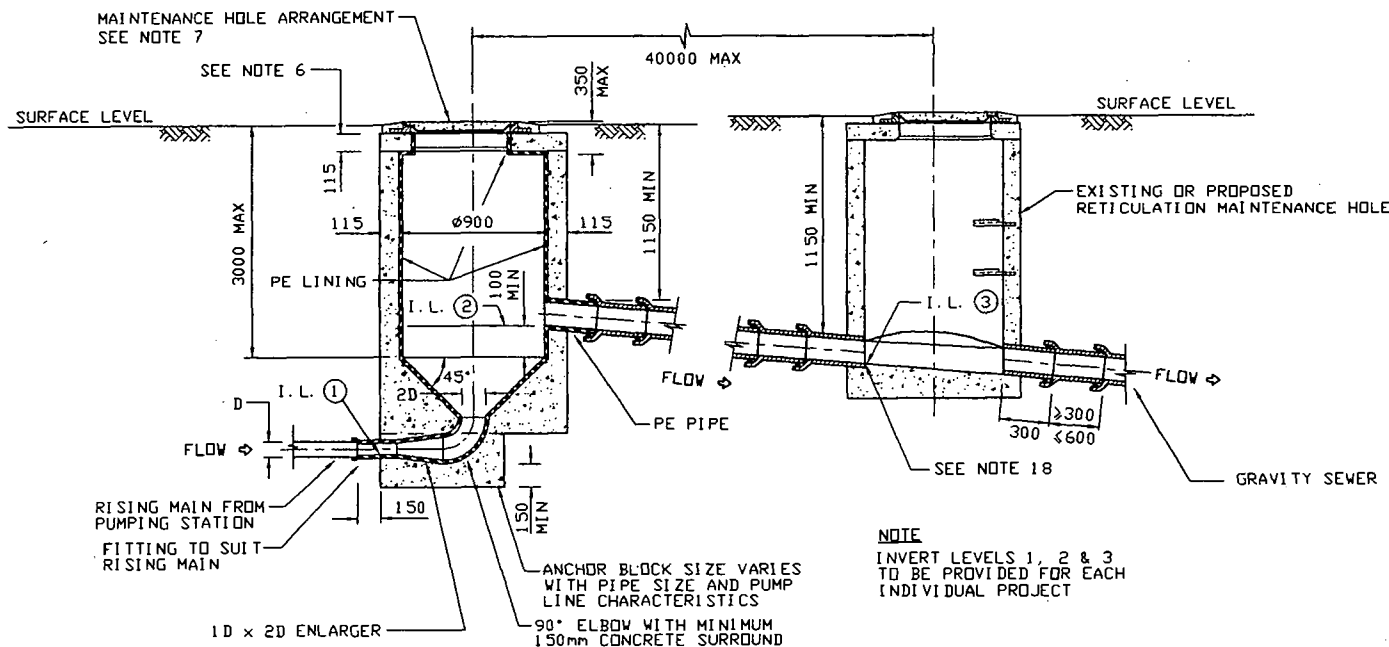




□



SECTIONAL PLAN



DISCHARGE M.H.

RETICULATION M.H.

SECTIONAL ELEVATION



PUMP FLOW RATES SHALL BE DESIGNED TO PROVIDE A NON-TURBULENT DISSIPATION IN THE DISCHARGE MAINTENANCE HOLE.
THE GRAVITY SEWER BETWEEN THE DISCHARGE MAINTENANCE HOLE AND THE RETICULATION MAINTENANCE HOLE SHALL BE TREATED AS THE LAST LENGTH OF SEWER TO AN END.
THE DESIGN VELOCITIES FROM THE DISCHARGE MAINTENANCE HOLE SHALL CONFORM WITH THE DESIGN VELOCITIES FOR GENERAL SEWER DESIGN AS SET OUT IN THE 'RETICULATION STANDARDS AND SPECIFICATIONS.'

NOTES

- ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH CURRENT BRISBANE CITY COUNCIL SPECIFICATIONS AND STANDARDS.
- UNLESS SPECIFIED OTHERWISE ALL MATERIALS AND WORK SHALL COMPLY WITH THE RELEVANT AUSTRALIAN STANDARDS.
- CONCRETE SHALL BE CLASS S32.20.60 THROUGHOUT.
- REINFORCING BARS SHALL BE TACK WELDED AT ALL INTERSECTIONS.
- VC SHORT PIPES SHALL BE AS DETAILED ON SECTIONAL ELEVATION (A) REFER TO THE 'RETICULATION STANDARDS AND SPECIFICATIONS' FOR REQUIREMENTS OF OTHER APPROVED PIPE MATERIALS.
- TOP SLAB THICKNESS SHALL BE INCREASED FROM 115mm TO 150mm WHERE CLASS 'D' COVERS ARE SPECIFIED FOR TRAFFICABLE LOCATIONS.
- MAINTENANCE HOLE FRAME, COVER AND COPING SHALL SUIT APPLICATION. REFER STANDARD DRAWING NOS. 486/5/25-SC001, 486/5/25-SF002, 486/5/25-SF003 AND 486/5/25-SF004 FOR DETAILS.
- ALL CONCRETE SHALL BE VIBRATED.
- VC SEWERS SHALL BE CLASS 4 TO A.S. 1741 OR CONFORM TO EN295-1.
DIOL SEWERS SHALL BE CLASS K12 TO A.S. 2280 AND POLYETHYLENE SLEEVED.
PE PIPELINES SHALL BE CLASS PE80C TO A.S. 4130 AND A.S. 4131.
UPVC SEWERS SHALL BE SEH TO A.S. 1260.
- DISCHARGE MAINTENANCE HOLE LINER SHALL BE POLYETHYLENE CLASS PE80C TO A.S. 4130 AND A.S. 4131.
- ALL POLYETHYLENE PIPES AND FITTINGS SHALL BE JOINED USING BUTT WELDING AND/OR ELECTRO FUSION WELDING PROCESSES.
- ALL DIMENSIONS ARE IN MILLIMETRES.
- THIS STANDARD DRAWING APPLIES FOR ALL RETICULATION SEWERS UP TO 300mm DIAMETER.
- DISCHARGE MAINTENANCE HOLES SHALL NOT BE LOCATED IN PRIVATE PROPERTY.
- MAINTENANCE HOLES IN FOOTPATH LOCATION SHALL BE CONSTRUCTED ON CENTRE LINE OF SEWERAGE ALLOCATION.
- ALL PIPEWORK SHALL FINISH FLUSH WITH INSIDE FACE OF MAINTENANCE HOLE WALL.
- UPVC PIPES SHALL NOT BE USED BETWEEN THE DISCHARGE MAINTENANCE HOLE AND THE FIRST RETICULATION MAINTENANCE HOLE.
- FOR DISCHARGE TO OTHER THAN RETICULATION SEWERS, REFER TO 'X' TYPE MAINTENANCE HOLE FOR DISCHARGE LEVELS. REFER STANDARD DRAWING NO. 486/5/25-SC004.

THIS DRAWING SUPERSEDES DRG No. 486/5/25-S8

ORIGINAL SIGNED R. JACKSON 06/05/98

A	9/98	DRAWING APPROVAL NOTE 1	GPM	APPROVED <i>R. Jackson</i> 9.9.98 FOR BRISBANE WATER <i>M. Jones</i> 11/9/98 FOR URBAN MANAGEMENT
NO	DATE	AMEND.	INITIALS	NO 1 OF 5 SHEETS



Brisbane Water

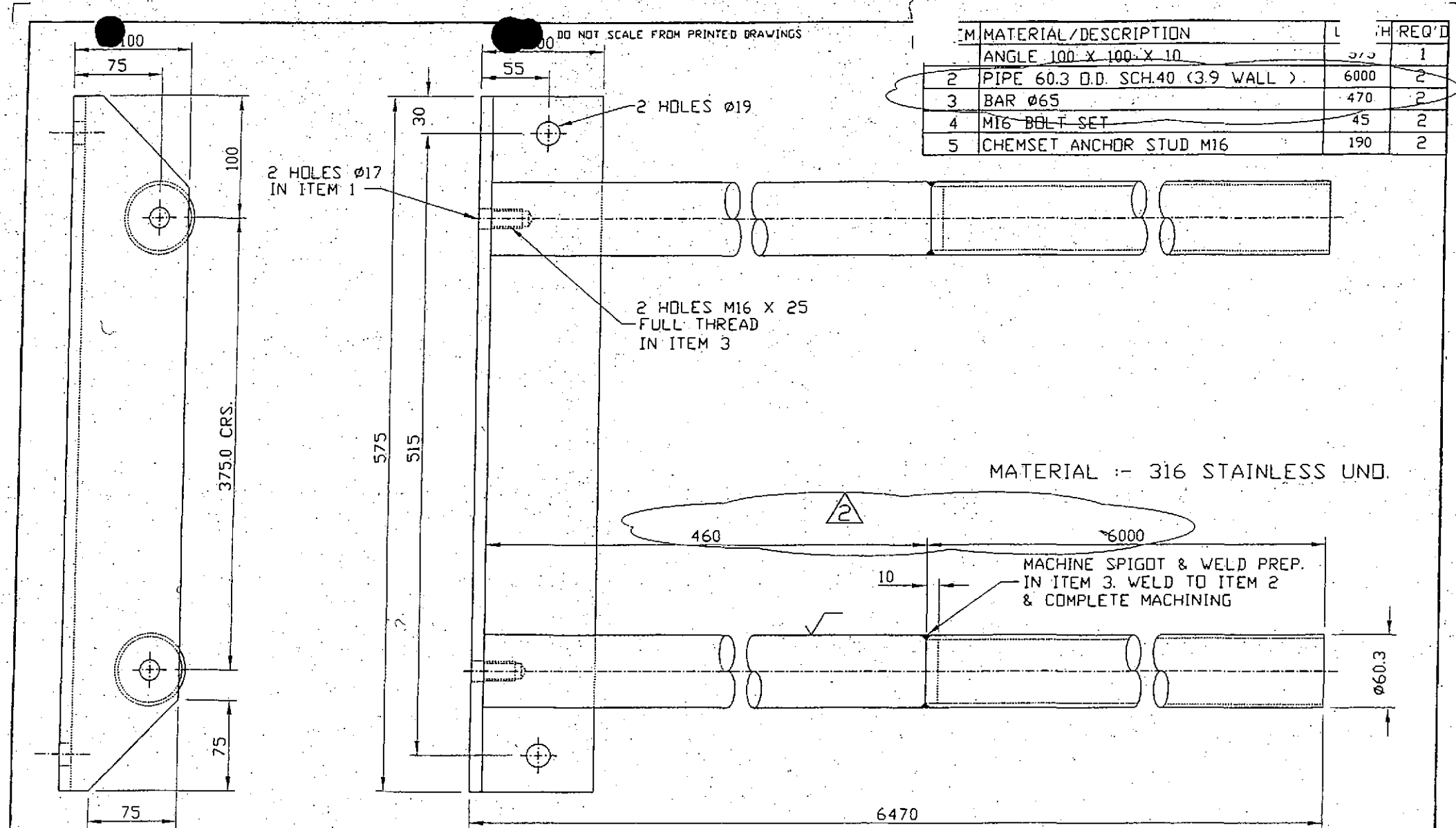
TITLE
900 DIA. RISING MAIN
DISCHARGE MAINTENANCE HOLE
PREFERRED OPTION

DRAWING NO. 486/5/25-SC006/1
AMEND. A

CADD FILE: G:\PDOSRL\CADD\AUTOCAD\STANDARD\B258-11A.DWG

Active 10/12/2014





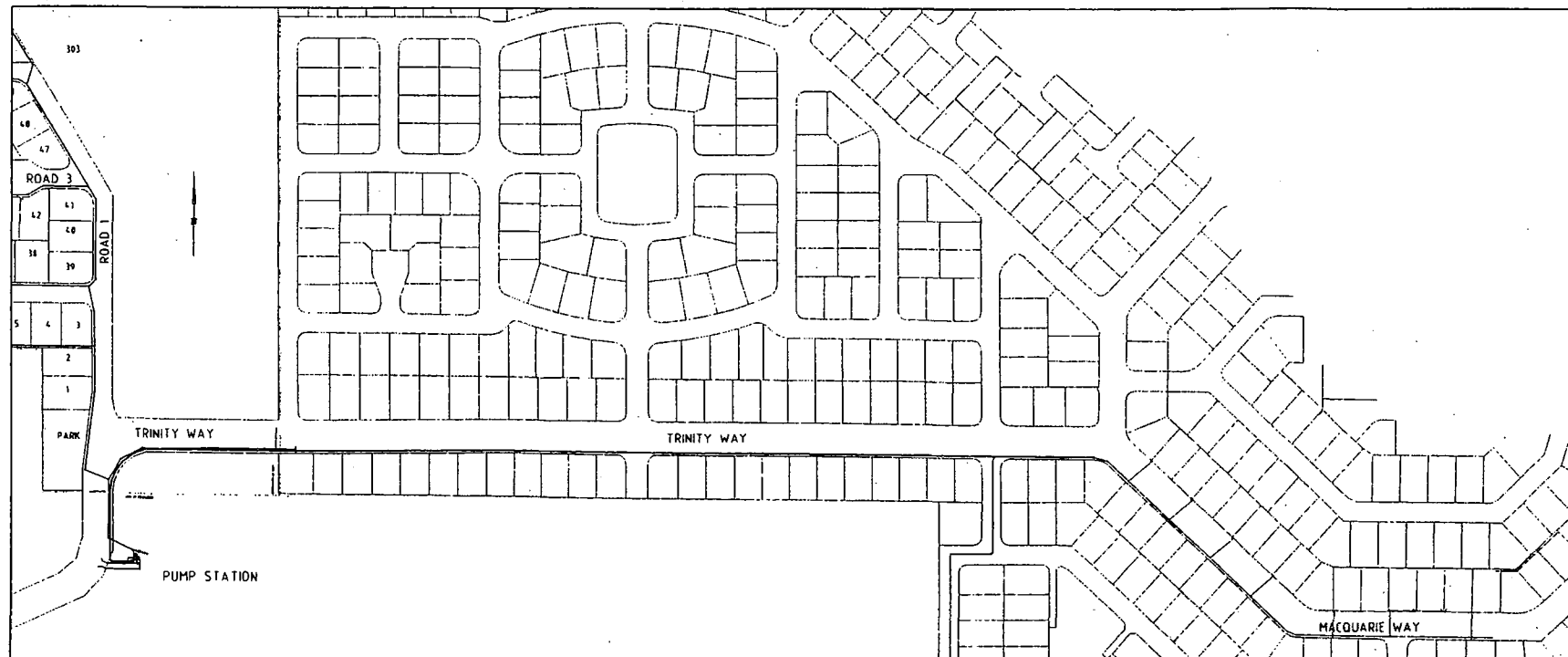
THIS DRAWING REMAINS THE PROPERTY OF ZILLMERE ENGINEERING & MUST NOT BE USED TO TRANSMIT INFORMATION OR BE REPRODUCED WITHOUT THE WRITTEN CONSENT OF THIS COMPANY.

	DO NOT SCALE.	DESIGN & MATERIAL CHANGE TO GUIDE RAILS M.CHEE 22/6/04		TITLE	DATE	21/6/04	ZILLMERE ENGINEERING ACN. 010 127 036 SODIUM STREET NARANGBA, QLD. AUSTRALIA
	IF IN DOUBT ASK.	1 DIM. 460 & 6000 WAS 360 AND 6100 M.CHEE 24/6/04		BCC. PUMP STATION TRINITY GREENS STAGE 1	DRAWN	M.CHEE	
	DIMENSIONS IN MILLIMETRES			STAINLESS STEEL PUMP GUIDE RAILS	CHECKED		
					APPROVED		
			TEL: +61 7 3888 2133		REVISED	2	DWG No. SK16669-01
			FAX: +61 7 3888 3002		PLOTTED SCALE	1:3	JOB No. 16669 CUSTOMER:- CIVDEC
					SHEET SIZE	A3	FILE:-G:\ACAD\---\---

SUBDIVISION - TRINITY GREEN, DREWVALE

STAGE 1

EXTERNAL SEWERAGE RETICULATION



LOCALITY PLAN

SCALE 1:2500
1:2500 UBD REF: MAP 240 GRID D-12

LEVEL ORIGIN:
P.S.M. 121281 AND RL 54.473

PROPERTY CONNECTIONS HAVE BEEN DESIGNED TO CONTROL ALL OF THE BLOCK AT A GRADE OF 140 AND A MAXIMUM PROPERTY CONNECTION DEPTH OF 1.5 METRES UNLESS OTHERWISE STATED.

BRISBANE WATER & CONTRACTOR LIVE SEWER WORKS

CONSULTING ENGINEERS ARE TO CONTACT COUNCIL'S SEWERAGE UTILITY SERVICES 24 HOURS PRIOR TO COMMENCEMENT OF CONSTRUCTION ON PH 3403 8888 TO ARRANGE FOR THIS WORK TO BE CARRIED OUT.
EXCAVATION, SAFE-SHORING AND ASSOCIATED WORK BY CONTRACTOR.
EXCAVATION WORKS CARRIED OUT BY CONTRACTORS AT DEPTH OF 1.5m OR GREATER MUST PROVIDE A 'SAFE WORK PLAN' AS PER WORKPLACE HEALTH AND SAFETY LEGISLATION TO COUNCIL PRIOR TO COUNCIL COMMENCING ANY WORK.
IT IS THE DEVELOPER'S RESPONSIBILITY TO ENSURE ALL LIVE SEWER WORKS ARE COMPLETE BEFORE ALLOWING PRIVATE DRAINAGE TO BE CONNECTED.

RP DESCRIPTION
LOT 2 RP 70191
PARISH OF YEERONGPILLY
COUNTY OF STANLEY
LOCAL AUTHORITY: BRISBANE CITY COUNCIL

LIVE SEWER WORKS

No.	DESCRIPTION	M.H. No.	DIA	M.H. TYPE	F.S.L.	I.L.	DEPTH	LID TYPE
1A	COUNCIL TO PLUG EXISTING STUB IN MH 19/1 PRIOR TO START OF CONSTRUCTION.	1/1	300	G	59.210	57.300	1.910	0
1B	CONTRACTOR TO LAY SHORT PIPE WITH AN I.O. THEN LAY LINE 1 AFTER CLEANSING, TESTING AND INSPECTING, I.O. PIPE TO BE SURROUNDED WITH 150mm OF CONCRETE.	19/1	300	G	59.210	57.300	1.910	0
1C	COUNCIL TO REMOVE TEMPORARY PLUG IN MAINTENANCE HOLE 12/1 AFTER SUCCESSFUL 'ON MAINTENANCE' INSPECTION.							

NAME OF ESTATE	TRINITY GREEN ESTATE STAGE 1 - DREWVALE
REF No.	DRS/USE/H02-828579
No. OF ALLOTS	48
AREA IN Ha.	4.75Ha.
LENGTH OF SEWERS	100mm - 300mm 338m
DA No.	DRS/USE/H02-828579
B.C.C. REG. BOARD APPROVAL DATE	12 JUNE 2003

ALL WATER AND SEWER CONSTRUCTION WORK SHALL COMPLY WITH THE REQUIREMENTS OF QUEENSLAND WORKPLACE HEALTH AND SAFETY ACT 1995. CONTACT YOUR NEAREST OFFICE OF THE DIVISION OF WORKPLACE HEALTH AND SAFETY FOR INFORMATION. PHONE 1071 3247 9478 (NORTH) 3896 3368 (SOUTH)

DRAWING LIST

DRG No.	DESCRIPTION
B01046-C-50	EXTERNAL SEWERAGE RETICULATION TITLE PAGE AND CONSTRUCTION NOTES
B01046-C-51(S1)	SEWER PUMP STATION DETAILS - SHEET 1 OF 3
B01046-C-51(S2)	SEWER PUMP STATION DETAILS - SHEET 2 OF 3
B01046-C-51(S3)	SEWER PUMP STATION DETAILS - SHEET 3 OF 3
B01046-C-52	SEWERAGE RISING MAIN LAYOUT PLAN SHEET 1 OF 2
B01046-C-53	SEWERAGE RISING MAIN LAYOUT PLAN SHEET 2 OF 2
B01046-C-54	SEWERAGE RISING MAIN LONGITUDINAL SECTIONS SHEET 1 OF 3
B01046-C-55	SEWERAGE RISING MAIN LONGITUDINAL SECTIONS SHEET 2 OF 3
B01046-C-58	SEWERAGE RISING MAIN LONGITUDINAL SECTIONS SHEET 3 OF 3

NOTES

- ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH CURRENT BRISBANE CITY COUNCIL SPECIFICATIONS AND STANDARDS
- UNLESS SPECIFIED OTHERWISE ALL MATERIAL AND WORK SHALL COMPLY WITH THE RELEVANT AUSTRALIAN STANDARDS.
- THE CONSTRUCTION OF THE SEWERAGE WORK SHOWN ON THIS DRAWING SHALL BE SUPERVISED BY AN ENGINEER WHO HAS RPED REGISTRATION. SEWERAGE WORKS NOT COMPLYING WITH THIS REQUIREMENT WILL NOT BE PERMITTED TO CONNECT INTO THE COUNCIL'S SEWERAGE SYSTEM
- ALL WORKS ASSOCIATED WITH LIVE SEWERS OR MAINTENANCE HOLES SHALL BE CARRIED OUT BY COUNCIL AT THE DEVELOPER'S COST.
- VC SEWERS SHALL BE CLASS 4 TO A.S 1741 OR CONFORM TO EN295-1. UPVC SEWER SHALL BE SN8 TO A.S. 1260. DICI SEWERS SHALL BE CLASS K12 TO A.S. 2280 AND POLYETHYLENE SLEEVED
- EACH ALLOTMENT SHALL BE SERVED BY A 100mm DIAMETER PROPERTY CONNECTION. FOR ALLOTMENT OTHER THAN SINGLE RESIDENTIAL A 150mm DIAMETER PROPERTY CONNECTION SHALL BE PROVIDED
- O.B'S SHALL BE LOCATED 1.2m FROM THE DOWNSTREAM ALIGNMENT. IF THIS IS NOT POSSIBLE, O.B'S SHALL NOT BE GREATER THAN 3.5m FROM THE DOWNSTREAM ALIGNMENT.
- PROPERTY CONNECTION BRANCHES SHALL EXTEND INTO THE PROPERTY A MINIMUM OF 300mm AND A MAXIMUM OF 750mm
- WHERE PIPES ARE LAID IN FILL, THE FILLING SHALL BE CARRIED OUT IN LAYERS NOT EXCEEDING 300mm (LOOSE) IN DEPTH AND SHALL BE COMPACTED UNTIL THE COMPACTION IS NOT LESS THAN 95% OF THE MATERIALS MAXIMUM COMPACTION WHEN TESTED IN ACCORDANCE WITH A.S. 1289 (MODIFIED COMPACTION). TESTING SHALL BE CARRIED OUT AFTER EACH ALTERNATIVE LAYER. IN ALL SUCH CASES APPROVAL OF CONSTRUCTED SEWER WILL NOT BE ISSUED BY THE COUNCIL UNLESS CERTIFICATES ARE PRODUCED CERTIFYING THAT THE REQUIRED COMPACTION HAS BEEN ACHIEVED.
- WHERE SEWERS HAVE A GRADE OF 1 IN 20 OR STEEPER, BULKHEADS SHALL BE CONSTRUCTED AS DETAILED ON STANDARD DRAWING NO.486/S/25-SB004 FOR VC AND UPVC SEWERS OR 486/S-25-SB003 FOR DICI SEWERS.
- THE CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF EXISTING SERVICES WITH RELEVANT AUTHORITIES BEFORE COMMENCING WORKS.
- SEWERS SHALL BE ABANDONED IN ACCORDANCE WITH PROCEDURES SET OUT IN APPENDIX 'F' OF THE RETICULATION STANDARDS AND SPECIFICATIONS.
- BENCH MARK LEVELS TO AHD

VEGETATION PROTECTION

- TREES LOCATED ALONG THE FOOTPATH SHOULD BE, WHERE POSSIBLE TRANSPLANTED PRIOR TO CONSTRUCTION, OR REPLACED IF DESTROYED
- WHEN WORKING WITHIN 4m OF TREES, RUBBER OR HARDWOOD GIRDLES SHOULD BE CONSTRUCTED WITH 1.8m BATTENS CLOSELY SPACED AND ARRANGED VERTICALLY FROM GROUND LEVEL. GIRDLES MUST BE STRAPPED TO TREES PRIOR TO CONSTRUCTION AND REMAIN UNTIL COMPLETION
- WHERE POSSIBLE, TREE ROOTS SHOULD BE TUNNELED UNDER, RATHER THAN SEVERED. IF ROOTS ARE SEVERED THE DAMAGE AREA SHOULD BE TREATED WITH SUITABLE FUNGICIDE, CONTACT COUNCIL FOR FURTHER ADVICE. PH.3403 8888
- ANY TREE LOPPING REQUIRED SHOULD BE UNDERTAKEN BY COUNCIL'S METROPOLITAN TREE SERVICE. PH.3403 8888

SOIL MANAGEMENT

- TOPSOIL AND SUBSOIL SHOULD BE STOCKPILED SEPARATELY
- CARE SHOULD BE TAKEN TO PREVENT SEDIMENT FROM ENTERING THE STORMWATER SYSTEM. THIS MAY INVOLVE PLACING APPROPRIATE SEDIMENT CONTROLS AROUND STOCKPILES.

REHABILITATION

- PREDISTURBANCE SOIL PROFILES AND COMPACTION LEVELS ARE TO BE REINSTATED
- PREDISTURBANCE VEGETATION PATTERNS SHOULD BE RESTORED. FOR FURTHER INFORMATION CONTACT COUNCIL ECOLOGICAL ASSESSMENT OFFICER PH. 3403 8888

NOTE: ALL ENVIRONMENT PROTECTION MEASURES SHOULD BE IMPLEMENTED PRIOR TO ANY CONSTRUCTION WORK COMMENCING (INCLUDING CLEARING)

Consultant: WEATHERED HOWE PTY. LTD.
Contact: PETER DUNKLEY
Telephone: (07) 3226 4888

COUNCIL'S DELEGATE DATE
(VALID FOR 12 MONTHS FROM THE ABOVE DATE)

B.C.C. FILE No. DRS/USE/H02-828579

REV	DESCRIPTION	BY	DATE	APPR'D.
B	DRAWING LIST AMENDED	PJD	10.08.04	
A	ORIGINAL ISSUE	D.Y.	20.6.03	P.N.D.

THIS DRAWING HAS BEEN CO-ORDINATED WITH CURRENT DOCUMENTATION FROM: OO SURVEY OO GEOTECH OO CIVIL OO HYDRAULIC OO STRUCTURAL OO ARCHITECTURAL OO MECHANICAL OO ELECTRICAL	CLIENT INDIGO PROPERTIES
AT: TENDER STAGE / B.A. APPRO'D. DATE AT: CONSTRUCTION STAGE APPRO'D. DATE	SURVEYOR PIKE MURILS MCKENLOUTY LAND SURVEYORS TOWN PLANNERS
BAR SCALES SCALE 1: 2500 (Unreduced at A1)	PROJECT PROPOSED SUBDIVISION TRINITY GREEN ESTATE DREWVALE - STAGE 1 CIVIL ENGINEERING WORKS

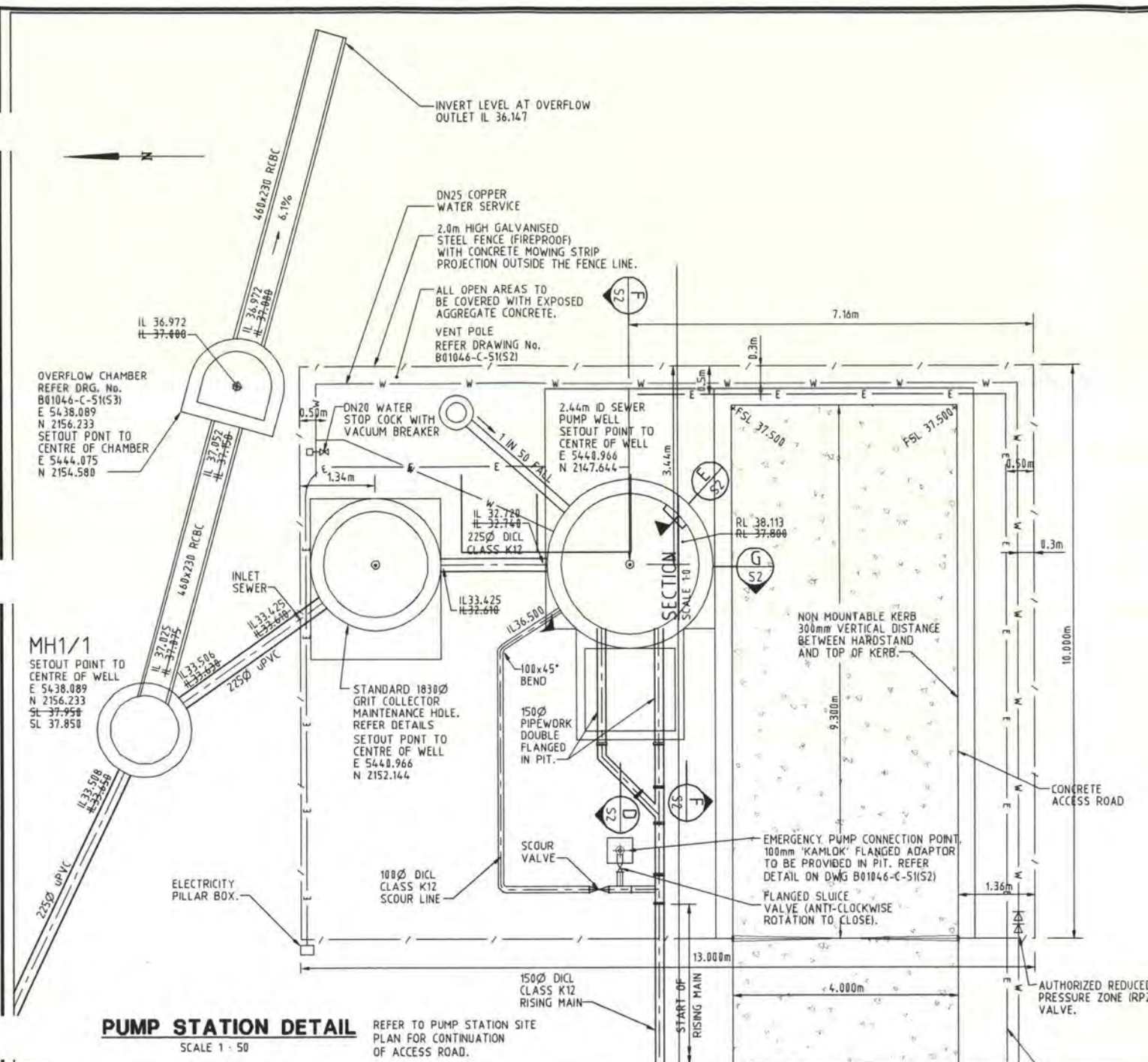
Weathered Howe ENGINEERS ARCHITECTS PROJECT PLANNERS	BRISBANE 13 BATESLEY STREET, WEST END, QLD 4101 P.O. BOX 3481, SOUTH BRISBANE, QC, QLD 4101 PH: (07) 3226 4888 FAX: (07) 3226 4889 EMAIL: wh@weatheredhowe.com.au
QUALITY ENDORSED COMPANY	COLD COAST LEVEL 5, 501 CLARE, 91 SCARBOROUGH STREET, SOUTHPORT, QLD 4215 P.O. BOX 1653, SOUTHPORT, QLD 4215 PH: (07) 5532 9333 FAX: (07) 5591 4778 EMAIL: wh@weatheredhowe.com.au

APPROVED: [Signature]	WEATHERED HOWE PTY. LTD. R.P.E.O. CERTIFICATE NO. 142
REVIEWED: [Signature]	DRAWING NUMBER
DESIGNED: D.Y.	B01046-C-50
DRAWN: V.R.F.	B
DATE: MARCH 2003	SCALE: 1:2500

ISO 9001 LK DEC 4/4/00	ISO 9001 LK DEC 4/4/00
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DATE: MARCH 2003	SCALE: 1:2500
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DATE: MARCH 2003	SCALE: 1:2500
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LEGEND

- 130 THK CONCRETE WITH F62 MESH
- PROPOSED SEWER
- RM 150° RISING MAIN
- E 63° ELECTRICAL SUPPLY CONDUIT. REFER TO DRG. No. 486/5/25-S22 FOR PUMP STATION ELECTRICAL REQUIREMENTS
- W 25° COPPER WATER SERVICE
- EXISTING 300° WATER RETICULATION

CERTIFICATION OF PLAN
WEATHERED HOWE PTY LTD HEREBY CERTIFY THAT THE INFORMATION REPRESENTED ON THIS PLAN IS A TRUE AND ACCURATE RECORD OF THE 'AS CONSTRUCTED' INFORMATION.

APPROVED: *[Signature]* DATE: 1/8/05

BRADLEY WOLFF
RPEQ NO. 4489

FOR AND ON BEHALF OF
WEATHERED HOWE PTY LTD

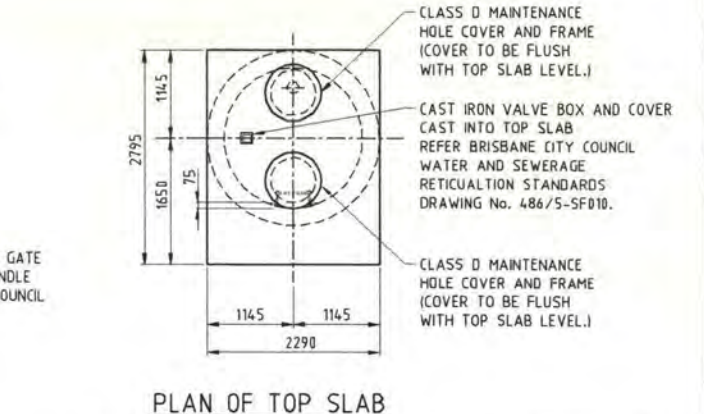
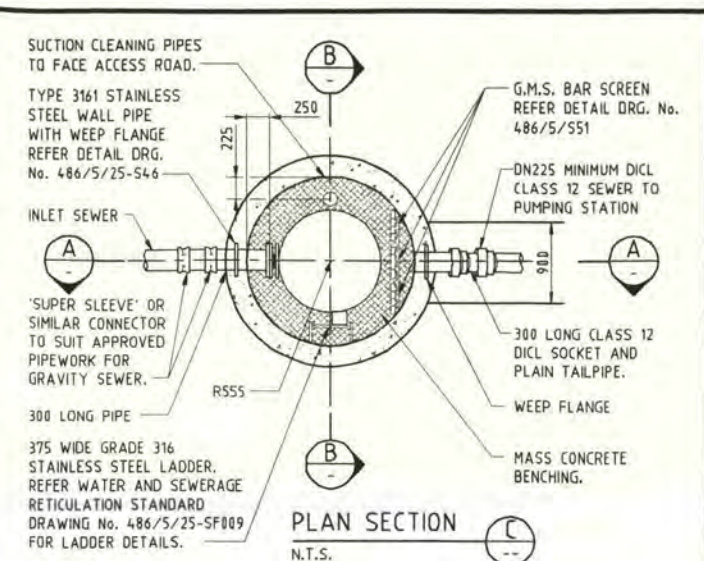
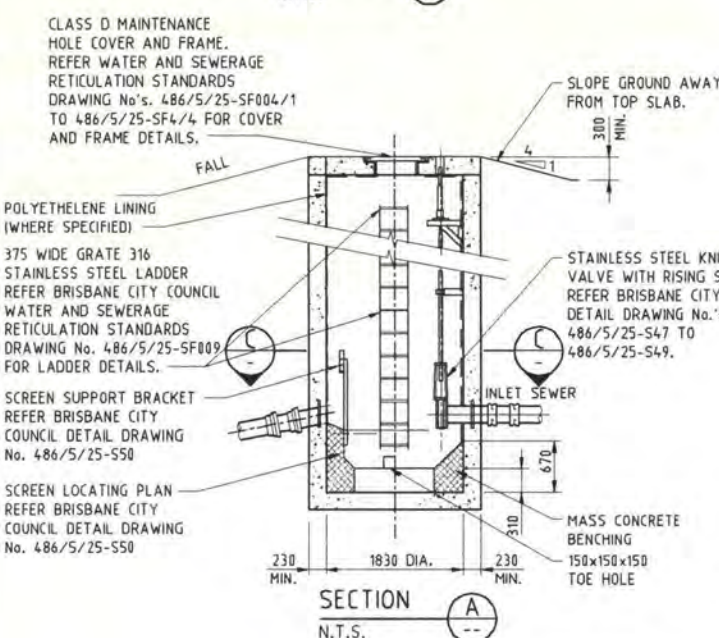
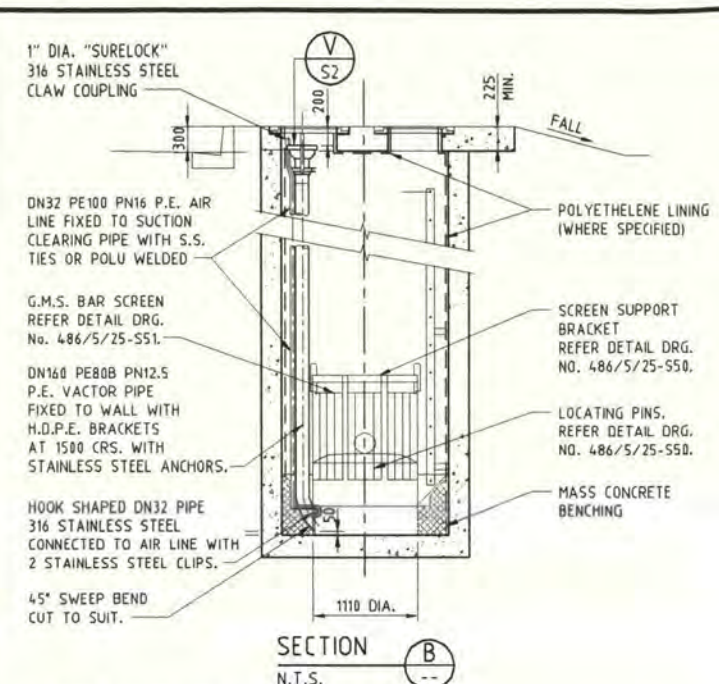
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O.D. SURVEY O.D. GEOTECH O.D. CIVIL O.D. HYDRAULIC O.D. STRUCTURAL
O.D. ARCHITECTURAL O.D. MECHANICAL O.D. ELECTRICAL

AT O.TENDER STAGE \ BA APP'D: DATE: _____
AT O.CONSTRUCTION STAGE APP'D: DATE: _____

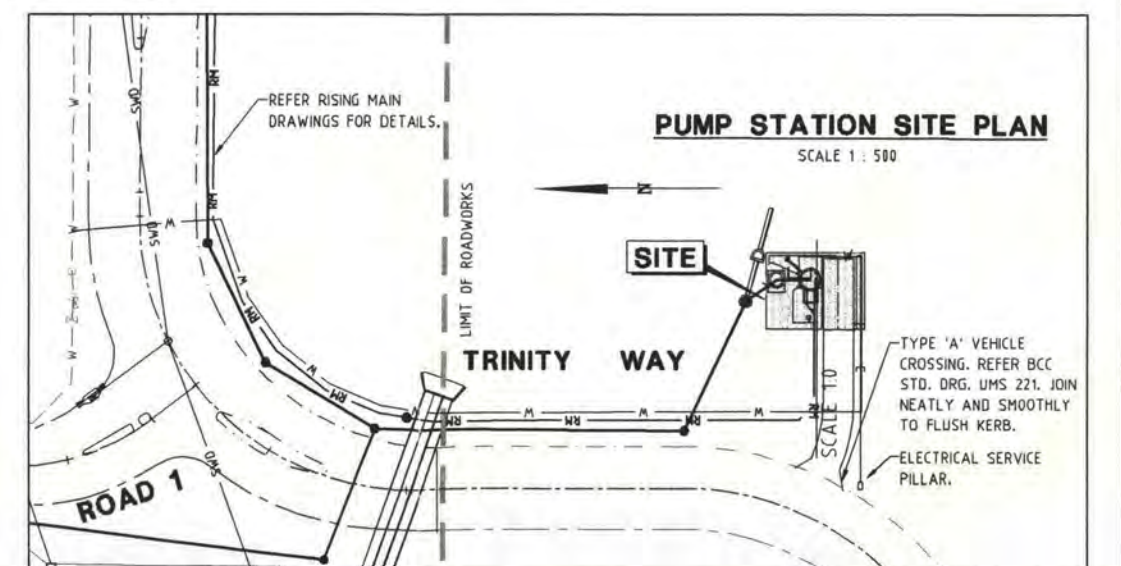
SCALE 1 : 50 (Unreduced at A1)
SCALE 1 : 500 (Unreduced at A1)

INDIGO PROPERTIES

omm
PETER MURPHY ARCHITECTS
LAND SURVEYORS
TOWN PLANNERS



GRIT COLLECTOR MAINTENANCE HOLE DETAILS



REV	DESCRIPTION	BY	DATE	APP'D.
C	ELECTRICAL & TELSTRA RETICULATION SHOWN	A.L.	19.07.05	<i>[Signature]</i>
B	AS CONSTRUCTED ISSUE	A.L.	18.05.05	J.C.H.
A	ORIGINAL ISSUE	D.Y.	17.7.03	J.C.H.

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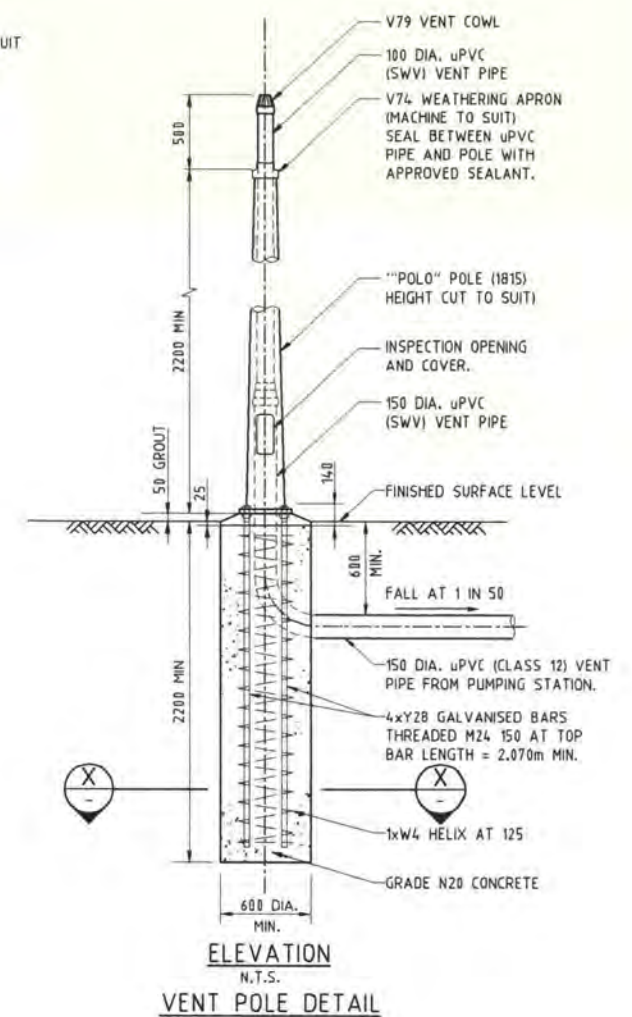
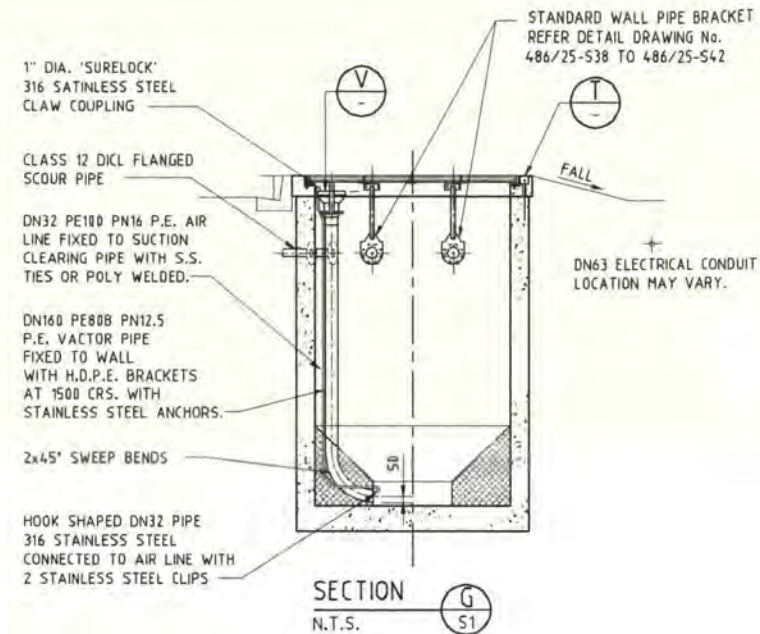
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PROPOSED SUBDIVISION
TRINITY GREEN ESTATE
DREWVALE - STAGE 1
CIVIL ENGINEERING WORKS

Weathered Howe
ENGINEERS
MANAGERS
PROJECT PLANNERS
QUALITY
ENDORSED
COMPANY
ISO 9001 LIC. DEC. 4440

108/8000
45 BENTLEY STREET,
WEST END, QLD. 4101
P.O. BOX 3481, SOUTH BRISBANE, BC,
QLD. 4101
PH. (07) 3226 4000 FAX (07) 3226 4009
EMAIL: info@weatheredhowe.com.au
GOLD COAST
LEVEL 3, 6201 CENTRE,
41 SOUTHBRIDGE STREET
SOUTHPORT, QLD. 4215
P.O. BOX 1653, SOUTHPORT QLD. 4215
PH. (07) 5552 3833 FAX (07) 5551 4778
EMAIL: info@weatheredhowe.com.au
A.B.N. 4809 915 846

TITLE			
SEWER PUMP STATION DETAILS SHEET 1 OF 3			
APPROVED	DESIGNED	DRAWN	DATE
	R.G.	V.K.F.	MARCH 2003
REVISION			
B01046-C-51(S1) C			
SCALES AS SHOWN			



REF.	DESCRIPTION	DESIGN LEVELS	AS CONSTRUCTED LEVELS
LEVEL 1	SURFACE LEVEL	37.800	37.902
LEVEL 2	INVERT OF INLET AND OUTLET OF GRIT COLLECTOR MAINTENANCE HOLE	33.610	33.425
LEVEL 3	TOP OF BASE OF REFLUX VALVE PIT	36.830	36.845
LEVEL 4	INVERT OF INLET SEWER AT PUMP WELL	32.740	32.720
LEVEL 5	TOP WATER LEVEL OF PUMP WELL	33.510	33.510
LEVEL 6	BOTTOM WATER LEVEL OF PUMP WELL	32.840	32.840
LEVEL 7	TOP OF BASE SLAB OF PUMP WELL	31.640	31.630
LEVEL 8	BOTTOM OF BASE SLAB OF PUMP WELL	31.340	31.330
LEVEL 9	TOP OF ROOF SLAB OF PUMP WELL	38.100	38.113
LEVEL 10	INVERT LEVEL OF RISING MAIN THROUGH PIT WALL	37.130	37.400
LEVEL 11	TOP OF BASE OF GRIT COLLECTOR MAINTENANCE HOLE	32.710	32.545
LEVEL 12	INVERT LEVEL OF FLOW	37.075	37.075

C	JMP RAIL SUPPORT SYSTEM ADDED	A.L.	19.07.05	<i>John</i>
B	AS CONSTRUCTED ISSUE	A.L.	18.05.05	J.C.H.
A	ORIGINAL ISSUE	D.Y.	20.6.03	J.C.H.
REV	DESCRIPTION	BY	DATE	APP'D.

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THIS DRAWING HAS BEEN CO-ORDINATED WITH CURRENT DOCUMENTATION FROM
☐ SURVEY ☐ GEO TECH ☐ CIVIL ☐ HYDRAULIC ☐ STRUCTURAL
☐ ARCHITECTURAL ☐ MECHANICAL ☐ ELECTRICAL

AT ☐ TENDER STAGE / BA APPRD. DATE
☐ CONSTRUCTION STAGE APPRD. DATE

BAR SCALES
 SCALE 1 : 1000
 (Unreduced at A1)


SCALE 1 : 100
 (Unreduced at A1)

CLIENT	INDIGO PROPERTIES
SURVEYOR	 PRICE MITCHELL & MCKENQUILTY LAND SURVEYORS TOWN PLANNERS

PROJECT

**PROPOSED SUBDIVISION
TRINITY GREEN ESTATE
DREWVALE - STAGE 1
CIVIL ENGINEERING WORKS**

Weathered Howe



- ENGINEERS
- MANAGERS
- PROJECT PLANNERS

Quality
Entered
Company

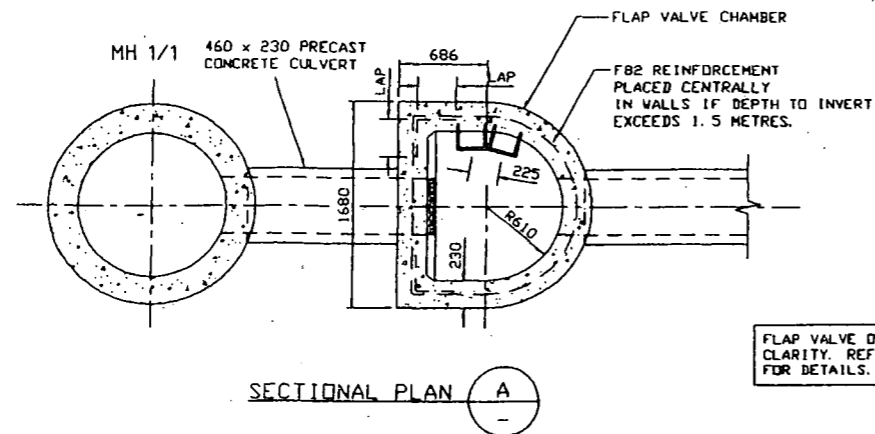
150 9181 LK. SEC. 44.0

BRISSAGE:
43 BOWLEY STREET,
WEST GLEN, QLD 4151
P.O. BOX 3481, SOUTH BRISBANE, QLD,
QLD 4101
Ph: (07) 3228 4848 FAX: (07) 3228 4848
E-Mail: info@weathered.com.au

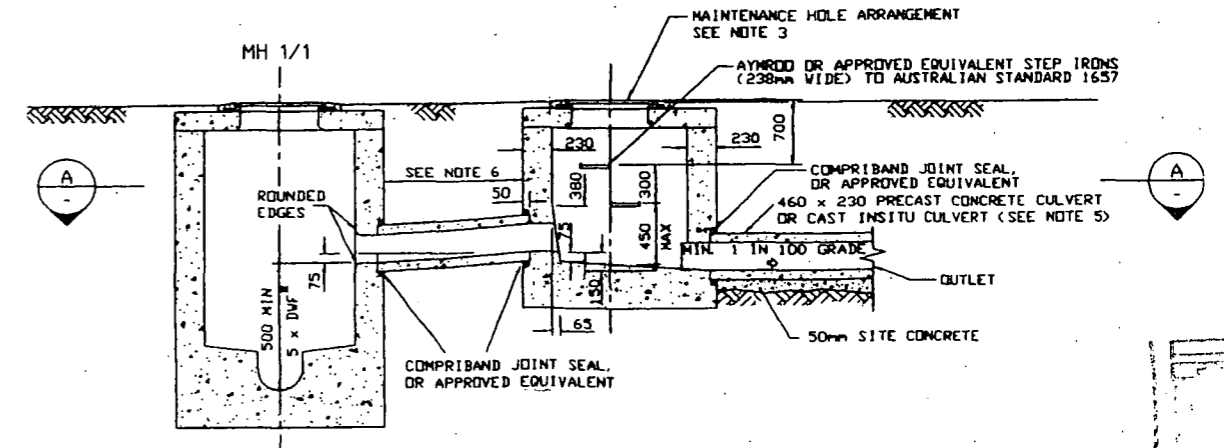
QLD COAST
LEVEL 8, GOLF CENTRE,
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P.O. BOX 1653, SOUTHPORT, QLD 4215
Ph: (07) 5532 3833 Fax: (07) 5581 4774
E-Mail: info@weathered.com.au

QLD - NORTH COAST
1/11

TITLE			
SEWERAGE PUMP STATION DETAILS			
SHEET 2 OF 3			
APPROVED		WEATHERED HOME PLY. LTD. R.P.E.D. CERTIFICATE NO. 142	
REVIEWED		DRAWING NUMBER	REVISION
DESIGNED		B01046-C-51(S2)	C
DRAWN	V.K.F.		
DATE	MARCH 2003	SCALES	AS SHOWN



FLAP VALVE OMITTED FOR CLARITY. REFER SHEET 2 FOR DETAILS.



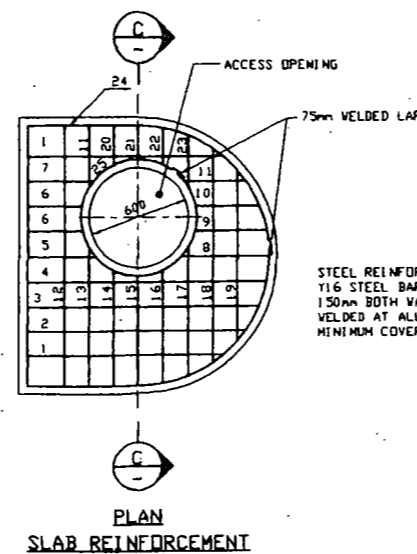
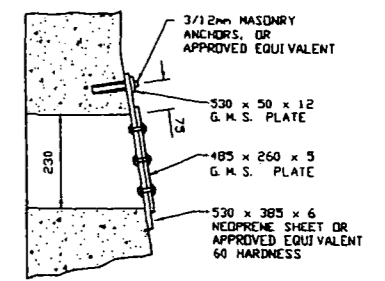
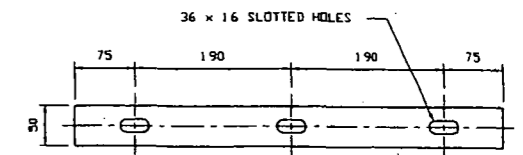
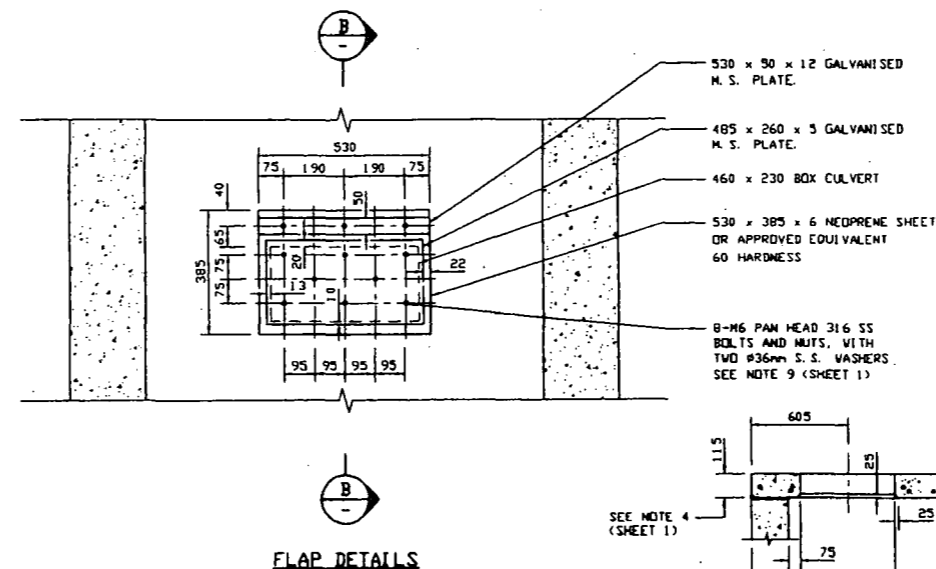
OVERFLOW CHAMBER CONSTRUCTION
SETOUT TABLE

A OVERFLOW SIZE BETWEEN M.H. AND F.C.V.	460x230 RCBC
B OVERFLOW SIZE LEAVING F.C.V.	460x230 RCBC
C FLAP VALVE TYPE	ONE
D I.L. OF O.F. AT MANHOLE	37.075
E I.L. OF O.F. AT F.V.C.	37.150
F I.L. OF O.F. AT F.V.C. OUT	37.000
G S.L. OF F.V.C.	37.700
H I.L. OF O.F. AT DISCHARGE POINT	36.940
I LENGTH BETWEEN M.H. AND F.V.C.	6.2m
J LENGTH BETWEEN F.V.C. AND OUTLET	6.35m
K TYPE OF SCREEN IF NECESSARY	-
L CONCRETE BULKHEAD LOCATION ON OUTLET PIPE	-

REFER B.C.C. STD. DRG. No. 486/5/25-Se001/1 AND SE 001/2

NOTES

- ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH CURRENT BRISBANE CITY COUNCIL STANDARDS AND SPECIFICATIONS
- UNLESS SPECIFIED OTHERWISE ALL MATERIALS AND WORK SHALL COMPLY WITH THE RELEVANT AUSTRALIAN STANDARDS
- ALL FLAP VALVE CHAMBERS SHALL BE FITTED WITH MAINTENANCE HOLE FRAME COVER AND COPING TO SUIT APPLICATION. REFER STANDARD DRAWINGS 486/5/25-SC001, 486/5/25-SF002, 486/5/25-SF003 AND 486/5/25-SF004 FOR DETAILS.
- TOP SLAB THICKNESS SHALL BE INCREASED FROM 115mm TO 150mm WHERE LOCATED IN A TRAFFICABLE LOCATION
- JOINTS IN THE BOX CULVERT BETWEEN THE MANHOLE AND THE FLAP VALVE CHAMBER SHALL BE CONCRETE SURROUNDED (150mm) WITH A 600mm WIDE STRIP OF F82 MESH PLACED CENTRALLY IN THE SURROUND.
- ALL MILD STEEL WORK SHALL BE HOT DIP GALVANISED.
- 36mm Dia S.S. WASHERS TO BE TRIMMED IF NECESSARY TO FIT INSIDE THE 460 X 230 BOX CULVERT OPENING.



STEEL REINFORCEMENT
Y16 STEEL BARS PITCH
150mm BOTH WAYS TACK
WELDED AT ALL INTERSECTIONS.
MINIMUM COVER - 50mm.

BAR NO	SHAPE	'A'	OVERALL LENGTH	NO	TOTAL LENGTH	BAR NO	SHAPE	'A'	OVERALL LENGTH	NO	TOTAL LENGTH	BAR NO	SHAPE	'A'	OVERALL LENGTH	NO	TOTAL LENGTH
1		1185	1185	2	2370	11		375	375	2	750	21		205	205	1	205
2		1320	1320	1	1320	12		1580	1580	1	1580	22		225	225	1	225
3		1400	1400	1	1400	13		845	845	1	845	23		315	315	1	315
4		1450	1450	1	1450	14		710	710	1	710	24		5410	5410	1	5410
5		410	410	1	410	15		675	675	1	675	25		790	790	1	790
6		330	330	2	660	16		695	695	1	695						
7		395	395	1	395	17		785	785	1	785						
8		530	530	1	530	18		1300	1300	1	1300						
9		435	435	1	435	19		1030	1030	1	1030						
10		385	385	1	385	20		240	240	1	240						

THIS DRAWING HAS BEEN CO-ORDINATED WITH CURRENT DOCUMENTATION FROM: <input type="checkbox"/> SURVEY <input type="checkbox"/> GEOTECH <input type="checkbox"/> CIVIL <input type="checkbox"/> HYDRAULIC <input type="checkbox"/> STRUCTURAL <input type="checkbox"/> ARCHITECTURAL <input type="checkbox"/> MECHANICAL <input type="checkbox"/> ELECTRICAL		CLIENT INDIGO PROPERTIES		PROJECT PROPOSED SUBDIVISION TRINITY GREEN ESTATE DREWVALE - STAGE 1 CIVIL ENGINEERING WORKS		Weathered Howe ENGINEERS MANAGERS PROJECT PLANNERS 150 9001 CR. DEC 4448		TITLE SEWERAGE PUMP STATION DETAILS SHEET 3 OF 3	
A ORIGINAL ISSUE REV DESCRIPTION BY DATE APP'D		BAR SCALES SCALE 1 : 1000 (Unreduced at A1) SCALE 1 : 100 (Unreduced at A1)		SURVEYOR mm PIKE MRLS MCKINLOUTY LAND SURVEYORS TOWN PLANNERS		APPROVED REVIEWED DESIGNED DRAWN DATE		WEATHERED HOWE PTY. LTD. R.F.O. CERTIFICATE NO. 141 DRAWING NUMBER B01046-C-51(S3) SCALES AS SHOWN	

REFER DRG. No. B01046-C-53 FOR CONTINUATION

CONTINUED BELOW LEFT

CONTINUED BELOW LEFT

RISING MAIN SETOUT TABLE

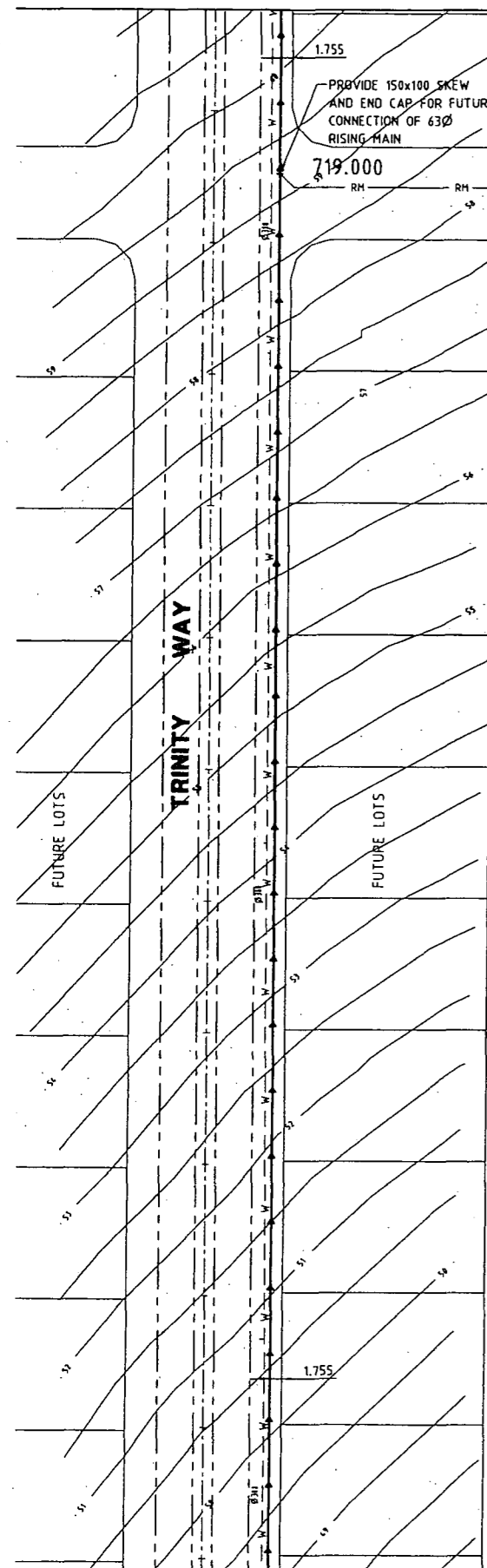
CHAINAGE	EASTING	NORTHING
0.000	5435.027	2147.135
10.507	5424.520	2147.135
13.340	5422.514	2149.135
61.809	5422.373	2197.604
69.429	5423.380	2205.157
77.296	5426.426	2212.410
85.492	5431.517	2218.833
93.685	5438.177	2223.607
104.920	5448.724	2227.476
217.769	5561.568	2226.475
360.894	5704.690	2227.391
790.359	6134.138	2223.583

LEGEND

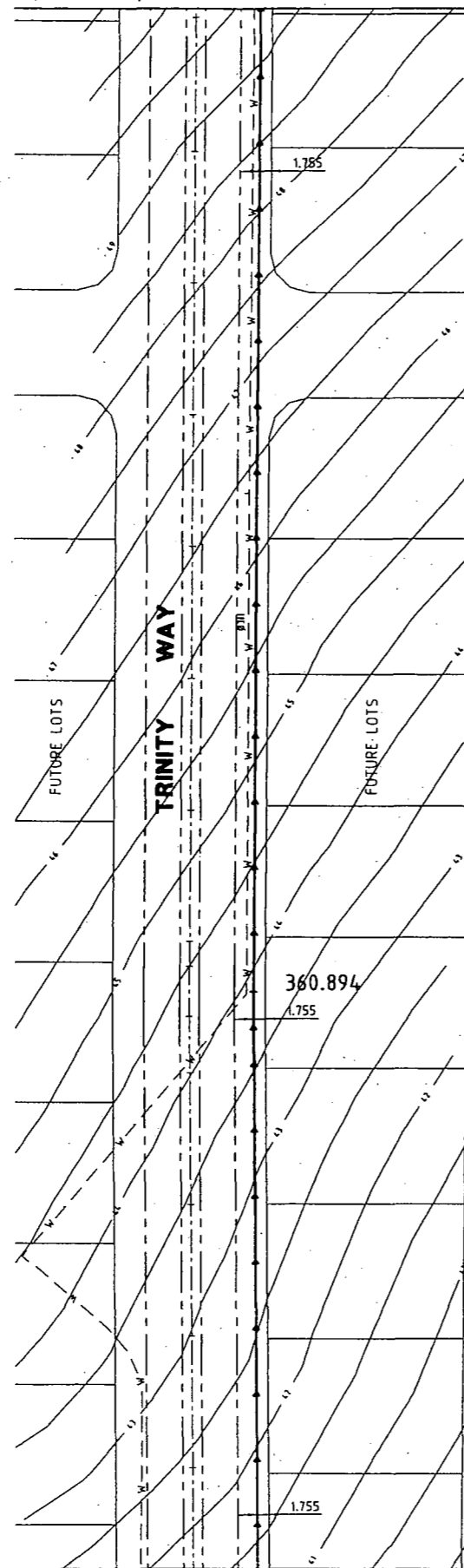
- PROPOSED SEWER LINE, HOUSE CONNECTION, MANHOLE AND MAINTENANCE HOLE NUMBER
 PROPOSED 150mm RISING MAIN
 PROPOSED SEWERAGE RETICULATION
 PROPOSED STORMWATER DRAINAGE
 PROPOSED WATER RETICULATION
 PROPOSED STORMWATER DRAINAGE
 EXISTING SEWERAGE RETICULATION
 EXISTING WATER RETICULATION
 EXISTING SEWERAGE RETICULATION AND MAINTENANCE HOLE/NUMBER
 NATURAL SURFACE CONTOURS (1m INTERVALS)
 DESIGN SURFACE CONTOURS (0.5m INTERVALS)
 STAGE/SEWER CATCHMENT BOUNDARY

NOTES:

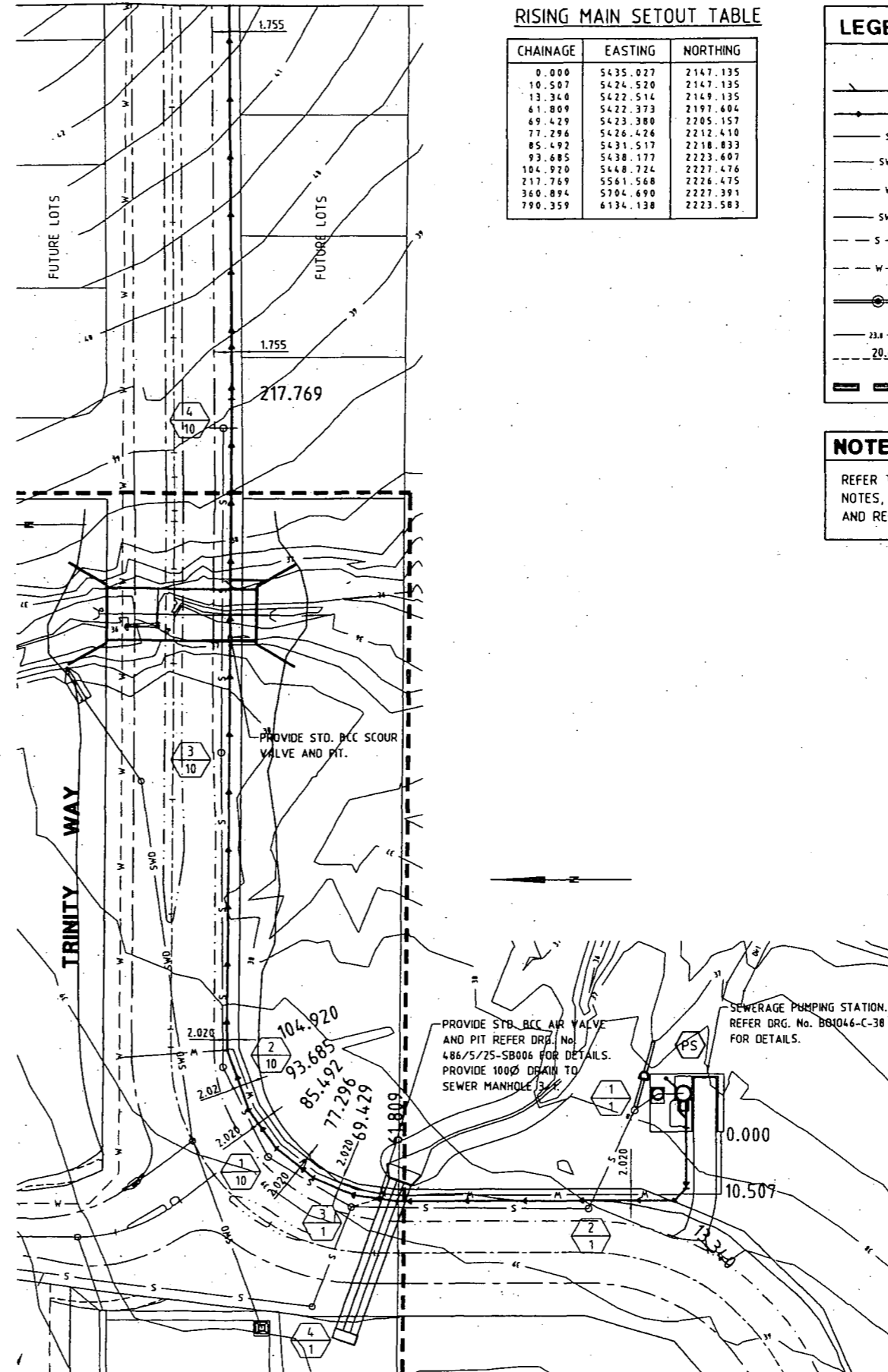
REFER TO DRAWING B01046-C-50 FOR SEWERAGE RISING MAIN NOTES, LOCALITY PLAN, BCC CONNECTION TABLES AND REHABILITATION NOTES.



CONTINUED ABOVE RIGHT



CONTINUED ABOVE RIGHT



SEWERAGE PUMPING STATION.
REFER DRG. No. B01046-C-38
FOR DETAILS.

COUNCIL'S DELEGATE DATE
(VALID FOR 12 MONTHS FROM THE ABOVE DATE)
B.C.C FILE No. DRS/USE/H02-828579

REV.	DESCRIPTION	BY	DATE	APPR'D.
C	SCOUR VALVE ADDED	A.W.N	15-6-04	
B	LOT BOUNDARIES AMENDED	A.J.T	18.11.03	
A	ORIGINAL ISSUE	D.Y.	17.7.03	P.N.D

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 ** DO NOT SCALE FROM THESE DRAWINGS. IF IN DOUBT ASK.

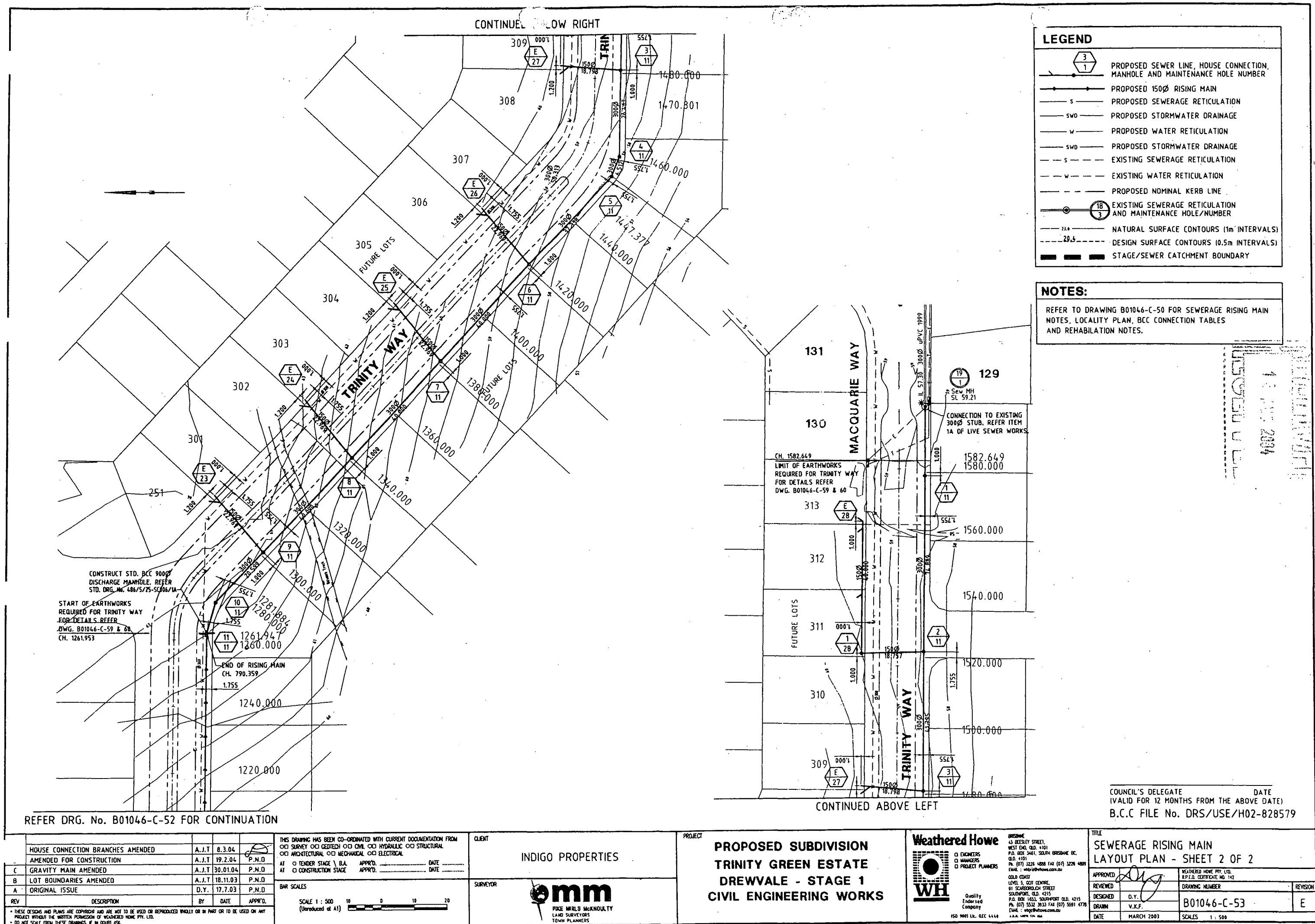
THIS DRAWING HAS BEEN CO-ORDINATED WITH CURRENT DOCUMENTATION FROM	CLIENT
<input type="checkbox"/> SURVEY <input type="checkbox"/> GEOTECH <input type="checkbox"/> CIVIL <input type="checkbox"/> HYDRAULIC <input type="checkbox"/> STRUCTURAL <input type="checkbox"/> ARCHITECTURAL <input type="checkbox"/> MECHANICAL <input type="checkbox"/> ELECTRICAL	INDIGO PROPERTIES
AT <input type="checkbox"/> TENDER STAGE <input type="checkbox"/> B.A. <input type="checkbox"/> APPR'D. DATE AT <input type="checkbox"/> CONSTRUCTION STAGE <input type="checkbox"/> APPR'D. DATE	SURVEYOR
BAR SCALES SCALE 1 : 500 (Unreduced of A1)	 PRICE MURILS MCKINLOUTY LAND SURVEYORS TOWN PLANNERS

PROJECT	PROPOSED SUBDIVISION TRINITY GREEN ESTATE DREWVALE - STAGE 1 CIVIL ENGINEERING WORKS
 WEATHERED HOWE CIVIL ENGINEERS MANAGERS PROJECT PLANNERS 45 BEECHLEY STREET, WEST END, QLD 4101 P.O. BOX 3451, SOUTH BRISBANE, BC, QLD 4101 Ph: (07) 3226 4088 FAX: (07) 3226 4099 Email: wh@weatheredhowe.com.au OLD COST LEVEL 5, 601 CENTRE 91 SCARBOROUGH STREET SOUTHPORT, QLD 4215 P.O. BOX 1553, SOUTHPORT QLD 4215 Ph: (07) 5532 3533 FAX: (07) 5591 4778 Email: whsp@weatheredhowe.com.au A.B.N. 48 00 111 111 111	TITLE SEWERAGE RISING MAIN LAYOUT PLAN - SHEET 1 OF 2 APPROVED REVIEWED DESIGNED DRAWN DATE
	WEATHERED HOWE PTY. LTD. R.P.E.C. CERTIFICATE NO. 112 5665 DRAWING NUMBER B01046-C-52 SCALES 1 : 500

APPROVED REVIEWED DESIGNED DRAWN DATE	WEATHERED HOWE PTY. LTD. R.P.E.C. CERTIFICATE NO. 112 5665 DRAWING NUMBER B01046-C-52 SCALES 1 : 500
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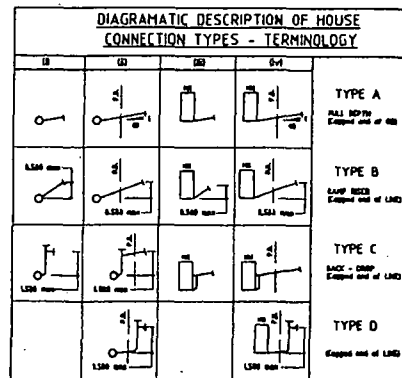
APPROVED REVIEWED DESIGNED DRAWN DATE	WEATHERED HOWE PTY. LTD. R.P.E.C. CERTIFICATE NO. 112 5665 DRAWING NUMBER B01046-C-52 SCALES 1 : 500
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APPROVED REVIEWED DESIGNED DRAWN DATE	WEATHERED HOWE PTY. LTD. R.P.E.C. CERTIFICATE NO. 112 5665 DRAWING NUMBER B01046-C-52 SCALES 1 : 500
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[illegible]

MANHOLE No.



NOTE:

MANHOLE DROP TYPES

TYPE A - MINIMUM DROP 0 > 190mm
TYPE B - SPILLWAY 190 < 375mm
TYPE C - OBLIQUE 375 < 675mm
TYPE D - EXTERNAL BACKDROP 675 < 3000mm

HOUSE CONNECTIONS HAVE BEEN DESIGNED TO CONTROL ALL OF THE BLOCK AT A GRADE OF 1:40 AT A MAXIMUM DEPTH OF PROPERTY CONNECTION OF 1500M UNLESS OTHERWISE STATED.

ALL WATER AND SEWER CONSTRUCTION WORK SHALL COMPLY WITH THE REQUIREMENTS OF QUEENSLAND WORKPLACE HEALTH AND SAFETY ACT 1995. CONTACT YOUR NEAREST OFFICE OF THE DIVISION OF WORKPLACE HEALTH AND SAFETY FOR INFORMATION. PHONE (07) 3247 9478 (NORTH) 3896 3368 (SOUTH)

REFER DRG. No. B01056-C-54 FOR CONTINUATION

STD. BCC 900Ø DISCHARGE
HAWHOLE. REFER STD. DRG.
No. 486/5/25-SC006/1A

STRUCTURE
CO-ORDINATES
MANHOLE TYPE
LID TYPE
JUNCTION LINE
DROP TYPE
DEPTH TO HC
HC INVERT LEVEL
HC TYPE
HC LOT No
CH FROM D/S MH

* STO. BCC 900Ø DISCHARGE
MANHOLE. REFER STO. DRG.
No. 486/5/25-SC006/1A .
IL ① = 59.530
IL ② = 60.305
IL ③ = 60.281

DATUM	45.000			
LOCATION				
PIPE				
GRADE (1 IN ...)				
LENGTH				
DEPTH TO INVERT BELOW F.S.L.				
INVERT LEVEL				
FINISHED SURFACE LEVEL				
NATURAL SURFACE LEVEL				
CHAINAGE				

SEWERAGE RISING MAIN LONGITUDINAL SECTION cont.


LOCATION
DIAMETER
GRADE (1 IN ...)
LENGTH
JUNCTION INVERT LEVEL
DEPTH TO INVERT BELOW F.S.L.
INVERT LEVEL
FINISHED SURFACE LEVEL
NATURAL SURFACE LEVEL
CHAINAGE

EXTERNAL SEWER LINE

[illegible]

11

COUNCIL'S DELEGATE _____ DATE _____
(VALID FOR 12 MONTHS FROM THE ABOVE DATE)
B.C.C FILE No. DRS/USE/H02-828579


D	AMENDED FOR CONSTRUCTION	A.J.T	19.2.04	
C	GRAVITY MAIN AMENDED	A.J.T	30.01.04	P.N.D
B	GRAVITY MAIN ADJUSTED TO SUIT NEW RP BOYS	A.J.T	19.11.03	P.N.D
A	ORIGINAL ISSUE	D.Y.	17.7.03	P.N.D
REV	DESCRIPTION	BY	DATE	APPR'D.


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THIS DRAWING HAS BEEN CO-ORDINATED WITH CURRENT DOCUMENTATION FROM
☐ SURVEY ☐ GEOTECH ☐ CIVIL ☐ HYDRAULIC ☐ STRUCTURAL
☐ ARCHITECTURAL ☐ MECHANICAL ☐ ELECTRICAL

AT ☐ TENDER STAGE \ B.A. APPR'D. _____ DATE _____
☐ CONSTRUCTION STAGE APPR'D. _____ DATE _____

BAR SCALES

SCALE 1 : 1000
 (Unreduced at A1)
 HORIZ

SCALE 1 : 100
 (Unreduced at A1)
 VERT

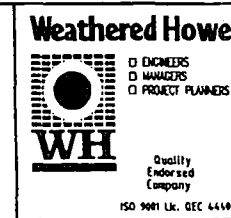
CLIENTE	
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INDIGO PROPERTIES



PROJECT

**PROPOSED SUBDIVISION
TRINITY GREEN ESTATE
DREWVALE - STAGE 1
CIVIL ENGINEERING WORKS**




BROSNAME
43 BICESLEY STREET,
WEST END, QLD. 4101
P.O. BOX 3461, SOUTH BROSNAME BC,
QLD. 4101
Ph: (07) 3278 4888 FAX (07) 3278 4899
EMAIL: whbr@whbrowns.com.au

GOLD COAST
LEVEL 5, COTI CENTRE,
91 SCARBOROUGH STREET
SOUTHPORT, QLD. 4215
P.O. BOX 1653, SOUTHPORT QLD. 4215
Ph: (07) 5532 3933 FAX (07) 5591 477
EMAIL: whgc@whbrowns.com.au

A.B.N. 48787 971 864

SEWERAGE RISING MAIN
LONGITUDINAL SECTIONS SHEET 2 OF 3

APPROVED		WEATHERED HOME PTY. LTD. S.P.C.O. CERTIFICATE NO. 142	
REVIEWED		DRAWING NUMBER	REVISION
DESIGNED B.D.K.		B01046-C-55	D
DRAWN V.K.F.			
DATE MARCH 2003	SCALES 1: 1000 HORIZ. 1: 100 VERT.		

