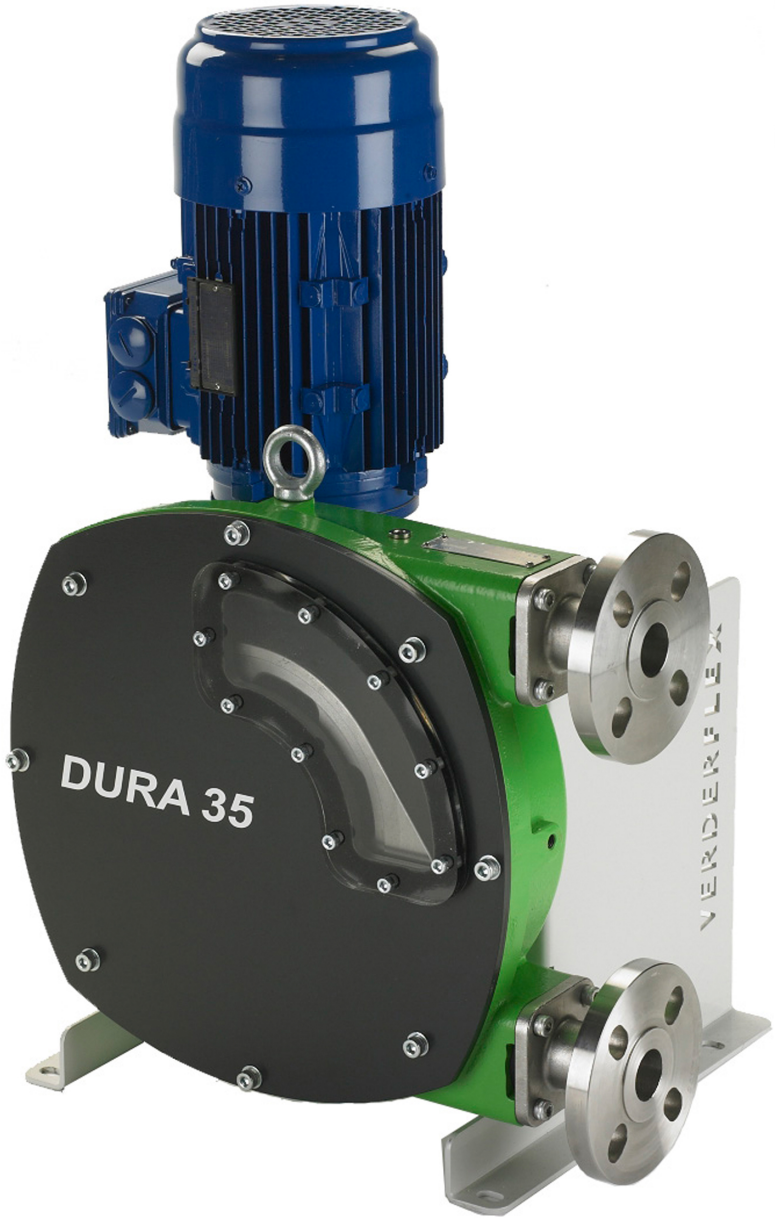
VERDERFLEX®

Peristaltic Hose Pumps

(Dura 10 - 35 Product Range)

Operations and
Maintenance Manual
Issue 3.3



VERDER

CHAPTER 1

PURPOSE AND PLANNING INFORMATION

CONTENTS

DISCLAIMER OF WARRANTY AND LIMITATIONS OF LIABILITY

1 Verderflex® Dura pumps are warranted against defects in workmanship and material under normal use (rental use excluded) for two years from date of purchase. This is to the extent that Verder will at its option replace, repair or refund, in full, the purchase price of the instrument of any part thereof manufactured by Verder, which in our opinion is defective. Also provided the instrument has been operated in strict accordance with this document, and has not been subjected to tampering, abuse or exposed to highly corrosive and/or unspecified explosive conditions.

2 This warranty does not cover the conditions arising as follows:

2.1 Failure of Verder manufactured parts or components including hose, due to normal wear or any damage or failure; that in Verder's judgment arises from misuse.

2.2 Failure to implement the necessary safety procedures for use in the European Community (EC) of a pump within an explosive atmosphere as laid down in latest EC ATEX directive from 1st July 2003. The Dura is not currently ATEX accredited.

2.3 Failure to disclose the use of a pump (intended or unauthorized) within a known explosive atmosphere.

Verder MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTIES OF FITNESS OR MERCHANTABILITY, EXCEPT AS EXPRESSLY SET FORTH ABOVE. Verder SHALL NOT BE LIABLE FOR ANY INJURIES, LOSSES OR DAMAGES INCLUDING, BUT NOT LIMITED TO ANY PERSONAL INJURIES, ANTICIPATED OR LOST PROFITS, INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES, COSTS, TIME CHARGES, OR OTHER DAMAGES OR LOSSES, IN CONNECTION WITH THE INSTRUMENT, ITS USE OR ANY REPLACEMENT PARTS THEREFORE:

3 Full completion of the warranty card is essential in order to be covered by Verder Ltd's outstanding warranty schemes. Please be aware of the declaration that you undertake to use only Verder spare parts - this is an essential part of the warranty scheme and is legally binding. The card will also act as a record of your dealings with Verder Ltd and it distributors.

4 This warranty is voided if the customer fails to follow any and all instructions, warnings or cautions in this document. Verder has made every effort to illustrate and describe the product(s) in this document. Such illustrations and descriptions are, however, for the sole purpose of identification and do not express or imply a warranty that the products are merchantable or fit for a particular purpose, or that the products will necessarily conform to the illustration or descriptions.

5 If a manufacturing defect is found, Verder will replace or repair the instrument or replace any defective part thereof without charge. However, Verder's obligation hereunder does not include the cost of transportation of the instrument to Verder or its return to the customer; these costs must be borne by the customer. Verder assumes no responsibility for damage in transit; any claims for such damage should be presented to the carrier by the purchaser.

6 In addition, instead of replacing or repairing the instrument as aforesaid, Verder may, at its sole option, take back the defective instrument and reimburse the customer for the purchase price in full settlement of any and all potential claims related to the purchase or use of the Verderflex® hose pump.

INTRODUCTION

7 The Verder Group of companies have offices located in Austria, Belgium, China, Czech Republic, France, Germany, Hungary, Japan, Netherlands, Norway, Poland, Romania, Slovakia, South Africa, Switzerland, United States and the UK. A network of worldwide distributors support our products in other countries of which a full list can be seen at www.verderflex.com. Group headquarters are in the Netherlands.

8 Verder's in-house designers and application engineers have developed a new generation of products, the range of Peristaltic hose pumps, which are designed by Verder's own production team. Full product training and documentation is available, and Verder takes no responsibility for malfunction of the pump caused by failure to follow these operating procedures; if operators do not read and understand this document, they are not considered by Verder to be qualified to assemble, install, operate or maintain this equipment. As any pump is no more or no less than one component part of an overall process, it is essential for the successful completion of the total process for the pump to be working to its fullest potential, and for the operator to be fully conversant with the operating principles of our hose pump.

9 Verder strives to maintain quality standards based upon ISO 9000 standards. It is Verder policy to supply its documentation in a number of languages and software options, and your Verder distributor will be able to assist you with the options available.

10 Verder recognizes its responsibilities to its customers around the world, and will always seek to meet or exceed their expectations. Customer comments and feedback are always warmly welcomed and input to the development of procedures and products, is common. Should you have any issues on which you wish to comment, please return your comments to your local Verder distributor who will then forward them for action by Verder.

SAFETY ISSUES

Warnings

11 Warnings are used throughout this document. Each warning contains important safety information. Warnings are generally used for potential hazards (indicated by a black on yellow triangle) and definite hazards (white on red triangle). Below are some examples of warnings that can be found in this publication.

PERSONNEL HAZARD. Ensure that all local standing operating proceedures and all current health & safety regulations are complied with, when carrying out any of the proceedures documented within this publication.

HEAVY WEIGHT. Due consideration must be given to the regulations governing the lifting of heavy weights when moving this equipment.

SAFETY HAZARD. Do not walk or work under a suspended pump cover.

LETHAL VOLTAGES. Dangerous voltages exist in this equipment. When carrying out work on any electrical equipment during failure diagnostics, refer to chap 4.

EQUIPMENT DAMAGE. Before test running the pump; check that all tools are removed, particularly from pump casing.

Safety First

12 The information in this document is essential for the safe operation and servicing of Verderflex® pumps. This document must be read and understood; in particular Chap 2 before operating or servicing such pumps.

13 The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure likely to cause injury.

14 It is understood that safety rules within individual companies vary. If a conflict exists between the material contained in this document and the rules of a using company, the more stringent rules should take precedence.

15 This document should be kept available to operating and maintenance personnel. Additional copies of this document may be acquired free of charge from Verder via your distributor.

16 Safety suggestions from users will be given the most serious consideration. This is especially true of advice for minimizing problems associated with safety misuse, which cannot be identified in advance during the production of the pump unit. Comments and recommendations should be submitted to Verder via your distributor.

17 Throughout this document these safety warning and cautions are repeated. The relevant information will act as a guideline for you in operating the pump; alternative courses of action are also described should you be unable for any reason to follow those procedures initially given for any procedure. You are advised to follow these guidelines to achieve maximum efficiency.

Pump Safety Features

18 The Verderflex® Dura has a number of in-built features, which have been designed specifically to ensure your safety during operation and maintenance of the unit:

18.1 Disaster proof design – the casing will contain most spillages preventing leaks and contamination of product.

18.2 Use of specially formulated Verderflex® lubricants, which prolong the working life of the pump.

18.3 One-piece tapered hose connection giving quicker and simpler hose change.

18.4 Pressure relief plugs in housing to allow safe relief of any built up pressure inside the pump housing.

18.5 Designed for safe and easy assembly and maintenance.

18.6 Fast and simple Geared Motor Unit (GMU) change reducing downtime.

19 Safety instructions and guidance are divided into operational safety, maintenance safety and safety advice for assembly, installation and commissioning, with each category having its own rules and philosophy. This section covers operational functions that are reasonably foreseeable. Many warnings and admonitions are included in this document; unfortunately there are too many to incorporate into “on unit” labels. For this reason it is essential that the document be treated as part of the product and made mandatory reading for personnel associated with the product and system.

Warranty Registration

20 Your Verder distributor will have completed a warranty card on your behalf, which is returned to Verder for registration on Verder's warranty scheme. Please ensure that the distributor has the following details from your initial and any subsequent orders for pump(s)/spare(s):

20.1 Pump / spares make and type

20.2 Serial number

20.3 Application

20.4 Media to be pumped

20.5 Pressure

20.6 Temperature

20.7 Capacity

20.8 Suction

20.9 Motor size

20.10 Date of order and delivery

20.11 Verder reference

21 Full completion of this card is essential for you to be covered by Verder's outstanding warranty schemes. Please be aware of the declaration that you undertake to use only Verder spare parts - this is an essential part of the warranty scheme and is legally binding. The card will also act as a record of your dealings with Verder.

22 This information will similarly be required if and when you should need to order spare parts from your local Verder distributor.

23 Should you have cause to return the pump for any reason, please ensure that you inform the local distributor as fully as possible of the details of the problem; the distributor has the necessary documentation for completion of the warranty application to Verder and is aware that this has to be completed in full before Verder can examine the application

Complaints Procedure

24 Verder takes its responsibilities to its customers extremely seriously and prides itself on its comprehensive complaint procedures. Should you be dissatisfied with your Verder pump(s) or with any aspect of the service you have received, then please contact your local Verder distributor in the first instance to discuss the matter fully.

25 The distributor will then take the matter up with Verder, acknowledging his actions to the customer and indicating a time scale by which he will reply. You will receive a response from the distributor with Verder's initial comments and proposed plan of any further action. If you feel that your complaint has still not been resolved satisfactorily, you should contact Verder Ltd directly.

Product shelf life

26 Table 1 lists the expected product shelf life of Verder products; for further information, please contact your local Verderflex® distributor or contact the Verderflex® team at info@verderflex.com.

TABLE 1 PRODUCT SHELF LIFE

Ser (1)	Product (2)	Shelf life (3)
1	Pump assembly	No shelf life; providing pump stored in a dry atmosphere
2	Natural Rubber (NR), Nitrile Buna Rubber (NBR), Nitrile Buna Rubber Food Grade (NBRF), Hypalon® (CSM) hoses	2 years from date of supply*
3	EPDM hoses	3 years from date of supply*
4	Verderlube® lubricant	1 year from date of supply*
5	Verdersil® lubricant	3 years from date of supply*
6	Gearbox and motor	In accordance with manufacturer's recommendations

*** Shelf life is based on the product being kept out of direct sunlight and not in temperatures above ambient.**

Verder Group Literature

27 Verder supplies its range of Group literature and product documentation in a number of languages and variety of software packages - please advise your Verder distributor if you are interested in receiving other information on Verder, indicating languages and formats.

28 Verder and its distributors undertake to conduct all its dealings with you as comprehensively, courteously and promptly as possible. Customer care is one of Verder's top priorities.

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CHAPTER 2

OPERATING INFORMATION/COMMISSIONING

CONTENTS

General – tools and facilities

1 Care should be taken at all times to ensure that any tools are used safely for the purpose for which they are designed and in accordance with the manufacturer's instructions. Ideally the pump should be installed using a drive, with facilities to inch the pump along and which is able to operate in reverse. Any maintenance work will require a complete set of metric spanners, a socket set and torque wrench; you should check your fastener kit to ensure you have all the correct sizes available.

2 Lifting equipment will be required for several of the procedures. The lifting equipment to be used should be checked for suitability for the task and capable of lifting the combined weight of the pump components. Always follow the manufacturer's instructions for safe operation of lifting equipment.

Operational Safety

WARNINGS

LETHAL VOLTAGES. Dangerous voltages exist in this equipment. Always isolate the power supply before working on the pump.

SAFETY HAZARD. Never place hands or other parts of the body inside or near any part of the pump when it is in operation or when the power is not totally isolated.

SAFETY HAZARD. When the pump is running, you should not touch the pump and should maintain an adequate safe distance around it.

SAFETY HAZARD. Do not climb onto the pump or connecting pipe work.

SAFETY HAZARD. Maintain a clean environment around the pump. The Verder pump is manufactured from cast iron, and therefore the flanges and casings etc may have sharp edges - slipping or falling against the pump may cause serious injury.

Wear appropriate Personel Protection Equipment (PPE) when operating on or working near the pump.

Assembly and Preparation

Assembly

3 The Verderflex® Dura can be supplied built or as a bareshaft pump.

Preparation

4 Prepare the workspace in which the pump is to be worked on, ensuring there is a clean and level work surface with sufficient room for not only the pump, but also to allow you sufficient access to the pump and fit pipe work, etc.

5 Carefully open the packaging and check for completeness by ensuring all the parts listed are present; remove all the loose components and set them out on a workbench. It is recommended that the fastener kit is sorted into piles of like items and kept in a safe place to avoid losing parts or using an incorrect part.

6 If the pump casing or any parts are found to be damaged, the wrong type, specification or are missing; then you should record the appropriate serial number from the casing identification plate and/or the quality check seal on the packaging, and inform Verder Ltd.

7 The power supply and control panel should be pre-installed. If the pump is to be operated remotely, a separate control panel with STOP and START functions should be installed near the pump (but at least 3 metres/9 feet distance from the pump).

8 Pipe work should:

8.1 Be as short and direct as possible.

8.2 Be oversized relative to the hose bore of the pump (min. 150%)

8.3 Be aligned correctly, free from stress and securely anchored.

8.4 Include a short, removable section adjacent to the port flanges to allow easy access when changing hoses, ideally this should be a flexible hose able to withstand the system pressure.

8.5 Include suction and discharge valves (if a discharge valve is fitted, a high pressure safety device will be required to prevent excess pressure build up when the pump is running with the discharge valve is closed).

8.6 Include drainage taps to allow safe removal of product, and a minimum number of long radius elbows where a change of direction is necessary.

Commissioning

9 Check all fasteners are tightened to the required settings (refer to chap 4). Before connecting any pipe work to the pump carryout the following:

9.1 Run the pump dry for 10-20 revolutions in both directions to ensure that the hose is properly secured.

10 Connect the pipe work and torque-tighten all fasteners to the required settings.

11 Close all drainage taps and open all valves.

12 Run the pump for 10-20 revolutions; check for any leaks.

13 Test the pump for leaks at operating pressure and correct flow rate. Carry out re-adjustments as necessary.

Operation

14 The pump should only be used for the purpose it was sold. For normal continuous operation of each Dura pump; speeds should **NOT** exceed the speeds stated in Table 1 unless expressively advised by your Verder distributor.

TABLE 1 NORMAL CONTINUOUS OPERATION PUMP SPEEDS

Dura 10		Dura 15		Dura 25		Dura 35	
SP	HP	SP	HP	SP	HP	SP	HP
76	40	76	40	76	35	80	n/a

15 Operating pressure should not be altered to operate outside the tolerances recommended by your Verder distributor.

Maintenance

16 It is good practice to wash down the external surfaces of the pump prior to carrying out any maintenance operations. This will prevent the interior of the pump being contaminated with dirt or debris.

TABLE 2 NORMAL OPERATION & RISK PREVENTATIVE MEASURES

17 Table 2 lists possible malfunctions of the pump and its components during normal operation; and preventative measures in place to avoid any malfunctions.

NORMAL OPERATION ASSESMENT			
Ser (1)	**Normal Operation** (2)	**Malfunction** (3)	**Preventative Measures** (4)
1	Pressure too high in casing Blocked Pump Pressure in tube during replacement	Tube rupture causing hazardous medium to spray out	Do not exceed the maximum working pressure of 12 bar (174 PSI). Install a suitable safety valve in the discharge line in order to prevent over-pressurization. This must be in turn checked on a regular basis. Do not work on a running pump near to filler tube/inspection window. When dismantling the pump isolate the power supply and relieve any pressure build up
2	Incorrect assembly		Observe correct build procedure (refer to chap 4)
3	Exceeds recommended temperatures	Tube rupture causing hazardous medium to spray out	Ensure lubricant level is correct. Rotor is shimmed correctly. Fitting of a temperature monitor
4	Polypropylene flange use	Distortion at high operating temperatures >35°C (95°F)	Check operational specification and use alternative stainless steel/ PVDF flange.
5	Excessive noise	Personal Injury	Observe safety regulations governing operation in close proximity. Wear appropriate PPE
6	Product chemical reaction	Potentially explosive	Carry out product handling measures during installation/operation to ensure operator safety
7	Drive spec to pump assembly		Ensure that an explosion proof motor is fitted
8	Rotating coupling	Personal Injury	All flat packed long coupled assemblies to carry guarding advice or have guards installed during the build
9	Hazardous medium in pump case after tube burst	Personal Injury	Observe safety precautions. Use of special tools to remove covers
10	Pump operational safety precautions	Personal Injury	Wear appropriate PPE
11	Construction materials not resistant to pumped media	Adverse chemical reaction, heat build up, personal injury	Ensure sub components other than hose are compatible with media being pumped
12	Verderlube® pump lubricant not resistant to pumped media	Adverse chemical reaction to glycerine based products with strong acids and oxidising agents with risk of explosion	Ensure Verderlube® lubricant is compatible with media being pumped. Use of Verdersil may be required

VERDERLUBE® SAFETY DATA SHEET **EDITION: FEB 2011**

IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Identification of Substance or Preparation

Product Name	Verderlube®
Chemical Identification	Glycerine based blend
CAS number	Preparation
Use	Food grade – pump lubricant/coolant

Company Identification

Producer/Supplier	VERDER LIMITED 3 California Drive Castleford WF10 5QH Great Britain
Tel number	+44 (0) 1924 221 020
Fax number	+44 (0) 113 246 5649
Emergency telephone number	
For advice on this product call:	+44 (0) 1924 221 020

COMPOSITION/INFORMATION ON INGREDIENTS

This product contains no substances classified as hazardous to health in concentrations that should be taken into account according to EC directive 91/155/EC.

- Main constituent may cause irritation to eyes and skin.
- Irritating to respiratory system in the form of a mist.

HAZARDOUS IDENTIFICATION

This product is not classified as hazardous according to EC directive 91/155/EC.

- May cause irritation to eyes and skin.
- Irritating to respiratory system in the form of a mist.
- Contact with hot product may cause burns.
- Product is a lubricant and in the event of untreated spillage, can cause external surfaces to become slippery when wet

FIRST AID MEASURES

Used lubricant may become contaminated with pumped product, also verify precautions and advice against relevant product information.

Ingestion

Except as a deliberate act, the ingestion of large amounts of product is unlikely. If this should occur, do not induce vomiting, obtain medical advice.

- If ingested give 500 ml of Water to drink.

Inhalation

If inhalation of fumes from overheated material causes irritation to the nose or throat, or coughing, remove to fresh air. Obtain medical advice if any symptoms persist.

Skin Contact

No first aid should be required but should any symptoms persist, seek medical advice. If contact with skin occurs:

- Wash thoroughly with mild soap and water as soon as reasonably practical.
- Remove heavily contaminated clothing and wash underlying skin.

Eye Contact

Direct contact may cause temporary redness and discomfort. Wash eye thoroughly with copious amounts of water, ensuring eyelids are held open. Obtain medical advice if any pain or redness develops or persists.

FIRE FIGHTING MEASURES

Extinguishing Media

The best type of fire fighting media to use is:

- Alcohol resistant foam.
- Dry powder.
- Water fog.

Extinguishing Media to avoid

Do **NOT** use water jets.

Unusual Fire and Explosion Hazards

Avoid spraying directly into storage containers due to a danger of boil over.

Special Protective Equipment for Fire fighters

Wear protective clothing and approved breathing apparatus when in close proximity of fire.

Poisonous Acrolein may be found during burning.

Accidental Release measures

Used lubricant may become contaminated with pumped product, also verify precautions and advice against relevant appropriate product information

Personal Protection

Wear goggles and gloves. If spillage has occurred in a confined space, ensure sufficient ventilation and check that a safe, breathable atmosphere is present before entry.

Environmental precautions

Protect drains from spills and prevent entry of product. Treated effluent may be biodegradable. Recover cleaning water for later treatment.

Methods for cleaning up

Contain and recover liquid, soak up with absorbent material (sand, peat, etc.) or contain and shovel into drums or containers. Remove residue by spraying with water.

HANDLING AND STORAGE

Handling

Contact with hot product causes burns.

- Avoid contact with eyes. If splashing is likely to occur wear a full visor or chemical goggles to appropriate local national standards.
- Avoid frequent or prolonged skin contact with fresh or used product.
- Wash hands thoroughly after use.

Storage

Store under cover; away from moisture and sources of ignition. Do not overheat in storage.

The lubricant/coolant is hygroscopic; keep the container tightly closed.

EXPOSURE CONTROLS/PERSONAL PROTECTION

Personal Protection

Hand Protection:

- PVC or Rubber Gloves

Eye Protection:

- Chemical goggles

Respiratory protection is unnecessary, providing concentration of vapour, mists or fumes is adequately controlled.

Occupational exposure limits

- Ensure good ventilation.
- Threshold limit Not tested

PHYSICAL AND CHEMICAL PROPERTIES

FORM	Viscous liquid
COLOUR	Blue. Colourless may be supplied to special order
ODOUR	Odourless
SOLIDIFICATION POINT	-40°C/-40°F approx.
FLASH POINT	177°C/350°F approx. (COC: ISO 2592)
BOILING POINT	290°C/554°F
SOLUBILITY IN WATER	Miscible (at 20°C)
VAPOUR PRESSURE	(20°C/68°F) <0.01 mbar (100°C/210°F) <1 mbar
VISCOCITY	700 mPaS approx. @ 20°C/68°F
pH	7 approx.

(continued)

PHYSICAL AND CHEMICAL PROPERTIES (Continued)

AUTO IGNITION TEMPERATURE	400°C / 750°F approx.
EXPLOSION LIMITS	Not established
DENSITY (20°C/68°F)	1245 kg/m3 approx.
BEHAVIOUR WITH WATER AT 20°C	Hygroscopic

STABILITY AND REACTIVITY

Conditions to avoid

Preparation is stable and unlikely to react in a hazardous manner under normal conditions of use.

No special precautions other than good housekeeping of chemicals.

Hazardous polymerization reactions are unlikely to occur.

This material is combustible.

Materials to avoid

Avoid contact with strong oxidizing agents, nitrogenous compounds and strong acids: risk of violent and or explosive reactions with pure compounds.

Hazardous decomposition products

During burning, poisonous acrolein may be found – very toxic by inhalation.

Incomplete combustion / thermal decomposition will generate smoke, carbon dioxide and hazardous gases, including carbon monoxide.

TOXICOLOGICAL INFORMATION

Toxicity Data

General purpose food grade lubricant/coolant.

LD50 oral (rat) 12600 mg/kg (not harmful) *

Significant data with possible relevance to human health

Eyes	Unlikely to cause more than transient stinging or redness (if accidental eye contact occurs).
Skin	Unlikely to cause harm to the skin
Ingestion	Unlikely to cause harm if accidentally swallowed in small doses, although larger quantities should be avoided
Inhalation	At ambient temperatures this product will be unlikely to present an inhalation hazard

ECOLOGICAL INFORMATION

Mobility

Spillage may penetrate the soil; unused preparation is food grade and is inherently harmless.

Persistence and Degradability

This preparation is inherently biodegradable.

Bio Accumulative Potential

There is no evidence to suggest that bioaccumulation will occur.

Aquatic Toxicity

Verderlube® is miscible in water. It is not considered harmful in low concentrations.

Water pollution reactors	gO2 /g
BOD^5:	0,87 (NEN 3235-5.4)
BOD^1:	1.16 (NEN 3235-5.3)
Fish: goldfish	LC50 (24h):>5000 mg/1 (modified ASTM D1345)

The aquatic toxicity (TLm96) is >1000mg/1, which is defined by NIOSH as an insignificant hazard

DISPOSAL CONSIDERATIONS

Waste Disposal Method(s)

- Where possible, arrange for unused product to be recycled.
- Disposal of preparation should be via an authorized person/licensed waste disposal contractor in accordance with local regulations.
- Incineration may be carried out under controlled conditions provided that local regulations are met.
- Dispose of preparation and container carefully and responsibly. Do not dispose of preparation near ponds, ditches, down drains onto soil.

TRANSPORT INFORMATION

Not classified as dangerous for transport (RID/ADR-ADNE-IATA-IMDG-MARPOL-ICAO).

REGULATORY INFORMATION

Classification not required.

Other Information

Employees of the Verder group have not experienced any harmful effect during normal handling and production.

Verderlube® and Verderflex® are registered trademarks.

*The information contained in this sheet is based on our knowledge of the preparation at its delivery date and that the information contained herein is current as of the date of this data sheet. Since the use of this information and of these opinions and the conditions of use of this preparation is not within the control of Verder Limited, it is the user's obligation to determine the conditions of safe use of the preparation. The information contained in this sheet is based on our knowledge of the product at its delivery date.

VERDERSIL® SAFETY DATA SHEET **EDITION: FEB 2011**

IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Identification of Substance or Preparation

Product Name	Verdersil
Chemical Identification	Silicone fluid (Polydimethyl siloxane 350 CPS)
CAS number	Preparation
Use	Pump lubricant/coolant

Company Identification

Producer/Supplier	VERDER LIMITED Unit 3 California Drive Castleford WF10 5QH Great Britain
Tel number	+44 (0) 1924 221 020
Fax number	+44 (0) 113 246 5649
Emergency telephone number	
For advice on this product call:	+44 (0) 1924 221 020

COMPOSITION/INFORMATION ON INGREDIENTS

This product contains no substances classified as hazardous to health in concentrations that should be taken into account according to EC directive 91/155/EC.

- Main constituent may cause irritation to eyes and skin.
- Irritating to respiratory system in the form of a mist.

HAZARDOUS IDENTIFICATION

This product is not classified as hazardous according to EC directive 91/155/EC.

- May cause irritation to eyes and skin.
- Irritating to respiratory system in the form of a mist.
- Contact with hot product may cause burns.
- Product is a lubricant and in the event of untreated spillage, can cause external surfaces to become slippery when wet

FIRST AID MEASURES

Used lubricant may become contaminated with pumped product, also verify precautions and advice against relevant product information.

Ingestion

No first aid should be required but should any symptoms persist, seek medical advice.

Inhalation

No first aid should be required but should any symptoms persist, seek medical advice.

Skin contact

No first aid should be required but should any symptoms persist, seek medical advice. If contact with skin occurs:

- Wash thoroughly with mild soap and water as soon as reasonably practical.
- Remove heavily contaminated clothing and wash underlying skin.

Eye contact

Direct contact may cause temporary redness and discomfort. Wash eye thoroughly with copious amounts of water, ensuring eyelids are held open. Obtain medical advice if any pain or redness develops or persists.

FIRE FIGHTING MEASURES

Extinguishing Media

The best type of fire fighting media to use is:

- Alcohol resistant foam.
- Dry powder.
- Water can be used to cool fire exposed containers.

Extinguishing Media to avoid

None known.

Unusual Fire and Explosion Hazards

None known.

Special Protective Equipment for Fire fighters

A self-contained respirator and protective clothing should be worn. Keep containers cool with water spray until well after the fire is out. Determine the need to evacuate or isolate any area in accordance with local emergency plans.

Hazardous combustion products include Silica, Carbon Oxides and traces of incompletely burned carbon compounds may form. Formaldehyde may also be found.

National Fire Protection Association (NFPA) Profile

Health: 0	Flammability: 1	Instability/reactivity: 0

ACCIDENTAL RELEASE MEASURES

Personal Protection

Wear goggles and gloves. If spillage has occurred in a confined space, ensure sufficient ventilation and check that a safe, breathable atmosphere is present before entry.

Environmental Precautions

Prevent from spreading or entering drains, ditches or rivers by using sand, earth or other appropriate barriers

Methods for Cleaning Up

Determine the need to evacuate or isolate the area in accordance with local emergency plan. Very large spills should be contained by bunding or similar methods. Contain and recover the liquid, soak up with absorbent material (sand, peat, etc.) or contain and shovel into drums or containers.

Caution : Spilled product will produce an extremely slippery surface.

Handling and Storage

Handling

Contact with hot product causes burns.

- Avoid contact with eyes. If splashing is likely to occur wear a full visor or chemical goggles to appropriate local national standards.
- Avoid frequent or prolonged skin contact with fresh or used product.
- Wash hands thoroughly after use.

Storage

Store under cover away from moisture and sources of ignition. Do not overheat in storage.

EXPOSURE CONTROLS / PERSONAL PROTECTION

None of the components have assigned exposure limits.

Personal Protection

- Hand Protection PVC or Rubber Gloves
- Eye Protection Safety glasses should be worn

Respiratory Protection Respiratory protection is unnecessary, providing concentration of vapour, mists or fumes is adequately controlled.

Occupational Exposure Limits

- Ensure good ventilation.
- No known assigned exposure limits.

Additional Information

These precautions are for room temperature handling

Use at elevated temperatures may require additional precautions

PHYSICAL AND CHEMICAL PROPERTIES

FORM	Viscous liquid
COLOUR	Colourless
ODOUR	Odourless
SOLIDIFICATION POINT	-45°C/-60°F approx.
FLASH POINT	121°C/250°F approx. (Closed cup)
BOILING POINT	>200°C/>390°F

PHYSICAL AND CHEMICAL PROPERTIES (CONTINUED)

SOLUBILITY IN WATER	0 g/litre at 20°C
VISCOCITY	350 mPaS approx. @ 20°C/68°F
pH	7 approx.
AUTO IGNITION TEMPERATURE	>200°C / >390°F approx.
EXPLOSION LIMITS	Not expolosive
DENSITY (20°C/68°F)	970 kg/m3 approx.

STABILITY AND REACTIVITY

Conditions to avoid

Preparation is stable and unlikely to react in a hazardous manner under normal conditions of use.

No special precautions other than good housekeeping of chemicals.

Materials to avoid

Can react with strong oxidizing agents.

Hazardous Decomposition Products

Hazardous decomposition products including Formaldehyde and Silica can be formed, refer to Toxicology Information, section.

TOXICOLOGICAL INFORMATION

Toxicity Data

General non toxic lubricant/coolant.

Other than temporary discomfort on contact with the eyes, no adverse effects are normally expected.

Significant data with possible relevance to human health

Eyes	Unlikely to cause more than transient stinging or redness (if accidental eye contact occurs).
Skin	Unlikely to cause harm to the skin
Ingestion	Unlikely to cause harm if accidentally swallowed in small doses, although larger quantities should be avoided
Inhalation	At ambient temperatures this product will be unlikely to present an inhalation hazard

Product may emit Formaldehyde vapours at temperatures above 150°C/302°F in the presence of air. Formaldehyde vapour is harmful by inhalation and irritating to the eyes and respiratory system at breathing concentrations of less than 1 part per million (ppm).

ECOLOGICAL INFORMATION

Environmental Fate and Distribution

Air

This product is a high molecular weight liquid polymer, which has a very low vapour pressure (<1 mm Hg). As a result it is unlikely to become an atmospheric contaminant unless generated as an aerosol.

Water

This product has very low water solubility (< 100 ppb). As it has a specific gravity of < 1, if discharged to water, it will initially form a surface film. As the product is non-volatile and has a high binding affinity for particulate matter, it will adsorb to particulates and sediment out.

Soil

If discharged to surface water, this product will bind to sediment. If discharged in effluent to a waste water treatment plant, the product is removed from the aqueous phase by binding to sewage sludge. If the sewage sludge is subsequently spread on soil, the silicone product is expected to degrade.

Degradation

This product, polydimethylsiloxane, degrades in soil abiotically to form smaller molecules. These in turn are either biodegraded in soil or volatilized into the air where they are broken down in the presence of sunlight. Under appropriate conditions, the ultimate degradation products are inorganic silica, carbon dioxide and water vapour. Due to the very low water solubility of this product, standard OECD protocols for ready and inherent biodegradability are not suitable for measuring the biodegradability of this product. The product is removed >80% during the sewage treatment process.

Environmental effects

Toxicity to Water Organisms:

Based on analogy to similar materials this product is expected to exhibit low toxicity to aquatic organisms.

Toxicity to Soil Organisms:

Experiments show that when sewage sludge containing polydimethylsiloxane is added to soil, it has no effect on soil micro-organisms, earthworms or subsequent crops grown in the soil.

Bio accumulative

This product is a liquid and is a high molecular weight polymer. Due to its physical size it is unable to pass through, or be absorbed by biological membranes. This has been confirmed by testing or analogy with similar products.

Fate and Effects in Waste Water Treatment Plants

This product or similar products have been shown to be non-toxic to sewage sludge bacteria.

TABLE 3 ECOTOXICITY CLASSIFICATION CRITERIA

Hazard Parameters (LC50 or EC50)	High	Medium	Low
Acute Aquatic Toxicity (mg/L)	<=1	>1and<=100	>100
Acute Terrestrial Toxicity	<=100	>100and<=2000	>2000

This table is adapted from "Environmental Toxicology and Risk Assessment", ASTM STP 1179, p.34, 1993. This table can be used to classify the ecotoxicity of this product when ecotoxicity data is listed above. Please read the other information presented in the section concerning the overall ecological safety of this material.

Disposal Considerations

Used lubricant may become contaminated with pumped product, also verify precautions and advice against relevant product information.

Waste Disposal Method(s)

Where possible, arrange for unused product to be recycled.

RCSA Hazard Class (40 CFR 261)

When a decision is made to discard this material, as received, is it classified as a hazardous waste? – No State or local laws may impose additional regulatory requirements regarding disposal.

Transport Information

Not classified as dangerous for transport (RID/ADR-ADNE-IATA-IMDG-MARPOL-ICAO). DOT Road Shipment Information (49 CFR 172.101) – Not subject to DOT.

Regulatory Information

Labelling according to EEC Directive – No special packaging or labelling requirements National legislation/regulations Ozone depleting chemicals – No ozone depleting chemicals are present or used in manufacture

Status

EINECS: All ingredients listed or exempt.

TSCA: All chemical substances in this material are included on or exempted from listing on the TSCA Inventory of Chemical substances.

OSHA Hazard Regulatory Information to Standard CFR29 1910.1200

Contents of this MSDS comply with the OSHA Hazard Communication Standard 29 CFR 1910.1200. TSCA Status: All chemical substances in this material are included on or exempted from listing on the TSCA Inventory of Chemical Substances.

TSCA Status

All chemical substances in this material are included on or exempted from listing on the TSCA.

TABLE 4 EPA SARA TITLE III CHEMICAL LISTINGS

SER (1)	SECTION (2)	HAZARD (3)
1	Section 302 extremely hazardous substances	None
2	Section 304 CERCLA hazardous substances	None
3	Section 312 hazard class: Acute: Chronic Fire Pressure Reactive	 No No No No No
4	Section 313 toxic chemicals	None present or none present in regulated quantities

Supplemental State Compliance Information for California

Warning: This product contains the following chemical(s) listed by the State of California under the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) as being known to cause cancer, birth defects or other reproductive harm.

None known.

Supplemental State Compliance Information for Massachusetts

No ingredient regulated by MA Right-to-Know Law present.

Supplemental State Compliance Information for New Jersey

CAS Number	*Wt%*	*Component Name*
63148-62-9	>60.0	Polydimethylsiloxane

Supplemental State Compliance Information for Pennsylvania

CAS Number	*Wt %*	*Component Name*
63148-62-9	>60.0	Polydimethylsiloxane

Other Information

Employees of the Verder group have not experienced any harmful effect during normal handling and production.

Verdersil® and Verderflex® are registered trademarks.

*The information contained in this sheet is based on our knowledge of the preparation at its delivery date and that the information contained herein is current as of the date of this data sheet. Since the use of this information, and of these opinions and the conditions of use of this preparation is not within the control of Verder Limited, it is the user's obligation to determine the conditions of safe use of the preparation.

The information contained in this sheet is based on our knowledge of the product at its delivery date.

CHAPTER 3

TECHNICAL INFORMATION

CONTENTS

THEORY OF THE PUMP

Working Principles

1 The pump is simple by design in its construction and operation. The medium to be pumped does not come into contact with any moving parts and is totally contained within a robust, heavy-duty hose, which consists of an inner layer, two - six reinforcement layers and an outer layer. A rotor passes along the length of the hose, compressing it totally closed. This motion forces the contents of the hose directly in front of the rotor to move forward along the length of the hose in a 'positive displacement', peristaltic movement. In the wake of the rotor's compressing action, the natural elasticity of the nylon reinforced rubber forces the hose to open and regain its round profile, creating suction pressure, which recharges the pump.

Features of a Verderflex® Dura pump

2 The pump has many features:

2.1 Dry running - the pump will run dry without damage.

2.2 The hose effectively forms an integral part of the suction & discharge lines, connected externally by flange or hose-tail connectors ensuring zero leakage.

2.3 Self-priming, the D10-25 pumps will prime themselves to 80% vacuum (equivalent to a suction lift of 8mWc), at sea level, when pumping a liquid with an s.g. of 1 (i.e. water). The Dura 35 will prime to 95% vacuum, equivalent to 9.5mWc.

2.4 High solids content handling - the pump is capable of handling media with a high proportion of solids and with large particle sizes.

2.5 Viscous liquids - pumps are typically capable of dealing with fluids up to 6,000 mPas (cPs).

2.6 High differential pressure; the pump is capable of continuously running at pressures up to 6 bar with a standard pressure rotor and up to 12 bar with a high pressure rotor.

2.7 Few moving parts - there are no valves or joints, reducing the possibility of malfunction.

2.8 Low maintenance - the main wearing part in the pump is the hose, which can be replaced quickly, easily and inexpensively.

2.9 Non shearing - delicate media can be pumped effectively with little or no damage.

Advantages of Verderflex® Dura pump

3 The Verderflex® Dura pump has many advantages:

3.1 Physical separation between pump-head and GMU eliminating risk of contamination.

3.2 Rigid housing design for heat dissipation and accurate hose compression.

3.3 Quick fit tapered flange design clamps and seals in one easy movement to speed hose replacement.

3.4 Breather tube on the rear of the pump acts as a filler tube.

3.5 Flexible drive connection allowing the GMU to be fully removed without the need to drain the pump casing

3.6 No moving parts in contact with the product.

3.7 Universal 316L Stainless Steel Flanges, compliant with DIN PN16, ANSI 150#, JIS10K and many other national standards.

4 The pump can also be supplied with the following additional features upon request:

4.1 High-pressure 12 bar rotor. Standard-pressure 6 bar rotor supplied as standard.

4.2 PVDF or PP Flanges. 316 Stainless Steel are standard.*

*** HP rotors and PP/PDVF are not available for Dura35**

Product range

5 The Verderflex® Dura pumps are sized and named according to the internal bore diameter of the hose. The range starts with the 10mm diameter Dura 10 unit, and incorporates a total of 6 models, up to the 35mm diameter Dura 35.

6 All pumps are capable of operating up to 12 bar (174 PSI) depending on the rotor that is fitted to the pump.

TABLE 1 PUMP CAPACITIES

Ser (1)	Pump Size (2)	Litres/Hr (US GPM) (3)		Continuous Limits RPM (4)		Maximum Pressure (5)		Pump head Weight kg* (6)	Sound level At Im dB (7)
		SP	HP	SP	HP	SP	HP		
1	Dura 10	106 (0.5)	56 (0.25)	76	40	6	12	19	<70
2	Dura 15	347 (1.5)	182 (0.8)	76	40	6	12	30	<70
3	Dura 25	1,295 (5.7)	682 (3.0)	76	35	6	12	49	<70
4	Dura 35	2,979 (13.1)	N/A	80	N/A	6	N/A	58	<70

* Pump head weights excluding geared motor unit.

Pump construction

7 Refer to Figs 1 and 2. The Verderflex® Dura pump unit is one of the most simple, yet most robust designs of its type, with very few actual moving parts:

8 The pump housing is terminated with a universal one piece port flange. Within the housing is a rotor. This assembly is rotated, causing it to compress the reinforced hose, which displaces liquid to generate the pumping action. The housing provides support for the hose whilst under compression from the rotor assembly. A flange/insert mechanism is used to retain the hose position within the housing. The flange uses a tapered design to clamp and seal the hose in the casing. The rotor runs in a lubricant bath, which is filled either through the inspection cover or via a pipe at the rear of the housing. Overall the unit is designed to enable simple assembly and maintenance.

Verderflex® Dura hose

9 To complement the hose pump, Verder has developed the Verderflex® Dura hose for continuous operation. Tests have shown that these hoses are highly durable and are able to achieve an 80% vacuum (equivalent to a suction lift of 8m of water at sea level) on the Dura 10-25 and 95% vacuum on the Dura 35 (9.5 mWc).

10 Hoses are available in Natural Rubber (NR), Nitrile Buna rubber (NBR), Food grade (NBRF), EPDM rubber, Hypalon® rubber (CSM) and Verderprene. This selection is suitable for the majority of applications, but there remain some products, which are not compatible with these hose materials; please consult your local VERDER distributor for more information on hose compatibility.

Limitations of the Verderflex® Dura pump

11 Verder is strongly committed to the belief that the customer must always be given as much information as possible in order to make the best possible pump selection. For this reason the list opposite contains details of the few Verderflex® limitations:

11.1 Hoses are available in Natural Rubber, Nitrile Buna rubber, Ethylene Propylene Diene Monomer (EPDM) rubber, Chlorosulfonated Polyethylene (CSM/Hypalon) and Verderprene. This selection is suitable for the majority of applications, but there remain some products which are not compatible with the hose material.

11.2 Hose pumps often appear bulky and large in size when compared to other positive displacement pumps with moderate flow rates.

11.3 When compressing the hose, the overall volume of the sliding shoe causes the volume of the suction line to be transferred to the discharge line, temporarily stopping the flow in both the suction and discharge lines.

12 Pulsation dampeners are needed occasionally as an accessory if:

12.1 The lines are hammering.

12.2 Lines are smaller the size of the pump.

12.3 The process is hammering and lines are long.

12.4 Severe pulsation is noticed (product has a high specific gravity).

12.5 The capacity of the pump may drop below minimal due to high impulse losses on the suction or discharge side.

12.6 The maximum impulse loss possible on the suction side is 0.4 Bar (6 PSI) – N.B. 0.3 Bar (4 PSI) if NBRF.

12.7 The maximum impulse loss possible on the discharge side is 6-9 Bar (85-130 PSI), dependent on the rotor type and pump specification.

12.8 Inlet pressure limitations of 0.2 Bar abs (2.9 PSI abs)

Pump and geared motor selection

13 The pumps higher capacities can be used to deliver for intermittent use only to enable the dissipation of heat, which is generated by high speed and pressures. The actual capacity of the pump depends upon the speed at which the rotor revolves. The pump's speed and consequent output achieved will depend on many factors:

13.1 Is the medium being pumped aggressive, abrasive, and viscous or shear sensitive?

13.2 What type of use is required for the pump, all day every day or short, periodic use?

13.3 Is the system a high or low-pressure system?

13.4 Is the medium being pumped at a high or low temperature?

13.5 What is the solid content - percentage of solids, shape and size of particles?

14 All these factors should be taken into consideration when selecting the pump size, speed of operation and geared motor unit. If you have any reservations, do not hesitate to contact your local Verder distributor, who will be more than pleased to offer professional, expert advice and recommendations to ensure you get the optimum pump for your application.

Drive selection

15 Your VERDER distributor will be pleased to assist in selecting a suitable drive to best fulfil the needs of the duty you require. You should ensure that the drive selected is sufficiently powerful to overcome the starting torque requirements of the pump at the pressure at which it to operate. Additionally, allowance must be made for the gearbox efficiency. Typically, this varies with gearbox type and ratios on the worm gearbox supplied as standard on the Dura and to simplify this process pumps are normally supplied completely assembled. Standard selections are available as per the pump datasheet

VDURA/041

Fig 1 Dura Pump unit (front view)

VDURA/042

Fig 2 Dura Pump unit (rear view)

Accessories and Options

16 There are a number of accessories available to complement the Verder hose pumps, all of which are available through your local Verder distributor:

Multi standard port flanges

17 The Dura is supplied with a cast 316 stainless steel universal slotted port flange that accommodates pipe work connections including DIN PN16, ANSI 150lb & JIS 10K. The flanges are resistant to many chemicals but for more aggressive chemicals they are available in PP or PVDF for maximum corrosion resistance.

Hose Failure Detection

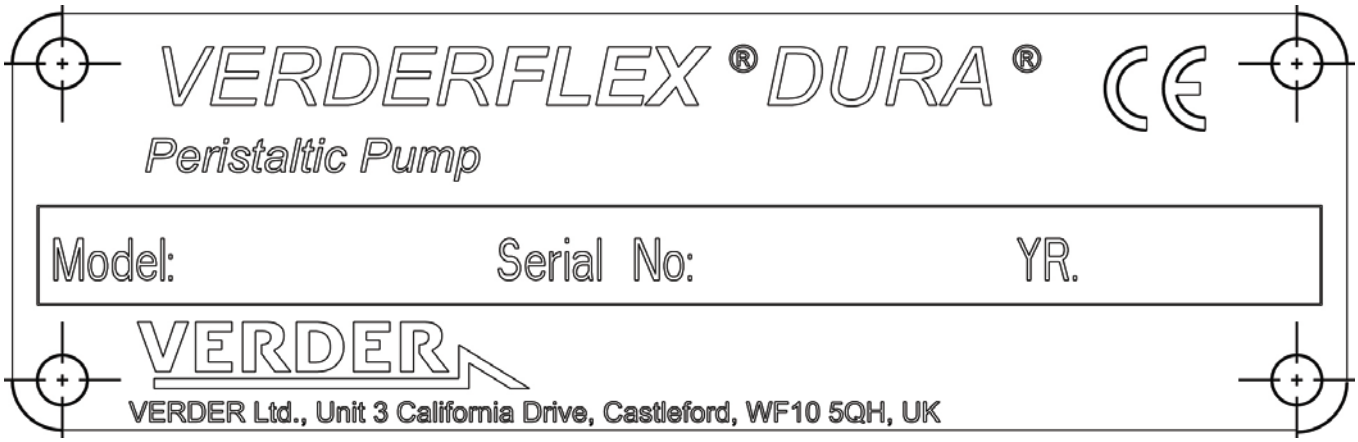
18 One of the VERDER's many advantages is the exceptional lifetime of the hoses. The Dura pump and its associated hoses are designed to maximize the hose's fatigue life, the primary cause of normal peristaltic hose failures. Periodically, however, hoses will need to be replaced as a consequence of such failures as they are the main consumable part of the Dura Pump.

19 Throughout the hose's lifetime, it is important that any possible failure be noticed in sufficient time to prevent leakage into and damage to the pump housing and unit. In order to prevent this VERDER has developed a pressure switch sensor which detects high-level discharge failures. Please contact your VERDER distributor for further details.

Verderflex® Dura name plate

20 Each Verderflex® Dura carries a name plate similar to Fig 3. This name plate is located on the top of the housing near the discharge flange. If you have any need to contact your Verderflex distributor please record the model number and serial number from this plate beforehand. This information will best enable your distributor to help you with any issues you may have.

Fig 3 Verderflex® Dura nameplate



Future Developments

21 Verder's in-house team of engineer's is continually striving to develop the hose pump and its application to new areas; naturally this covers the development of accessories and complementary versions of the hose pump to achieve maximum efficiency and performance. Feedback from operators and customers is always welcomed therefore, and any comments or queries concerning your particular application should be forwarded to your local Verder distributor, who will then forward them to Verderflex

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CHAPTER 4

INSTALLATION & FAULT FINDING

CONTENTS

MAINTENANCE SAFETY

WARNINGS

LETHAL VOLTAGES. Dangerous voltages exist within this equipment. Only a fully qualified electrician should work on electrical components. Always isolate the power supply before working on the pump.

SAFETY HAZARD. Do not stand near the pump while the hose is being removed – if the hose is expelled too quickly, it could cause serious injury.

SAFETY HAZARD. Never try to install a hose without the front cover in place, it could cause serious injury.

SAFETY HAZARD. Never remove the front cover when the hose is still in position, it could cause serious injury.

HEAVY WEIGHT. When moving heavy weights, lifting equipment should be used to support the weight.

HEAVY WEIGHT. Always use lifting equipment safely in accordance with the manufacturer's recommendations.

HEAVY WEIGHT. The pump is provided with a lifting eye, which can be fitted into the threaded hole of the front cover, (located by removing the top left of centre front cover fastening bolt) to assist with lifting.

HEAVY WEIGHT. Take care not to drop the front cover as this is likely to cause an injury.

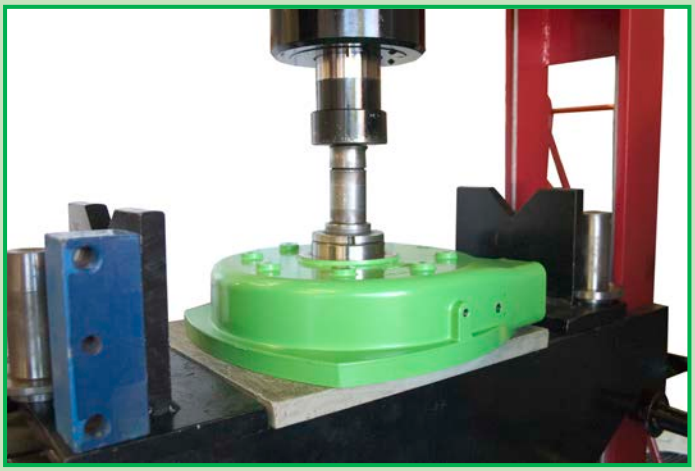
SAFETY HAZARD. Do not stand in the immediate vicinity of the pump when operating with the inspection cover removed; follow safety procedures for operation of pump with inspection cover off.

HEAVY WEIGHT. Care should be taken to support the weight of the pump case when fitting it to the frame. Although this will give the case a certain amount of rigidity once stood upright, the pump could still tip forward

EQUIPMENT DAMAGE. Before test running the pump, check that all tools are removed, particularly from pump casing.

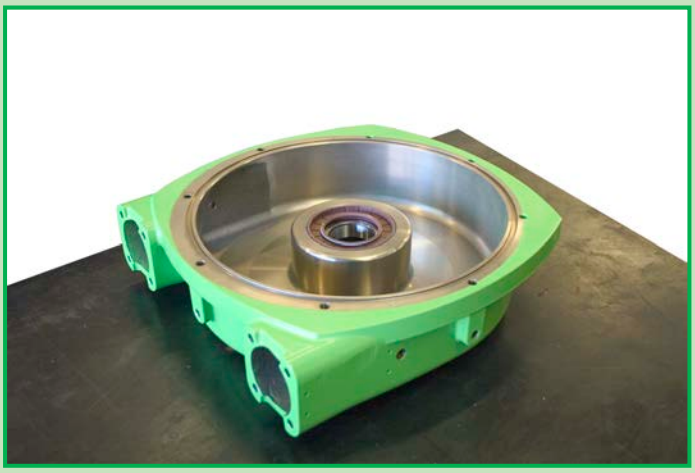
EQUIPMENT DAMAGE. Correct torque figures must be applied when using Torque wrench adaptors. Pump casing and rotor mounting bolts require the use of these adaptors.

1 PUMP CASE INSTALLATION



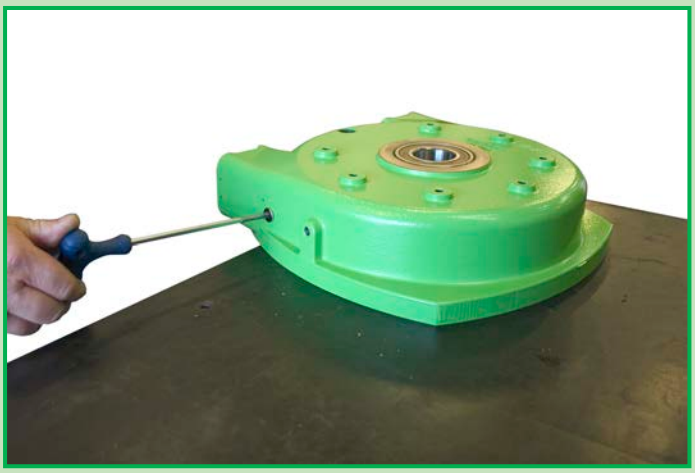
VDURA001

Using a bearing press, press the bearings squarely into the front and rear of the pump body until they locate on the shoulders in the pump housing.



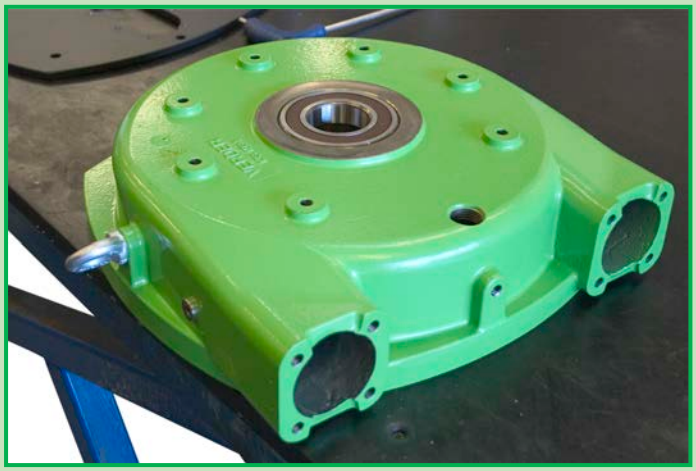
VDURA002

The shaft seal should be pressed squarely on top of the inner bearing with the sprung lip facing into the pump cavity.



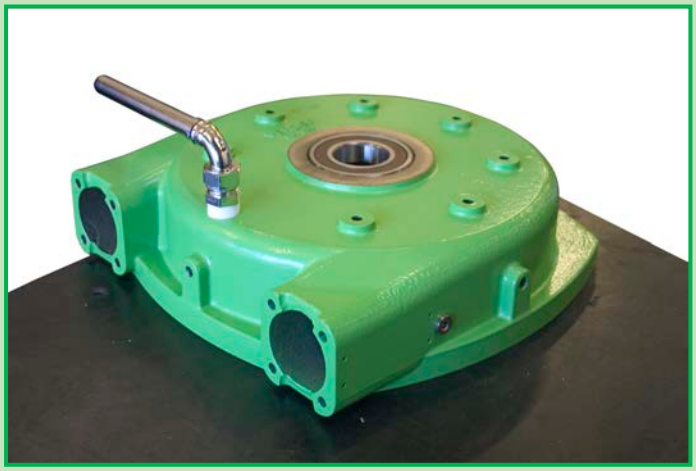
VDURA003

Screw in the case blanking plugs.



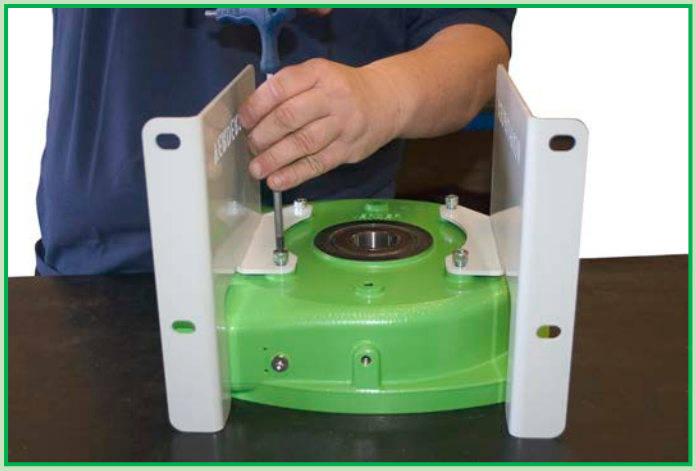
VDURA004

Fit the lifting eye to the case.



VDURA005

It is also important at this point to attach the filler tube to the back of the pump as it could be difficult to attach once the Geared Motor Unit (GMU) is in place. Line the thread of the breather tube with PTFE tape and tighten into position to give a leak free seal.



VDURA006

Mount the framework to pump housing using four of the cap head bolts and torque-tighten.

(See Table 1 for torque figures)

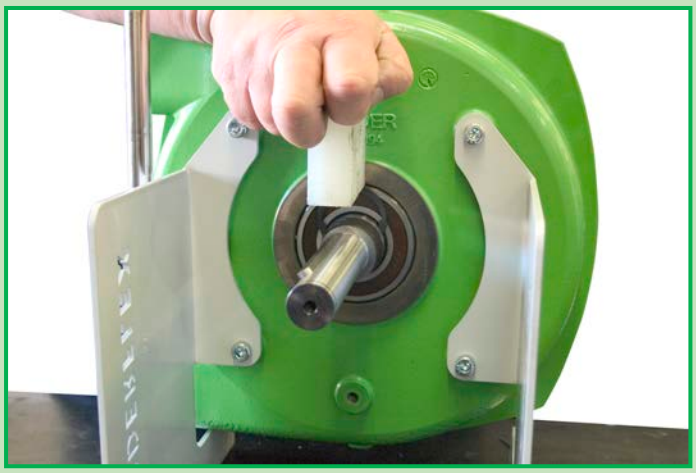
2 DRIVE SHAFT INSTALLATION

VDURA007

Apply some triple life bearing grease (Roccol Sapphire 2) to the drive shaft before assembly.

VDURA008

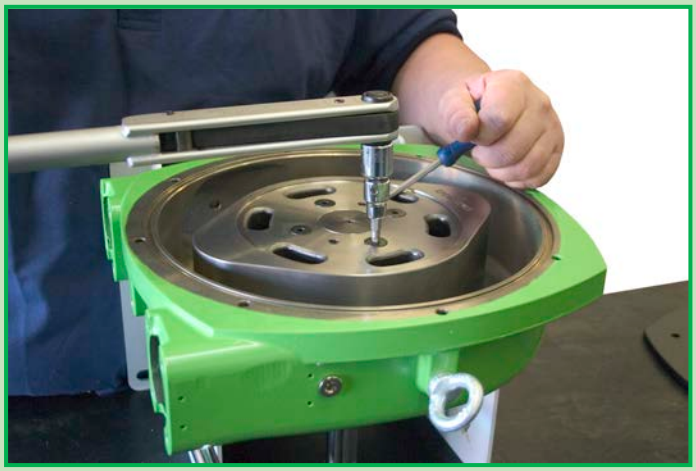
Press the drive shaft through the bearing assembly.



VDURA009

Once the drive shaft is in place the crescent ring groove should become visible at the rear of the pump. It is recommended to lock the drive shaft in place with the crescent ring before bolting the rotor in place.

3 ROTOR INSTALLATION



VDURA010

Secure the rotor to the drive shaft using 4 countersunk socket cap head screws. Failure to use all of the screws could compromise the performance of the pump.

(See Chapter 4 Table 1 for torque figures)

4 FRONT COVER INSTALLATION

VDURA011

The O-ring should sit securely in the groove located around the front of the pump housing. A small amount of grease may be required to hold the O-ring in place. The front cover should bolt in place with the use of cap head screws and washers.

(See Chapter 4 Table 1 for torque figures)

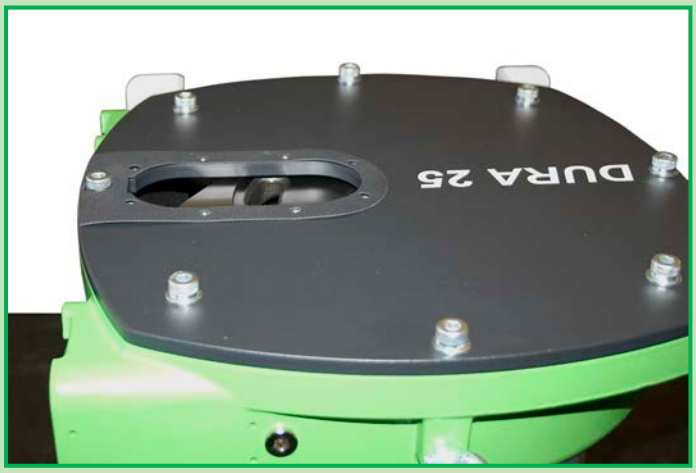
VDURA012

When fitting the front cover, the cap head screw nearest to the inspection window, is fitted without a washer (pictured).

VDURA013

Fit the rest of the cap head screws with washers and torque-tighten.

(See Chapter 4 Table 1 for torque figures)



VDURA014

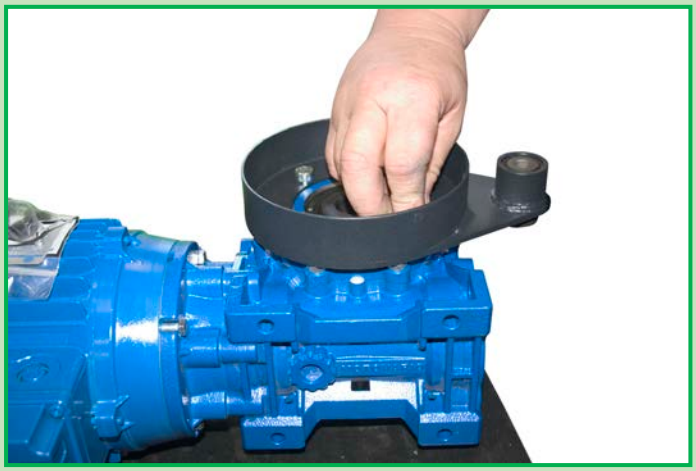
Fit the inspection window gasket to the front cover.

VDURA015

Secure the inspection window to the front cover with cap head screws. Care must be taken not to over tighten the screws, as this may damage the inspection window.

(See chapter 4 Table 1 for torque figures)

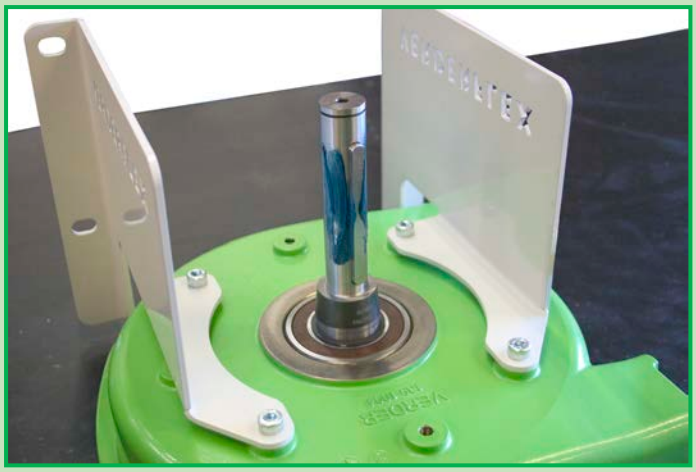
5 GEARED MOTOR UNIT INSTALLATION



VDURA016

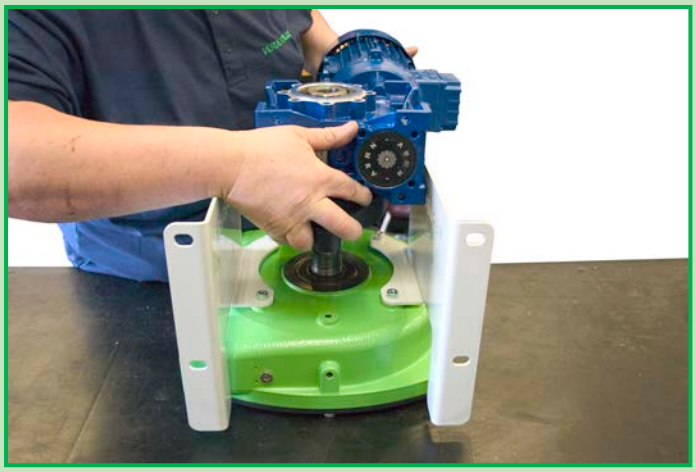
Press fit the torque arm bush into the torque arm; then fasten the torque arm to the GMU with the shaft sleeve facing away from the gearbox before attempting to fit it onto the drive shaft.

(See Chapter 4 Table 1 for torque figures)



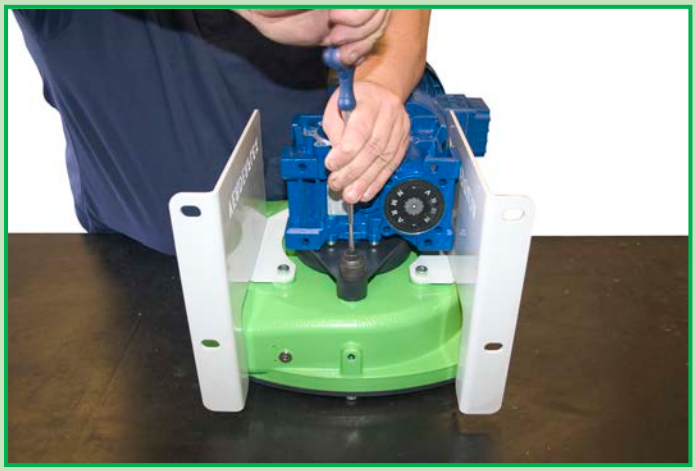
VDURA017

Grease the shaft before fitting the GMU.



VDURA018

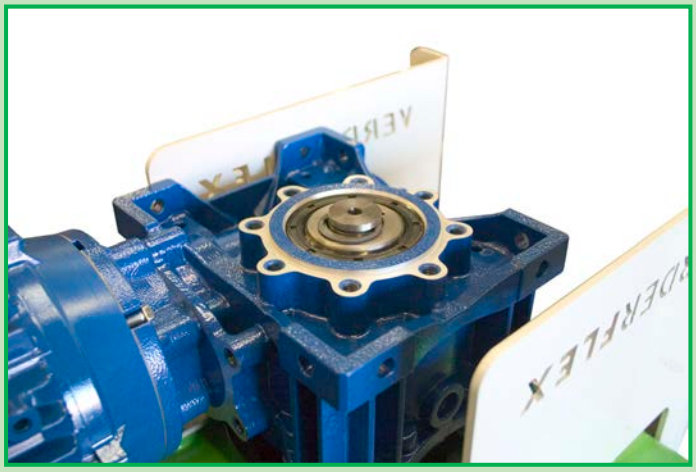
Align the drive shaft key and GMU keyway; then slide the GMU over the drive shaft.



VDURA019

Fasten the torque arm to the housing and complete the installation of the GMU.

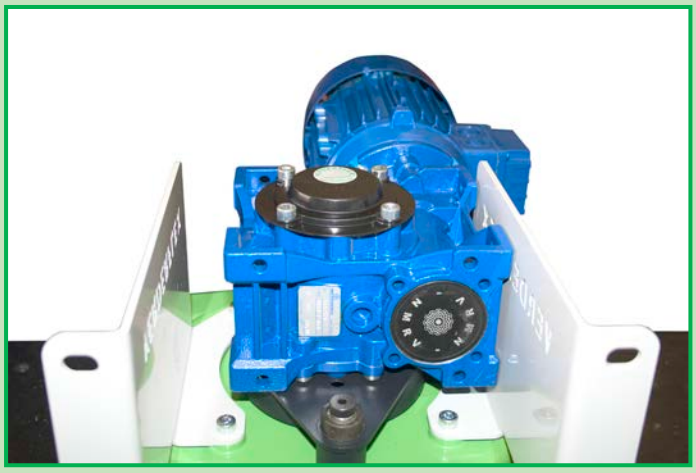
(See Chapter 4 Table 1 for torque figures)



VDURA020

Use the crescent clip supplied to stop the GMU from sliding off the end of the shaft.

Variations may be secured using bolt and washer.



VDURA021

To complete the assembly, mount the dust cover using the screw cap head screws supplied.

(See Chapter 4 Table 1 for torque figures)

6 ELECTRICAL POWER INSTALLATION

VDURA022

Remove the cover to the GMU electrical connections. Re-fit the cover, apply power to the GMU.

(Danger! This task should be carried out by a qualified electrician)

7 HOSE INSTALLATION

VDURA023

Before installing the hose it is best practice to remove any paint overspray or burrs from the port flange mounting holes with a correctly sized tap.

Fully lubricate the outer wall of the hose with lubricant to aid installation.

VDURA024

Insert one end of the hose into the mouth of the suction port (the hose should be fed into the pump in the direction of normal operation). Once the hose reaches the rotor, the drive can be inched forward slowly to feed in the remainder of the hose into the pump housing.

VDURA025

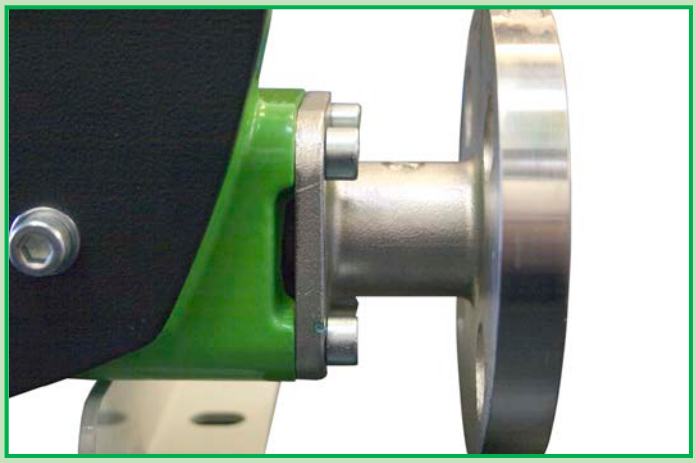
The hose should be inched forward until there is sufficient hose protruding from the suction and discharge ports to fit the tapered flanges (10mm). If the hose passes this point the drive should be reversed and inched back slowly into the correct position.

VDURA026

With the hose in position the tapered flanges can be fitted. Apply some pump lubricant to the taper flanges to aid fitment.

VDURA027

Tightening the bolts in a 1-3-4-2 sequence, repeating the sequence until the flange is evenly fitted. All 4 bolts should be fitted to each flange to avoid compromising the performance of the pump.



VDURA028

The tapered flange should be pulled toward the housing for as close as is possible ensuring 5mm (16”) of the hose can be seen in the gap between the fixing holes.

8 LUBRICANT

VDURA029

The pump must always be filled with the correct amount of lubricant. Fill to the mid level of the front cover. Check the compatibility of the lubricant with the product being pumped; it can react when mixed with certain types of nitrogenous or oxidizing substances such as nitric acid.

The safety data sheets for both lubricants are contained in Chap 2.

TABLE 1 PUMP FASTENER TORQUE FIGURES

Table 1 is to be used as a guide to torque-tightening of pump fasteners:

Ser (1)	Position (2)	Torque Nm (3)			
		D10	D15	D25	D35
1	Mounting Frame	7	7	7	7
2	Rotor	12	12	27	54
3	Front Cover	12	12	27	27
4	Inspection Window	3.4	3.4	3.4	3.4
5	Port Flange	12	12	27	27
6	Torque Arm	12	12	27	27
7	Torque Arm Bush	12	12	27	27
8	Gearbox	7	7	7	14

TABLE 2 FAULT FINDING

Table 2 is to be used as an aide to fault finding.

Serial (1)	Fault (2)	Probable Cause (3)	Corrective Action (4)
1	Abnormally high pump temperature	Non-standard lubricant	Consult Verder distributor to obtain correct lubricant
		Low lubricant level	Add required amount
		Product ambient temperature too high	Consult Verder distributor regarding maximum temperature
		Internal friction on hose caused by blocked suction or bad suction characteristics	Check pipe-work/valves for blockages; check that the suction pipe-work is as short and as large in diameter as feasible; consult Verder distributor for advice
		Over shimming of the pump	Check & remove excess shims
		High pump speed	Reduce speed to a minimum; consult Verder distributor for advice on recommended pump speeds
2	Low capacity/pressure	Suction/discharge valve closed	Open suction/discharge valve
		Hose failure	Replace hose
		Blocked suction/no product	Check suction pipe-work for blockages and product; remove any product
		Poor pump selection	Consult Verder distributor to check pump selection
		Suction line too long, pump speed too high, suction line bore too small.	Consult Verder distributor for advice
		High product viscosity	Use vacuum on housing
		Suction/discharge lines not secured properly	Check and secure suction/discharge lines
3	Pump and pipe-work vibrating	High pump speed, long suction/discharge lines, high product specific gravity, or a combination of them all	Reduce pump speed, shorten suction/discharge line wherever possible; consult Verder distributor
		Under-sized suction /discharge diameter	Increase suction/discharge pipe-work diameter
		Insufficient lubricant in the casing	Check lubrication chart and add the required amount of lubrication
4	Hose pulled in to pump housing	Inlet pressure too high	Reduce the inlet pressure
		Blocked hose	Check the hose and remove any blockages
		Large particles in the product	Mount sieve/filter in suction line to avoid particles entering the hose

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CHAPTER 5

MAINTENANCE AND SERVICING

CONTENTS

Maintenance Safety

WARNINGS

LETHAL VOLTAGES. Dangerous voltages exist in this equipment. Always isolate the power supply before working on the pump.

SAFETY HAZARD. Always follow the safety procedures for handling the product being pumped.

SAFETY HAZARD. If the hose has ruptured, the lubricant may be contaminated with product and the pump casing may be pressurized – care must be taken to handle the mixture appropriately and appropriate measures taken to relieve any pressure build up.

SAFETY HAZARD. Do not stand near the pump while the hose is being removed – if the hose is expelled too quickly, it could cause serious injury.

Always use lifting equipment safely in accordance with the manufacturer's recommendations. The pump is provided with a lifting eye, which can be fitted into the threaded hole of the front cover, (located by removing the top left of centre front cover fastening bolt) to assist with lifting.

HEAVY WEIGHT. Take care not to drop the front cover as this is likely to cause serious injury.

SAFETY HAZARD. Do not stand in the immediate vicinity of the pump when operating with the inspection cover removed; follow safety procedures for operation of pump with inspection cover off.

PUMP & HOSE STORAGE

Introduction

1 Verderflex® Dura pumps are designed for continuous use; however, there may be instances when pumps are withdrawn from use and stored for periods of more than 2 weeks. We recommend certain pre- storage actions and precautions be taken whilst pumps and their components are not in use. Similarly, hoses and lubricants may be held as stock to service working pumps and their recommended storage conditions are advised.

Hose Pre-Storage Actions

2 The hose should be removed from the pump and the lubricant drained out of the pump casing.

2.1 The pump casing should be washed out and allowed to dry and any external build up of product removed.

2.2 The gearbox should be drained and re-filled with oil in accordance with the manufacturer's recommendations.

2.3 Rinse the hose carefully to remove any aggressive chemicals.

Pump Pre-Storage Actions

3 Pumps should be stored in a dry environment. Depending on these conditions, it may be advisable to place a moisture-absorbing product, such as Silica gel, inside the pump's casing or to coat the pump's inner surfaces with moisture-repelling oil, whilst the pump is stored.

3.1 Gearboxes may require intermittent attention (such as periodic rotation) as indicated by the gearbox manufacturer's recommendations.

3.2 Hoses should be stored as supplied in their wrapper and should be stored away from direct sunlight and other sources of ultra violet light and at room temperature of between 10 to 20 °C.

3.3 Lubricants should be stored under normal warehouse conditions with their caps securely fastened.

3.4 It is recommended that lubricant containers be inverted every month and shaken before being used in the pump.

Hose storage and shelf life

4 Shelf life for hoses is approximately two years for NR and NBR hoses, and approximately four years for EPDM hoses. The hoses should be stored flat in a cool, dark location and should not come in contact with any ultra-violet lighting; otherwise the product will be aged artificially.

TABLE 1 SERVICE/REPLACEMENT COMPONENTS

5 Table 1 lists the sub components that may require replacement and recommended change times after maintenance.

Serial (1)	Item (2)	Related Sub Components (3)	Recommended Change (4)
1	Front Cover	Front cover 'O' ring Inspection window gasket	Every removal Every 12 months
2	Geared motor unit	Top up/replenish with recommended OEP gear oil.	In-line with manufacturers recommendation
3	Lubricant	Flush out casing and refill	Every 6 months or hose change (whichever soonest)

Lubrication

CAUTIONS

EQUIPMENT DAMAGE. At all times the pump housing needs to be at least one third full with Verderlube lubricant (future front covers will incorporate a level plug which can be used to check/maintain lubricant level).

EQUIPMENT DAMAGE. Check compatibility of the lubricant with the product being pumped; Verderlube is a specially formulated food grade lubricant containing glycerine. In most cases this is a very stable compound, but can react when mixed with certain types of substance.

EQUIPMENT DAMAGE. Do not use Verderlube with nitrogenous compounds, concentrated acids or strong oxidizing agents. If you are unsure of the chemical compatibility of your product with Verderlube, your Verder distributor will offer advice and if necessary, supply an alternative lubricant such as Verdersil.

6 The standard lubricant used is Verderlube®, which is a specially formulated food grade lubricant. An important function of Verderlube® is to provide a thermal transfer mechanism to get the heat generated in the hose away from it and to provide heat transfer from the lube to the housing and away.

7 A daily visual inspection of lubrication levels is essential for safe and efficient operation of the pump. The lubricant is blue in colour and can be used at temperatures ranging from -40°C up to 50°C (-40°F up to 122°F). During normal operation this lubricant will discolour, turning black. This is perfectly normal. The pump housing needs to be filled at all times with Verderlube® or Verdersil® lubricant. As a guide it is recommended that the pump housing be filled between the two marks indicated on the front cover. Some products are not compatible with Verderlube®. Please refer to the safety data sheet in chap 2.

TABLE 2 PUMP LUBRICANTS

8 The pump must always be filled with the correct amount of lubricant to the middle level marks of the front cover. Table 2 shows the standard amount of lubricant supplied with Dura pumps in litres and US gallons.

Serial (1)	Pump size (2)	Lubricant (3)	Standard Quantity Supplied with Pump (US Gallons) (4)	Part Number (5)
1	Dura 10	Verderlube® VerderSil®	0.5 (0.1)	129.1418 129.1372
2	Dura 15	Verderlube® VerderSil®	0.5 (0.1)	129.1418 129.1372
3	Dura 25	Verderlube® VerderSil®	2.5 (0.7)	129.2379 129.2505
4	Dura 35	Verderlube® VerderSil®	2.5 (0.7)	129.2379 129.2505

Maintenance

9 Maintenance checks should be carried out to help support the pumps operation and long life, and to reduce the high cost of major component failure. If there are no customer maintenance schedules then please contact UK Service/Repair (+44) 113 222 0282 or your local distributor workshop for service details. Table 3 should be used as an aide to carry out external checks.

TABLE 3 MAINTENANCE

Serial (1)	Task (2)	Frequency (3)	Action (4)
1	Check pump and gearbox for leaks and damage	Before pump start up. Daily visual inspection. Scheduled intervals during operation	Repair leaks and damage before operating the pump. Replace components as necessary. Refer to geared motor unit instruction manual. Clean up any spillage.
2	Check pump housing lubrication level	Before pump start up. Daily visual inspection. Scheduled intervals during operation	Lubricant can evaporate away over time. Lubricant level should be between the 2 marks on the pump front cover. Do not operate the pump if the level is too low or too high. Top up as required.
3	Check geared motor unit lubrication level.	Before pump start up. Daily visual inspection. Scheduled intervals during operation	Refer to geared motor unit instruction manual.
4	Check pump for unusual temperatures or noise in operation.	Before pump start up. Daily visual inspection. Scheduled intervals during operation	Unusual temperatures or noise can be an indication of imminent failure.
5	Replace pump housing lubricant	After every hose change or every six months, whichever is the sooner. When required after inspection.	Lubricant is very important for the safe and efficient running of the pump.

(continued)

TABLE 3 MAINTENANCE (continued)

Serial (1)	Task (2)	Related Sub Components (3)	Action (4)
6	Replace hose	Annually. 75% of the life of previous hoses for same application. When required after inspection. When flow has dropped by 25% of nominal.	Preventative maintenance. Having pumps on standby is good practice whilst others are being worked on. Check bearing free play and function on hose replacement.
7	Check pump housing and rotor internally	Annually. On replacing the hose.	Worn or damaged surfaces gives rise to premature hose failure. Replace worn components. Check bearing play and function.
8	Replace bearings	30,000 running hours. When damage is suspected.	Unusually high temperatures or noise could be an indication of imminent failure. Check bearing play and function on hose replacement.
9	Replace shaft seal	On replacing the bearings. When damage is suspected.	The shaft seal protects the bearings and prevents pumped media from escaping the pump housing.
10	Replace shaft	On replacing the bearings. When damage is suspected.	The shaft seal protects the bearings and prevents pumped media from escaping the pump housing.

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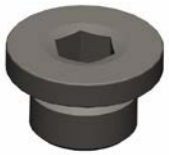
CHAPTER 6

SPARE PARTS LISTS
CONTENTS

Dura 10 Spare Parts List

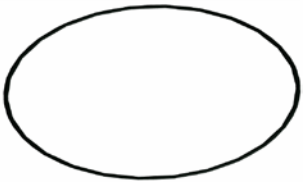
1 Table 1 contains a list of spares to help maintain and repair the Dura 10 peristaltic pump. Your Verder distributor will be able to advise you where genuine Verderflex® spares can be purchased.

TABLE 1 DURA 10 SPARE PARTS LIST

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
1	Housing	139.1092	1	
2	Drain plugs 1/8” BSPP Brass Nickel Plated		2	
3	Shaft Mounting Kit Comprising: Bearings and Viton Lip seal	139.1450.VT	2 1	
4	Shaft Mounting Kit Comprising: Bearings and PFTE Lip seal	139.1450.PT	2 1	
5	Filler tube	139.0759.D	1	

(continued)

TABLE 1 DURA 10 SPARE PARTS LIST (continued)

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
6	Mounting frame assembly	139.2314.A	1	
7	Drive shaft assembly	139.1554	1	
8	Mounting frame fasteners M6 x 12 – 8.8 Steel BZP	139.7020	4	
9	Crescent clip (Pack of 50)	139.7030.50 (Large) 139.7060.50 (Small)	1	
10	Rotor Standard pressure High pressure	 139.2117.3.CI 139.2117.3 139.2117 139.2117.CI	 1 1 1 1	
11	Rotor screws M6 x 12 – 10.9 Steel BZP		8	
12	Front cover ‘O’ ring NBR	139.0075	1	

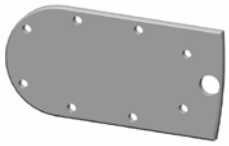
(continued)

TABLE 1 DURA 10 SPARE PARTS LIST (continued)

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
13	Front cover assembly	139.1039	1	
14	Front cover screws M6 x 16 – 8.8 Steel BZP		8	
15	Torque arm assembly	139.1210.A	1	
16	Torque arm bush	139.1479	1	
17	Torque arm bolt M6 x 30 Socket Head Shoulder 12.9		1	
18	Universal port flange assembly	139.1334.A 139.1334.P 139.1334.V 139.1334.H	2 2 2 2	
19	Port flange screws M6 x 30 – 12.9 Steel BZP		8	

(continued)

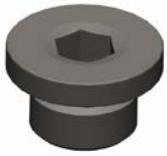
TABLE 1 DURA 10 SPARE PARTS LIST (continued)

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
20	Hose option NR/White	139.0001	1	
21	Hose option NBR/Yellow	139.0512	1	
22	Hose option NBRF/Yellow + White	139.2021	1	
23	Hose option Hypalon® /Green	139.2010	1	
24	Hose option EPDM/Red	139.0010	1	
25	Front cover Inspection window	139.1221.P	1	
26	Inspection window gasket	139.1234	1	
27	Spring washer M8 Bright Zinc Plate Steel		1	No Image

Dura 15 Spare Parts List

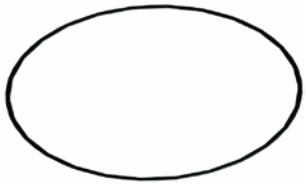
2 Table 2 contains a list of spares to help maintain and repair the Dura 15 peristaltic pump. Your Verder distributor will be able to advise you where genuine Verderflex® spares can be purchased.

TABLE 2 DURA 15 SPARE PARTS LIST

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
1	Housing	139.1093	1	
2	Drain plugs ⅛" BSPP Brass Nickel Plated		2	
3	Shaft Mounting Kit Comprising: Bearings and Viton Lip seal	139.1451.VT	2 1	
4	Shaft Mounting Kit Comprising: Bearings and PFTE Lip seal	139.1451.PT	2 1	
5	Filler tube	139.0759.D	1	
6	Mounting frame assembly	139.2315.A	1	

(continued)

TABLE 2 DURA 15 SPARE PARTS LIST (continued)

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
7	Drive shaft assembly	139.1559	1	
8	Mounting frame fasteners M6 x 12 – 8.8 Steel BZP		4	
9	Crescent clip (Pack of 50)	139.7031.50 (Large) 139.7061.50 (Small)	1 1	
10	Rotor Standard pressure High pressure	 139.2369.3.CI 139.2369.3 139.2369 139.2369.CI	 1 1 1 1	
11	Rotor screws M6 x 12 – 10.9 Steel BZP		8	
12	Front cover ‘O’ ring NBR	139.0076	1	
13	Front cover assembly	139.1040	1	

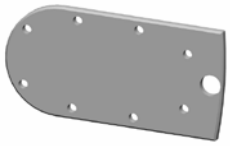
(continued)

TABLE 2 DURA 15 SPARE PARTS LIST (continued)

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
14	Front cover screws M6 x 16 – 8.8 Steel BZP		8	
15	Torque arm assembly	139.1220.A	1	
16	Torque arm bush	139.1479	1	
17	Torque arm bolt 8 (M6) x 30 12.9 Steel		1	
18	Universal port flanges	139.1335.A 139.1335.P 139.1335.V 139.1335.H	2 2 2 2	
19	Port flange screws M6 x 30 – 12.9 Steel BZP		8	
20	Hose option NR/White	139.0002	1	

(continued)

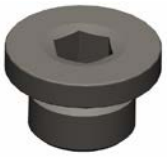
TABLE 2 DURA 15 SPARE PARTS LIST (continued)

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
21	Hose option NBR/Yellow	139.0513	1	
22	Hose option NBRF/Yellow + White	139.2022	1	
23	Hose option Hypalon® /Green	139.2011	1	
24	Hose option EPDM/Red	139.0011	1	
25	Front cover Inspection window	139.1222.P	1	
26	Inspection window gasket	139.1235	1	
27	Spring washer M8 Bright Zinc Plate Steel		1	No Image

Dura 25 Spare Parts List

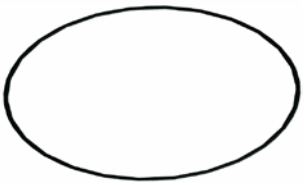
3 Table 3 contains a list of spares to help maintain and repair the Dura 25 peristaltic pump. Your Verder distributor will be able to advise you where genuine Verderflex® spares can be purchased.

TABLE 3 DURA 25 SPARE PARTS LIST

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
1	Housing	139.1094	1	
2	Drain plugs ⅛" BSPP Brass Nickel Plated	139.7010	2	
3	Shaft Mounting Kit Comprising: Bearings and Viton Lip seal	139.1452.VT	2 1	
4	Shaft Mounting Kit Comprising: Bearings and PFTE Lip seal	139.1452.PT	2 1	
5	Filler tube	139.0760	1	
6	Mounting frame assembly	139.2326.A	1	

(continued)

TABLE 3 DURA 25 SPARE PARTS LIST (continued)

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
7	Drive shaft assembly	139.1160	1	
8	Mounting frame fasteners M8 x 12 – 8.8 Steel BZP		4	
9	Crescent clip (Pack of 50)	139.7032.50 (Large) 139.7061.50 (Small)	1 1	
10	Rotor Standard pressure High pressure	 139.2049.3.CI 139.2049.CI 139.2049	 1 1 1	
11	Rotor screws M8 x 15 – 8.8 Steel BZP		8	
12	Front cover ‘O’ ring NBR	139.0077	1	
13	Front cover Assembly	139.1041	1	

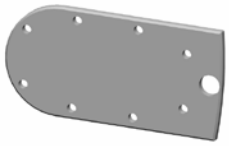
(continued)

TABLE 3 DURA 25 SPARE PARTS LIST (continued)

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
14	Front cover screws M6 x 12 – 8.8 Steel BZP		8	
15	Torque arm assembly	139.1230.A	1	
16	Torque arm bush	139.2479	1	
17	Torque arm bolt 10 (M8) x 40 Socket Head Shoulder 12.9 Steel		1	
18	Universal port flanges	139.1336.A 139.1336.P 139.1336.V	2 2 2	
19	Port flange screws M8 x 45 – 12.9 Steel BZP		8	
20	Hose option NR/White	139.0003	1	

(continued)

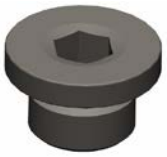
TABLE 3 DURA 25 SPARE PARTS LIST (continued)

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
21	Hose option NBR/Yellow	139.0514	1	
22	Hose option NBRF/Yellow + White	139.2023	1	
23	Hose option Hypalon® /Green	139.2012	1	
24	Hose option EPDM/Red	139.0012	1	
25	Front cover Inspection window	139.1223.P	1	
26	Inspection window gasket	139.1236	1	
27	Spring washer M10 Bright Zinc Plate Steel		1	No Image

Dura 35 Spare Parts List

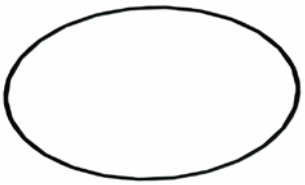
4 Table 4 contains a list of spares to help maintain and repair the Dura 35 peristaltic pump. Your Verder distributor will be able to advise you where genuine Verderflex® spares can be purchased.

TABLE 4 DURA 35 SPARE PARTS LIST

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
1	Housing	139.1095	1	
2	Drain plugs ⅛" BSPP Brass Nickel Plated	139.7010	2	
3	Shaft Mounting Kit Comprising: Bearings and Viton Lip seal	139.1453.VT	2 1	
4	Filler tube	139.0761	1	
5	Mounting frame assembly	139.2327.A	1	
6	Drive shaft assembly	139.1161 139.1261 (Universal)	1	
7	Mounting frame fasteners M10 x 16 – 12.9 Steel BZP		4	

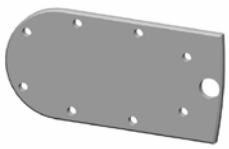
(continued)

TABLE 4 DURA 35 SPARE PARTS LIST (continued)

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
8	Crescent clip (Small - Pack of 50) (Large - Pack of 25)	139.7031.50 139.7033.25	1 1	
9	Rotor Standard pressure	139.2050.3.CI	1	
10	Rotor screws M10 x 20 – 12.9 Steel BZP		8	
11	Front cover ‘O’ ring NBR	139.0078	1	
12	Front cover assembly	139.1042	1	
13	Front cover screws M8 x 16 – 12.9 Steel BZP		8	
14	Torque arm assembly	1) A352/W86 139.1540.A 2) NMRVP90 139.1240.A 3) SK92672 139.1340.A 4) SK15175 139.1440.A	1	

(continued)

TABLE 4 DURA 35 SPARE PARTS LIST (continued)

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
15	Torque arm bush	139.2479	1	
16	Torque arm bolt M10 x 50 – 8.8 Steel BZP		1	
17	Universal port flange assembly	139.1337.A	2	
18	Port flange screws M8 x 45 – 12.9 Steel BZP		8	
19	Hose option NR/White	139.0004	1	
20	Hose option Hypalon/Green	139.2013	1	
21	Hose option EPDM/Red	139.0013	1	
22	Front cover Inspection window	139.1224.P	1	

(continued)

TABLE 4 DURA 35 SPARE PARTS LIST (continued)

Serial (1)	Item Description (2)	Part No (3)	Qty (4)	Image (5)
23	Inspection window gasket	139.1233	1	
24	Insp cover fasteners M6 x 16 – 8.8 Steel BZP		10	No Image
25	Spring washer M10 Bright Zinc Plate Steel		1	No Image

TABLE 5 PUMP LUBRICANTS

The pump must always be filled with the correct amount of lubricant to the middle level marks of the front cover. Table 2 shows the standard amount of lubricant supplied with Dura pumps in litres and US gallons.

Serial (1)	Pump size (2)	Lubricant (3)	Standard Quantity Supplied with Pump (US Gallons) (4)	Part Number (5)
1	Dura 10	Verderlube® VerderSil®	0.5 (0.1)	129.1418 129.1372
2	Dura 15	Verderlube® VerderSil®	0.5 (0.1)	129.1418 129.1372
3	Dura 25	Verderlube® VerderSil®	2.5 (0.7)	129.2379 129.2505
4	Dura 35	Verderlube® VerderSil®	2.5 (0.7)	129.2379 129.2505