Dutypoint Systems

FR

Compact Twin/Triple Fixed Speed Booster Sets

FULL USER GUIDE

Please Note: If the system that you have purchased has been modified, updated or otherwise altered from the Dutypoint standard range, additional information applicable to the change(s) will be provided in Appendix D at the end of this manual.

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SAFETY

Important Health & Safety Information

Please read this section before attempting to use or work on your FRPumpset as it contains important Safety Information and the System Operating Limitations.

User Guide - Document Conventions

Throughout this manual, text may be accompanied by one of the following icons. Where these occur the conventions shown below are applied.

In general these conventions will also apply to OEM Manufacture's manuals that are included within this User Guide, however variations may occur, but these will be redefined at the beginning of their manual.

DANGER — **Denotes attention to the possibility of the risk of personal injury or damage to adjacent property if the information is ignored.**

ELECTRIC SHOCK — **Denotes attention to the possibility of life-threatening electric shock if the information is ignored.**

or

WARNING

WARNING — **Denotes attention to a condition that may result in under-performance or damage to the equipment if the information is ignored.**

NOTE — **Denotes attention to an important factor applicable to the action being performed.**

PLEASE READ THE FOLLOWING INFORMATION WHICH IS PROVIDED FOR YOUR SAFETY

United Kingdom Health & Safety at Work Act 1974

Dutypoint responsibility

Section 6(a) of this Act requires manufacturers to advise their customers on the safety and the handling precautions to be observed when installing, operating, maintaining and servicing their products. The user's attention is therefore drawn to the following:

- The appropriate sections of this manual must be read before working on the equipment.
- Installation, operating and maintenance must only be carried out by suitably trained/qualified personnel.
- Normal safety precautions must be taken and appropriate procedures observed to avoid accidents.

Refer to DUTYPOINT SYSTEMS for any technical advice or product information.

Customer / Contractor responsibility

It is the responsibility of the customer and/or the contractor:

- To ensure that anyone working on the equipment is wearing all necessary protective gear/clothing.
- Is aware of appropriate health & safety warnings
- has read the information in this section of the manual.

"Hand Control" Mode

With control panels that provide a "HAND" option the following applies:

In the 'HAND' position the pump(s) controlled by the switch will normally run at full speed and completely independently of any control devices, and can result in pump(s) running against a closed valve head if there is no draw.

This can cause the system to be maintained at the maximum pressure produced by the pump plus any incoming pressure and additional pressure caused by water surge and can potentially damage the pump and other parts of the system.

The 'HAND' option should only be used with a competent operator in attendance, or when there is a continued demand sufficient to provide constant flow through the pumps to maintain the running pressure of the system to an acceptable level.

Pump Servicing

Before attempting to open any unit or service a pump:

- Familiarise yourself with the relevant contents of this manual.
- Installation, maintenance and repair work must only be carried out by trained, skilled and suitably qualified personnel.

- Disconnect or lock-out the power source to ensure that the pump(s) will remain inoperative.
  Locking out the equipment by switching off the release mechanism or set value WILL NOT prevent accidental starting of the motor.
- Allow the pump(s) to cool if over-heated.
- **CLOSE** the isolating valves on the suction and discharge connections of the affected pump(s).

- **VENT** the pump(s) slowly and cautiously – *Refer to Section 4 of this manual.*
- **DRAIN** the pump(s).

Electrical Safety

High voltages

Especially applicable when Variable Speed Controllers (Inverters) are fitted.

- When the inverter variable speed drive head is connected to the power supply the components of the power unit – as well as certain components of the master control unit – are also connected to the power supply.

TOUCHING THESE COMPONENTS CAN SERIOUSLY ENDANGER LIFE!

- Before removing the frequency inverter cover, the system must be disconnected from the power supply. After switching off the power supply **wait at least 5 minutes** before starting work on or in the inverter drive head – the capacitors in the intermediate circuit must be given time to discharge completely via the discharge resistors.
  Up to 800 volts can be present – if there are faults this can be higher.
- All work carried out when the frequency inverter is open must be performed only by suitably qualified and properly authorised personnel.
  When connecting external control wires care must be taken not to short circuit adjacent components. Bare cable ends which are not in use must be insulated.

THE SYSTEM MUST ONLY BE OPERATED WHEN IT HAS BEEN CORRECTLY EARTHED AND PIPES BONDED TO EARTH IN ACCORDANCE WITH IEE REGULATIONS

Electronic safety devices

- The inverter drive heads used in *Dutypoint Systems* Pumpsets contain electronic safety devices which switch off the control element in the event of a fault developing.
  The motor will have zero current but will remain energised as it stops.
- The motor can also be stopped by ‘mechanical blocking’.
- If it is switched off electronically, the motor is disconnected from the mains voltage supply via the electronics in the frequency converter.
  The motor is not voltage-free in the circuit itself.
- Voltage fluctuations and power failures (temporary outages) can cause the motor to switch itself off.
  Repair of faults can cause the motor to start up again unexpectedly!

High voltage testing may damage electronic components

- High voltage tests of the inverter or the motor may damage the electronic components.
  Bridge before the incoming/outgoing terminals L-L2-L3 and U-V-W.
- To avoid incorrect metering by capacitors incorporated in the electronic circuits, isolate the motor from the inverter drive head.

Operating Limits For Standard *Dutypoint* Pumpsets

Type of pumped liquids.	Water with no gas or aggressive substances.
Maximum pumped liquids temperature.	+35°C for domestic uses. (EN 60335-2-41). 40°C for other purposes.
Minimum pumped liquid temperature.	1°C to avoid icing.
Operating ambient temperature.	+5°C to 40°C for indoor installation. (CEI EN 60439-1).
Relative humidity.	Max 50% at 40°C.
Air impurities.	The air must be clean and free of acid vapours, corrosive gases and excessive amounts of dust.
Storage temperature.	+5°C to 50°C.
Suction Conditions. *Refer to notes on Net Positive Suction Head (NPSH) included in Appendix C*	Minimum positive pressure 0.1 Bar, Maximum positive pressure 0.5 Bar.

1

Introduction

This Section introduces the FR Compact Twin/ Triple Fixed Speed Booster Sets and provides an overview of the Pumps and Controllers.

Welcome

Thank you for purchasing one of the **DUTYPOINT FR Compact Twin/Triple Fixed Speed Booster Sets**.

Dutypoint Systems is a Division of Elmbridge Pump Company and manufactures pressure boosting pump systems. Since its beginnings as a supplier of pumpsets to the water industry the name 'Dutypoint' has become synonymous with unrivalled quality, service and reliability.

This manual is compiled as a composite to include both the *Dutypoint* package information and the specific manufacturer's information necessary for the installation, safe operation and user maintenance of your booster set.

Please read and familiarise yourself with the contents of this manual.

Fig. 1-1 The Twin FR Fixed Speed Booster Set

FR Series Overview

The FR Series of fixed speed pump sets provides a selection of compact, efficient multistage booster sets. They are fitted with adjustable transducer-monitored speed control for operational simplicity and reliability. Setting are made through a keypad and LCD display mounted on the Control Panel.

The twin pump set has been designed to be only 650mm wide to fit through a standard internal door opening, without compromising performance, ease of maintenance and reliability.

Technical features

- Fixed speed pumps.
- Electronic pressure sensing and control.
- Cyclic duty changeover.
- Adjustable minimum run timers.
- Common alarm volt-free contact.
- Hours run meter and duty cycle counter.
- Automatic/manual selectors.
- Local electrical isolation.
- Integral antivibration mountings.
- Pumps easily removable for overhaul.

Options

- Pressure reducing valve.
- Additional pressure vessel.
- Flexible expansion joints.

Pumps

The FR Series uses ITT Lowara e-SV Vertical Multistage Centrifugal Pumps. These are highly reliable, technologically advanced, multipurpose stainless steel pumps with nominal capacities of 5, 10, 15, 22 m³/h.

With a head up to 330m and a maximum operating pressure of 40 bar, the pumps can achieve high delivery rates and support liquid temperatures of -30 to 120°C.

All parts in contact with liquid are constructed from stainless steel and are suitable for drinking water applications.

Fig. 1-2 ITT Lowara e-SV Pumps

The e-SV pumps provide increased energy saving as they are designed to maximize the performance of both the liquid end and the motor. This gives a high efficiency and a lower motor power. Minimised impeller axial thrust results in longer bearing life and enables the use of directly coupled motors. Overall construction allows for easy installation and maintenance.

Full details of the pumps are given in the manufacturer's manual republished in Appendix A of this manual.

Pump Control

To facilitate automatic operation, the pumpsets use a transducer-operated fixed-speed Programmable Pressure Control module. This is more accurate and simpler to operate than conventional electro-mechanical pressure-switch control and provides greater reliability.

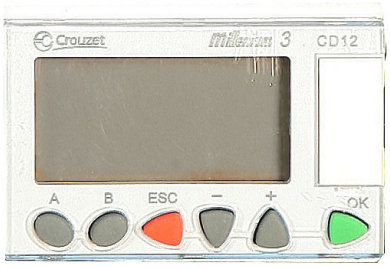


Fig. 1-3 Programmable Controller

An LCD display mounted on the control box indicates the running system information and push buttons below the display allow access to a menu for alteration of the settings.

Running information for each pump includes system pressure, hours run and number of starts. Adjustable settings include duty start and stop pressures, delays for low water cut-out and assist pump cut-in and cyclic rotation of duty.

Full details of programming the Controller are given in Section 3 of this manual.

The Control Panel

The Control Panel on the Pumpset, will be specific to the number of pumps used. Externally the panel provides user power control. Internally the unit houses protection and fault monitoring circuitry.

Power control consists of an overall System (Main) Isolator and a separate switch for each pump which is used to turn it on/off and to select manual (hand) or automatic operation.

The automatic operation mode uses a Programmable Controller (located at the top of the front panel) to monitors a Transducer System fitted to each pump.

Two overall System Indicators are provided, a white light to show *Power On* status and a red light which illuminates when a *Low Water* warning occurs.

Fig. 1-4 FR Twin Control Panel

Additionally each pumpset has a green *Pump Running* and yellow *Pump Tripped* light located above each pump switch.

Full details of the Control Panel is given in Section 3 of this manual.

Pressure Vessels

Pressure Vessels are fitted to the discharge manifold of the pump sets.

They maintain the pressure in the system when there is no demand and the pumps are stopped.

If required, additional larger vessels can be installed to reduce the number of pump starts.

Full details of the pressure vessels used are given in the manufacturer's manuals republished in Appendix B of this manual.

Fig. 1-5 The Pressure Vessel

Commissioning and Post-Installation Help

Dutypoint Systems is a Division of Elmbridge Pumps, a long-established firm of Pumping Engineers specialising in packaged Booster Pumpsets. Operating from our works and offices in Gloucester with easy access to the national motorway network, *Dutypoint* is strategically placed to provide prompt and efficient Commissioning and Maintenance service all over the UK

Commissioning

Before shipment, all Dutypoint booster sets are pre-commissioned. Whilst important procedures such as venting and rotational direction checks need to be carried out on site, parameters including pressure settings and delay timers are adjusted to suit the site conditions as advised.

In practice, a system can almost invariably be made to perform more efficiently if correctly commissioned on site.

Please note that engineer visits are priced at one visit to commission one pump set. If there are multiple units on a site, special terms can be negotiated.

To arrange a commissioning visit, please call the Technical Service Help line shown below.

Post-Installation Help

For any assistance required, call the Technical Service Help line shown below.

TECHSERVICE HELPLINE 01452 300590

2

Specifications, Configurations & Dimensions

This Section lists specifications and specific details for available variants of FR Compact Twin/ Triple Fixed Speed Booster Sets.

- ***Identifying Your Pump***
- ***General Specifications***
- ***Electrical Specifications***
- ***Arrangement & Dimensions***
- ***Pump Performance***

Identifying Your Pump

Attached to each pump is a label (fig 2-1) that identifies the type and specification.

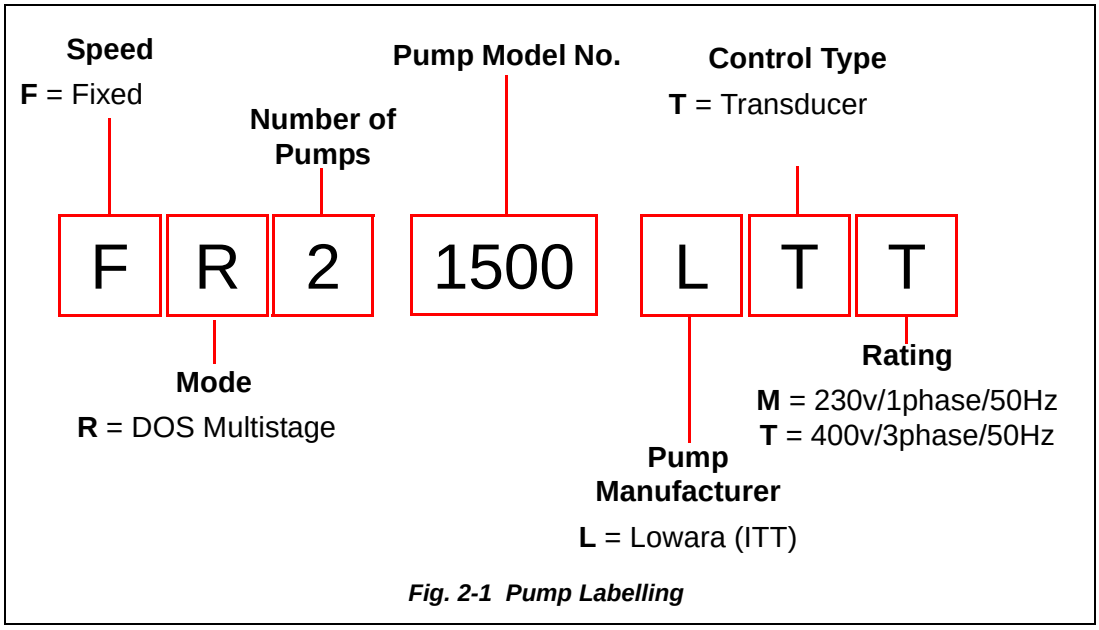


Fig. 2-1 Pump Labelling

General Specifications

Performance & Control

Flow range Twin	0.75 - 15.7 Litres/sec.
Flow range Triple	1.0 - 24.0 Litres/sec.
Pressure range	2.0 - 12.0 Bar.
Control type	0 - 10v Pressure transducer with microprocessor.

Construction

Base	Powder coated mild steel.
Manifolds	AISI 304.
Pressure Vessels	AISI 304/Butyl. PED 97/23/C Certified.
Vessel Isolation Valves	PTFE/EN12165 Cu Zn 40.
Pump Isolation Valves	PTFE/EN12165/12164.
Non-Return Valves	CF8M/AISI 316/AISI 304.
Fasteners	BS EN 3506/A2 70/BS 3643.
Gaskets	WRAS Approved BS4865.
Antivibration Mountings	Integral.
Pumps	WRAS Approved.
Casings	AISI 304.
Impellers	AISI 316L.
Max System Pressure	10 Bar. *(except where higher pressure rated vessels are required)*
Max System Temp.	40°C

Electrical Specifications

FR2 Twin Pump Range

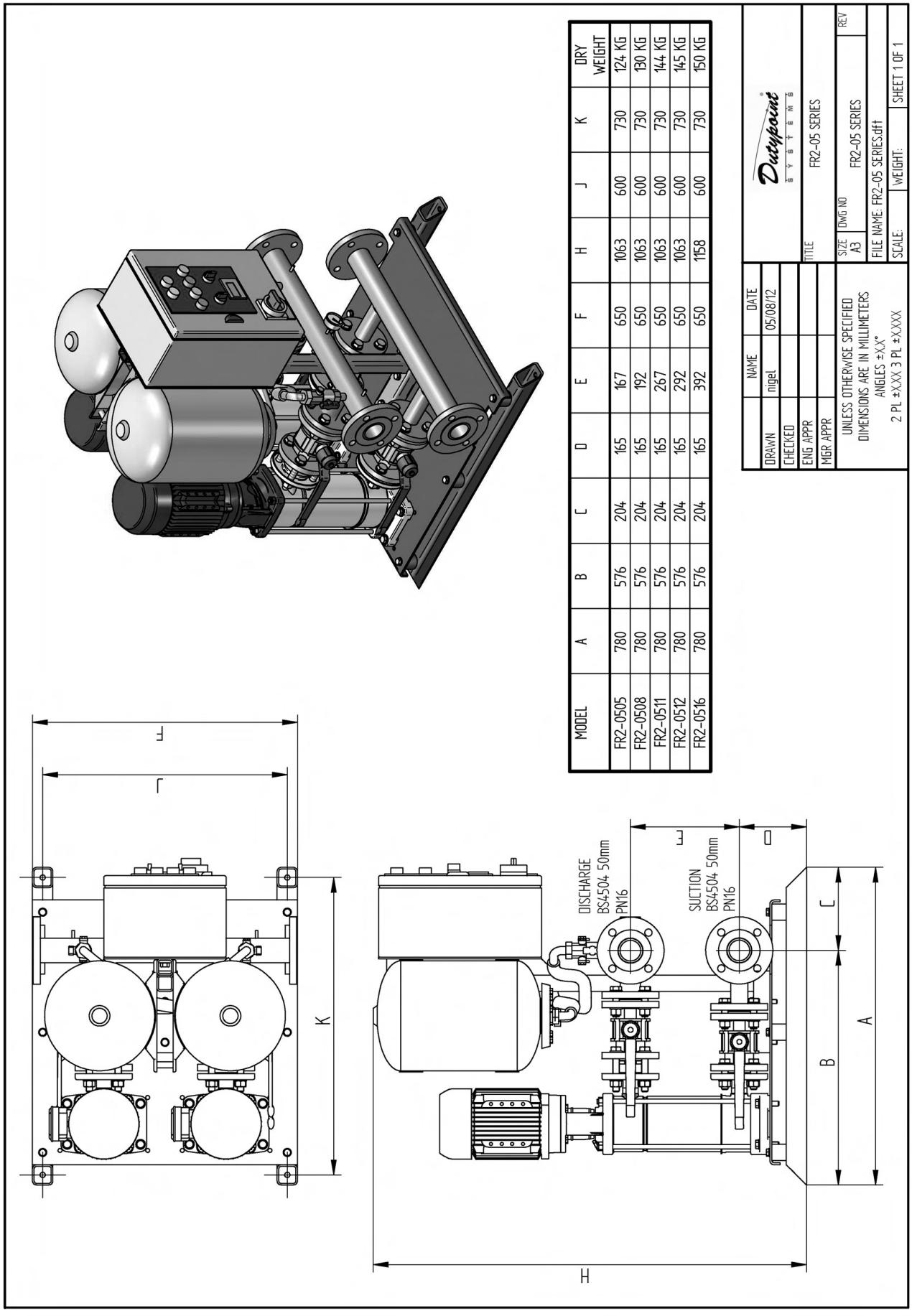
Model No.	Controller	Motor Rating	Voltage/ Phase/ Hertz	Full Load Current/ Pump	Total Full Load Current
FR2-0505-LTM	Transducer	0.75kW	230/1/50	3.05A	6.10A
FR2-0508-LTM	Transducer	1.1kW	230/1/50	4.09A	8.18A
FR2-0508-LTT	Transducer	1.1kW	400/3/50	2.36A	4.72A
FR2-0511-LTM	Transducer	1.5kW	230/1/50	9.21A	18.42A
FR2-0511-LTT	Transducer	1.5kW	400/3/50	3.02A	6.04A
FR2-0512-LTM	Transducer	2.2kW	230/1/50	12.50A	25.00A
FR2-0512-LTT	Transducer	2.2kW	400/3/50	4.64A	9.28A
FR2-0516-LTM	Transducer	2.2kW	230/1/50	12.50A	25.00A
FR2-0516-LTT	Transducer	2.2kW	400/3/50	4.64A	9.28A
FR2-0518-LTT	Transducer	3.0kW	400/3/50	6.19A	12.38A
FR2-1003-LTM	Transducer	1.1kW	230/1/50	4.09A	8.18A
FR2-1003-LTT	Transducer	1.1kW	400/3/50	2.36A	4.72A
FR2-1004-LTM	Transducer	1.5kW	230/1/50	9.21A	18.42A
FR2-1004-LTT	Transducer	1.5kW	400/3/50	3.02A	6.04A
FR2-1006-LTM	Transducer	2.2kW	230/1/50	12.50A	25.00A
FR2-1006-LTT	Transducer	2.2kW	400/3/50	4.64A	9.28A
FR2-1008-LTT	Transducer	3.0kW	400/3/50	6.19A	12.38A
FR2-1011-LTT	Transducer	4.0kW	400/3/50	7.63A	15.26A
FR2-1502-LTM	Transducer	2.2kW	230/1/50	12.50A	25.00A
FR2-1502-LTT	Transducer	2.2kW	400/3/50	4.64A	9.28A
FR2-1503-LTT	Transducer	3.0kW	400/3/50	6.19A	12.38A
FR2-1505-LTT	Transducer	4.0kW	400/3/50	7.63A	15.26A
FR2-1506-LTT	Transducer	5.5kW	400/3/50	10.40A	20.80A
FR2-1507-LTT	Transducer	5.5kW	400/3/50	10.40A	20.80A
FR2-1509-LTT	Transducer	7.5kW	400/3/50	14.00A	28.00A
FR2-2202-LTM	Transducer	2.2kW	230/1/50	12.50A	25.50A
FR2-2202-LTT	Transducer	2.2kW	400/3/50	4.64A	9.28A
FR2-2203-LTT	Transducer	3.0kW	400/3/50	6.19A	12.38A
FR2-2204-LTT	Transducer	4.0kW	400/3/50	7.63A	15.26A
FR2-2205-LTT	Transducer	5.5kW	400/3/50	10.40A	20.80A
FR2-2207-LTT	Transducer	7.5kW	400/3/50	14.00A	28.00A

FR3 Triple Pump Range

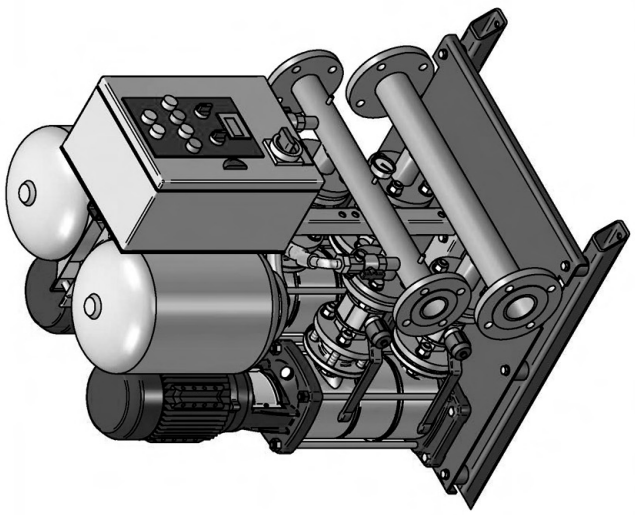
Model No.	Controller	Motor Rating	Voltage/ Phase/ Hertz	Full Load Current/ Pump	Total Full Load Current
FR3-0505-LTM	Transducer	0.75kW	230/1/50	3.05A	9.15A
FR3-0508-LTM	Transducer	1.1kW	230/1/50	4.09A	7.08A
FR3-0508-LTT	Transducer	1.1kW	400/3/50	2.36A	12.27A
FR3-0509-LTM	Transducer	1.5kW	230/1/50	9.21A	27.63A
FR3-0509-LTT	Transducer	1.5kW	400/3/50	3.02A	9.06A
FR3-0511-LTM	Transducer	1.5kW	230/1/50	9.21A	27.63A
FR3-0511-LTT	Transducer	1.5kW	400/3/50	3.02A	9.06A
FR3-0512-LTM	Transducer	2.2kW	230/1/50	12.50A	37.50A
FR3-0512-LTT	Transducer	2.2kW	400/3/50	4.64A	13.92A
FR3-0516-LTM	Transducer	2.2kW	230/1/50	12.50A	37.50A
FR3-0516-LTT	Transducer	2.2kW	400/3/50	4.64A	13.92A
FR3-1003-LTM	Transducer	1.1kW	230/1/50	4.09A	12.27A
FR3-1003-LTT	Transducer	1.1kW	400/3/50	2.36A	7.08A
FR3-1004-LTM	Transducer	1.5kW	230/1/50	9.21A	27.63A
FR3-1004-LTT	Transducer	1.5kW	400/3/50	3.02A	9.06A
FR3-1006-LTM	Transducer	2.2kW	230/1/50	12.50A	37.50A
FR3-1006-LTT	Transducer	2.2kW	400/3/50	4.64A	13.92A
FR3-1008-LTT	Transducer	3.0kW	400/3/50	6.19A	18.57A
FR3-1011-LTT	Transducer	4.0kW	400/3/50	7.63A	22.89A
FR3-1502-LTM	Transducer	2.2kW	230/1/50	12.50A	37.50A
FR3-1502-LTT	Transducer	2.2kW	400/3/50	4.64A	13.92A
FR3-1503-LTT	Transducer	3.0kW	400/3/50	6.19A	18.57A
FR3-1505-LTT	Transducer	4.0kW	400/3/50	7.63A	22.89A
FR3-1507-LTT	Transducer	5.5kW	400/3/50	10.40A	31.20A
FR3-1509-LTT	Transducer	7.5kW	400/3/50	14.00A	42.00A
FR3-2202-LTM	Transducer	2.2kW	230/1/50	12.50A	37.50A
FR3-2202-LTT	Transducer	2.2kW	400/3/50	4.64A	13.92A
FR3-2203-LTT	Transducer	3.0kW	400/3/50	6.19A	18.57A
FR3-2204-LTT	Transducer	4.0kW	400/3/50	7.63A	22.89A
FR3-2205-LTT	Transducer	5.5kW	400/3/50	10.40A	31.20A
FR3-2207-LTT	Transducer	7.5kW	400/3/50	14.00A	42.00A

Arrangement & Dimensions

FR2 05 Twin Pump Range



FR2 10 Twin Pump Range



MODEL	A	B	C	D	E	F	H	J	K	DRY WEIGHT
FR2-1003	780	577	203	170	179	650	1063	600	730	156 KG
FR2-1004	780	577	203	170	179	650	1063	600	730	166 KG
FR2-1006	780	577	203	170	211	650	1063	600	730	174 KG
FR2-1008	780	577	203	170	275	650	1127	600	730	185 KG
FR2-1011	780	577	203	170	371	650	1223	600	730	202 KG

	NAME	DATE
DRAWN	nigel	05/08/12
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±.XXX 3 PL ±.XXXX

Dutypoint SYSTEMS

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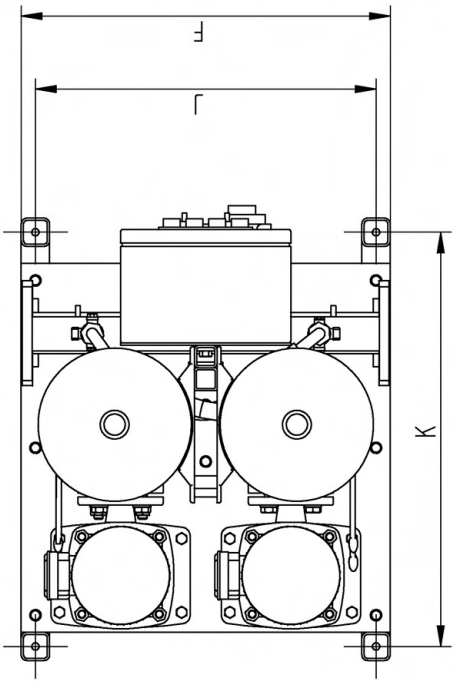
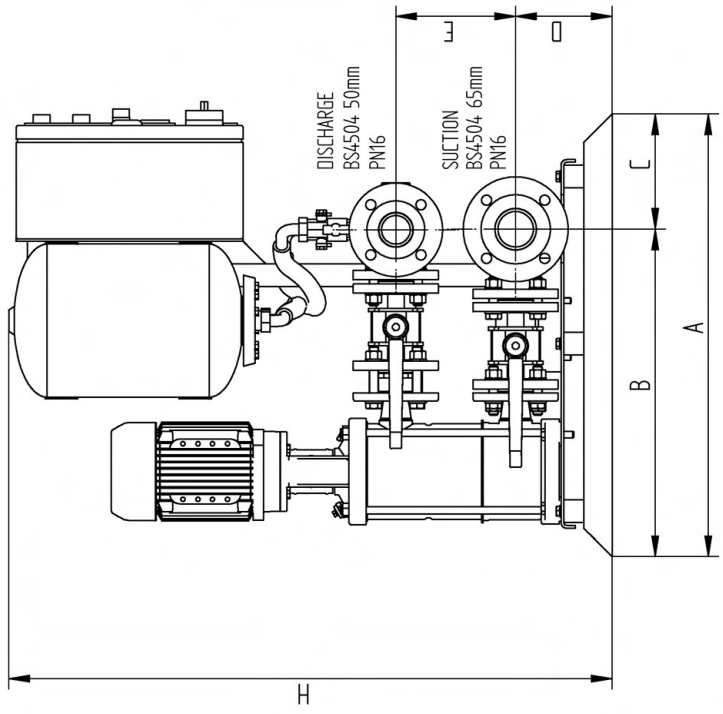
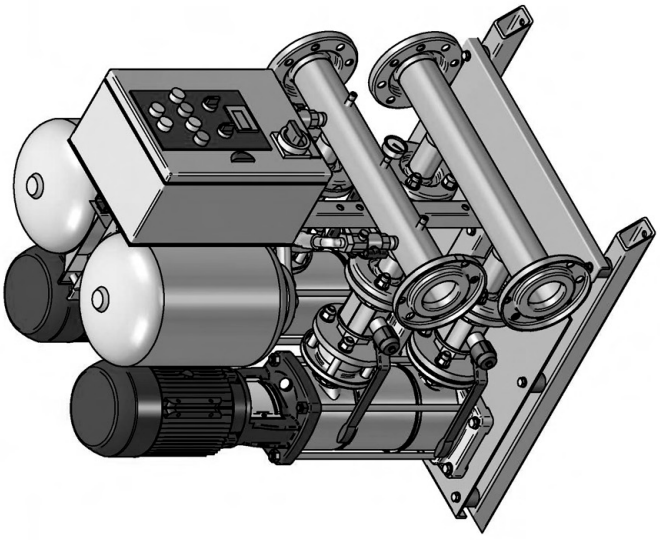




FR2 15 Twin Pump Range



MODEL	A	B	C	D	E	F	H	J	K	DRY WEIGHT
FR2-1502	850	674	176	180	211	650	1063	600	800	183 KG
FR2-1503	850	674	176	180	211	650	1063	600	800	194 KG
FR2-1505	850	674	176	180	259	650	1113	600	800	210 KG
FR2-1507	850	674	176	180	355	650	1213	600	800	258 KG
FR2-1509	850	674	176	180	451	650	1313	600	800	302 KG

	NAME	DATE
DRAWN	nigel	09/05/12
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±X.XX 3 PL ±X.XXX

Dutypoint SYSTEMS

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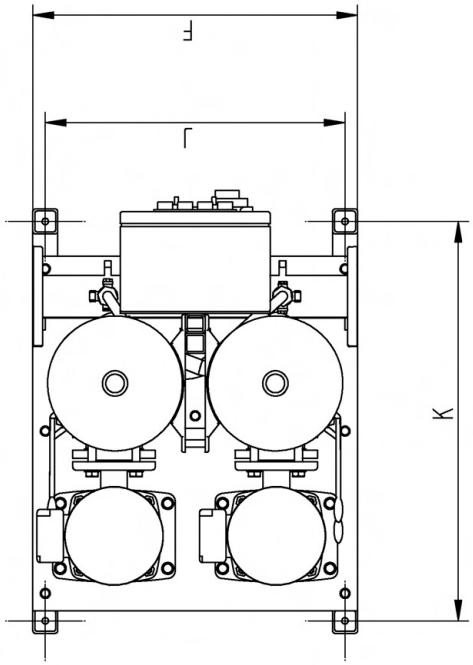
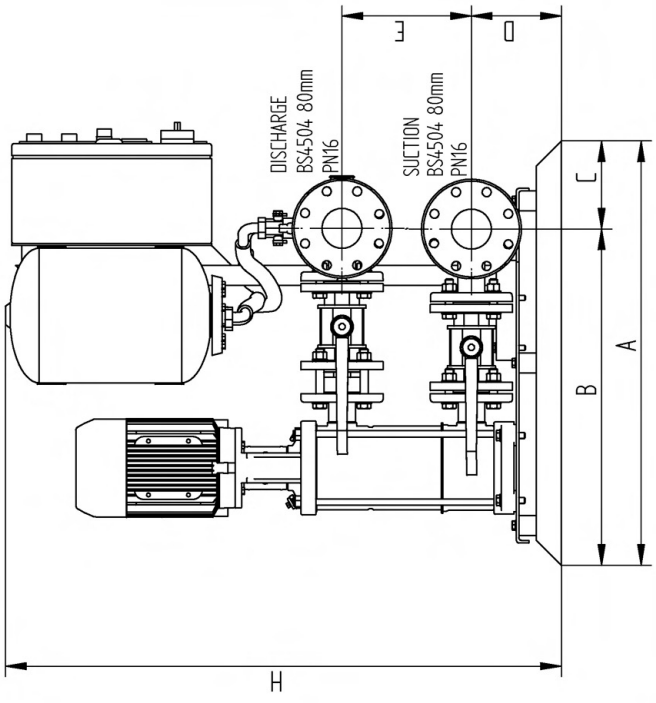
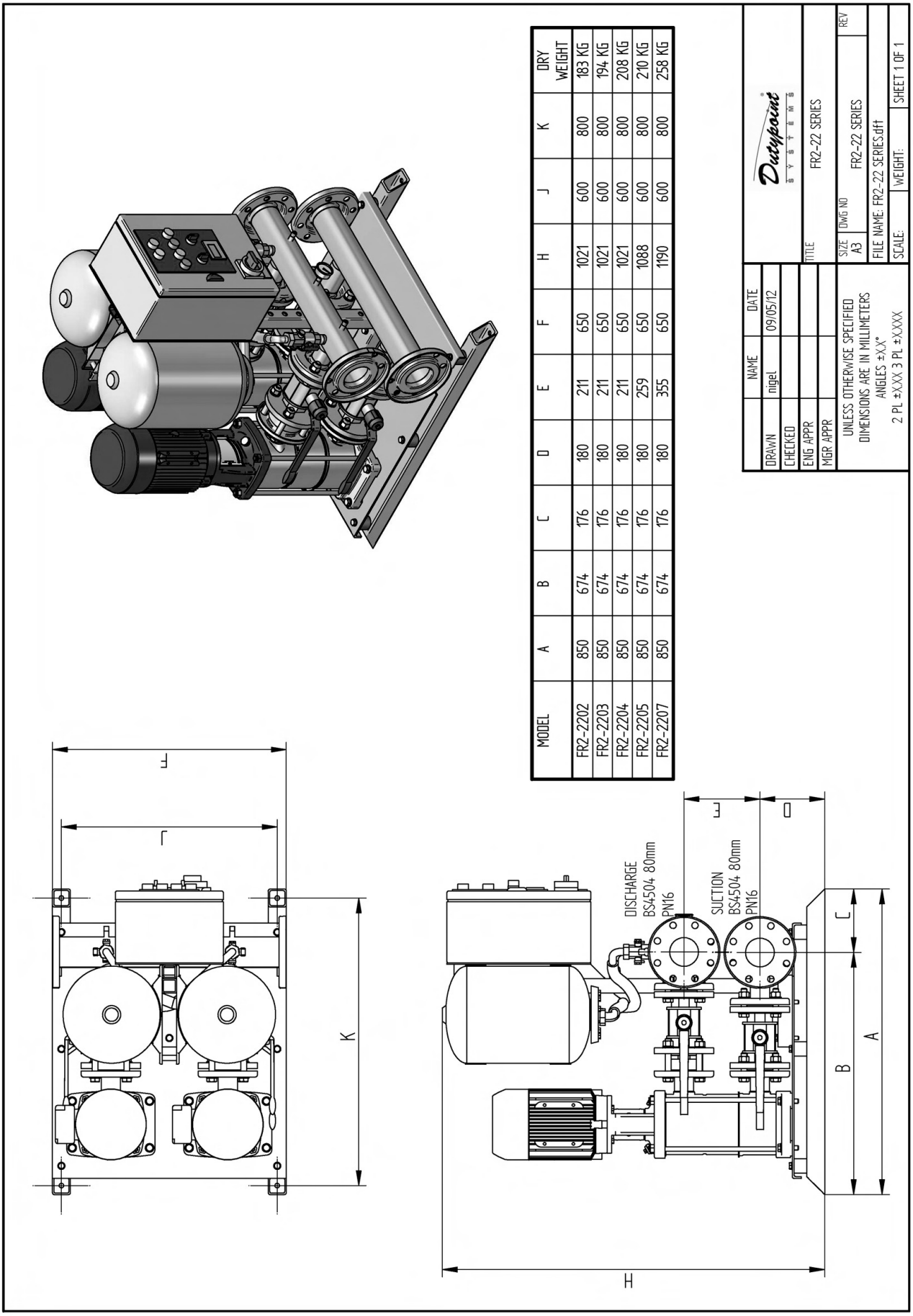
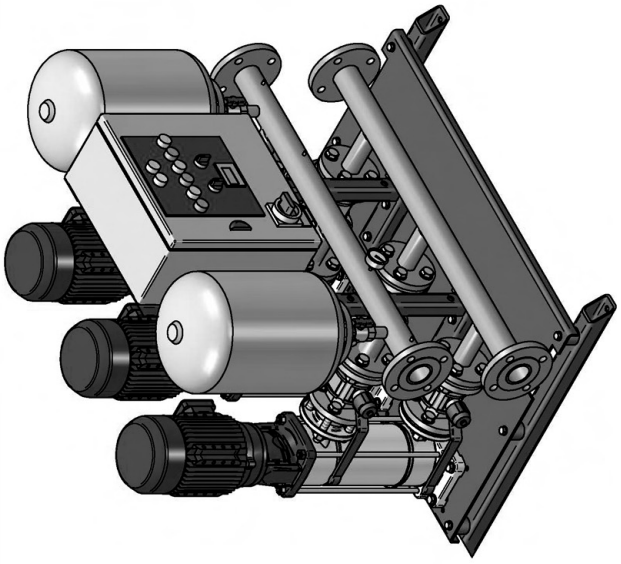




FR2 22 Twin Pump Range



FR3 05 Triple Pump Range



MODEL	A	B	C	D	E	F	H	J	K	DRY WEIGHT
FR3-0505	780	576	204	165	167	950	1025	900	730	161 KG
FR3-0508	780	576	204	165	192	950	1025	900	730	170 KG
FR3-0509	780	576	204	165	217	950	1025	900	730	189 KG
FR3-0511	780	576	204	165	267	950	1025	900	730	192 KG
FR3-0512	780	576	204	165	292	950	1059	900	730	194 KG
FR3-0516	780	576	204	165	392	950	1158	900	730	200 KG

	NAME	DATE
DRAWN	nigel	09/05/12
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS ANGLES ±X.X° 2 PL ±.XX 3 PL ±.XXX

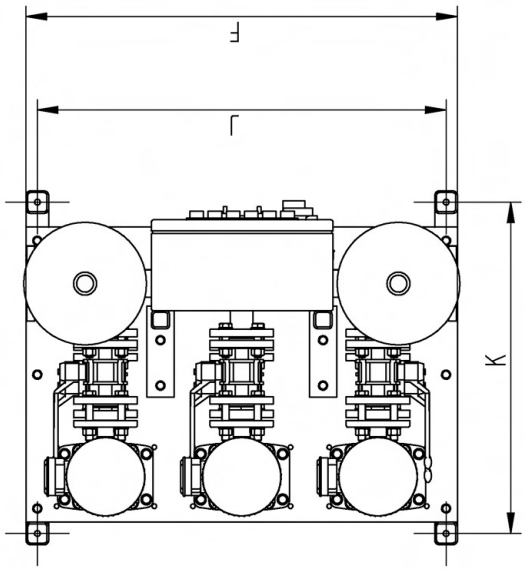
TITLE

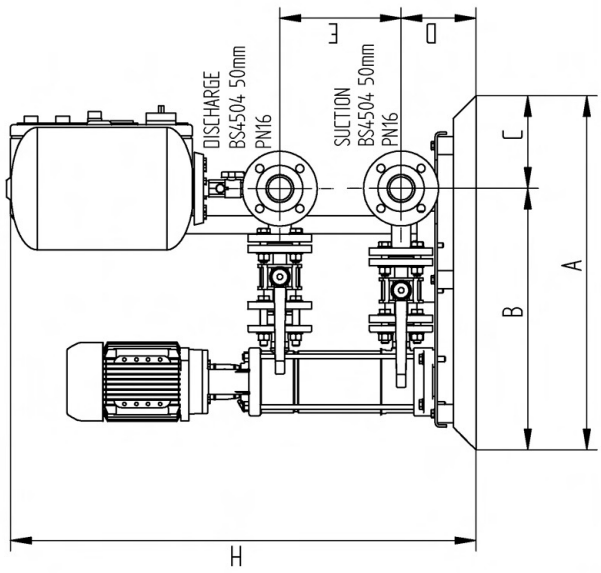
Dutypoint SYSTEMS

SIZE A3 | DWG NO FR3-0511-LTM | REV

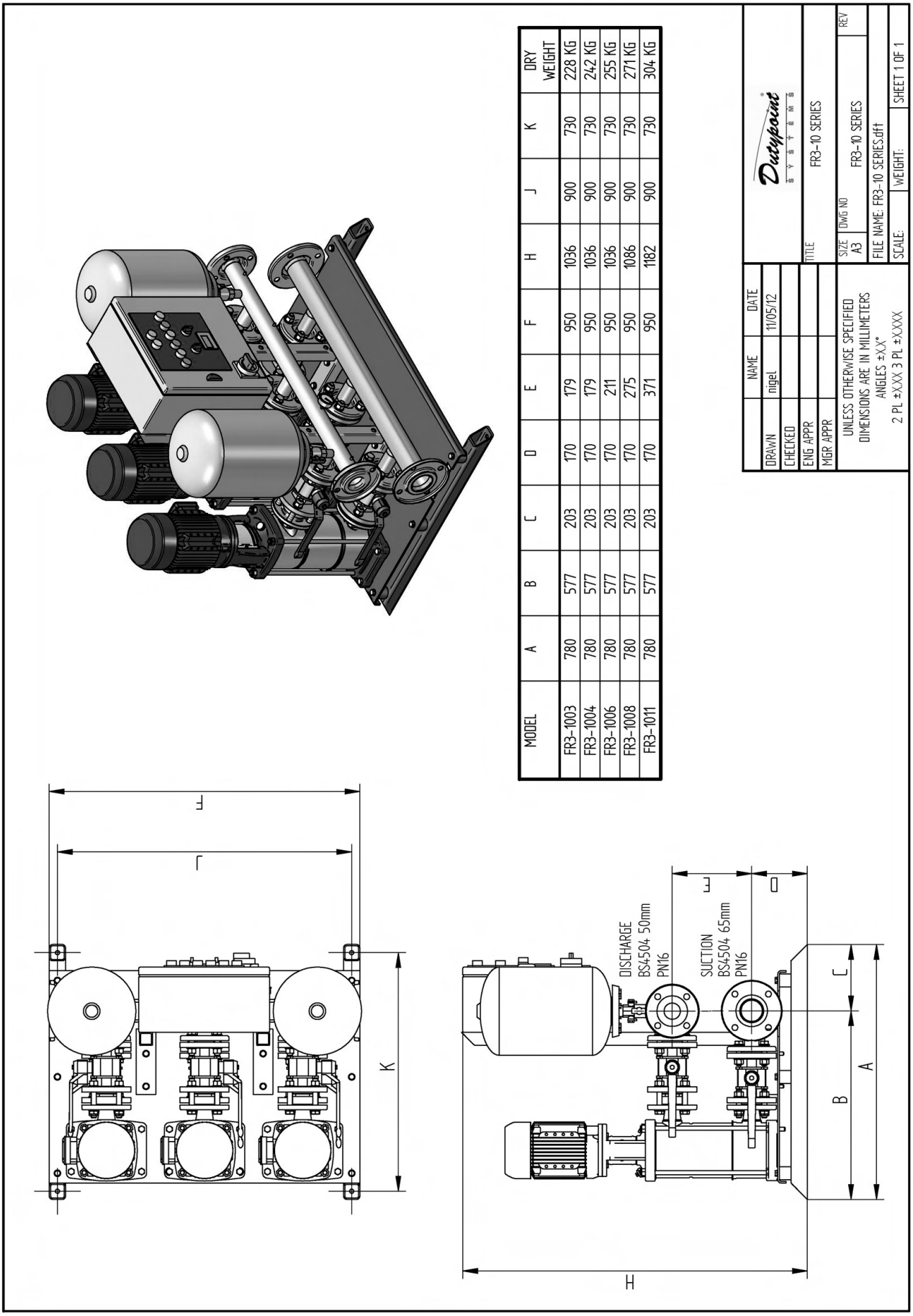
FILE NAME: FR3-05 SERIES.dft

SCALE: | WEIGHT: | SHEET 1 OF 1

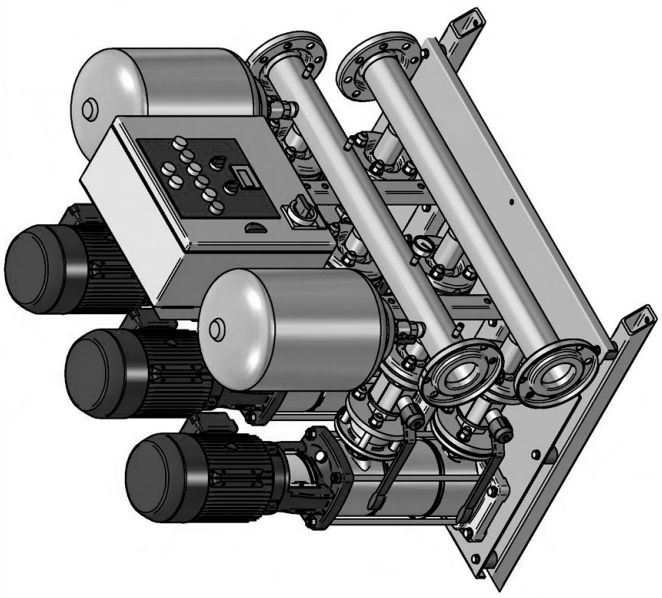




FR3 10 Triple Pump Range



FR3 15 Triple Pump Range



MODEL	A	B	C	D	E	F	H	J	K	DRY WEIGHT
FR3-1502	850	674	176	180	211	975	1021	925	800	252 KG
FR3-1503	850	674	176	180	211	975	1021	925	800	268 KG
FR3-1505	850	674	176	180	259	975	1088	925	800	292 KG
FR3-1507	850	674	176	180	355	975	1190	925	800	363 KG
FR3-1509	850	674	176	180	451	975	1288	925	800	429 KG

	NAME	DATE
DRAWN	nigel	11/05/12
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±.XX 3 PL ±.XXX

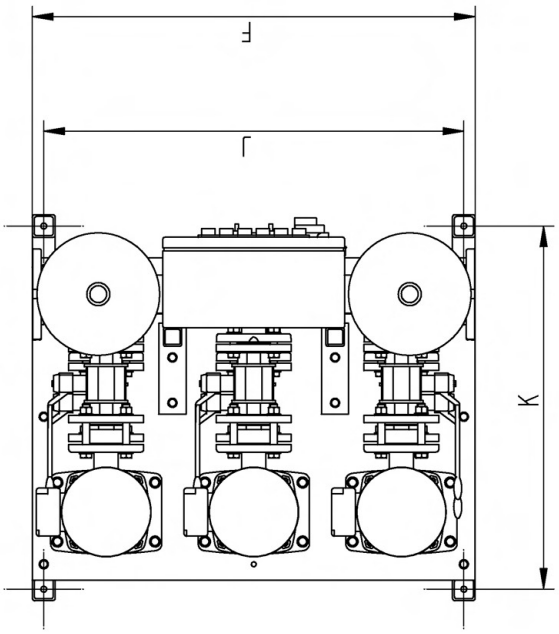
Dairypoint SYSTEMS

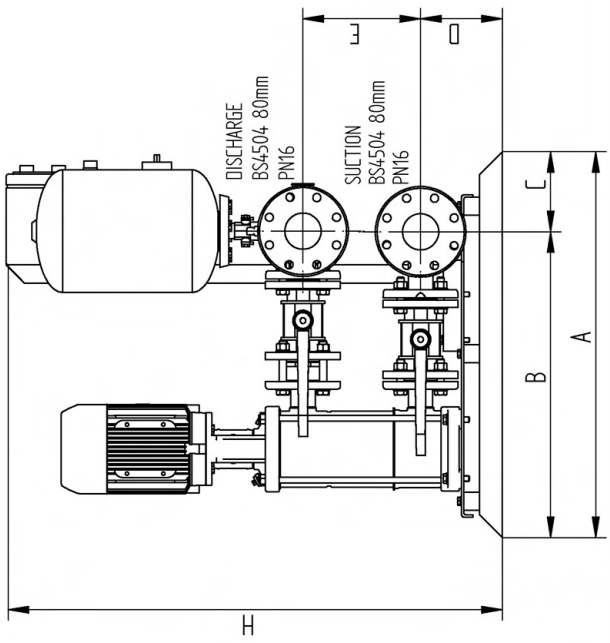
TITTLE

SIZE A3 | DWG NO FR3-1505-LTT | REV

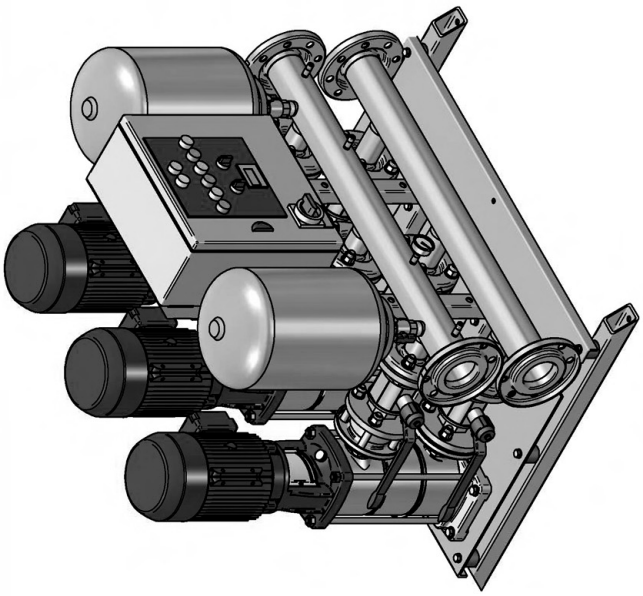
FILE NAME: FR3-15 SERIES.dft

SCALE: | WEIGHT: | SHEET 1 OF 1





FR3 22 Triple Pump Range



MODEL	A	B	C	D	E	F	H	J	K	DRY WEIGHT
FR3-2202	850	674	176	180	211	975	1063	925	800	253 KG
FR3-2203	850	674	176	180	211	975	1063	925	800	268 KG
FR3-2204	850	674	176	180	211	975	1063	925	800	288 KG
FR3-2205	850	674	176	180	259	975	1088	925	800	292 KG
FR3-2207	850	674	176	180	355	975	1190	925	800	363 KG

	NAME	DATE
DRAWN	nigel	09/05/12
CHECKED		
ENG APPR		
MGR APPR		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS
ANGLES ±X.X°
2 PL ±XXX 3 PL ±XXXX

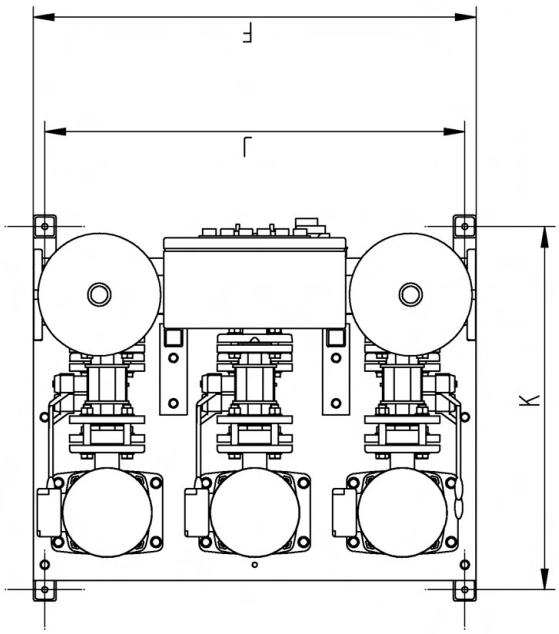
Dutypoint SYSTEMS

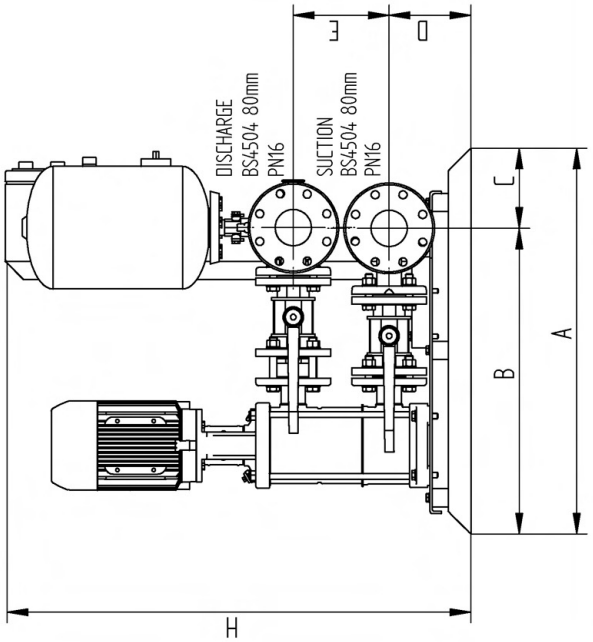
TITLE: FR3-22 SERIES

SIZE A3 | DWG NO: FR3-22 SERIES | REV

FILE NAME: FR3-22 SERIES.dft

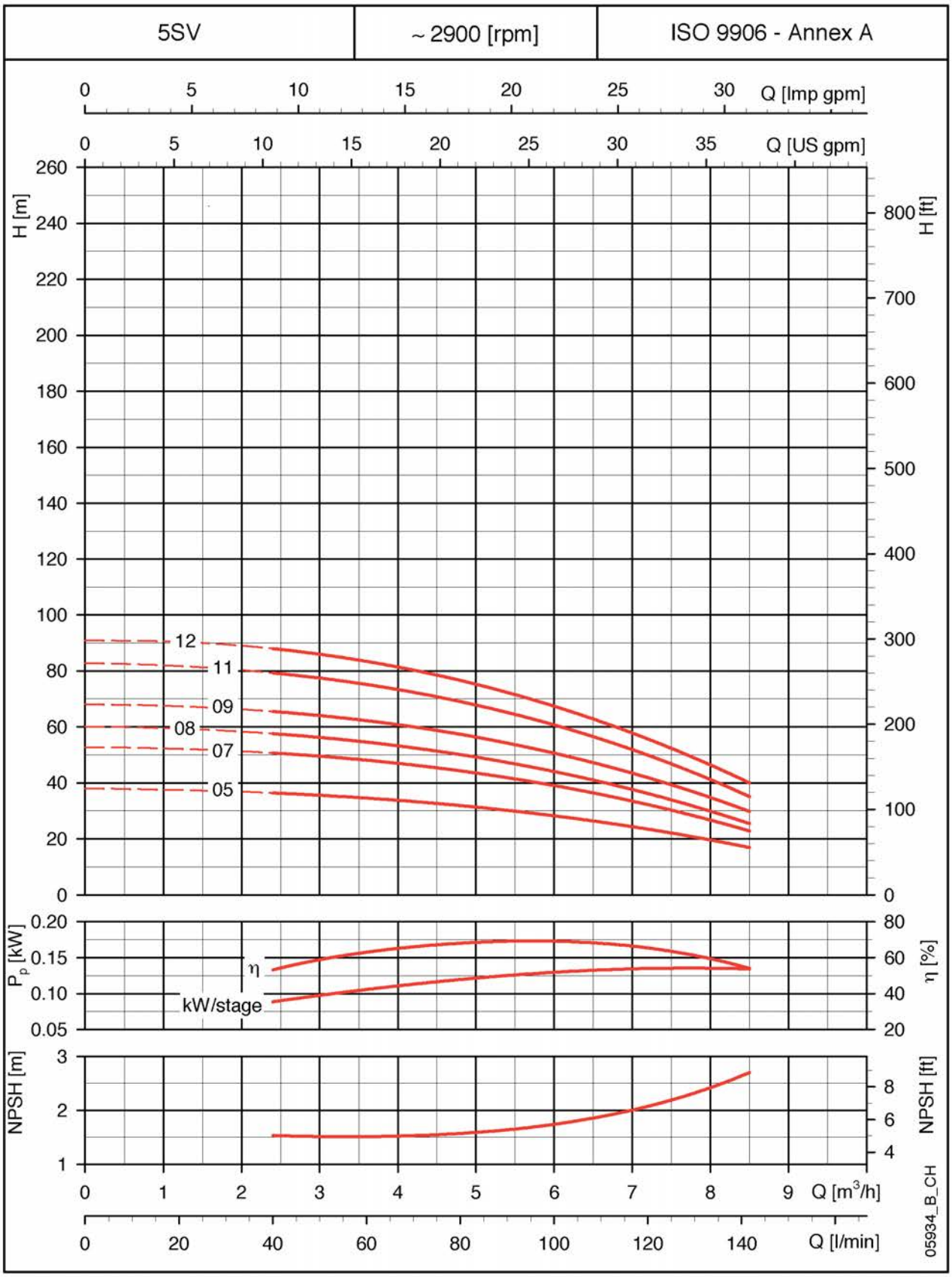
SCALE: | WEIGHT: | SHEET 1 OF 1





Pump Performance

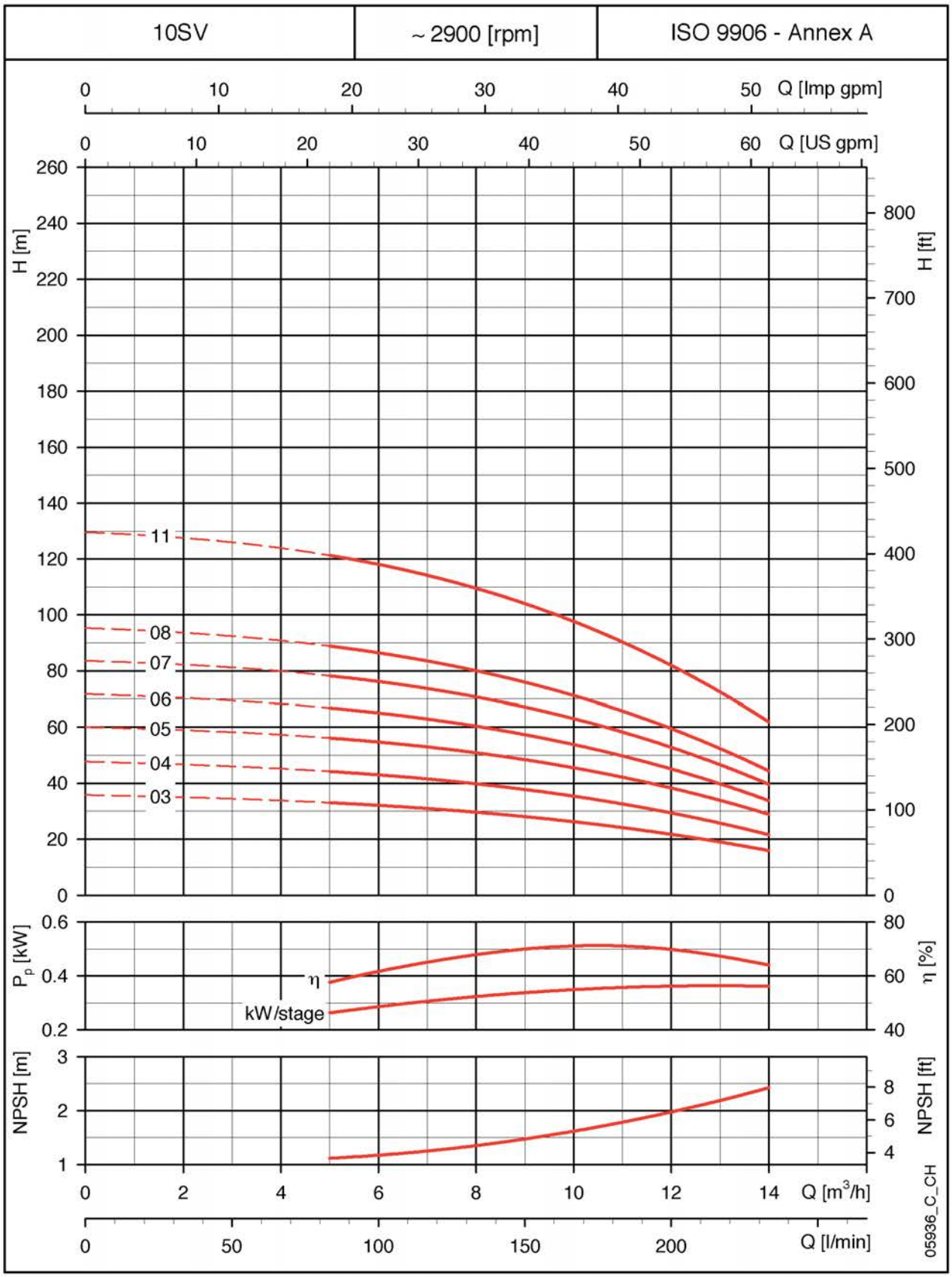
5SV Series Pumps - Operating Characteristics @ 2900rpm 50Hz



These performances are valid for liquids with density = 1.0 Kg/dm3 and kinematic viscosity = 1 mm2/sec.

Lowara
ITT Industries

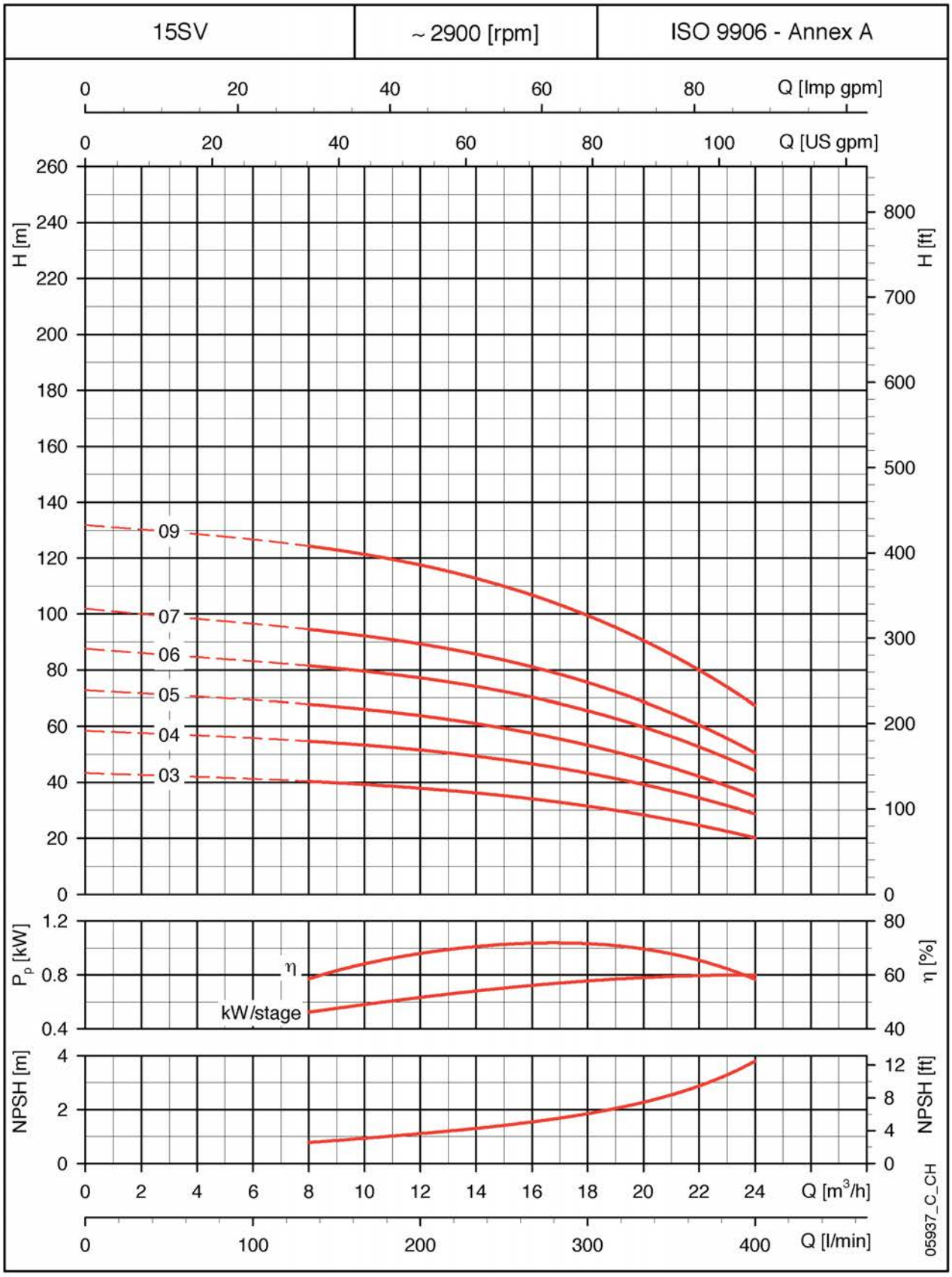
10SV Series Pumps - Operating Characteristics @ 2900rpm 50Hz



These performances are valid for liquids with density = 1.0 Kg/dm3 and kinematic viscosity = 1 mm2/sec.

Lowara
ITT Industries

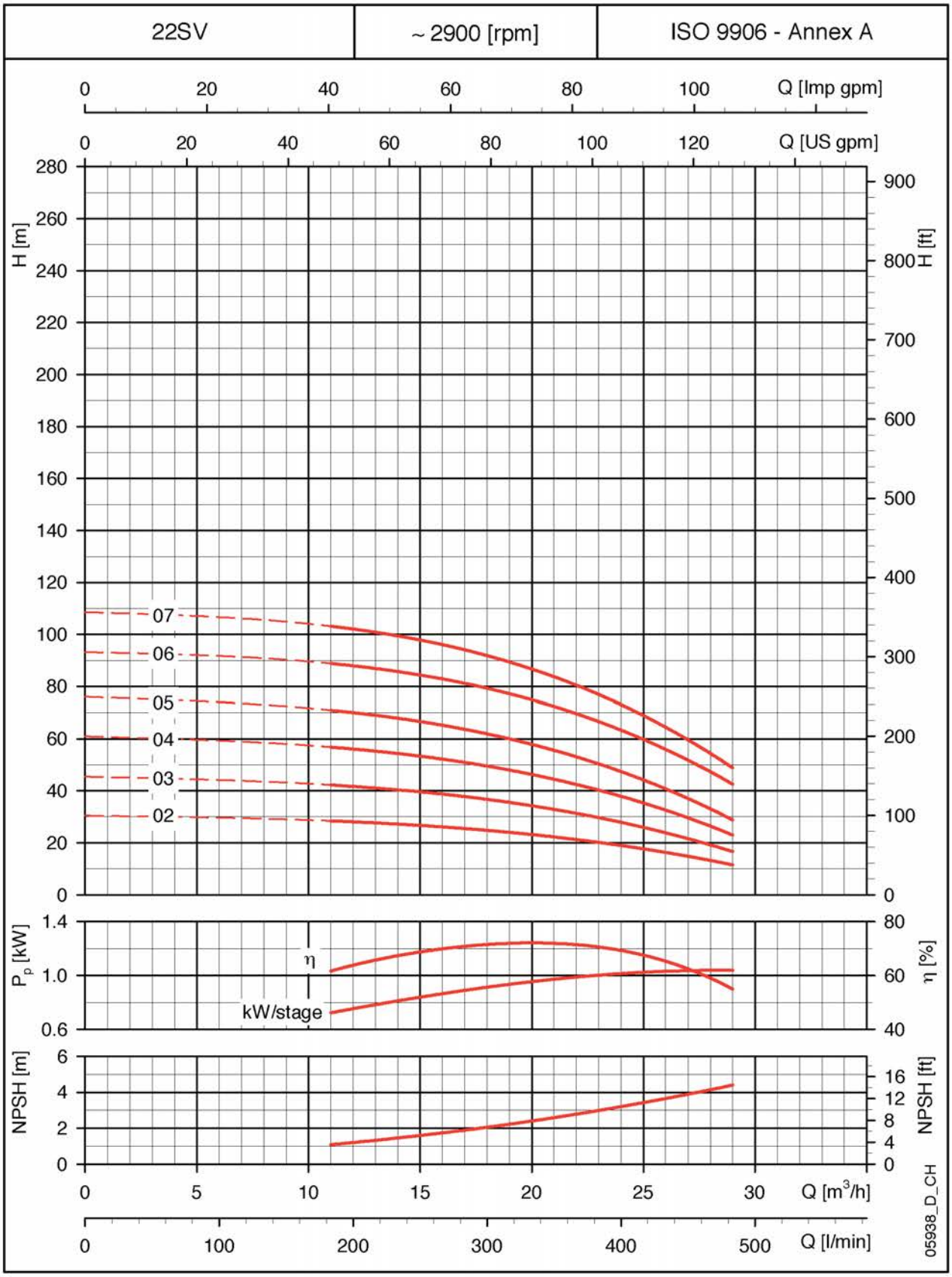
15SV Series Pumps - Operating Characteristics @ 2900rpm 50Hz



These performances are valid for liquids with density = 1.0 Kg/dm3 and kinematic viscosity = 1 mm2/sec.

Lowara
ITT Industries

22SV Series Pumps - Operating Characteristics @ 2900rpm 50Hz



These performances are valid for liquids with density = 1.0 Kg/dm3 and kinematic viscosity = 1 mm2/sec.

Lowara
ITT Industries

3

The *Dutypoint* Control Panel

This Section provides information on the Control Panel fitted to the range of FR pumpsets.

Pump Set Control Panel

The Control Panel on the Pumpset, fig 3-1, interfaces to a Transducer Control System to provides external user control, internal protection and fault monitoring circuitry.

Externally the panel provides:

- An overall System (Main) Isolator (single phase or 3 phase as required).
- A white Indicator Light to show Power On status
- A separate Isolator for each pump, used to independently switch between Hand / Off / Automatic Operation.
- A green Indicator Light for each pump to show that it is running.
- A yellow Indicator Light for each pump to show if it has tripped.
- An red Indicator Light to show a Low Water condition.
- A Programmable Pressure Controller to view the pump status and to allow presetting of duty pressure settings, low water reset period, sequencing run time and transducer parameters.

The internal circuitry (fig 3-2 to fig 3-4) provides the following protection and monitoring:

- A fused Power Feed giving overload current protection for each pump.
- Pressure Transducer connection to the Pressure Controller
- Trip Relays for each pump. These are interlocked via the Pressure Controller and a Low Water Detection Sensor (pressure or float) feed. These set the Tripped/ Running Indicators on the front of the panel.
- A system “Volt Free” (0v) alarm line link which is broken in the event of low water.
- A 24v supply for the Programmable Pressure Control Unit, protection and indicator circuitry.

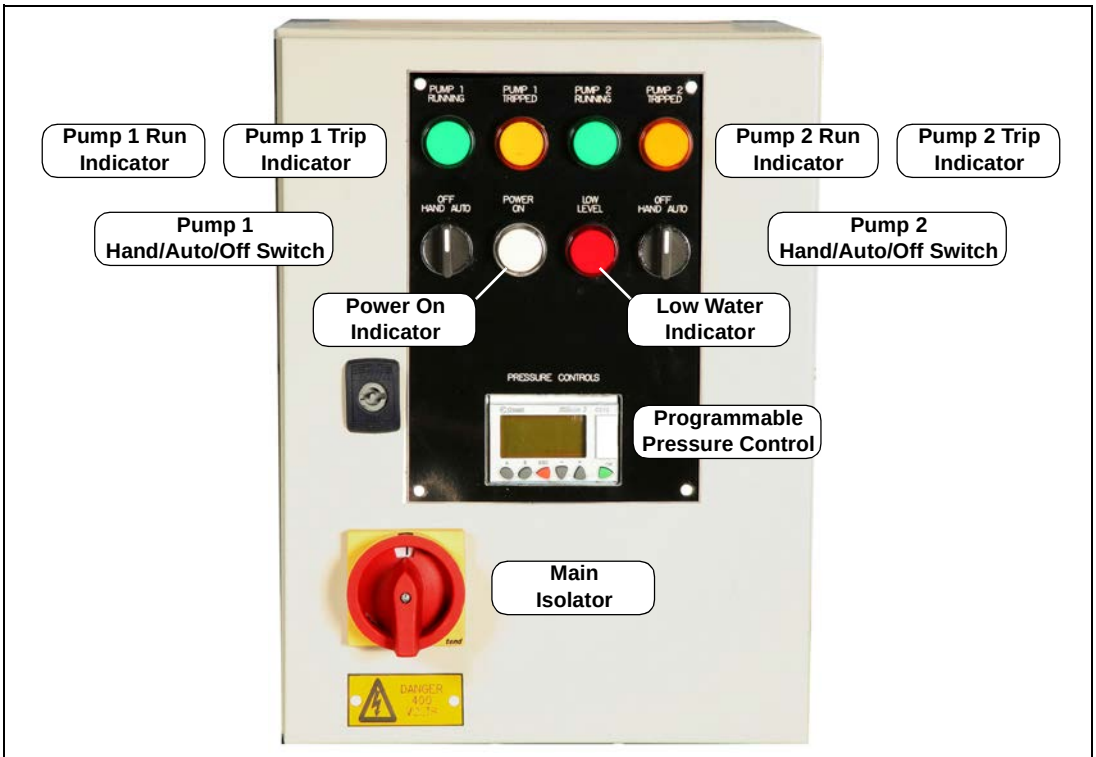


Fig. 3-1 FR Twin Pump Set Control Panel

HAND/OFF/AUTO Switch Operation

It is important that the function of this switch is fully understood.

- **HAND**: When this is selected the pump(s) controlled by the switch will normally run at FULL SPEED and be independent of any control devices. This means that the pump(s) will run against a closed valve head if there is no draw.
  This can cause the system to be maintained at the maximum pressure produced by the pump plus any incoming pressure and additional pressure caused by water surge, and therfore potential damage can occur to the pump and other parts of the system when the 'HAND' option is selected.

WARNING **This option should ONLY BE USED where a competent operator is in attendance, or when there is a continuous demand sufficient to provide a constant flow through the pumps to reduce the running pressure of the system to an acceptable level.**

- **OFF**: When selected the pump(s) controlled by the switch will not run.
- **AUTO**: This is the normal operational setting allowing the pump to be controlled by the relevant sensing devices.

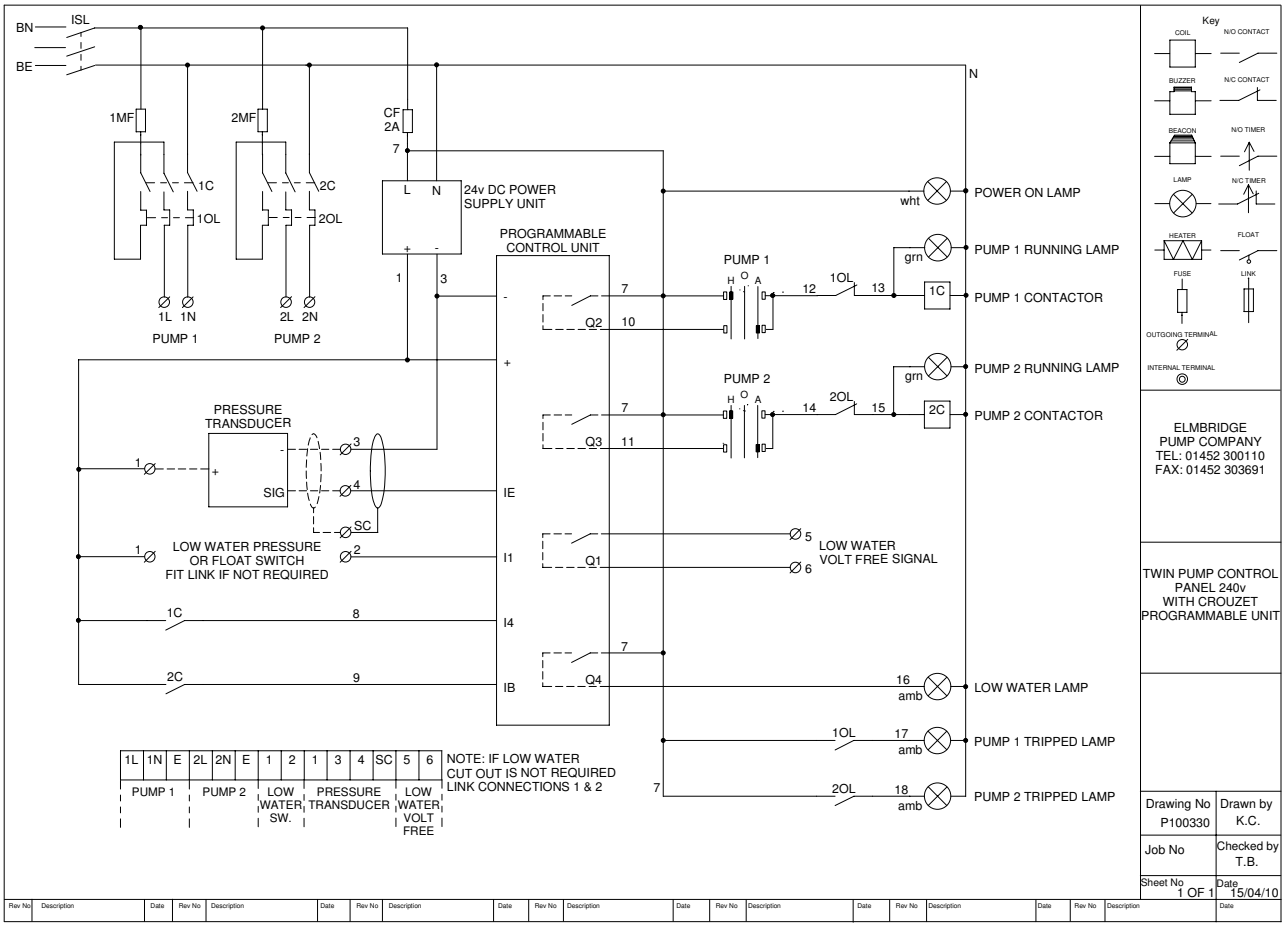


Fig. 3-2 Two Pump Set - Single Phase Control Panel Wiring Diagram

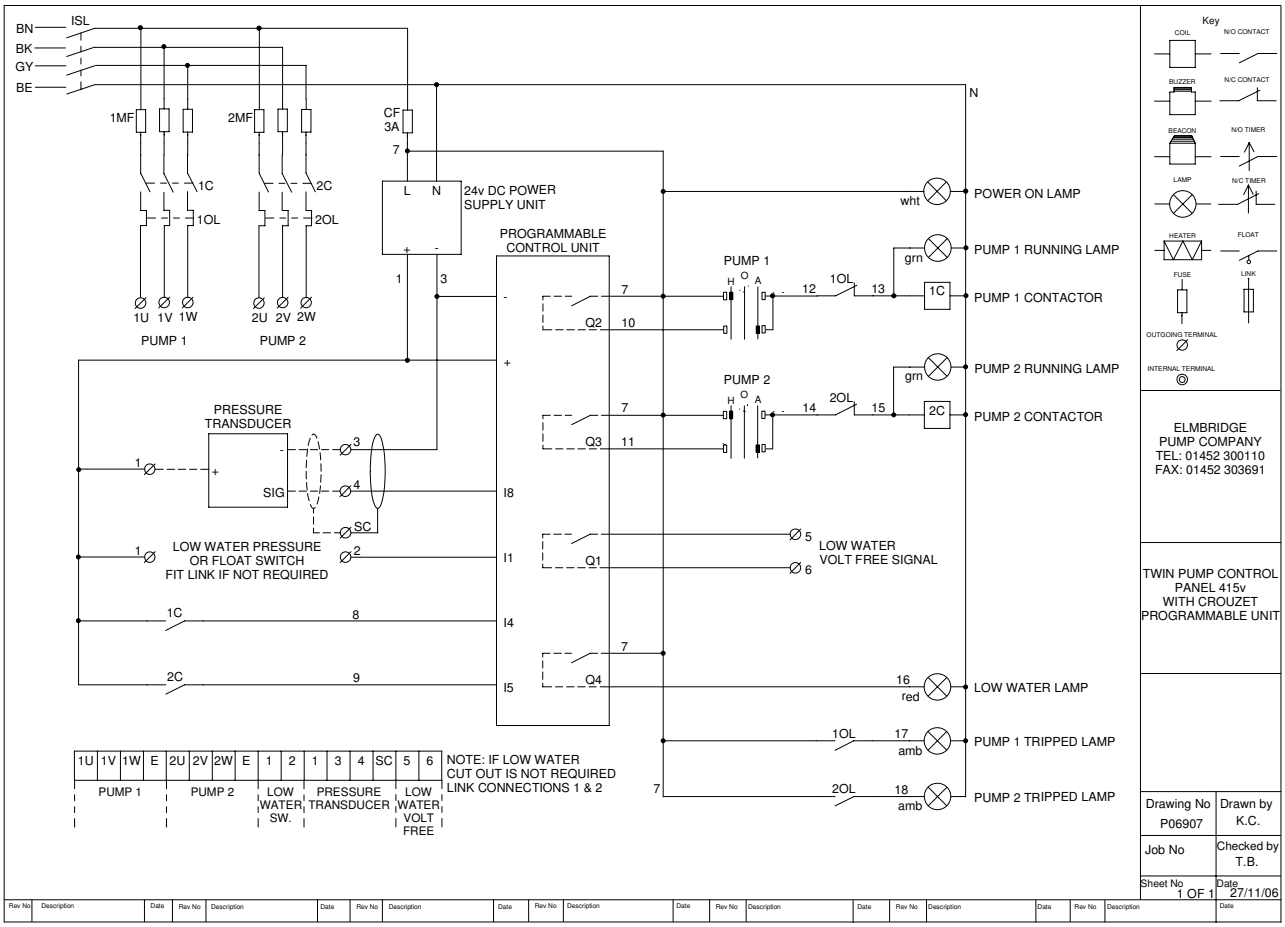


Fig. 3-3 Two Pump Set - Three Phase Control Panel Wiring Diagram

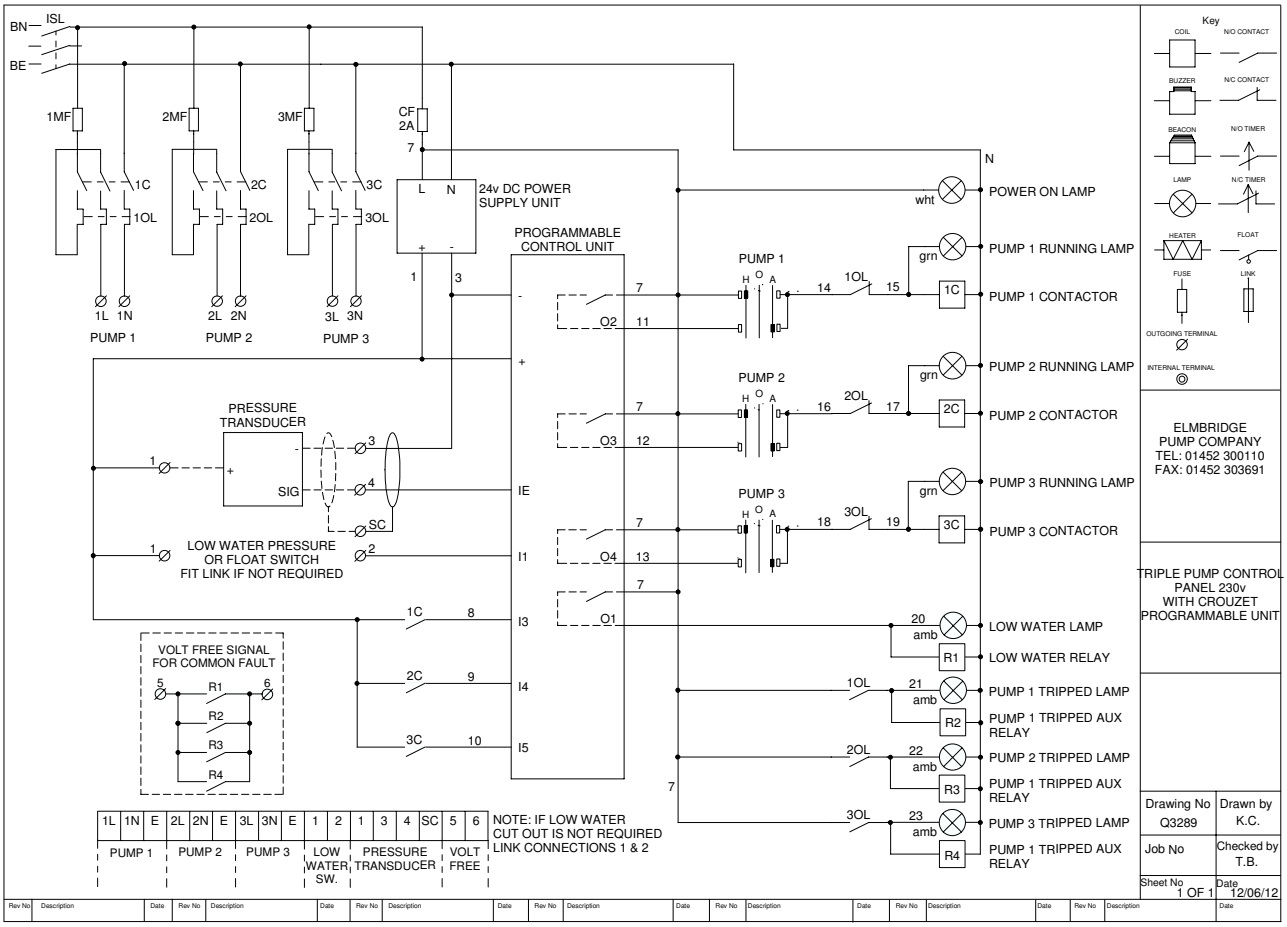


Fig. 3-4 Three Pump Set - Single Phase Control Panel Wiring Diagram

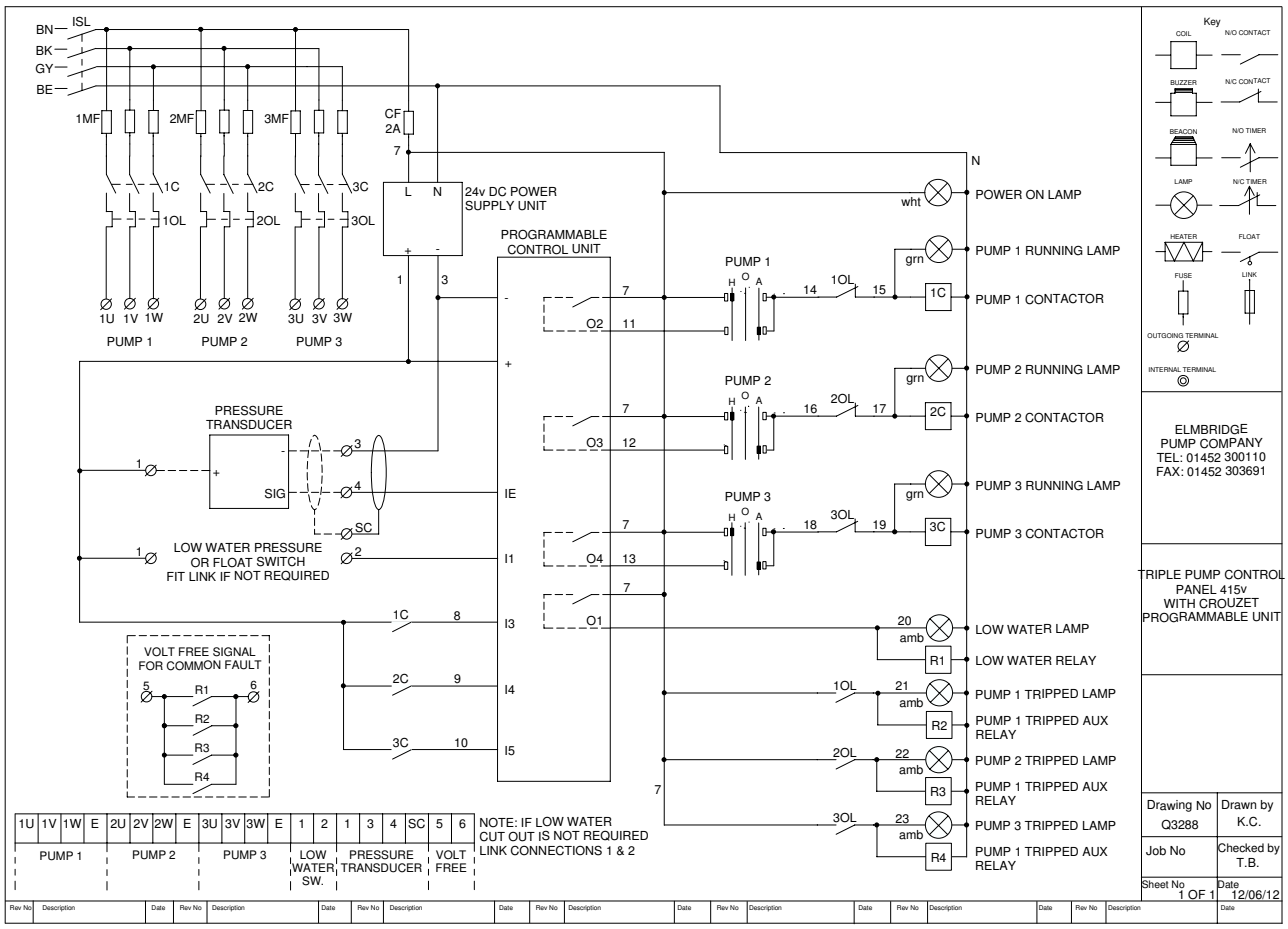


Fig. 3-5 Three Pump Set - Three Phase Control Panel Wiring Diagram

Using the Programmable Transducer Control Panel

Display screen.

The screen displays system settings and information.

Buttons **A** and **B**, positioned below the screen, are used to scroll through the various displays.

Buttons **- /+** decrease/increase set values.

OK button confirms and saves an entry.

ESC button exits a setting without storing the value.

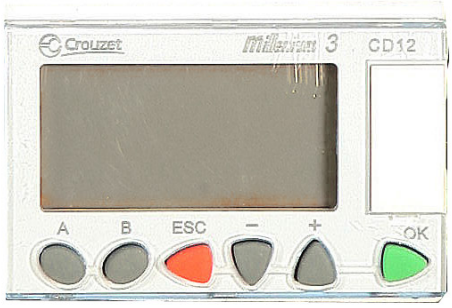
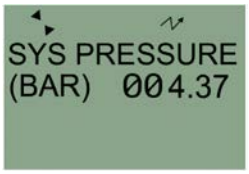


Fig. 3-6 Programmable Controller

System information displays



Actual system pressure

This is the current system pressure in measured in bar.

Pump No.1 information

STARTS = number of starts the Pump has made.

HOURSMINS = Total number of hours and minutes the Pump has run.

These values can be reset to zero by simultaneously holding down the three buttons marked **+**, **-** and **OK**.

Pump No.2 information

STARTS = number of starts the Pump has made.

HOURSMINS = Total number of hours and minutes the Pump has run.

These values can be reset to zero by simultaneously holding down the three buttons marked **+**, **-** and **OK**.

Pump No.3 information

STARTS = number of starts the Pump has made.

HOURSMINS = Total number of hours and minutes the Pump has run.

These values can be reset to zero by simultaneously holding down the three buttons marked **+**, **-** and **OK**.

Pump No.4 information

STARTS = number of starts the Pump has made.

HOURSMINS = Total number of hours and minutes the Pump has run.

These values can be reset to zero by simultaneously holding down the three buttons marked **+**, **-** and **OK**.

Adjusting the settings

1 Use buttons **A** or **B** to scroll through the displays until the required setting is displayed.
The value to be adjusted will be shown flashing against a black background.

2 Press and release the **OK** button.
The value will flash against a neutral background.

3 Operate the **+** or **-** buttons to increase or decrease the set value.

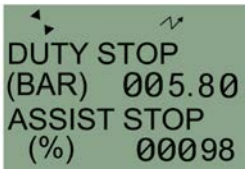
4 When the value has been adjusted as required, press and release the **OK** button.
The value will flash against a black background, indicating the new value has been stored.

NOTE **To exit without storing the new value, press and release the ESC button. The original value will be shown flashing against a black background.**

5 Use buttons **A** and **B** to scroll through to the next setting to be displayed/ adjusted.

*Where displays show two setting values, first operate the buttons marked **+** or **-** until the required value flashes against a black background, then follow the instructions as above.*

Values which may be adjusted



Duty Stop Pressure

DUTY STOP is the pressure required in the system. The Duty Pump will stop when pressure reaches this value.

ASSIST STOP is the pressure required for the Assist Pump to stop. It is set as a percentage of the DUTY STOP value.

Duty Start Pressure

DUTY START is the pressure at which the Duty Pump should start.

ASSIST START is the pressure required for the Assist Pump to start. It is set as a percentage of the DUTY START value.

It is set as a percentage of the DUTY STOP value.

Low Water Reset Period

This is the period in seconds required to allow the water supply to recover to a safe level before restarting the pumps.

Minimum Run Time

This is the period in seconds required for each pump to avoid rapid Start/Stop sequencing of the pumps.

Transducer Range

This value must be adjusted to match the range of the pressure transducer connected to the Control Panel.

e.g. 0 to 5.00 bar, 0 to 10.00 bar, etc.

4

Installation, Commissioning and Routine Maintenance

This Section gives general information on installation, commissioning and routine maintenance procedures for the FR range of Pumpsets.

- ***Installation and Pre-Commissioning Checks***
- ***Pressure Vessel Precharging***
- ***Venting Pumps***
- ***Setting-Up the Controller***
- ***Operational and Performance Tests***
- ***Commissioning/Handover Check***
- ***Routine User Maintenance***

WARNING

Be aware that where control panels are fitted with 3-position HAND/OFF/ AUTO selector switches:

<u>HAND</u> When this is selected the pump(s) controlled by the switch will normally run at FULL SPEED and be independent of any control devices. This means that the pump(s) will run against a closed valve head if there is no draw.
This can cause the system to be maintained at the maximum pressure produced by the pump plus any incoming pressure and additional pressure caused by water surge.
Potential damage can occur to the pump and other parts of the system when the 'HAND' option is selected, and this option should ONLY BE USED where a competent operator is in attendance, or when there is a continuous demand sufficient to provide a constant flow through the pumps to reduce the running pressure of the system to an acceptable level.

<u>OFF</u> When selected the pump(s) controlled by the switch will not run.

<u>AUTO</u> This is the normal operational setting allowing the pump to be controlled by the relevant sensing devices.

Installation and Commissioning Overview

Before shipment, all *Dutypoint* pumpsets are pre-commissioned. Whilst important procedures such as venting and rotational direction checks need to be carried out on site, initial parameters including pressure settings and delay timers will be adjusted to suit the site conditions previously advised to *Dutypoint*.

In practice, a system can almost invariably be made to perform more efficiently if further re-commissioning is carried out on site.

NOTE

Please note that engineer visits by *Dutypoint* are priced at one visit to commission one pump set. If there are multiple units on a site, special terms can be negotiated. To arrange a commissioning visit, please call the Technical Service Help line 01452 300590.

Installation and Pre-Commissioning Checks

The following checks should be carried out at the initial installation on site **BEFORE** any run tests are carried out.

DANGER

Ensure that you have read and understood the SAFETY section at the front of this manual before proceeding.

Pipework and mechanical components

1. Ensure that the mounting area and any associated groundwork provides adequate support for the pumpset.
2. Ensure all supports/brackets are in place and secure.
3. Verify all pipe joints are sealed and tight.

Electrical

ELECTRIC SHOCK **These checks MUST be carried out by a competent electrician.**

1. Check the motor voltage and frequency information on all the motor nameplates and on controllers etc. correspond with that of the source power supply.

WARNING **Ensure that the power source is sufficient to allow the running of two (Duplex Sets) or three (Triplex Sets) pumps together. (Refer to Section 2 of this manual).**

2. Check that all electrical connections are correctly made and secure. Pay particular attention to Earth and bonding connections.
3. Carry out specific checks for Earth bonding.
4. Carry out NICEIC certification checks as required for the installation, *e.g Earth Loop Impedance, Insulation Tests, etc.*
5. Carry out any other pre-start checks recommended by the pump manufacturer. Refer to the pump manual in Appendix A of this manual. **DO NOT POWER UP AT THIS STAGE.**

Final checks before commissioning

1. Re-check all equipment for any accidental damage caused during installation.
2. Carry out the Precharging and Venting procedures described next.

Pressure Vessel Precharging

Before commissioning starts the precharge of the pressure vessels should be checked.

The precharge air pressure for vessels on fixed speed systems should be **0.2 Bar BELOW** the cut-in pressure of the duty pump.

To verify the precharge pressure.

1. First check that the expansion or pressure vessel(s) are totally drained of water, and that the system is switched off and no electrical parts are live.
2. Locate the charging valve on each vessel, accessed by removing the plastic cover on the top of the vessel.
3. Connect a portable pressure gauge with a measuring range compatible with the expected pressures in your application, which has a flexible hose and Schrader-type connector to the charging valve.
4. Check the pre-charge pressure above the diaphragm in each pressure vessel [*Accumulator*]. correspond to criteria given in the text above.
5. If necessary, release or add additional air to correct.

Venting Pumps

It is important to bleed all air from the pump body before initial start-up.

Procedure for flooded suction

Flooded Suction is defined as the condition where there is positive pressure on the suction (inlet) side of the pump(s) as is the case where the storage tank water level is at the same or higher level than the pump bleed point.

This procedure should be carried out individually for each pump in the Pumpset.

1. Close any valve on the discharge manifold outlet to the system.
2. Open all valves on the suction (inlet) side of the pump.
3. Using the vent screw at the top of the pump (refer to Appendix A to locate), allow any air in the pump body and suction pipework to vent to atmosphere.
4. When water (under pressure from the storage tank feeding the pump on the suction side) escapes through the vent screw hole - and no more air bubbles can be seen - close the vent screw.
5. Switch on the electrical supply to the pump motor and start the pump in AUTO mode.
   As each motor starts verify that the direction of rotation correctly corresponds with the direction of the arrow shown on the body of the pump. If rotation is backward STOP, switch off the pump and investigate.
6. Slowly open the valve on the discharge manifold outlet to the system allowing water to be pumped into the system.
7. Switch off, re-close the discharge valve and repeat steps 3 to 6 several times to ensure that all air is released from the pump body and local pipework.
8. The above procedure should be carried out individually for each pump in the Pumpset.

Procedure for lift suction

Lift Suction is defined where the water storage tank is at a lower level than the pumpset. In this case a negative pressure condition may exist at the pump suction.

WARNING **The "Lift Suction" mode of operation requires specific venting procedures. Please call *Dutypoint* Technical Support on 01452 300592 for advice before attempting to vent the pump(s).**

The advised procedure should then be carried out individually for each pump in the Pumpset.

Setting-Up the Controller

Fixed Speed pumps are pre-commissioned at the factory prior to start-up. Proceed directly to the Performance Tests below.
If required the procedure for adjusting the settings of the Programmable Pressure Controller can be found in Section 3 of this manual.

Operational and Performance Tests

Having checked that the Pumpset is installed, precharged, vented in accordance with the procedures set out earlier, carry out the following running tests before handing over the Pumpset for operational use.

1. Run each pump by selecting HAND (Manual) control.
2. Re-select to AUTO mode.
3. Create the conditions for a normal start and run and allow the selected ‘Duty’ pump to run. Whilst running observe the pressure values.

Duty/Standby sets

1. On Duty/Standby sets, wait for a normal stop to take place (or create the conditions where this would happen) and check that the ‘Duty’ pump stops.

   Whilst stopped simulate a fault by inhibiting the ‘Duty’ pump and then recreate the conditions for a normal start to take place.

   Check that the ‘Standby’ Pump now starts and runs in place of the inhibited ‘Duty’ pump and observe the pressure values.
2. Wait for a normal stop to take place (or create the conditions where this would happen) and check the ‘Standby’ pump stops. Whilst stopped undo the inhibit to the ‘Duty’ pump which should now return to normal.

Duty/Assist sets

1. For ‘Duty/Assist’ applications, run the system up to pressure using the ‘Duty’ Pump only, then deliberately create the condition(s) which will require the ‘Assist’ Pump to operate as well. (e.g: open taps to reduce the pressure in the system to a point where one pump only cannot maintain the required output.

   Verify that the ‘Assist’ Pump starts and runs together with the ‘Duty’ Pump and that the desired pressure is duly restored and maintained.
2. Close the taps again (thereby reducing the demand) and check the ‘Assist’ Pump slows down and stops, allowing the ‘Duty’ Pump to continue on its own.

Commissioning/Handover Check

1. Record any indicated voltage / amperage / pressure data / controller passwords for future reference.
2. Re-check all isolating valves are fully open and replace any cover(s).

With all the isolators ON and the switches and/or control programs set to AUTO, the pumpset is now fully operational in automatic control mode.

NOTE **No manual operation or attendance is required other than for routine servicing and maintenance checks.**
Other than for maintenance purposes, the supply to the Controller(s) and the Pump motor(s) should never be switched off

Routine User Maintenance

Dutypoint Pumpsets have been designed to keep major maintenance requirements to a minimum. Planned maintenance of the pumps and other principal components should therefore be undertaken at the intervals recommended in the manuals referenced below.

It is essential that a full test following the Pre-Commissioning procedure on page 42 is carried out on an annual basis.

In addition, the operator in charge should routinely make visual checks of the equipment during use, noting particularly any unusual noises or vibrations. This will give an immediate indication of any irregularity in the operation of the system.

DANGER

DO NOT COMMENCE ANY MINTENANCE WORK UNTIL:

1. YOU HAVE READ THE SAFETY SECTION AT THE BEGINNING OF THIS MANUAL.

2. ARE DRESSED IN THE CORRECT PROTECTIVE CLOTHING.

3. HAVE ALL NECESSARY SAFETY EQUIPMENT TO HAND.

Refer to the appropriate manufacturer's information that is provided in the appendices of this manual for the equipment being serviced.

Recommended user weekly checks

1. Visually check the complete pumpsets system.
2. Observe the running of the pump(s) and note any unusual vibration, etc.

Recommended user quarterly checks

1. Visually check the complete pumpsets system.
2. Observe the running of the pump(s) and note any unusual vibration, etc.
3. Operate each manual isolating valve three times to ensure continued efficient working.

Recommended user 6 monthly checks

The pressure vessel should be drained and the pre-charge pressure checked.

Refer to page 43 of this section for details.

Essential 12 monthly (maximum interval) service

Carry out the full Pre-Commissioning procedure to verify correct safe operation. Refer to page 42 of this section for details.

Detailed Pump Maintenance

Please refer to the Manufacturer's document which you can find in Appendix A of this manual.

Detailed Accessory Maintenance

If you have purchased additional accessories for your system, please refer to the appropriate manufacture's document supplied.

5

Troubleshooting

This Section provides general troubleshooting tips applicable to the Dutypoint range of pumpsets.

NOTE **The information in this section is common to all Dutypoint centrifugal pumps. For more detailed troubleshooting information that is specific to the type and model of Pump and Controller used in the FR pumpsets, please refer to the Manufacturer's literature located in the appendices of this manual.**

First Step When a Fault Occurs

When a fault first occurs, turn off the main power to the pumpset and leave off for around 1 minute.

Switching power back on and re-energising the system may be sufficient to clear the fault.

General Pump Troubleshooting

Item/Fault	Possible Cause(s)	Recommended Action
Pump will not start.	1. No electrical power. 2. Blown fuse(s). 3. Overload trip.	1. Check and rectify. 2. Check and rectify. 3. Check and (if necessary) reset the overload trip value. *For Control Panel information refer to Section 3 of this manual.* *For Pump and Controller manufacturer's information refer to the appendices to this manual.*
Low (or zero) output (discharge rate).	1. The rotating part(s) of the pump is(are) partially or completely obstructed e.g: impeller obstructed by foreign matter 2. Pump not primed - WARNING: running the pump 'dry' can cause serious damage to the mechanical seal. 3. Valve in suction pipework closed or partially closed. 4. Incorrect pump rotation	1. Strip the pump to inspect and rectify. 2. Having first checked the mechanical seal for damage, prime and air-bleed the pump and try again 3. Check all appropriate valves are fully open. 4. Check and rectify. *For Pump and Controller manufacturer's information refer to the appendices to this manual.*

Item/Fault	Possible Cause(s)	Recommended Action
Pump vibrates and/or is noisy	1. Pump is cavitating.	1. Increase the discharge back pressure slightly by progressively closing a manual isolating valve on the discharge side until the cavitation stops.
	2. Motor bearings worn.	2. Check and rectify
	3. The rotating part(s) of the pump is(are) partially or completely obstructed. e.g: impeller obstructed by foreign matter.	3. Strip the pump to inspect and rectify. *For Pump and Controller manufacturer's information refer to the appendices to this manual.*
Pump runs continuously	1. If the pump has a "Hand Control" option on it's control panel.	1. Switching to "Auto" should restore normal control. If normal control is not returned an immediate service visit is required.
	2. Pump has no "Hand Control" option.	2. An immediate service visit is required.
Overload Trip	1. Pipework or the pump chamber has a partial blockage.	1. Check and rectify
	2. Momentary loss of one phase of power supply.	2. Check and try again.
	3. Discharge flow rate too high.	3. Reduce by the discharge flow rate by increasing the discharge back pressure slightly, progressively closing a manual isolating valve on the discharge side: then try again
	4. Overload trip setting too low for rated duty	4. Check and (if necessary) reset the overload trip value *For Pump and Controller manufacturer's information refer to the appendices to this manual.*

A

Appendix A Manufacturer's Guide - eSV™ Vertical Multistage Centrifugal Pumps

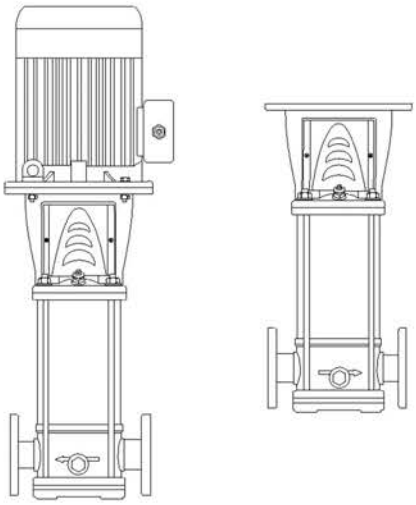
This Section contains a facimile copy of the English sections of Installation Safety, Operating and Troubleshooting instructions provided by ITT Lowara for their eSV™ Vertical Multistage Centrifugal Pumps Series:

eSV 1, 3, 5, 10, 15, 22, 33, 46, 66, 92, 125

ITT

Lowara

e-SV™ Series



Keep this manual for future reference

cod. 001076090 rev.B ed.11/10

WARNINGS FOR THE SAFETY OF PEOPLE AND PROPERTY

Meaning of the symbols used in this manual

DANGER
Failure to observe this warning may cause personal injury and damage to property

ELECTRIC SHOCK
Failure to observe this warning may result in electric shock

WARNING
Failure to observe this warning may cause damage to the pump, system, panel or environment

Read the manual carefully before proceeding

Information for …	
… carriers	Specific information for carriers, handlers and warehouse personnel
… installers	Specific information for personnel in charge of installing the product in the system (plumbing and/or electrical aspects)
… users	Specific information for users of the product
…maintenance personnel	Specific information for personnel in charge of maintenance
… repair personnel	Specific information for repair personnel

1. Overview

The purpose of this manual is to provide the necessary information for proper installation, operation and maintenance of the pumps/electric pump units. The instructions and warnings provided below concern the standard version, as described in the sale documents. Special versions may be supplied with supplementary instructions leaflets. Please refer to the sale contract for any modifications or special version characteristics. Always specify the exact pump/electric pump unit type and identification code when requesting technical information or spare parts from the Sales and Service department. For instructions, situations or events not considered in this manual or in the sale documents, please contact the nearest Lowara Service Center.

2. Product Description

Information for installers and users

The SV range features vertical multistage non-self priming pumps which can be coupled to standard electric motors.
In the 1, 3, 5, 10, 15, 22SV series, all the metal parts that are in contact with the water are made of stainless steel. They are available in different versions according to the position of the suction and delivery ports and the shape of the connection flanges. In the 33, 46, 66, 92, 125SV series, some of the metal parts in contact with the water are made of stainless steel, others are made of cast iron. A special version is available, in which all the metal parts in contact with the water are made of stainless steel. If you have bought a pump without an electric motor, make sure that the motor used is suitable for coupling to the pump.

3. Applications

Information for installers and users

These pumps are suitable for civil and industrial water distribution systems, irrigation (agriculture, sports facilities), water treatment, boiler feed, parts washing, cooling - air conditioning - refrigeration and firefighting applications.

3.1 Working Limits

3.1.1 How to Read the Pump's Rating Plate

The drawings in section 11, **Fig.A** and **Fig.B**, show the essential data found on the rating plates for electric pump units and pumps.

3.1.2 Pumped Liquids, Pressures, Temperatures

This pump can be used to pump cold water, hot water, water with glycol.
The rating plate in **Fig.A** provides information regarding the gasket and mechanical seal materials (whose representation is depicted in **Fig.B**).

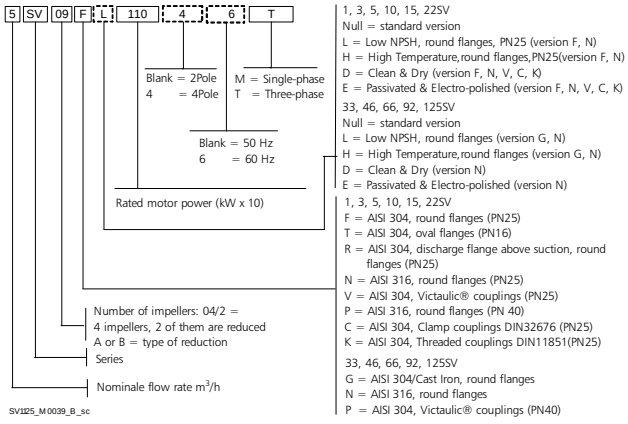
Fig.A KEY

1	Mechanical seal material identification code
2	Flow range
3	Head range
4	Minimum head
5	Speed
6	Frequency
7	Maximum operating pressure
8	Electric pump unit absorbed power
9	Pump / electric pump unit type
10	O-ring material identification code
11	Electric pump unit / Pump code
12	Protection class
13	Maximum liquid temperature
14	Motor nominal power
15	Rated Voltage
16	Manufacturing date and serial number

Fig.B KEY

1	B Resin impregnated carbon
	C Special resin impregnated carbon
	Q1 Silicon carbide
2	E EPDM
	T PTFE
	V FPM (FKM)
3	G 1.4401 (AISI 316)

Identification code on Rating Plate is exemplified below:

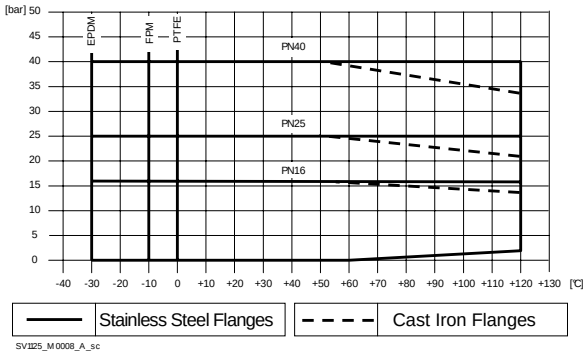


Do not use this pump/electric pump unit to handle flammable and/or explosive liquids..

WARNING Do not use this pump to handle liquids containing abrasive, solid or fibrous substances.

For special requirements, please contact the Sales and Service Department.
Depending on the pump model and on the temperature of the pumped liquid, the maximum operating pressure is shown in the following chart.

Liquid Temperature	Minimum	Maximum
- for standard version (EPDM gaskets):	- 30℃	+ 120 ° C
- for special version (FPM gaskets):	- 10 ℃	+ 120 ° C
- for special version (PTFE gaskets):	0 ℃	+ 120 ℃
- for household and similar purposes (EN 60335-2-41):		+ 90 ℃



3.1.3 Suction

In theory, a pump could suck water from a source located 10.33 meters lower than the pump's own installation level, but this does not happen because the pump offers its own intrinsic flow resistance, moreover the suction capacity is reduced as a result of flow resistance in the piping, height difference, liquid temperature and elevation above sea level.
A wrong choice in the altimetric placement of the pump could lead to cavitation.
With reference to **Fig. C** and given **Z** as the maximum height at which the pump can be installed, with reference to the level of the liquid source the following can be stated:

$Z = p_b \cdot 10{,}2 - NPSH - H_f - H_v - 0{,}5$ [m]

p_b	Barometric pressure in bar, in closed systems it shows system pressure
NPSH	Value in [m] of the pump intrinsic flow resistance
H_f	Total losses in [m] caused by passage of liquid through parts on the inlet side of the pump
0.50	Recommended safety margin in [m]
H_v	Steam pressure in [m] through the liquid Temperature T [℃] (for additional information → **Fig.C**)

With the meanings given in the above table it can be stated that:
If Z≥0 the pump can work with a maximum suction height equal to Z.
If Z<0 the pump must be provided with an inlet pressure equal to –Z.
For additional information on SV-series performances → **Fig.D**

WARNING Do not use the pump if cavitation occurs, as its internal components could be damaged.

WARNING If hot water is pumped, guarantee an appropriate condition on the suction side to prevent cavitation.

WARNING Make sure that the sum of the pressure on the suction side (water mains, gravity tank) and the maximum pressure delivered by the pump does not exceed the maximum working pressure allowed (nominal pressure PN) for the pump (→ **Fig.E**).

$p_{1max} \leq PN - p_{max}$

With the following meaning of the symbols:

p_{max}	Maximum pressure delivered by the pump
p_{1max}	Maximum inlet pressure
PN	Maximum operating pressure

If a motor with an axially locked shaft (Lowara standard) is used, ensure that the above formula is fulfilled, if not please contact the Sales and Service Department.

3.1.4 Minimum nominal flow rate

WARNING Do not run the pump with the on-off valve shut on the delivery side for longer than a few seconds.

To determine minimum nominal flow rate → **Fig.G**

3.1.5 Number of starts per hour

For electric pump units coupled to motors supplied by Lowara, the maximum number of work cycles (starts and stops) in one hour is as follows:

kW	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3
n	60							

kW	4	5.5	7.5	11	15	18.5	22	30	37	45	55
n	40			30		24		16		8	4

WARNING If a different motor is used instead of the standard one supplied by Lowara, check the relevant instructions to find out the maximum number of work cycles allowed.

3.1.6 Installation Site

WARNING Protect the pump/electric pump unit from the weather (rain, wind,…) and freezing temperatures. Provide adequate ventilation for motor cooling purposes.

Ambient temperature +0℃ to +40℃.
Relative ambient humidity must not exceed 50% at +40℃.

WARNING For temperatures above +40℃ and for installation sites located at elevations of over 1000 meters above sea level, the motor must be derated (the power it delivers must be decreased) to guarantee its proper cooling. The motor may have to be replaced with a more powerful one. Please check **Fig.H** and, when in doubt, please contact the Sales and Service Department.

If the relative air humidity conditions are high, please contact the Sales and Service Department.

Do not use the pump/electric pump unit in environments that may contain flammable/explosive or chemically aggressive gases or powders.

Provide adequate lighting and clearance around the pump/electric pump unit. Make sure it is easily accessible for installation and maintenance operations. Make sure that any fluid leaks or other events of this nature will not lead to flooding of the installation area and consequent submersion of the pump/electric pump unit.

3.1.7 Power Supply Requirements

WARNING Make sure that the supply voltages and frequencies are suited to the characteristics of the electric motor. Check the motor rating plate.

In general, the supply voltage tolerances for motor operation are as follows:

f [Hz]	~	UN [V]	±%	f [Hz]	~	UN [V]	±%
50	1	220-240	6	60	1	220-240	6
50	3	230/400	10	60	3	220/380	5
50	3	400/690	10	60	3	380/660	10

3.1.8 Sound Emission Level
See **Fig.I** , where P2 is the nominal rated motor power.

3.1.9 Special Applications

WARNING Please contact the Sales and Service Department in the following cases:
- if liquids with a density and/or viscosity value exceeding that of water (such as water and glycol mixture) must be pumped; as it may be necessary to install a more powerful motor
- if chemically treated water (softened, deionized, demineralized, …) must be pumped
- if the pump must be installed horizontally (→ section 9)

and for any situation other than the ones described, related to the nature of the liquid.

3.1.10 Improper Use

If the pump/electric pump unit is used improperly, dangerous conditions may be created and personal injury and damage to property may be caused.
Here are a few examples of improper use:
- pumping liquids that are not compatible with the pump construction materials
- pumping hazardous (toxic, explosive, corrosive) liquids
- pumping liquids for drinking (wine, milk,……)
- installing the pump/electric pump unit in hazardous locations (explosive atmospheres)
- installing the electric pump unit in a location where the air temperature is very high and/or there is poor ventilation
- installing the electric pump unit outdoors where it is not protected against rain and/or freezing temperatures

An improper use of the electric pump unit /pump leads to the loss of the Warranty.

3.2 Warranty
Please refer to the sale contract for any information.

3.3 For UK market only (Installation Requirements and Notes)
A WRAS label on the product means it is a Water Regulations Advisory Scheme - Approved Product. This product is suitable to be used with cold potable water for human consumption.
For further information, please refer to IRNs R001 and R420 in the WRAS Water Fittings and Materials Directory (www.wras.co.uk).

4. Transportation and Storage

information for carriers

4.1 Transportation, Storing and Handling of the Packed Product
The pumps/electric pump units are packed in cartons or wooden crates having different dimensions and shapes. Check the outside of the package for evident signs of damage.

WARNING Some cartons (the supporting base is made of wood) are designed to be transported and handled in the vertical position. Other cartons, as well as the wooden crates, are designed to be transported and handled in the horizontal position. Protect the product against humidity, heat sources and mechanical damage (collisions, falls, …). Do not place heavy weights on the cartons.

Lift and handle the product carefully, using suitable lifting equipment. Observe all the accident prevention regulations.

The packed product must be stored at the following room temperature range: -5℃ to +40℃.

4.2 Unpacking the Product

information for installers

Use suitable equipment. Observe all the accident prevention regulations in force. Lift and handle the product carefully, using suitable lifting equipment.

When the pump/electric pump unit is unpacked, check the outside of the package for evident signs of damage that may have occurred during transportation and storage.

4.2.1 Carton (for transportation in vertical position)
Remove the staples and open the carton. The pump/electric pump unit is secured to the wooden base by screws.

4.2.2 Carton (for transportation in horizontal position)
Remove the staples and open the carton. The pump/electric pump unit is secured to one of the sides by screws or straps.

4.2.3 Wooden Crate (for transportation in horizontal position)
Open the cover, pay attention to the nails and straps. The pump/electric pump unit is secured to one of the sides by bolts or straps.

4.2.4 Disposal of Packing Materials
If the packing container cannot be utilized for other purposes, dispose of it according to the sorted waste disposal regulations locally in force.

4.3 Handling the Product

Lift and handle the product carefully, using suitable lifting equipment. Observe the accident prevention regulations in force. Check the gross weight indicated on the package to select proper lifting equipment.

The product must be securely harnessed for lifting and handling → **Fig.F**.

To move the electric pump unit:
•Use straps surrounding the motor if the electric pump unit is equipped with the following motor power: 0.25÷4kW.
•Use ropes linked to the 2 flanges (or the 2 eyebolts, if provided) located near the mating zone between motor and pump with the following motor power: 5.5÷55KW
•Use eyebolts screwed onto the motor exclusively for handling the individual motor and not for handling the whole electric pump unit.

5. Installation

information for installers

The installation operations must be carried out by qualified and experienced personnel. Use suitable equipment and protections. Observe the accident prevention regulations in force.

Carefully read the installation limits specified in section 3.1.6.
Always refer to the local and/or national regulations, legislation and codes in force relating to the selection of the installation site and the water and power connections.

5.1.1 Position
Make sure that no obstructions or obstacles hinder the normal flow of the cooling air delivered by the motor fan. Make sure there is adequate clearance around the pump for the maintenance operations. Whenever possible, raise the pump

slightly from the level of the floor. Carefully observe the diagrams provided in **Fig.J**.

5.1.2 Anchoring

Anchor the pump/electric pump unit securely with bolts to a concrete foundation or equivalent metal structure (shelf or platform). If the pump/electric pump unit is large-sized and needs to be installed near rooms inhabited by people, suitable vibration-damping supports should be provided to prevent the transmission of the vibrations from the pump to the reinforced concrete structure. The dimensions of the pump base and anchoring holes are shown in the diagrams in **Fig.L**.

5.1.3 Selecting the Suction and Delivery Pipes

Use pipes suited to the maximum working pressure of the pump.

In the case of an open circuit, make sure that the diameter of the suction pipe is suited to the installation conditions and that it is not smaller than the diameter of the suction port. Refer to the illustrations in section 3.1.3 and the diagrams in **Fig.K**.

Fig.K KEY

1	Pipe support so burden does not weigh on pump flange
2	On-off valve to avoid having to drain the system for maintenance, repair or pump replacement operations
3	Flexible pipe or union to avoid transmitting vibrations to the pipes
4	Non-return valve to prevent water backflow when pump is off, in case of positive suction head or closed loop system
5	Control panel
6	Do not install elbows near the pump ports
7	Provide a by-pass circuit if the pump must operate with the delivery side closed for more than a few seconds, in order to avoid overheating the water inside the pump
8	Use eccentric reducer adaptors if it is necessary to increase the diameter of the suction pipe
9	Use wide bends, avoid using elbows which cause excessive flow resistance
10	The piping must have a positive gradient to prevent the formation of air pockets
11	The diameter of the pipe must not be smaller than the diameter of the pump's suction port to prevent pump malfunctions
12	Use a foot valve in case of negative suction head
13	Make sure the height difference is not excessive in order to prevent pump malfunctions and damage
14	Make sure the foot valve is adequately submerged when the water is at minimum level. If the water level is too low, air suction could occur

5.1.4 Selecting the Foot Valve

Install a foot valve at the end of the suction pipe if the level of the liquid source is lower than the pump's. Refer to the illustrations in section 3.1.3 and the diagrams in **Fig.K**.

5.1.5 Selecting the Electric Control Panel

The motors must be suitably protected against overload and short circuits.

WARNING Make sure that the panel's electric ratings match those of the electric pump unit. Improper combinations may cause problems and fail to guarantee the protection of the electric motor.

If thermal relays are used, those that are sensitive to phase failure are recommended.

6. Start-up

information for installers

6.1 Water Connection

The water connections must be made by qualified installation technicians in compliance with the regulations in force.
In case of connection to the water system, the regulations issued by the competent authorities (municipality, public utility company) must be observed.

Authorities often require the installation of a backflow prevention device, such as a disconnector or check valve or disconnection tank.

The suction pipe must be perfectly sealed and watertight. If the pump/electric pump unit is installed near dwellings, suitable pipes or flexible unions should be provided to prevent the transmission of vibrations from the pump to the pipes. Install on-off valves on the suction and delivery sides to avoid having to drain the system before maintenance, repair or pump replacement operations can be performed. Whenever necessary, provide a by-pass circuit to prevent the overheating of the water inside the pump.
Refer to the illustrations in section 3.1.3 and the diagrams in **Fig.K**.

6.2 Electrical Connection

The electrical connections must be performed by a qualified installation technician in compliance with the regulations in force.

WARNING Make sure that the supply voltages and frequencies are suited to the characteristics of the electric motor. Check the motor rating plate. Provide suitable general protection against short circuits on the power line.

Before proceeding, make sure that all the connections (even those that are potential-free) are voltage-free. The power supply line must be provided with the following devices (unless otherwise specified by the local regulations in force:
• A short-circuit protection device
• A high-sensitivity differential device (30mA) providing additional protection against electric shock in case the grounding system is inefficient.
• A main isolator switch with a contact gap of at least 3 millimeters.
Ground the system according to the regulations in force. First of all, connect the external protection conductor to the PE terminal, making sure that it is longer than the phase leads. The selection of the leads (gauge, material, sheath material,…) must take into account the actual operating conditions. Protect the electrical leads from too high temperatures, vibrations and collisions.

To facilitate the connection, the terminal board can be placed in one of the four 90° positions. To obtain the most convenient position for the connection of the power supply cables, remove the 4 adaptor/motor fastening bolts and rotate the motor to the desired position without removing the coupling between the motor shaft and the pump shaft. Replace the 4 bolts and tighten them. Remove the screws that fasten the terminal box cover and make the connections as shown on the back of the cover and in the diagrams in **Fig.M**.

6.2.1 Overload protection (single-phase motors)

The single-phase electric pump units, up to 1.5 kW power, have an automatic reset protection incorporated in the motor (motor protector). Be careful because the pump could start up suddenly once the motor winding has cooled down.

en

WARNING For versions with 2.2 kW and higher powers, an overload protection (thermal relay or motor protector) must be provided. If a different motor from the standard one Lowara provides is used, read the operating instructions to ensure whether the protection is provided or not.

Adjust the thermal relay or motor protector to the nominal current value of the electric pump unit or to the operating current if the motor is not used at full load.

6.2.2 Overload protection (three-phase motors)

WARNING Provide the overload protection (thermal relay or motor protector)

Adjust the thermal relay or motor protector to the nominal current value of the electric pump unit or to the operating current in case the motor is not used at full load. If the motor has a star-delta starting system, adjust the thermal relay to a value equal to 58% of the nominal current or operating current.

6.2.3 Protection against Dry Running

WARNING Avoid the possibility of dry running, i.e. the pump must not run without water inside it. Make sure that the electric panel is equipped with a dry running protection system to which a pressure switch or float switch or sensors or other suitable device must be connected.

If the pump sucks the water from the mains, a pressure switch can be installed on the suction side to switch off the pump in the event of low mains pressure (always refer to the regulations locally in force). If the pump sucks the water from a storage tank or reservoir, a float switch or sensors to switch off the pump in the event of low water level can be installed.

6.3 Priming

WARNING Fill the pump and suction pipes with water before starting the unit. Dry running can damage the pump.

Pay attention to the instructions contained in this chapter and to the diagrams in **Fig.Na** and **Fig.Nb** for placement of the plugs.

Fig.Na , Nb KEY

A	Fill plug with air valve (R3/8 for 1, 3, 5, 10, 15, 22SV, G 1/2 in all other cases)
B	Fill plug (R3/8 for 1, 3, 5, 10, 15, 22SV , G 1/2 in all other cases)
C	Drain plug (R3/8 for 10, 15, 22SV , G 1/2 in all other cases)
D	Plug for drum, if present (do not unscrew)
E	Gauge connection plug (R 3/8) only for 33, 46, 66, 92, 125SV
1	Fill plug with open air valve
2	Fill plug with closed air valve
3	Version without plug and drum
4	Version with plug but no drum (do not unscrew)
5	Version with plug and drum (do not unscrew)

Pay attention to **Fig.Pa** , **Fig.Pb** and to the KEY below for correct application of the procedures in 6.3.1 and 6.3.2.

Fig.Pa , Pb KEY

A	Fill and air plug
B	Drain plug
C	Fill plug
D	Funnel

6.3.1 Suction from a Higher Level or From the Water Mains (Positive Suction Head)
Shut the on-off valve located downstream from the pump.

6.3.1.1 1, 3, 5SV Series
Loosen the drain plug pin B to end of travel without forcing it. Remove the fill plug/air valve A and open the on-off valve upstream until the water flows out of the fill plug/air valve A. Tighten the drain plug pin B to the end of travel without forcing it. Replace the fill plug/air valve A.

6.3.1.2 10, 15, 22, 33, 46, 66, 92, 125SV Series
Remove the fill plug/air valve A and open the on-off valve upstream until the water flows out of the fill plug/air valve A. Close the fill plug/air valve A. Fill plug C can be used instead of plug A.

6.3.2 Suction from a Lower Level (Suction Lift)
Open the on-off valve located upstream from the pump and close the on-off valve downstream.

6.3.2.1 1, 3, 5SV Series
Loosen the drain plug pin B to end of travel without forcing it. Remove the fill plug/air valve A and fill the pump using a funnel until water flows out. Replace the fill plug/air valve A and tighten the drain plug pin B to the end of travel without forcing it .

6.3.2.2 10, 15, 22, 33, 46, 66, 92, 125SV Series
Remove the fill plug/air valve A and fill the pump using a funnel.Replace the fill plug/air valve A. Fill plug C can be used instead of plug A.

6.4 Checking the Rotation Direction of Three-Phase Motors
When the pump has been electrically connected (→ section 6.2) and primed (→ section 6.3), make sure the on-off valve downstream from the pump is closed.
Start the pump and check the direction of rotation through the coupling protection or through the motor fan cover (for the three-phase versions). The correct rotation direction is indicated by arrows on the adaptor, coupling and/or motor fan cover. If the rotation direction is incorrect, stop the pump, disconnect the power supply and exchange the position of two wires in the motor's terminal board or in the electric control panel.

6.5 Operation
Start the pump, keeping the on-off valve downstream from the pump closed. Open the on-off valve gradually. The pump must run smoothly and quietly.
If necessary, re-prime the pump. Check the current absorbed by the motor and, if necessary, adjust the setting of the thermal relay. Any air pockets trapped inside the pump may be released by turning the air screw.

WARNING If a pump installed in a location where freezing may occur remains inactive, drain it through the drain plugs. This operation is not necessary if suitable antifreeze has been added to the water.

Make sure that the drained liquid does not cause damage or injuries.

During operation, the outer surface of the pump (if hot liquids are being pumped) and the outer surface of the motor can exceed 40°C. Do not touch with parts of t he body (e.g.: hands) and do not put combustible material in contact with the pump.

WARNING Please refer to **Fig.Q**, **Fig.R**, **Fig.S** for torques to be applied in threaded elements (bolts and plugs, mating between motor and adapter, mating between couplings).

WARNING For applicable Forces and Torques to the flanges please refer to **Fig.T**

Fig.Q KEY

A	Motor size
B	Adapter - motor screw
C	Coupling screw
Ø	Diameter
N•m	Driving torque

Fig.R, Fig.S KEY

A	Impeller locking screw
B	Tie rod nut
C	Drum locking plate screws (and diffuser bushings, 125SV only)
D	Mechanical seal housing lock screws (and diffuser, 125SV only)
E	Fill plug with air valve
F	Fill/drain plugs
G	Gauge connection plug
H	Round counter flange screws
I	Oval counter flange screws
Ø	Diameter
N•m	Driving torque

7. Maintenance, Service, Spare Parts

Information for maintenance personnel

Before performing any maintenance operations on the electric pump unit, make sure that the motor is voltage-free.

Maintenance operations must be performed by skilled and qualified personnel only. Use suitable equipment and protection devices. Observe the accident prevention regulations in force.
If pump must be drained, make sure that the drained liquid does not cause damage or injuries.

The pump is supplied with a calibrated fork-shaped shim designed to facilitate the motor coupling and replacement operations.

7.1 Routine Maintenance

The pump does not require any scheduled routine maintenance. In general, the checking of the following aspects, or some of them, at varying intervals depending on the operating conditions is recommended: pumped liquid leaks, delivery pressure, starts per hour, noise, triggering of the electrical protections (relays, fuses,…).
If the user wishes to draw up a maintenance schedule, related deadlines depend on the type of liquid pumped and on the operating conditions.

7.2 Extraordinary Maintenance

Extraordinary maintenance may be necessary in order to clean the liquid end or replace the mechanical seal and other worn parts.

7.3 Motor/Pump Coupling

The pump may be supplied without the electric motor. In this case the calibrated fork-shaped shim is already inserted between the adapter and the transmission coupling in order to keep the impeller stack in the correct axial position. To prevent damage during transportation, the pump shaft is held in position by Styrofoam and two plastic straps. The bolts and nuts needed to fasten the motor to the adaptor are not included. Refer to the diagrams in **Fig.U**, **Fig.V**.to couple the pump to the motor.

7.3.1 Selecting the Electric Motor

If the pump alone has been bought, without the motor, the safety of the coupled pump with a motor other than those described in Lowara's catalogue must be guaranteed by the person making the coupling.

Single-phase or three-phase motors whose size and power comply with the European standards can be used.

WARNING Use dynamically balanced motors, with half-sized key in the shaft extension (IEC 60034-14) and with normal vibration rate (N).

7.4 Replacing the Motor

Refer to the diagrams in **Fig.U**, **Fig.V**.
If the calibrated fork-shaped shim is not available, use a 5 ± 0.1 mm shim.

7.5 Mechanical Seals

Pumps	Basic characteristics of the mechanical seals
1, 3, 5SV	Nominal diameter 12 mm, unbalanced, right-hand rotation, K version (EN 12756)
10, 15, 22SV	Nominal diameter 16 mm, unbalanced, balanced with motor power ≥ 5.5kW , right-hand rotation, K version (EN 12756)
33, 46, 66, 92, 125SV	Nominal diameter 22 mm, balanced, right-hand rotation, K version (EN 12756)

7.5.1 Replacing the Mechanical Seal on 1, 3, 5, 10, 15, 22SV Series Pumps with motor power of 4kW or lower.

Contact the Sales and Service department.

7.5.2 Replacing the Mechanical Seal on 10, 15, 22SV (with motor power ≥ 5.5kW), 33, 46, 66, 92, 125SV Series Pumps

Refer to the diagrams in **Fig.X**.

7.6 Service

Please contact the Sales and Service Department for any request or information.

7.7 Spare Parts

WARNING Always specify the exact pump/electric pump unit type and identification code when requesting technical information or spare parts from the Sales and Service department.

Use only original spare parts to replace any worn or faulty components. The use of unsuitable spare parts may cause malfunctions, damage and injuries.

Refer to the diagrams in **Fig.Y, W, Z**.

8. Disposal

Information for installation and maintenance personnel

Observe the regulations and codes locally in force regarding sorted waste disposal.

9. Special Version - Horizontal Installation

Information for installers and users

If pump must be installed in the horizontal position, a special version and mounting brackets must be requested from the Sales and Service Department.

en

10. Troubleshooting **information for users and maintenance personnel**

PROBLEM	PROBABLE CAUSE	POSSIBLE SOLUTION
The electric pump unit does not start. The main switch is on	No power supply	Restore the power supply
	Triggering of thermal protector incorporated in the pump (if any)	Wait for the pump motor to cool down
	Triggering of thermal relay or motor protector found in the electric control panel	Reset the thermal protector
	Pump or auxiliary circuits protection fuses blown	Replace fuses
	Triggering of protection device against dry running	Check the water level in the tank or the mains pressure. If everything is in order, check the protection device and its connection cables
The electric pump unit starts up but the thermal protector is immediately triggered or the fuses blow	Power supply cable is damaged	Check the components and replace as necessary
	Electric motor short circuit	
	Thermal protector or fuses not suited to the motor current	
	Motor overload	Check the operating conditions of the electric pump unit and reset the protection
The electric pump unit starts up but, after a short time, the thermal protector is triggered or the fuses blow	A phase in the power supply is missing	Check the power supply
	Power supply voltage not within the motor's working limits	Check the operating conditions of the electric pump unit
	The electric panel is situated in an excessively heated area or is exposed to direct sunlight	Protect the panel from heat sources and from the sun
The electric pump unit starts up but, after a varying period of time, the thermal protector is triggered	There are foreign bodies inside the pump, the impellers are jammed	Disassemble and clean the pump
	The pump's delivery rate is higher than the limit specified on the rating plate	Partially close the on-off valve located downstream until the delivery rate returns within the specified limits
	The pump is overloaded because it is sucking a dense and viscous liquid	Check the actual power requirements based on the characteristics of the pumped liquid, and replace the motor accordingly
	Worn motor bearings	Replace the bearings or the motor
The electric pump unit starts up but does not deliver the required flow	Wrong rotation direction (three-phase version)	Check the direction of rotation and, if necessary, exchange two phases in the motor or in the electrical panel
	Pump is not primed because not filled with water	Repeat the priming procedure and make sure there are no leaks in the mechanical seal
	Pump not primed due to tightness failure in suction pipe or foot valve	Check the suction pipe and foot valve for perfect tightness, make sure there are no leaks in the mechanical seal
	Air in the pipes or pump	Bleed the air
	Excessive suction lift or flow resistance in suction piping	Check the operating conditions of the pump. If necessary, decrease suction lift and/or increase the diameter of the suction pipe
	Piping or pump clogged	Disassemble and clean
	Valves locked in closed or partially closed position	Disassemble and clean, if necessary replace the valve.
The system's general protection cuts in	Short circuit	Check electrical system
The system's differential thermal-magnetic protection cuts in	Ground leakage	Check insulation of the electrical system components.
The pump rotates in the wrong direction when it is stopped	Leaks in suction pipe	Check and locate leaks Repair or replace components.
	Leaks in foot valve or check valve	
	Air in the suction pipe	Bleed the air
The pump starts up too frequently	Leaks in foot valve, check valve or system	Check and locate leaks. Repair or replace the components.
	Ruptured membrane or no air pre-charge in surge tank	See relevant instructions in surge tank manual
The pump vibrates and generates too much noise	Pump cavitation	Reduce the required flow rate by partially closing the on-off valve downstream from the pump. If the problem persists check the operating conditions of the pump (height difference, flow resistance, liquid temperature,….)
	Worn motor bearings	Replace bearings or motor
	Presence of foreign bodies inside the pump, between the impellers and diffusers	Disassemble and clean the pump

11. Tables and Drawings

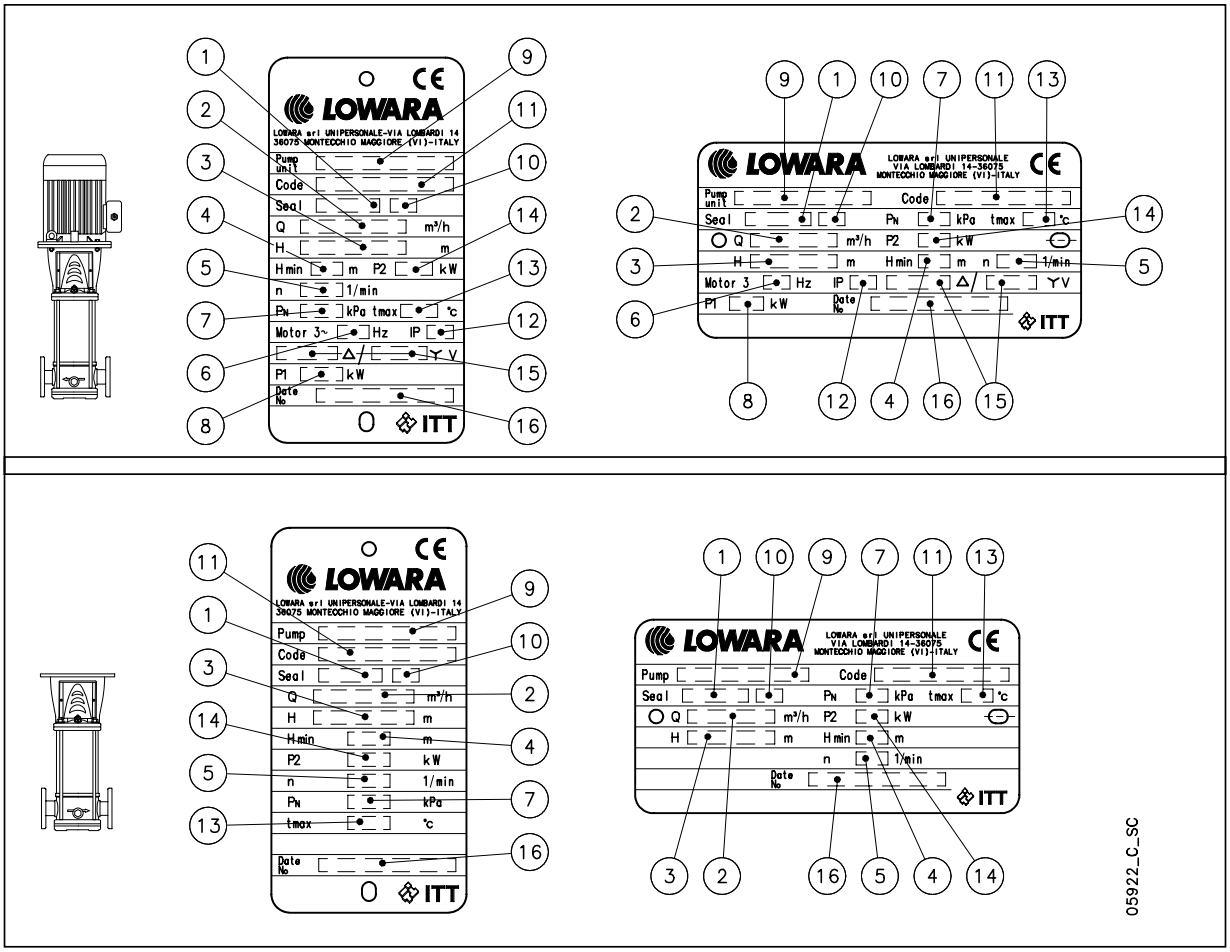


Figure A

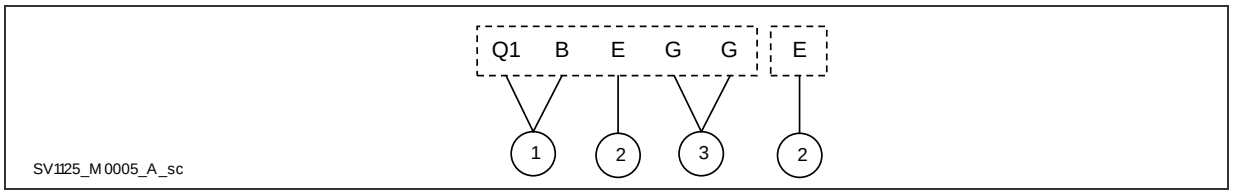
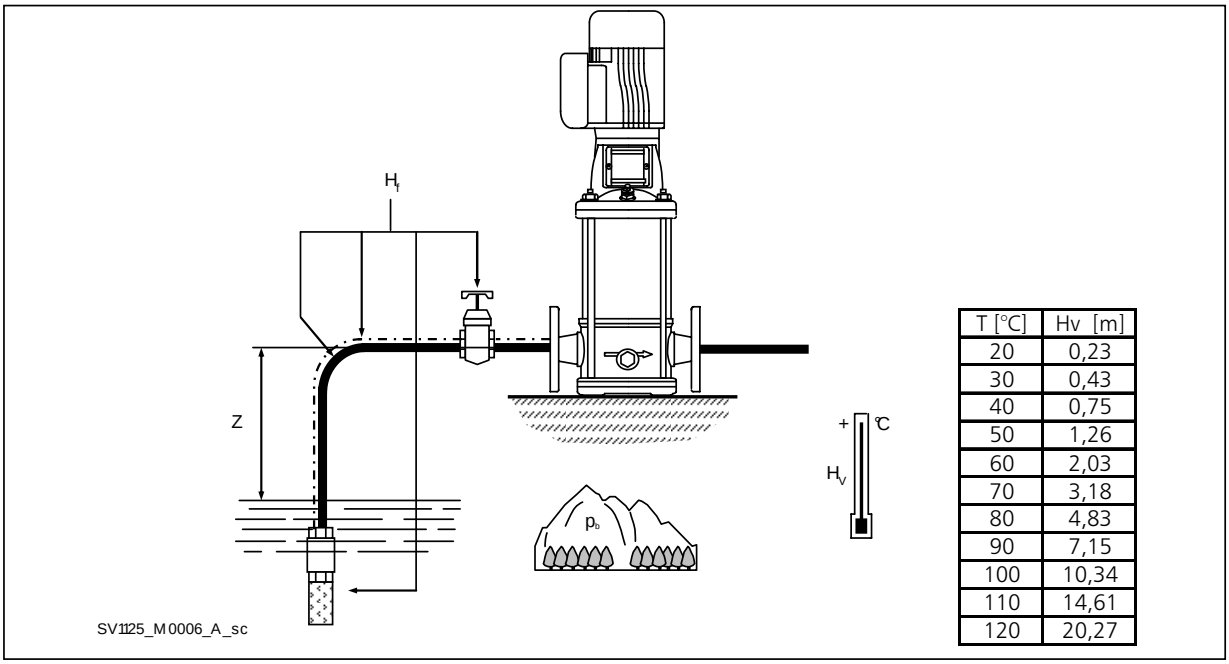


Figure B



T [°C]	Hv [m]
20	0,23
30	0,43
40	0,75
50	1,26
60	2,03
70	3,18
80	4,83
90	7,15
100	10,34
110	14,61
120	20,27

Figure C

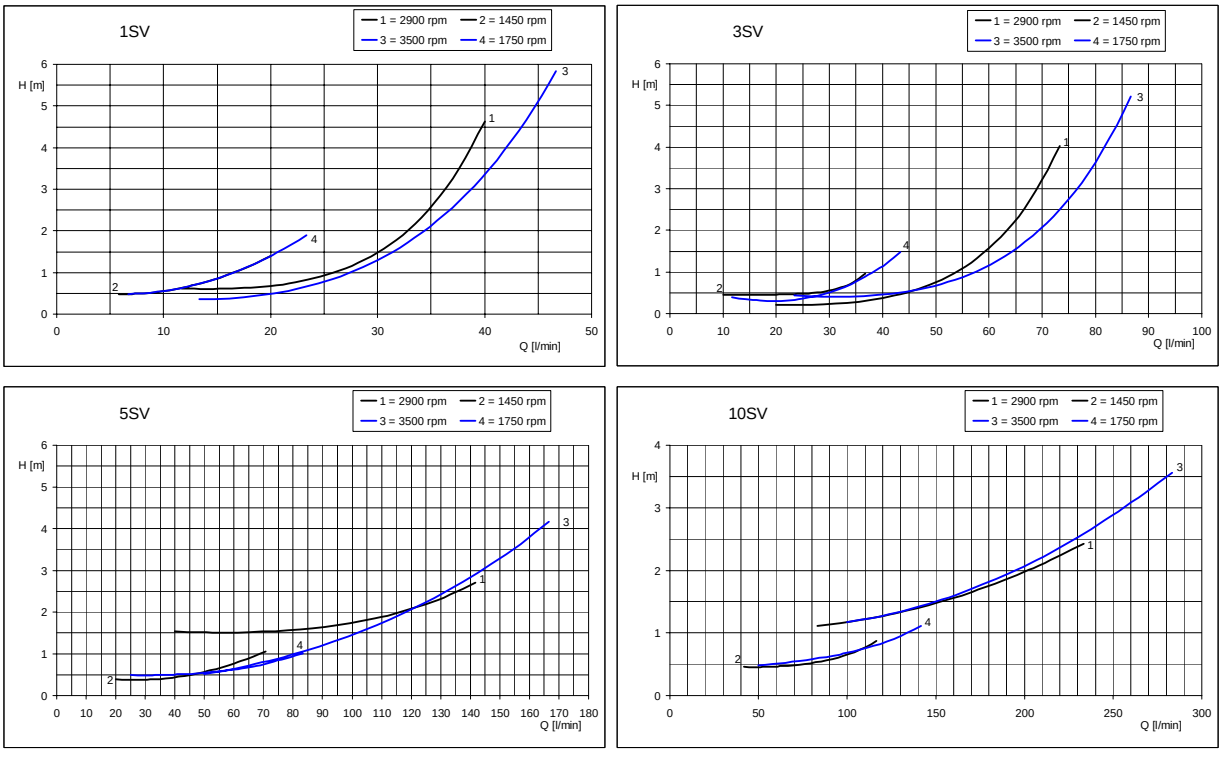
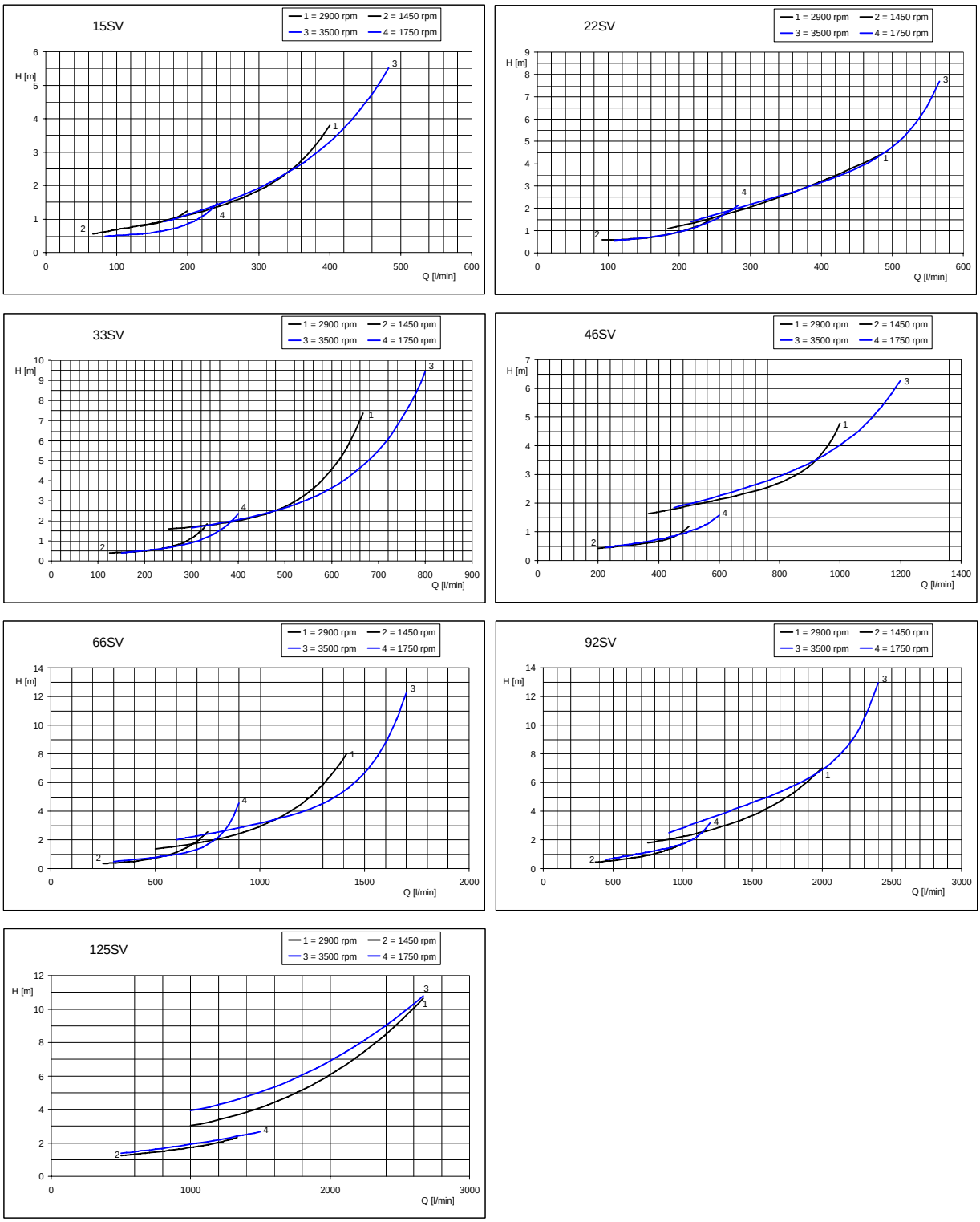


Figure D



SV1125_M0045_A_OT (2)

Figure D

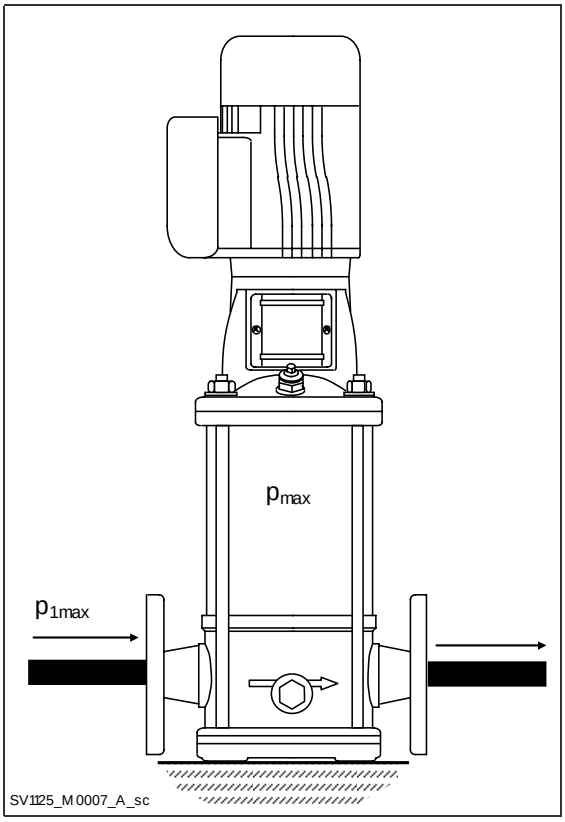


Figure E

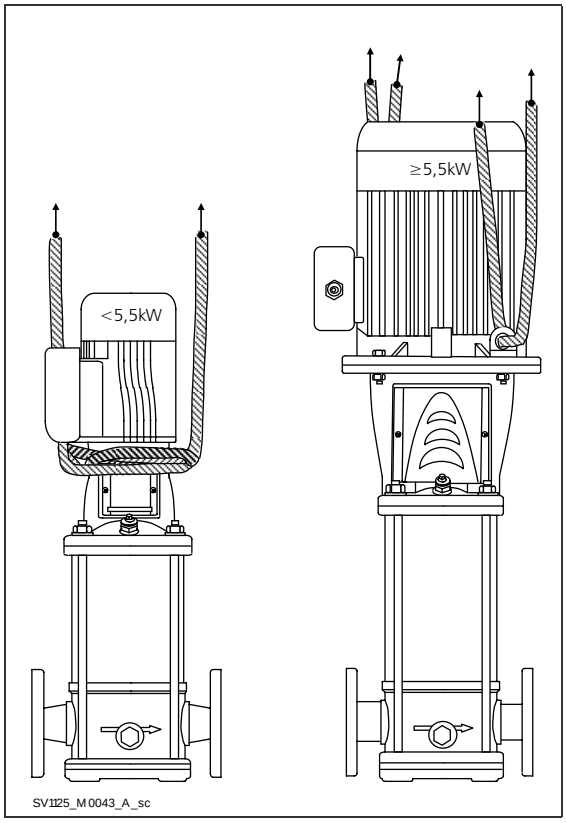


Figure F

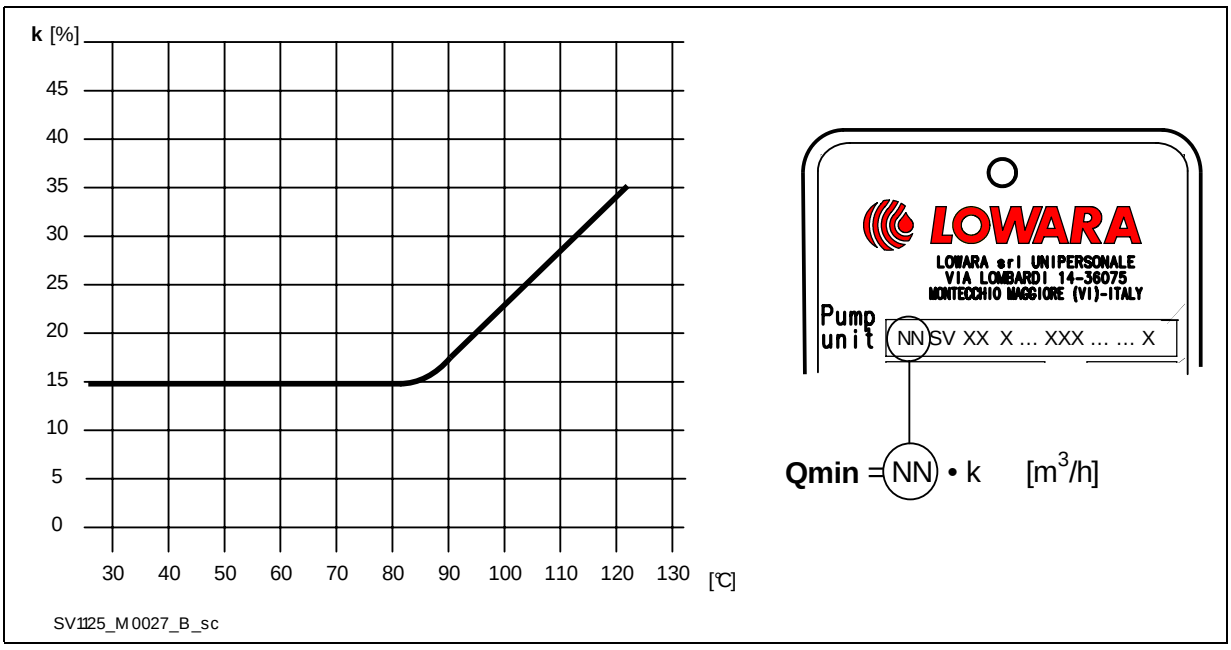


Figure G

		T (°C)								
		0	10	20	30	40	45	50	55	60
H (m)	0	1.00	1.00	1.00	1.00	1.00	0.95	0.90	0.85	0.80
	500	1.00	1.00	1.00	1.00	1.00	0.95	0.90	0.85	0.80
	1000	1.00	1.00	1.00	1.00	1.00	0.95	0.90	0.85	0.80
	1500	0.97	0.97	0.97	0.97	0.97	0.92	0.87	0.82	0.78
	2000	0.95	0.95	0.95	0.95	0.95	0.90	0.85	0.80	0.76

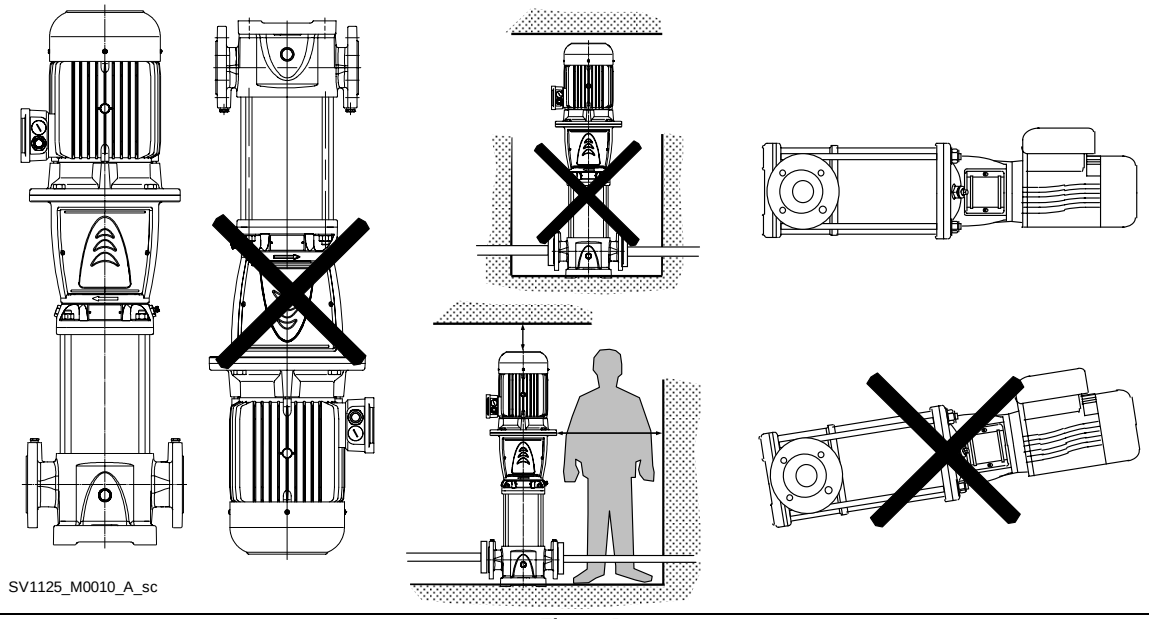
SV1125_M0028_A_ot

Figure H

P2	dB ± 2							
	50 Hz 2900 min^{-1}		50 Hz 1450 min^{-1}		60 Hz 3500 min^{-1}		60 Hz 1750 min^{-1}	
kW	IEC	LpA	IEC	LpA	IEC	LpA	IEC	LpA
0.25	-	-	71	< 70	-	-	71	< 70
0.37	71R	< 70	71	< 70	-	-	71	< 70
0.55	71	< 70	80	< 70	71	< 70	80	< 70
0.75	80R	< 70	80	< 70	80R	< 70	80	< 70
1.1	80	< 70	90	< 70	80	< 70	90	< 70
1.5	90R	< 70	90	< 70	90R	< 70	90	< 70
2.2	90R	< 70	100	< 70	90R	70	100	< 70
3	100R	< 70	100	< 70	100R	70	100	< 70
4	112R	< 70	112	< 70	112R	71	112	< 70
5.5	132R	< 70	132	< 70	132R	73	132	< 70
7.5	132R	< 70	132	< 70	132R	73	132	< 70
11	160R	73	-	-	160R	79	160	< 70
15	160	75	-	-	160	80	160	< 70
18.5	160	75	-	-	160	80	-	-
22	180R	75	-	-	180R	80	-	-
30	200	74	-	-	200	78	-	-
37	200	74	-	-	200	78	-	-
45	225	78	-	-	225	83	-	-
55	250	84	-	-	250	89	-	-

SV1125_M0029_A_ot

Figure I. Airborne noise emission by units equipped with Lowara supplied motor



SV1125_M0010_A_sc

Figure J

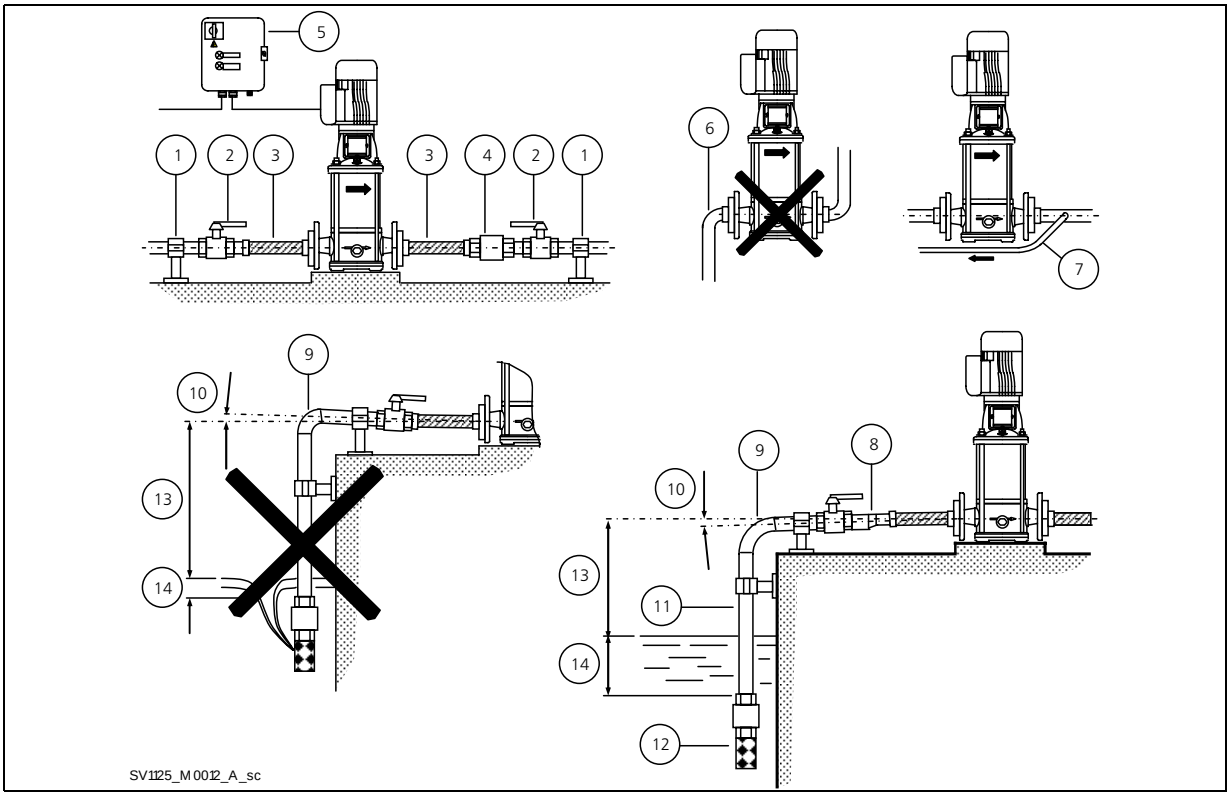
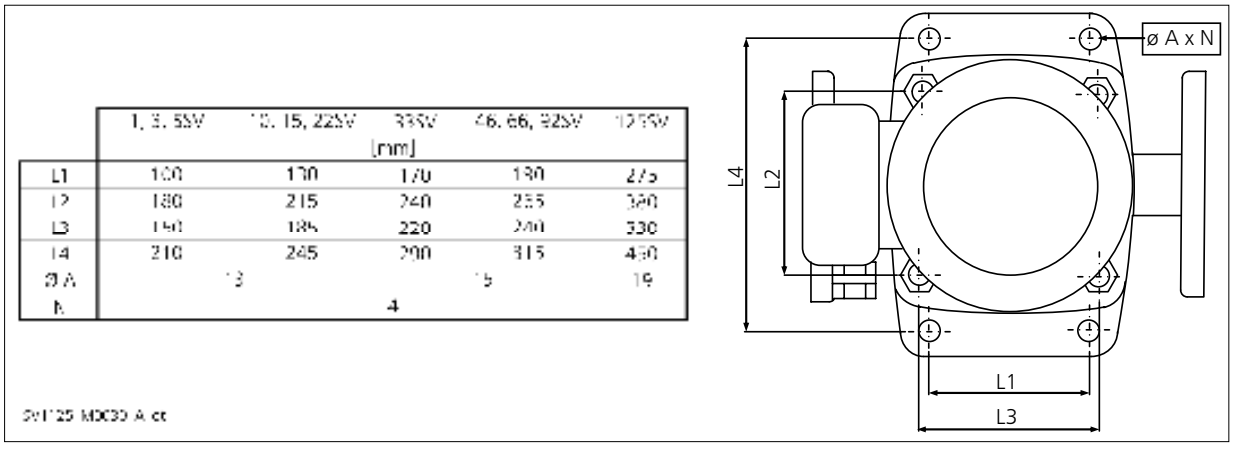


Figure K



	1, 3, 5SV	10, 15, 22SV	33SV	46, 66, 92SV	125SV
	[mm]				
L1	100	130	170	190	275
L2	180	215	240	255	360
L3	150	185	220	240	330
L4	210	245	290	315	430
ØA	13		15		19
N	4				

SV1125_M0030_A_sc

Figure L

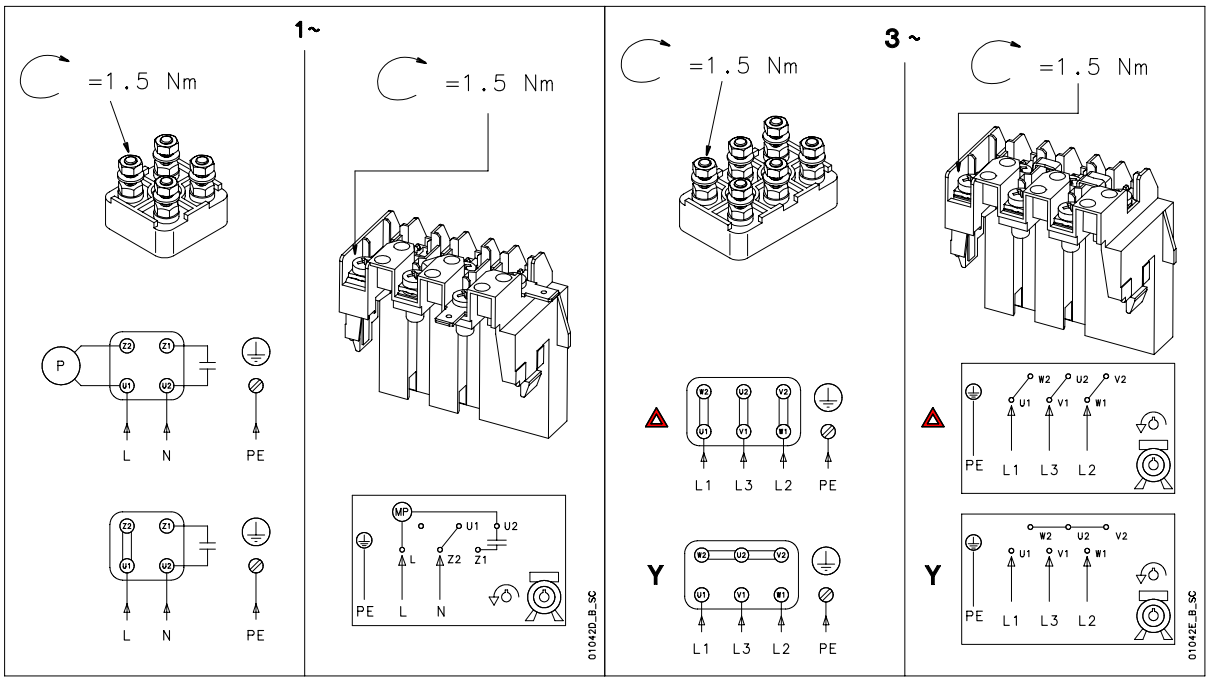


Figure M

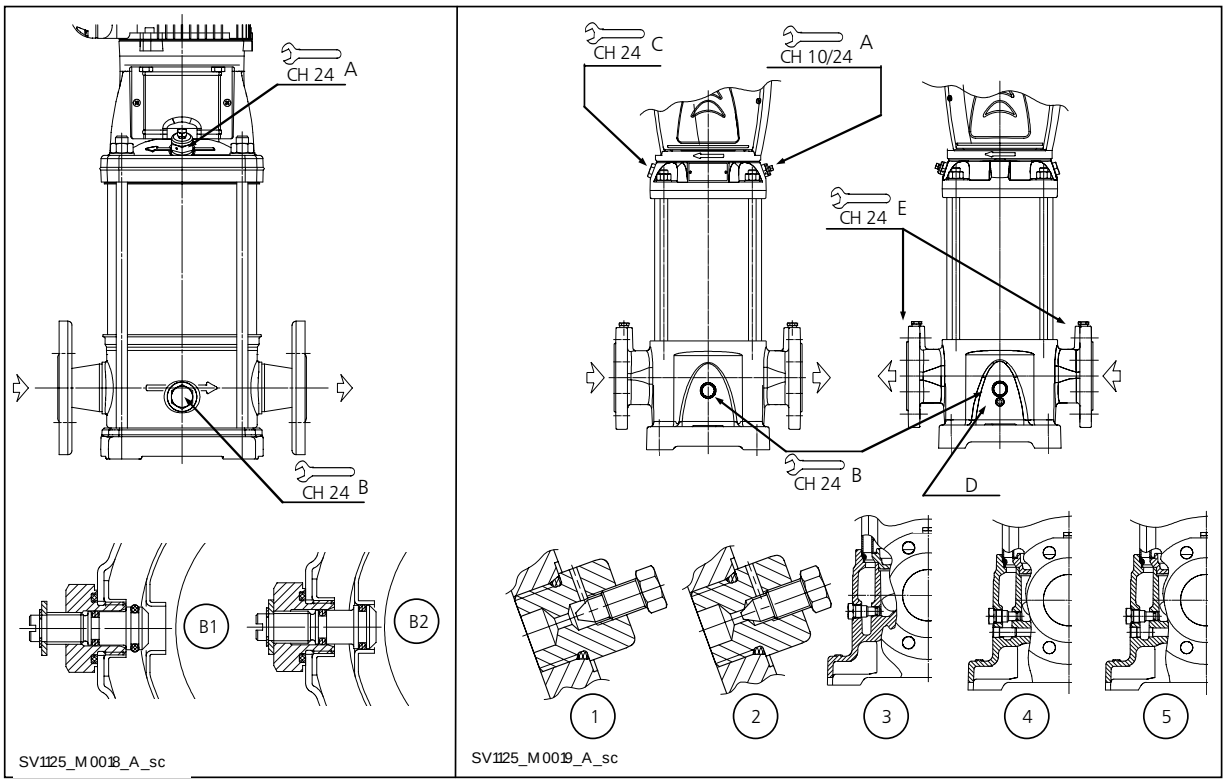


Figure Na **Figure Nb**

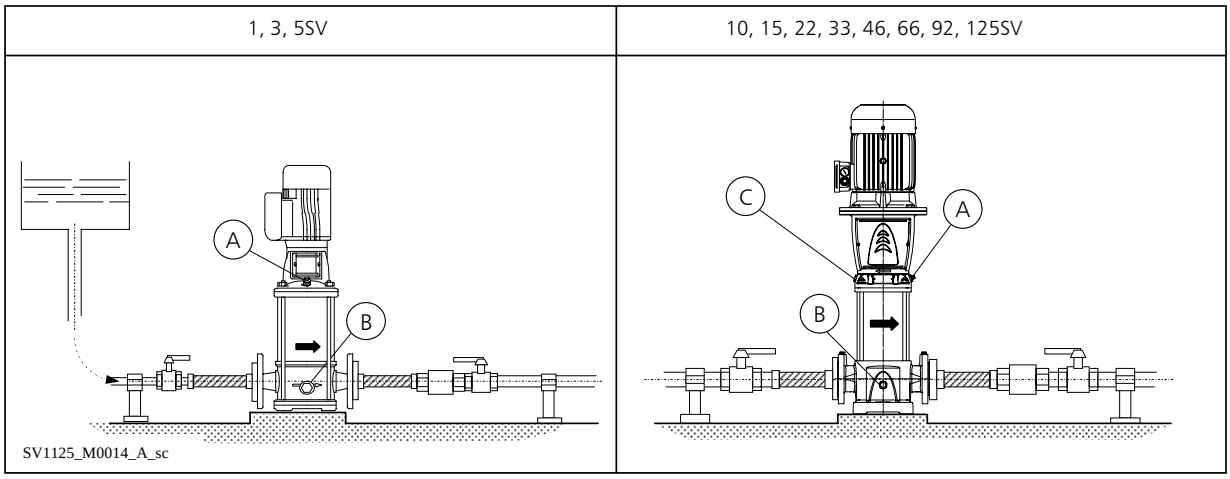


Figure Pa

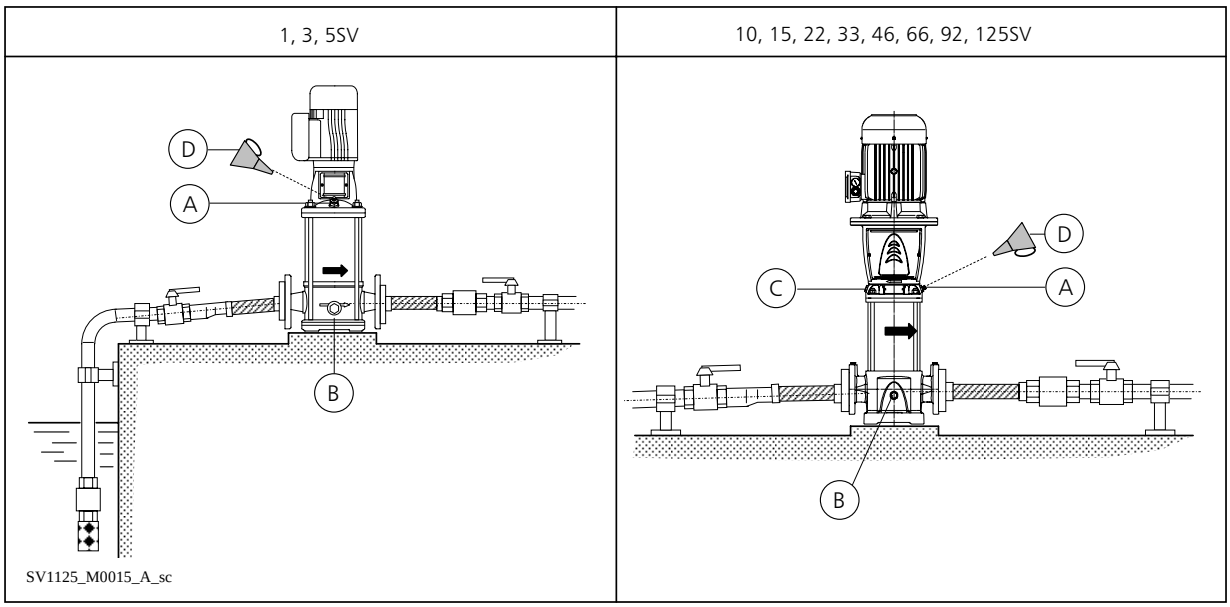


Figure Pb

	A		B		C		D		E		F		G		H		I	
	Ø	N•m	Ø	N•m	Ø	N•m	Ø	N•m	Ø	N•m	Ø	N•m	Ø	N•m	Ø	N•m	Ø	N•m
1SV	M 8	20	M 12	25	-	-	-	-	-	-	G3/8	25	-	-	M 12	50	M 10	30
3SV																		
5SV															M16	100	M 12	50
10SV	M 10	35	M 14	30			M 8	25										
15SV																		
22SV																		
33SV	M 12	55	M 16	60	M 6	8	M 10	35	G1/2	40	G1/2	40	R3/8	40	M20	200	-	-
46SV															M16	100		
66SV-PN16															M20	200		
66SV-PN25															M16	100		
92SV-PN16															M20	200		
92SV-PN25															M16	100		
125SV-PN16															M24	350		
125SV-PN25																		

SV1125_M0040_A_ot

Figure Q

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A		71	80	90	100	112	132	160	180	200	225	250
B	Ø	M 6		M 8			M 12	M 16				
	N•m	6		15			50	75				
CH	⬢	10		13			19	24				

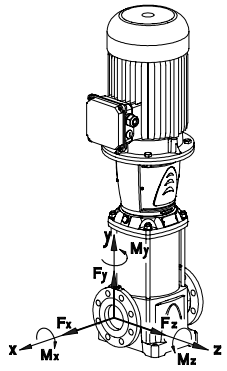
SV1125_M0041_A_ot

Figure R

A		1, 3, 5, 10, 15, 22SV					1, 3, 5SV	10, 15, 22SV		33, 46, 66, 92, 125SV						
		71	80	90	100	112	132	132	160	90	100	112	132	160	180	200	225	250
C	Ø	M 6			M 8		M8	M 10		M 10			M 12					
	N•m	15			25		25	50		50			75					
CH	⬡	5			6		6	8		8			10					

SV1125_M0042_A_ot

Figure S



PUMP TYPE	DN	Forces (N)			Moments (Nm)		
		Fx	Fy	Fz	Mx	My	Mz
1-3 SV	25	200	180	230	240	160	190
5 SV	32	260	240	300	310	210	250
10 SV	40	330	300	370	390	270	310
15-22 SV	50	450	400	490	420	300	340
33 SV	65	1800	1700	2000	1500	1050	1200
46 SV	80	2250	2050	2500	1600	1150	1300
66-92 SV	100	3000	2700	3350	1750	1250	1450
125 SV	125	3700	3300	4100	2100	1500	1750

1-125sv-forza-FNG-en_a_td_a_td

Figure T

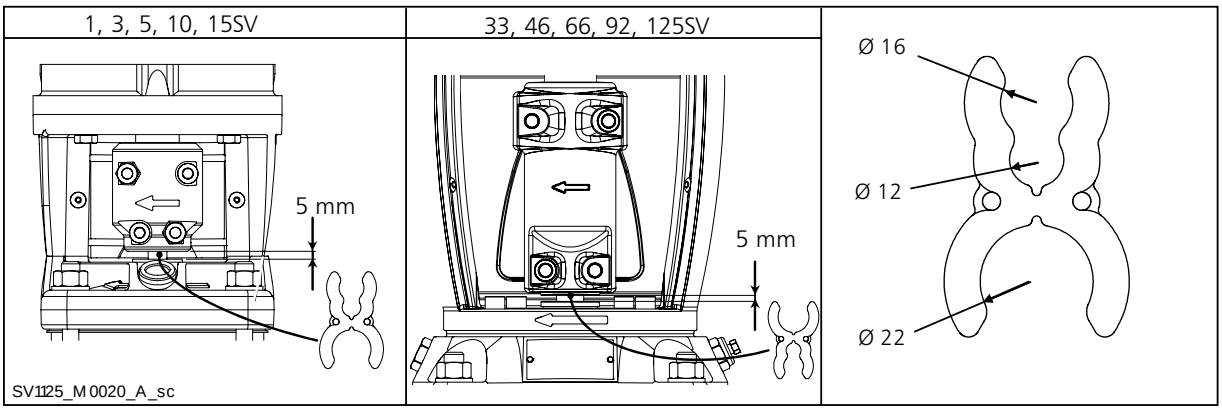


Figure U

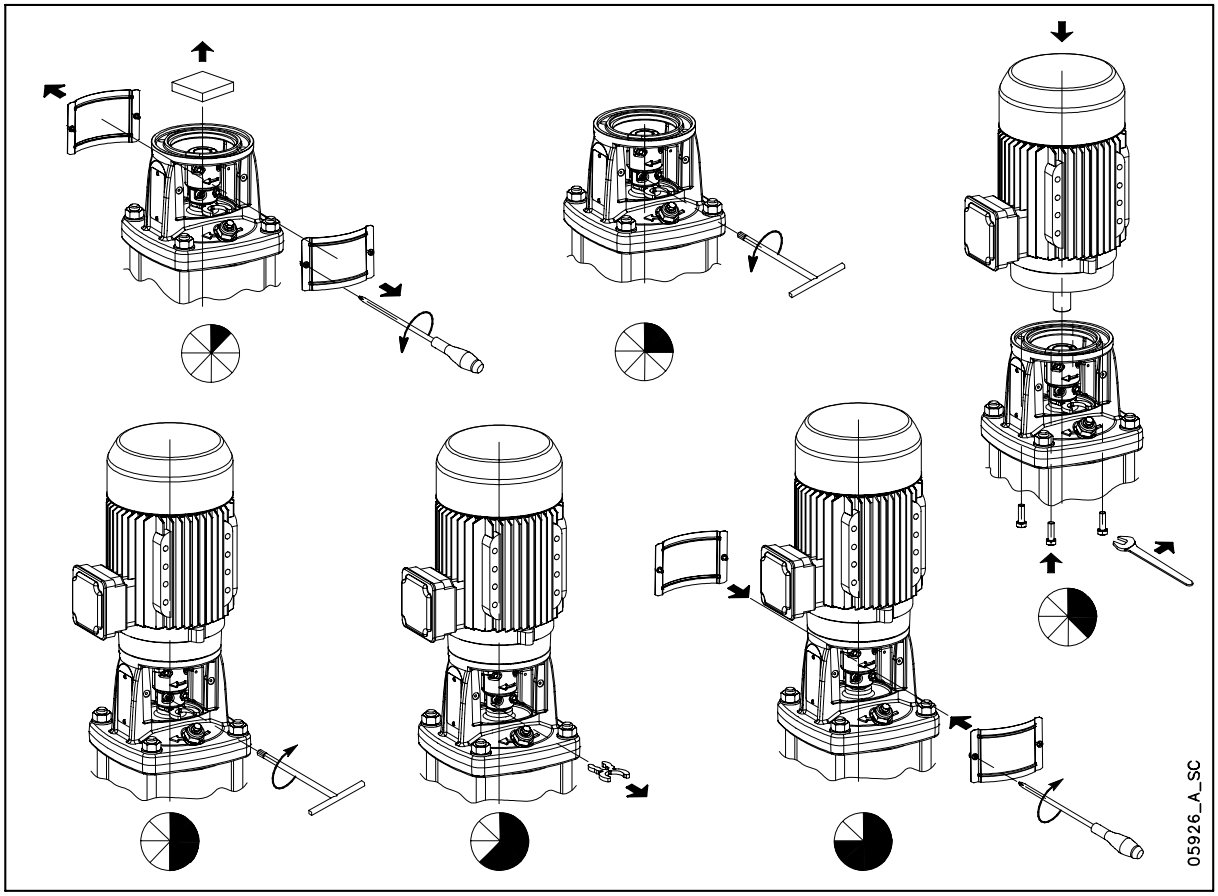


Figure V

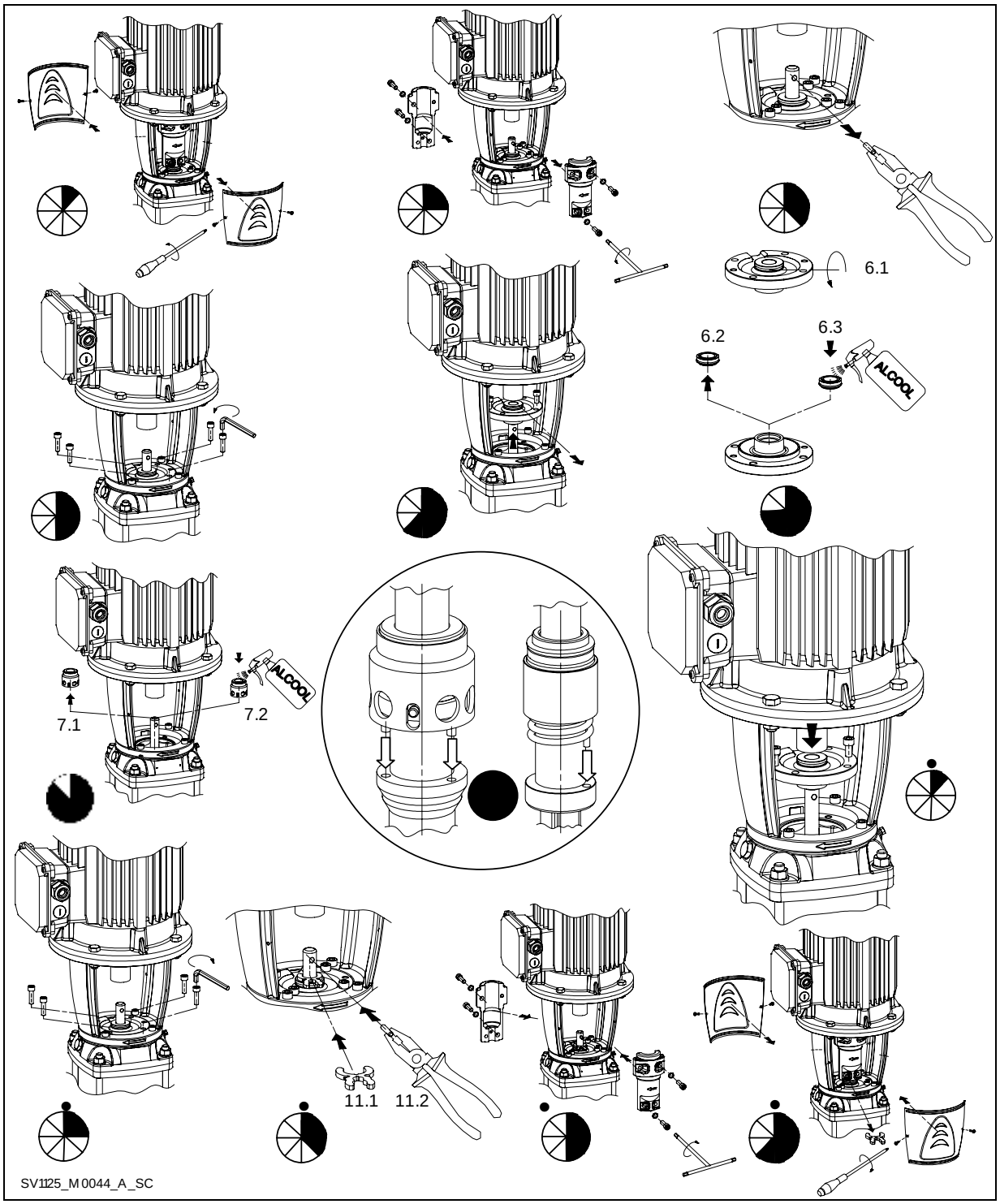


Figure X

222

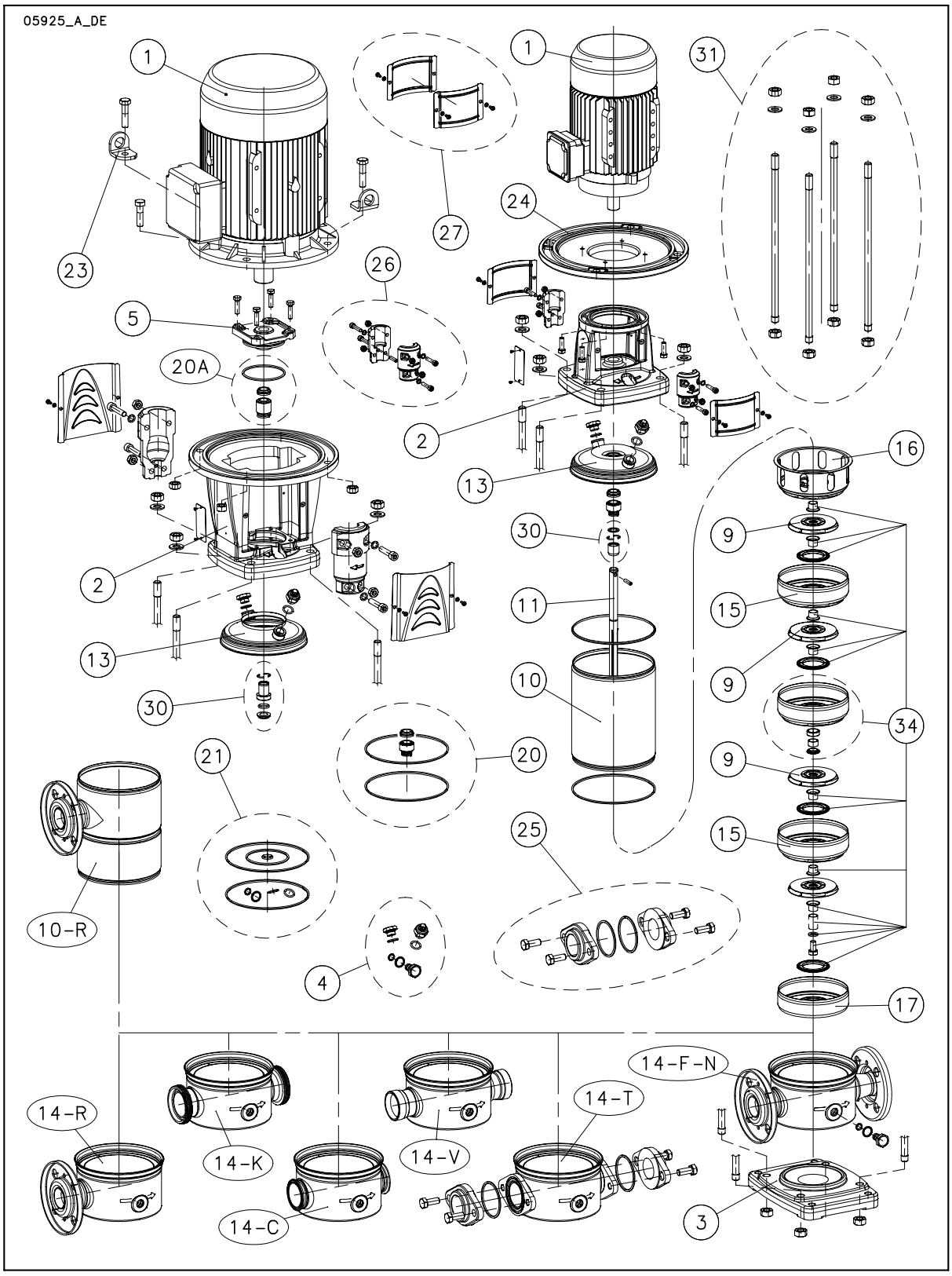


Figure Y 1, 3, 5, 10, 15, 22 SV

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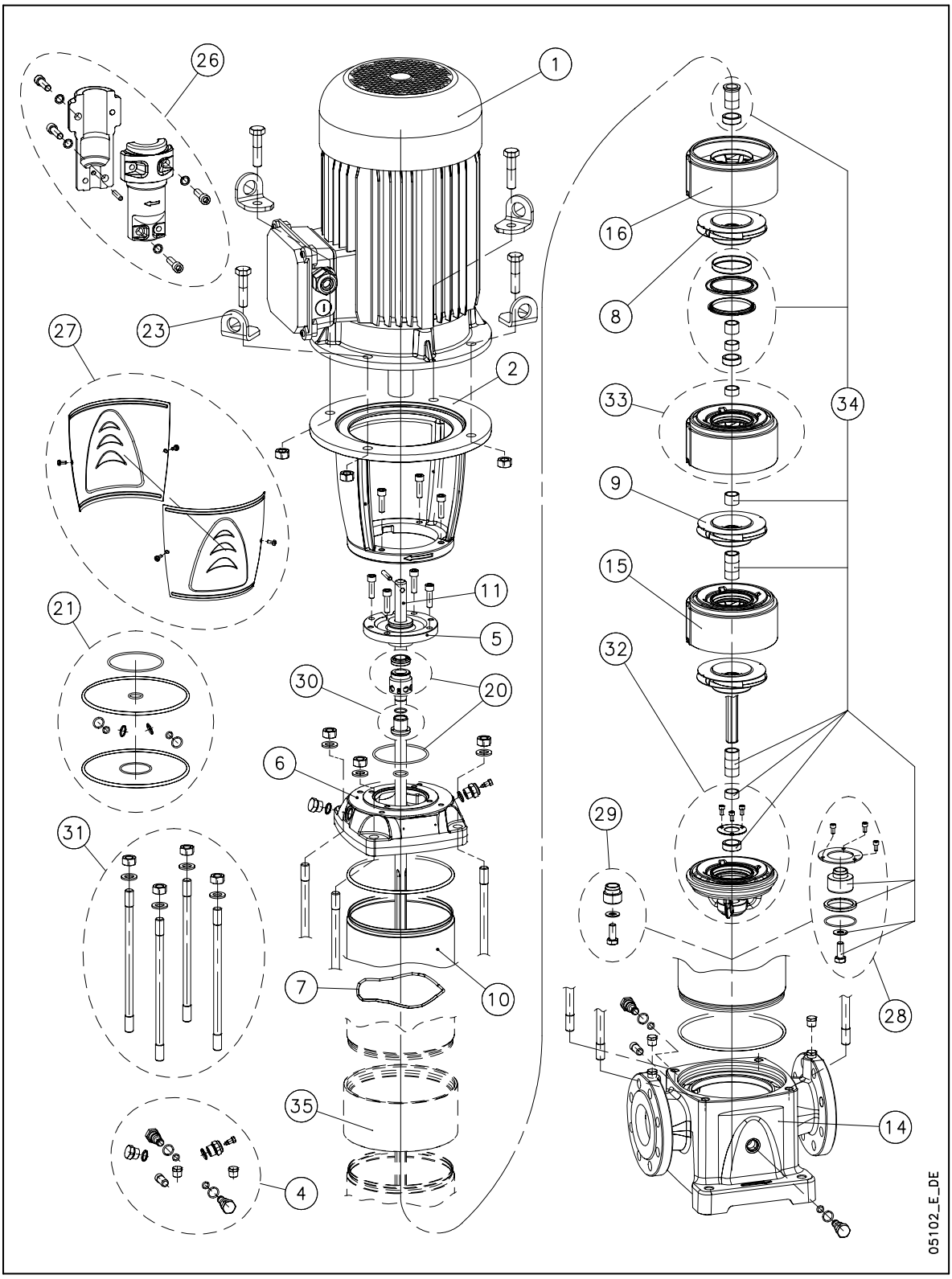

Figure W 33, 46, 66, 92SV

224

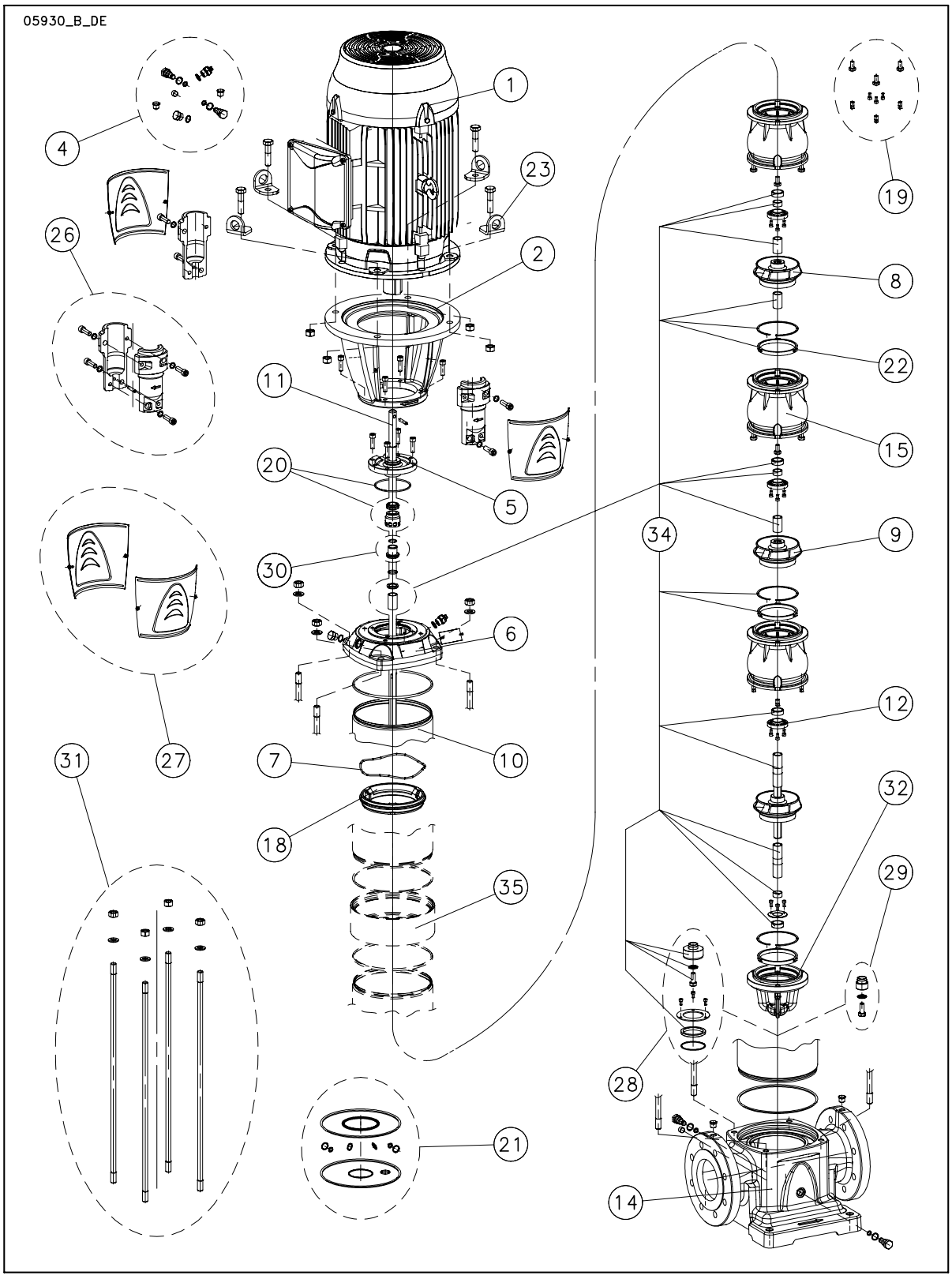

Figure Z 125SV

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N.	Description
1	Motor
2	Adapter
3	Base
4	Plug kit + O Ring
5	Seal housing plate
6	Upper head
7	Diffusers stack spring
8	Impeller (reduced diameter)
9	Impeller (full diameter)
10, 10-R	Sleeve
11	Shaft
12	Bush locking cover
13	Upper pressed holder with connections
14, 14-[redacted]	Pump body F, N, R, K, C, V, T type
15	Diffuser kit
16	Last stage diffuser kit
17	First stage box
18	Adapter ring
19	Diffuser bolts kit
*20, 20-A	Mechanical seal

N.	Description
*21	O ring kit
22	Diffuser wear ring support ring
23	Lifting ring
24	Flange for motor
25	Oval counterflanges + O Ring
26	Pair of half-couplings kit
27	Coupling guard
28	Thrust drum and impeller stack locking kit
29	Impeller stack locking kit
30	Seal bush kit
31	Tie rods kit
32	Lower support and bush kit
33	Diffuser and bush kit
34	Wear parts kit
35	Ring for sleeve
*	Recommended spare parts

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B

Appendix B
Manufacturer's Guide - Zilmet Pressure Vessel

This Appendix contains a modified version of the Installation Safety and Configuration instructions provided by Zilmet S.p.A for the Zilmet® Pressure Vessel.

Instructions for the User

1. Descriptions and Use

ZILMET pressurised expansion vessels with fixed and interchangeable membranes are manufactured according to the safety essential requirements of 97/23/EC pressure equipment directive. These instructions for use have been prepared in accordance with the purpose of article 3.4 of Annex1 of 97/23/EC Directive ("instructions for the user, containing all the necessary safety information relating to ….") and are enclosed with the product when placed on the market.

The expansion vessels for which these instructions refer (identified by drawings 20012, 20014, 20015, 20020) have been designed and manufactured for the following purposes:

The interchangeable membrane pressure tanks allow storage and lifting of sanitary / potable water in pump systems; moreover, they can be used also in closed hydraulic heating systems.

All the vessels incorporate a flexible synthetic diaphragm to keep the system water or fluid from contacting the sealed in air cushion in the tank. In model 20016 the internal surface in contact with water has a special epoxy coating suitable for use with potable water. Also the diaphragms of models 500 HPD, 20012, 20014, 20015, 20016, 20018, 20020 are suitable for potable water applications

2. Technical Characteristics

The technical characteristics of the expansion vessel are written on the identifying label applied to each product; among them, the most important information are: product identification, vessel volume, maximum working pressure and temperature (please, see the following table), pre-charge pressure (factory set or user set), production year, serial number. The label is firmly applied to the vessel and must not be removed or tampered or changed.

Any use at sustained or instantaneous pressure and temperatures exceeding the prescribed limits is **unsafe** and can cause reduced vessel life, property damage, serious scalding and/or bodily injuries or result in death. The vessel may be utilised in systems having a maximum working temperature as in the table, providing all the means that ensure the temperature on the vessel is 70 °C at maximum (installation in the coldest part of the system, thermostatic control and so on). About the minimum temperature, the vessels may work, using proper antifreeze as ethylene glycol (with a percentage up to 50%), at a temperature not lower than -10 °C. Due to the toxicity of such substances, the vessels may not be used for the production and storage of sanitary / potable water. Moreover, all the proper means and precautions for avoiding dispersion in the environment and possible poisoning must be adopted. Please, refer to local safety, occupational, health and environmental codes and standards.

3. Warning

WARNING **THE FOLLOWING SAFETY POINTS MUST BE HEEDED**

- The system in which the expansion vessel is installed must have a pressure-limiting device (pressure relief valve).
- To prevent corrosion due to stray and galvanic currents, the system must be grounded properly according to local electrical and plumbing codes and standards and, if needed, the vessel may be provided with dielectric joints.

- Other possible causes for pin holing and corrosion phenomena have to be considered, for instance, water characteristics (included its temperature), presence of oxygen, melted salts, the use in the same system of devices made of different materials (e.g. carbon steel and stainless steel). All of these factors have to been considered by the manufacturer of the complete system and by the personnel in charge for the installation and maintenance, taking into account also all the local plumbing, electrical and safety standards and regulations.
- Do not use this vessel with chemicals, solvents, petroleum products, acids or any fluids that may be detrimental to the vessel itself.
- Do not use this vessel with water containing sand, clay or other solid substances that may damage the vessel (particularly the internal coating) and / or clog its connection.
- Proper means must be provided for preventing the air from accumulating, during the working of the plant, in the chamber of the vessel (water side) connected to the system.
- The vessel and the connected system must be protected against below freezing temperatures, for instance using proper antifreeze or installing the vessel in suitable areas.
- Do not use this expansion tank for any other purpose that it has been intended for.
- The expansion vessel, piping and connections may in time leak. Select a location to install the expansion vessel where a water leak will not damage the surrounding area and will not cause scalding injuries. The manufacturer shall not be responsible for any water damage to people and/or things and properties in connection with this expansion vessel.
- The manufacturer of this vessel shall not be responsible for any possible damage to things and property and / or injuries to persons due to improper transport and/or handling of the tank itself.
- As in all plumbing products, bacteria can grow in this expansion vessel, especially during times of non use. The local plumbing official and the competent authorities must be consulted regarding any step the personnel in charge for service and maintenance takes to safely disinfect the plumbing system.
- It is forbidden to drill, open, heat with flames or tamper with the vessel in any way.
- Attention, for the pressure tanks which have the upper connection, please note this is opened to allow for the installation of a three way connection on which a manometer and a pressure relief valve may be installed.
- Should it be necessary to change the factory pre-charge, only specialised technical personnel should calculate or determine the new pre-charge. The calculation must ensure that, for all foreseeable working conditions, the specified limits (particularly the maximum working pressure) are never exceeded and local codes and standards are observed. In any case it is advisable the pre charge does not exceed 50% of the maximum working pressure.

4. General Instructions for Installation

DANGER

Before the installation, it is mandatory to calculate and choose the correct type of vessel according to the system design, specifications, instructions and operation requirements. Only qualified and licensed technicians may perform the calculation and the choice of the vessel according to local codes and standards. Only qualified and licensed personnel may install, operate and service this equipment in accordance with system design, specifications and instructions, operation requirements and local thermal, plumbing and electrical codes and standards. Moreover, all local safety, occupational, health, environmental and whatever other applicable codes and standards must be followed. Please, pass these instructions on the personnel in charge for installation, operation and service. All instructions must be carefully read before installing this expansion vessel. After the installation, these instructions must be kept for future reference.

- Make sure all the suitable and required lifting and transport means are used and all the precautions are adopted when positioning and installing this expansion tank.
- Do not install this vessel outdoors, but only in closed and well aerated areas, far from heat sources, electric generators and any other source that may be detrimental to the vessel itself.
- Depending on the model, the weight of the expansion vessel filled with water is supported by the system piping. Therefore, it is important that, where appropriate, the piping has suitable bracing (strapping, hanger, brackets). Moreover, if the vessel has not a support base and is installed horizontally, it must be properly supported.
- Shut off the electric power and the water supply to the system. Make sure the system is cooled and not pressurised for avoiding scalding and / or serious bodily injuries.
- Before the installation, remove the plastic cap on the air valve of the vessel and check for the correct factory set pre-charge (with a tolerance of ± 20%) with a controlled manometer. Adjust the tank pre-charge to the required value; replace and tighten the plastic cap on the air valve.
- Install the vessel at the point specified by the system design, specifications and instructions, preferably in vertical position and with the connection in downward direction (please, see the diagram) and in the following positions:
  In pump systems for storage and lifting of sanitary / potable water, after the backflow preventer at the exit of the pump.
- After the installation of the vessel and the re-start of the plant, check it for leakage and remove all air from the system. Check to make sure that the system pressure and temperature are within a safe operating range; if necessary, remove system water to bring the system pressure within safe limits and/or adjust the temperature control up to the desired ending temperature.

NOTE

Please, note the above described installation is just a reference procedure and for this reason must be used taking into account the specifications and instructions of the plant on which the vessel is installed, the system design, the operation requirements and the local codes and standards.

5. Maintenance

PLEASE, NOTE THAT ONLY QUALIFIED AND LICENSED PERSONNEL MAY PERFORM SERVICE AND MAINTENANCE.

DANGER **ZILMET shall not be responsible for any damage to things, property and / or injuries to persons due to not observing all the above instructions and, particularly, to improper calculation and choice, installation, operation and maintenance of the tank itself and / or the connected system.**

- To perform maintenance and control, make sure the system is off, cooled and not pressurised, all the electric parts are not energised and the vessel is completely empty.
- At least once every six months the expansion vessel has to be verified, checking that the pre-charge is within the value indicated on the label (factory pre-charge or customer set pre-charge) with a tolerance of ± 20%, if not otherwise stated.
- For a longer life of the expansion tank external protection, a periodical external cleaning shall be performed, only using water and soap.
- This expansion vessel includes components which undergo stresses; in the case such components should deteriorate in time, the vessel must be replaced.

Declaration of Conformity

The present declaration of conformity for expansion vessels with fixed diaphragm and pressure tanks with interchangeable membrane can be applied solely to CE marked devices of the categories I, II, III and IV of 97/23/EC Pressure Equipment Directive.

It can not be applied to devices referring to article 3.3 of the above mentioned Directive.

DECLARATION OF CONFORMITY

ZILMET S.p.A.

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35010 Limena (PD) - ITALY

CE

Notified Body Nr. 0036

declares under its sole responsibility that the CE marked diaphragm expansion vessels and pressure tanks of its production, identified with the following drawing numbers:

20012, 20013, 20014, 20015, 20016, 20018, 20020, 200 T, 500 HS/T, 500 HPD, P 636/637, 531

and provided with this declaration, are in conformity with the essential requirements of 97/23/EC Pressure Equipment Directive and the present provisions of the standard prEN 13831, according to module D1 for categories I and II and modules B+D for categories III and IV.

ZILMET S.p.A.

Limena,

rev. 00 - 05/2005

C

Appendix C Miscellaneous Technical Information

This Appendix contains miscellaneous technical information applicable to Dutypoint equipment.

- ***Net Positive Suction Head (NPSH)***
- ***Convertion Factors***
- ***Variable Speed Flow, Head and Power Calculations***
- ***General Operating Limits (Standard Dutypoint Pumpsets)***

Net Positive Suction Head (NPSH)

The minimum operating values that can be reached at the pump suction end are limited by the onset of cavitation.

Cavitation

Cavitation is the formation of vapour-filled cavities within liquids where the pressure is locally reduced to a critical value, or where the local pressure is equal to, or just below the vapour pressure of the liquid. The vapour-filled cavities flow with the current and when they reach a higher pressure area the vapour contained in the cavities condenses.

The cavities collide, generating pressure waves that are transmitted to the walls. These, being subjected to stress cycles, gradually become deformed and yield due to fatigue. This phenomenon, characterised by a metallic noise produced by the hammering on the pipe walls, is called incipient cavitation.

The damage caused by cavitation may be magnified by electro-chemical corrosion and a local rise in temperature due to the plastic deformation of the walls. The materials that offer the highest resistance to heat and corrosion are alloy steels, especially austenitic steel. The conditions that trigger cavitation may be assessed by calculating the total net suction head, referred to in technical literature with the code NPSH (Net Positive Suction Head).

Calculating NPSH

The NPSH represents the total energy (expressed in m) of the liquid measured at suction under conditions of incipient cavitation, excluding the vapour pressure (expressed in m.) that the liquid has at the pump inlet.

To find the static height $\mathbf{h_z}$ at which to install the machine under safe conditions, the following formula must be verified:

$$\mathbf{h_p + h_z \geq (NPSH_r + 0.5) + h_f + h_{pv}}$$

Where:

- $\mathbf{h_p}$ is the absolute pressure applied to the free liquid surface in the suction tank, expressed in m. of liquid; h_p is the quotient between the barometric pressure and the specific weight of the liquid.
- $\mathbf{h_z}$ is the difference in height between the pump axis and the free liquid surface in the suction tank, expressed in m; h_z is negative when the liquid level is lower than the pump axis.
- $\mathbf{h_f}$ is the friction loss in the suction line and its accessories, such as: fittings, foot valve, gate valve, elbows, etc.
- $\mathbf{hp_v}$ the vapour pressure of the liquid at the operating temperature, expressed in m of liquid. hpv is the quotient between the Pv vapour pressure and the liquid's specific weight.
  0.5 is the safety factor.

The maximum possible suction head for installation depends on the value of the atmospheric pressure (i.e. the elevation above sea level at which the pump is installed) and the temperature of the liquid.

To help the user, with reference to water temperature (4°C) and to the elevation above sea level, the following tables show the drop in hydraulic pressure head in relation to the elevation above sea level, and the suction loss in relation to temperature.

Water temp (°C)	20	40	60	80	90	110	120
Suction loss (m)	20	40	60	80	90	110	120

Elevation above sea level (m)	500	1000	1500	2000	2500	3000
Suction loss (m)	0,55	1,1	1,65	2,2	2,75	3,3

Friction loss must be calculated using a recognised formula. To reduce it to a minimum, especially in cases of high suction head (over 4-5m.) or within the operating limits with high delivery values, we recommend using a suction line having a larger diameter than that of the pump's suction inlet.

It is always a good idea to position the pump as close as possible to the liquid to be pumped.

Make the following calculation:

Liquid: water at ~ 15 °C g = 1 Kg/dm3

Delivery required: 30 m3/h

Head for required delivery: 43 m

Suction difference in height: 3,5 m

The selection is a FHE 40-200/75 pump whose NPSH required value is 2.5m @ 30 m^3/h

For water at 15°C the h_{pv} term is: Pv/g = 0.174 m (0.01701 bar)

eh = Pa/g = 10.33 m

The h_f friction loss in the suction line with foot valves is 1.2 m.

By substituting the parameters in formula with the numeric values above:

$$10.33 + (-3.5) \geq (2.5 + 0.5) + 1,2 + 0.17$$

6.8 > 4.4. The relation is therefore verified.

Convertion Factors

Flow conversion			Pressure conversion		
L/min.	÷ 60	= L/Sec	m Hd	÷ 10.2	= Bar
m_3/hr	÷ 3.6	= L/Sec	Psi	÷ 14.47	= Bar
Gpm	÷ 13.2	= L/Sec	Kpa	÷ 100	= Bar
Kg/Sec	÷ 1.0	= L/Sec	Kg/cm^3	÷ 1.02	= Bar

Variable Speed Flow, Head and Power Calculations

V_1 = Full speed
V_2 = Reduced speed
Q_1 = Flow rate at full speed
Q_2 = Flow rate at reduced speed
H_1 = Head at full speed
H_2 = Head at reduced speed
P_1 = Power at full speed
P_2 = Power at reduced speed

$$Q_2 = \left(\frac{V_2}{V_1}\right) Q_1$$

$$H_2 = \left(\frac{V_2}{V_1}\right)^2 H_1$$

$$P_2 = \left(\frac{V_2}{V_1}\right)^2 P_1$$

General Operating Limits (Standard *Dutypoint* Pumpsets)

Type of pumped liquids	Water with no gas or aggressive substances
Maximum pumped liquids temperature	+35°C for domestic uses (EN 60335-2-41) 40°C for other purposes
Minimum pumped liquid temperature	1°C to avoid icing
Operating ambient temperature	+5°C to 40°C for indoor installation (CEI EN 60439-1)
Relative humidity	Max 50% at 40°C
Air impurities	The air must be clean and free of acid vapours, corrosive gases and excessive amounts of dust
Storage temperature	+5°C to 50°C
Suction Conditions	Minimum positive pressure 0.1 Bar, Max 0.5 Bar

D

Appendix D
Additional Information

If the system that you have purchased has been modified, updated or otherwise altered from the Dutypoint standard range, this Appendix will contains additional information applicable to the change(s).

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