# OPERATION & MAINTENANCE MANUAL
# DDF2-2-50-FM-EKO-Y-STRAINER
# P-0238


| DOCUMENT DETAILS | |
|---|---|
| Production Release: | March 2023 |
| Revision: | 1 |
| Original Language: | English |
| Customer: | Fuel-Service AS |
| Sales Order Number: | SOP049504 |
| Serial Number: | A33251, A33252, A33253, A3324, A33255 |

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# Contents

# INTRODUCTION

## Scope and Definition

This manual provides operation and maintenance instructions for the Diesel Polishing Unit. You must use the unit as described in this manual. Read this manual before you install, operate, and maintain the unit.

**IMPORTANT:** The unit is available in various forms which include stainless steel or mild steel enclosures, frame mounted or wall mounted without enclosures. The images included in this manual are representative of the unit only, and the final unit may differ to the images shown. However, the operational instructions remain the same for every variant of the unit.

Important safety information is highlighted as **WARNING** and **CAUTION** instructions. Warnings are given where failure to observe the instruction could result in injury or death to people. Cautions are given where failure to observe the instructions could result in damage to the equipment, associated equipment, or process.

## Warning Labels

Labels are located on the unit to identify potential hazards as well as help identify safe working procedures. The below examples are some of the labels located on this unit. Please note other labels other than what is shown below may be present. It is the end user's responsibility to ensure the unit is used in a safe way.





# SPECIFICATIONS

| Specification | Detail |
|---|---|
| Dimensions | (H) 1099mm (W)1300 mm (D) 350 mm |
| Weight | 110Kg |
| Finish | Powder Coated: RAL 7005 Black Blue |
| Voltage | 115 VAC (±10%); 230 VAC (±10%) |
| Nominal Frequency | 50Hz/60Hz |
| Nominal Motor Wattage | 230V/50Hz = 700W |
| Nominal Motor Current (Amp) | 230V/50Hz = 3.5 |
| Motor Protection | Automatic Thermal Protection Switch |
| Out Door Use | When used outdoors, a suitable RCD “Residual Current Device” must be used in conjunction with the power supply |
| Pump Type | Self – Priming Vane Type |
| Duty Cycle | Continuous |
| Noise Level | <85dB @ 1 Metre |
| Fluid Compatibility | Diesel & Mineral Oils |
| Filtration | Size 1 Filter<br>Particulate - 1, 5, 10 or 25 Micron<br>Water Absorbing – Filtasorb 2<br>Stainless Steel Mesh – 10, 20 Micron |
| Filter Blocked Indicator | Electronic via HMI |
| Pressure | Nominal Working Pressure - 1 Bar (14.7 psi)<br>Maximum Working Pressure - 2 Bar (29 psi) |
| Fluid Temperature | 0°C to 50°C |
| Ambient Operating Temperature | 0°C to 50°C |
| Pump Capacity | 100 Litres/min |
| Maximum Humidity | 90% relative humidity, non-condensing |
| Environment | Control Box IP65 |
| Inlet/Outlet | 1 ¼” BSPP Male/1” BSPP Male |

*This is dependent on media conditions, and this can affect performance.

**Specifications above indicate the version shown. Other variants will differ depending on configuration.

***If in doubt, please contact your IPU Representative.

## Typical Applications

Typical applications for the filtration unit include:

- Filtering the fluid in a diesel storage tank periodically as a supplement to continuous filtration by system filters.
- Cleaning heavily contaminated fuel to eliminate water, solid particulate and tank sludge.
- Cleaning your fuel system before restarting the system following component failure.
- Providing clean fuel when re-filling and adding fuel to storage tanks.
- Reclaiming contaminated diesel fuel.
- Transferring diesel fuel from one storage location to another.
- Emptying waste fuel quickly.

## Best Efficiency

When used for recirculation filtration (as opposed to transfer filtration) position the ends of both the inlet and outlet standpipe as far apart as possible inside the reservoir in order to ensure proper recirculation and cleaning.

Operate the filtration cart until the total volume of the system fluid passes through the filtration cart. For recirculation filtration, cycle the reservoir fluid through the filter cart six to eight times to ensure the total system fluid is filtered completely.

## Precautionary Measures

- Never start up or run a dry pump. This will cause galling, seizing or destructive wear between the rotors, end plates and casing.
- The filtration unit is designed for diesel fuel only.
- It is not to be used for highly volatile fluids, such as gasoline, paint thinners etc.

## General System Requirements

| | |
|---|---|
| Positioning | The unit may be placed higher than the fuel storage tank. However, with an empty suction tube and the pump wetted with fluid, the electric pump unit is capable of suctioning the liquid to a maximum of 2 meters (7 Feet), without a non-return valve. If a non-return valve is installed, it will be 4 meters (14 Feet). The difference in height between the pump and the fluid level must be kept as small as possible and, at any rate within the above-mentioned parameters anticipated for the priming phase. If this height is exceeded, it will always be necessary to install a foot valve to allow for the filling of the suction tube and provide tubing of a wider diameter. |
| Pump Inlet Pressure | When the unit is functioning, the pump can work with a maximum pressure at the inlet of 0.5 bar. Pump inlet pressure beyond this value will lead to cavitation, a consequent reduction in system flow rate and an increase in system noise |
| Permitted Use | Diesel fuel at a viscosity of between 2 and 5.35 cSt (@ 37.8°C)<br>Minimum Flash Point (PM): 52°C |
| | |
| **NOT PERMITTED** | **RELATED DANGERS** |
| Gasoline | Fire - explosion |
| Inflammable Liquids with Flash Point >55°C | Fire - explosion |
| Liquids with Viscosity >20cSt | Motor overload |
| Water | Pump oxidation |
| Food Liquids | Contamination of the same |
| Corrosive Chemical Products | Pump corrosion |
| Solvents | Injury to persons<br>Fire - explosion<br>Damage to gasket seals |

## Health, Safety & Environmental Considerations

### Caution/Warning

**WARNING**: Inappropriate use of this equipment can cause serious injury. Only competent and authorised persons should be permitted to operate this equipment. Children/minors should NEVER be permitted to operate or move this equipment.
**WARNING**: This product should only be used for its intended purpose. Using this product for any other than its intended purpose could result in serious injury or death.

Always use appropriate safety equipment e.g. safety glasses, protective gloves, safety shoes etc. Observe local health and safety requirements.

Prolonged contact with diesel fuel can damage the skin. The use of safety glasses and protective gloves is recommended.
Only use this product with DIESEL FUELS having a viscosity of between 2 & 5.35 cSt (@ 37.8°C) and a minimum Flash Point (PM) of 55°C. It must NOT be used for any other liquids.

Never start or stop the pump by connecting or disconnecting the unit from the mains power supply or any other plugs or switches that will isolate the power supply to the unit. DO NOT run the pump dry, this can cause serious damage to its components.

**WARNING:** Always disconnect the equipment from the mains electrical supply before carrying out any routine maintenance or repairs.
**DO NOT** operate switches with wet hands.
Periodically check the power supply cable for damage.

Observe local environmental requirements and ensure there is appropriate equipment available to clear up any accidental diesel fuel spills.
Special consideration should be given when this equipment is used in a marine environment.
Appropriate equipment should be available to clean up any accidental diesel fuel spills and always ensure that any used filters or coalesced water removed from the filter bowl are disposed of according to local environmental requirements.

**WARNING:** Do not open, or attempt to open, the control panel unless you are qualified to do so – increased risk of electric shock and death.

# Unit Identification

## Basic Description

Diesel fuel is known to be inherently unstable. Particulate contamination such as rust and dirt enters the fuel, condensation introduces water and this in turn encourages microbial growth. These 3 forms of contamination will eventually clog engine filters and potentially damage fuel injection equipment leading to unplanned maintenance and potential engine failure.

The on-tank Fuel Polishing System is designed to be used for the "polishing" of diesel fuels having a viscosity between 2 and 5.35 cSt (@ 37.8°C) and a minimum Flash Point (PM) of 52°C. It must NOT be used for any other liquids.

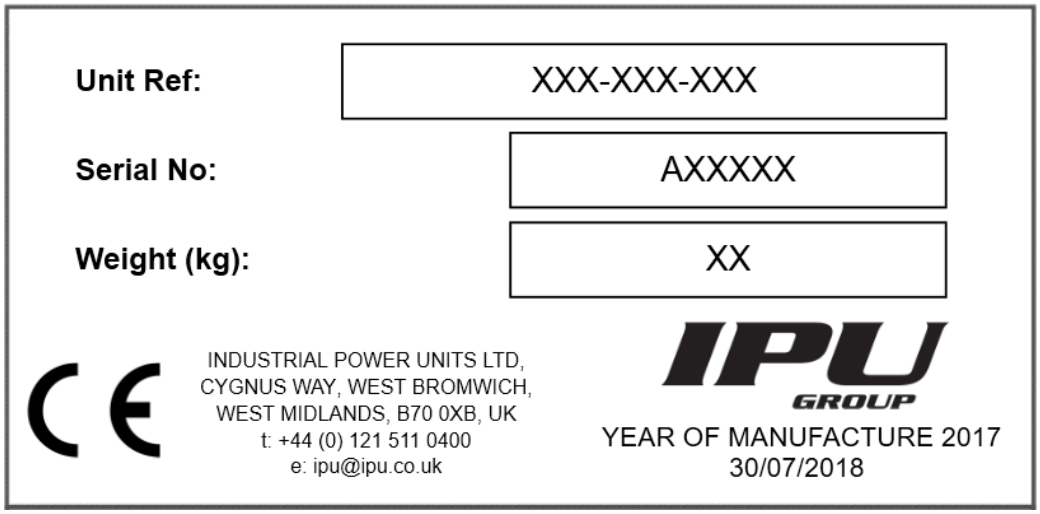
The on-tank fuel polishing system can be used in conjunction with a suitable biocide and a rigorous fuel management program. The system will condition and stabilise the fuel, remove water and solid particulates.

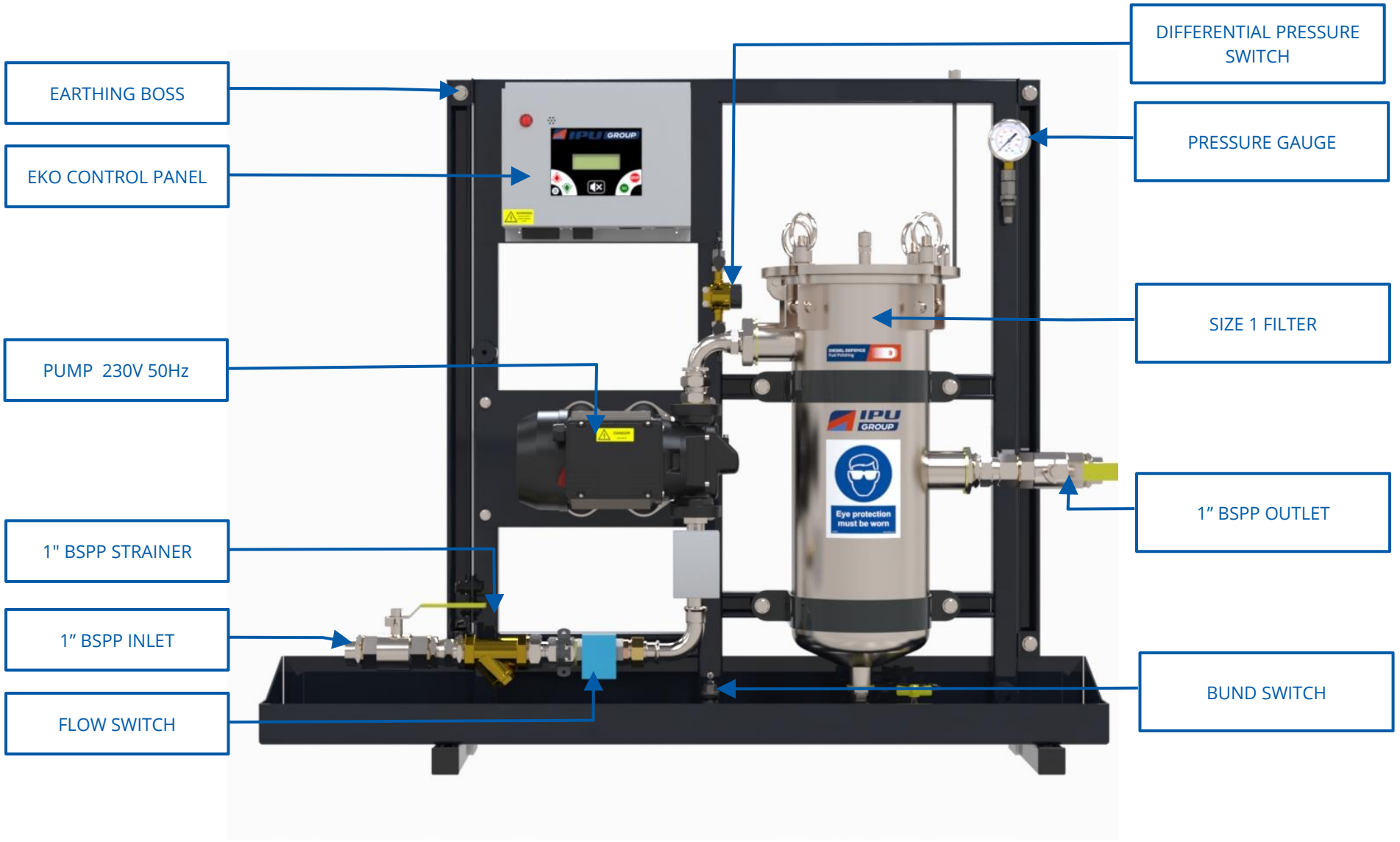
**WARNING:** The unit is designed to be used as a static "on-tank" polishing system and should be permanently mounted either on a suitable wall or stand within the bund of the tank to which it is operating on. The system is NOT designed to be mobile and should not be used as such. It should only be installed by suitably qualified personnel.

## Unit Identification

Each unit carries a unique serial number together with a model part number. This can be found on the front of the electrical panel inside the cabinet.

Always quote the Part number and serial number when requesting spare parts, service, or warranty assistance.



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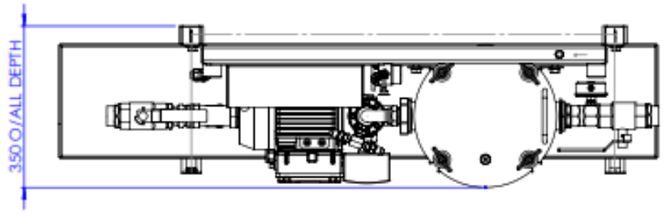
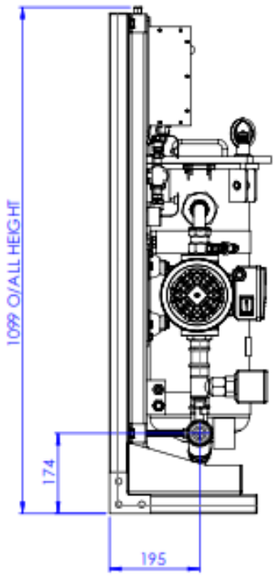
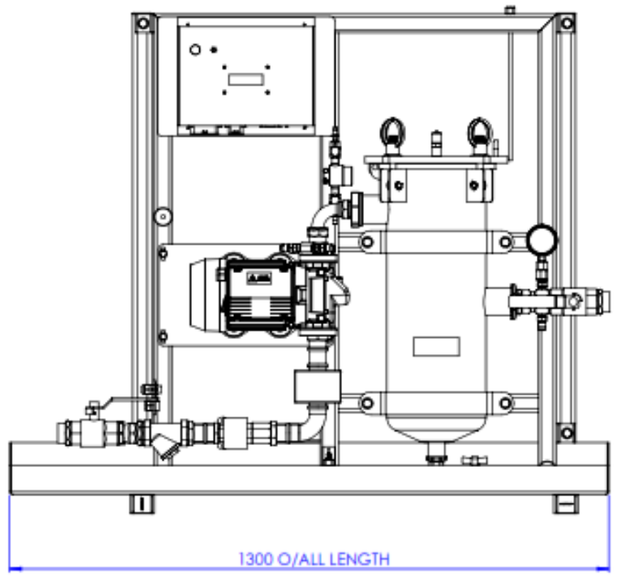
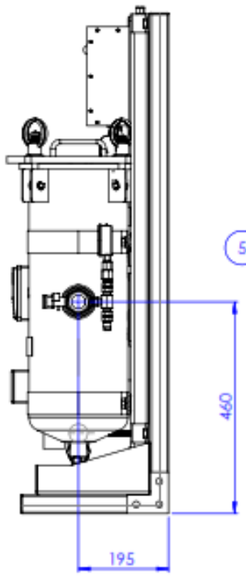
## General Arrangement Drawing

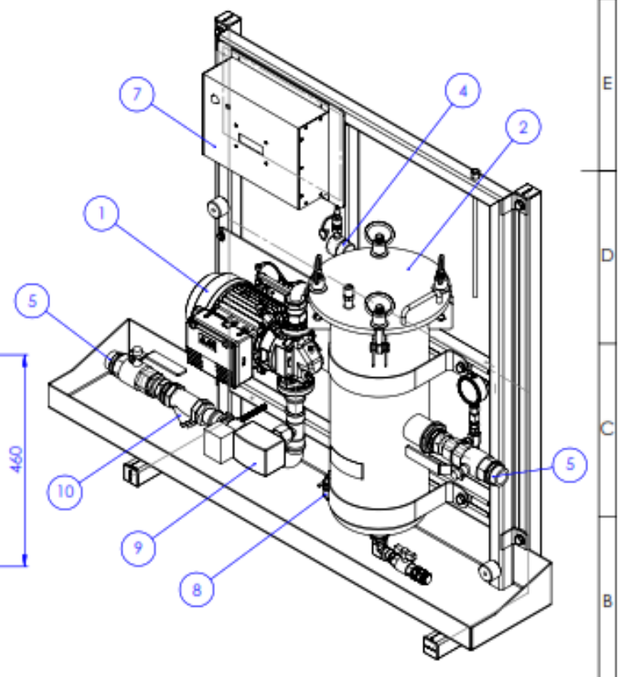
| | |
|---|---|
| 1 | 230V 50Hz PUMP |
| 2 | SIZE 1 FILTER CELL HOUSING |
| 3 | MOTORISED BALL VALVE |
| 4 | DIFFERENTIAL PRESSURE SWITCH |
| 5 | 1" BSPP INLET |
| 6 | 1" BSPP OUTLET |
| 7 | EKO CONTROL PANEL |
| 8 | BUND FLOAT SWITCH |
| 9 | FLOW SWITCH |
| 10 | 1" Y STRAINER |




| ZONE | REV. | DESCRIPTION | DATE | APPROVED |
|---|---|---|---|---|
| | A | INITIAL ISSUE | 05/01/2023 | MD |

DRAWING TITLE: DIESEL DEFENCE 2, 230V, 50HZ, FRAME MOUNTED, EKO PANEL

DRAWN: TR | APPROVED: MD | DATE: 05/01/2023 | DATE: 05/01/2023 | CUSTOMER | PROJECT TITLE | PROJECT REFERENCE | SCALE: 1:15 | ORG NO.: P-0238 | SHEET: 1 OF 1 | A2 | REVISION: 0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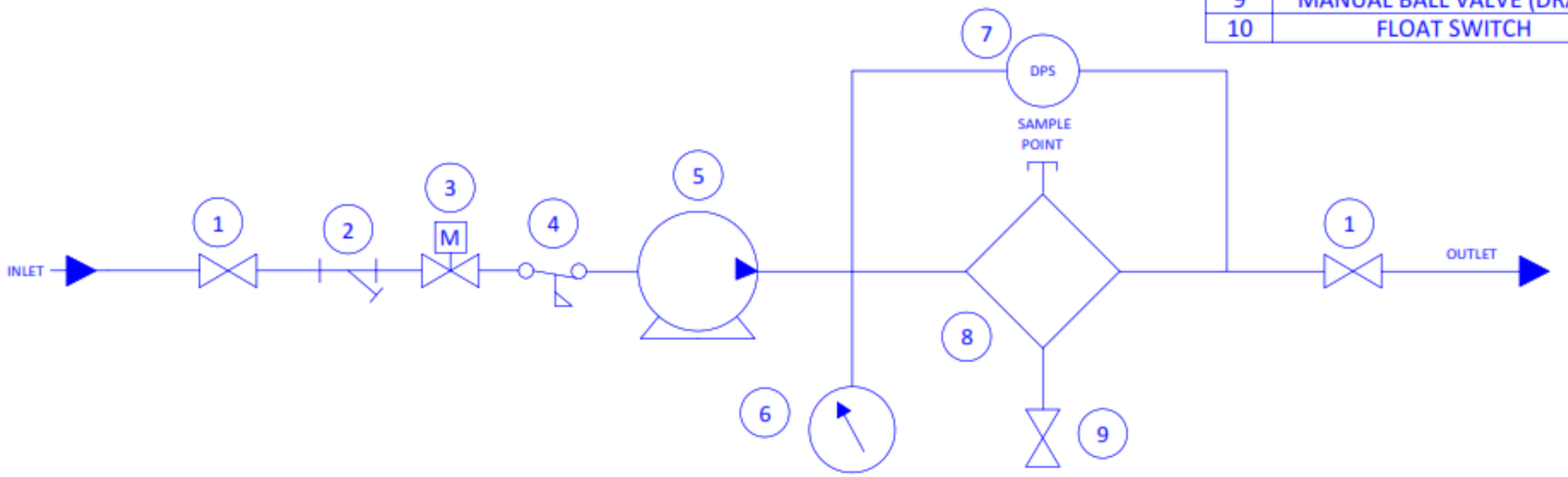
## P&ID

| ITEM NO. | ITEM DESCRIPTION | SIZE |
|---|---|---|
| 1 | MANUAL BALL VALVE | 1-1/4" |
| 2 | Y STRAINER | 1-1/4" |
| 3 | MOTORISED BALL VALVE | 1-1/4" |
| 4 | FLOW SWITCH | 1 " |
| 5 | PUMP CAPACITY 100L/MIN | 1" |
| 6 | PRESSURE GAUGE | - |
| 7 | DIFFERENTIAL PRESSURE SWITCH | - |
| 8 | FILTER | 2" PORTS |
| 9 | MANUAL BALL VALVE (DRAIN) | 1/2" |
| 10 | FLOAT SWITCH | - |




| REV | DESCRIPTION | DATE | BY |
|---|---|---|---|
| B | Y STRAINER MOVED | 14/02/2023 | MD |
| A | INITIAL RELEASE | 09/02/2023 | MD |

THIRD ANGLE PROJECTION

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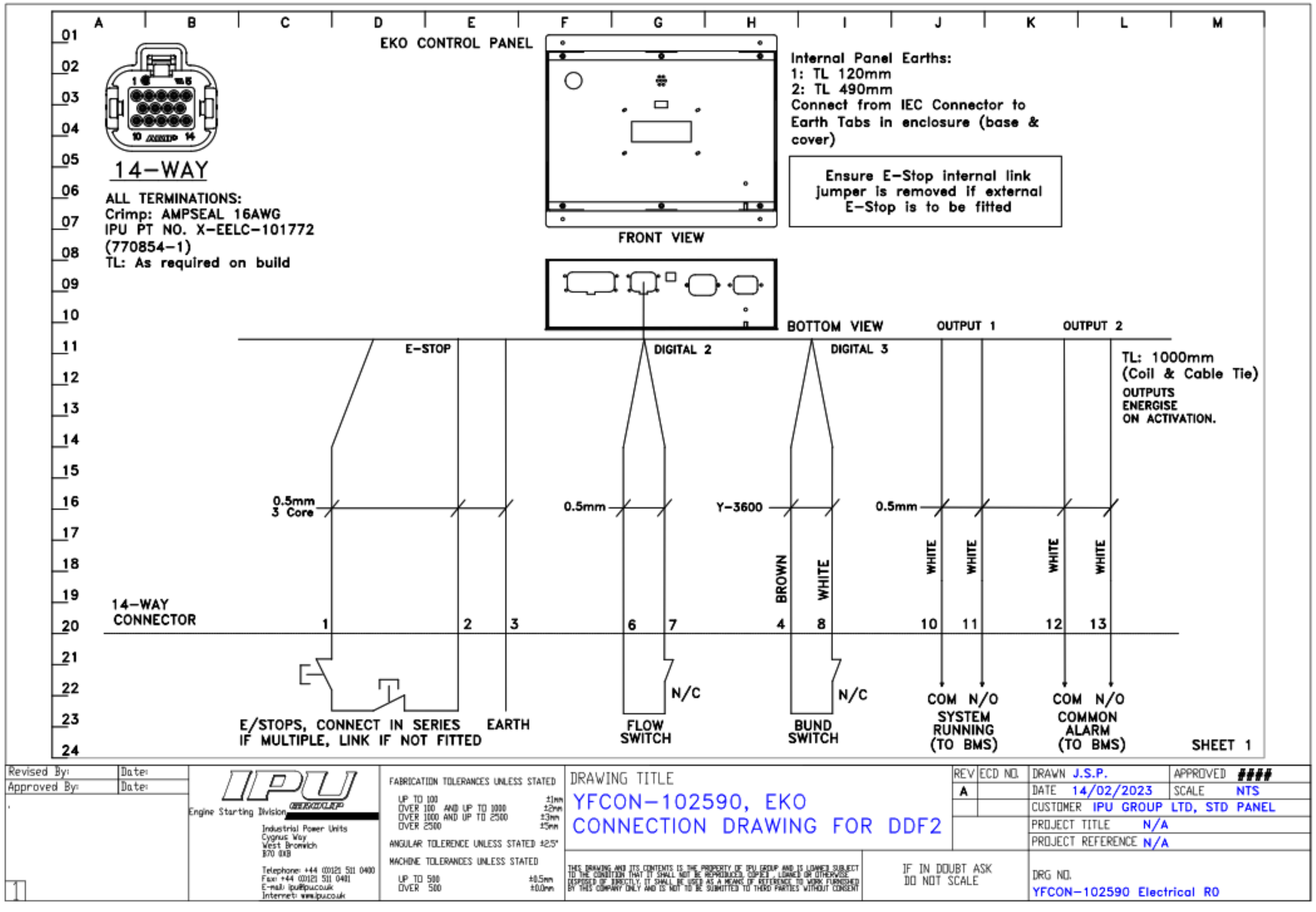
INTERNET: WWW.IPU.CO.UK

FINISH
MATERIAL
MASS

DRAWING TITLE: P-0238 - P & ID

| | |
|---|---|
| DRAWN TB | APPROVED MD |
| DATE 09/02/2023 | DATE 09/02/2023 |
| PROJECT TITLE DOF2 | |
| PROJECT REFERENCE P-0238 | SCALE NTS |
| DRG NO. P-0238 - P&ID | SHEET 1 OF 1 |
| | A3 |
| | REVISION 0 |

## Electrical drawing




| | | | | | |
|---|---|---|---|---|---|
| Revised By: | Date: | IPU Engine Starting Division | DRAWING TITLE: YFCON-102590, EKO CONNECTION DRAWING FOR DDF2 | REV: A | DRAWN: J.S.P. |
| Approved By: | Date: | Industrial Power Units, Cygnus Way, West Bromwich, B70 0XB<br>Telephone: +44 (0)121 511 0400<br>Fax: +44 (0)121 511 0401<br>E-mail: ipu@ipu.co.uk<br>Internet: www.ipu.co.uk | | ECD NO: | DATE: 14/02/2023 |
| | | | | | CUSTOMER: IPU GROUP LTD, STD PANEL |
| | | | | | PROJECT TITLE: N/A |
| | | | | | PROJECT REFERENCE: N/A |
| | | | | APPROVED: #### | SCALE: NTS |

FABRICATION TOLERANCES UNLESS STATED
UP TO 100 ±1mm
OVER 100 AND UP TO 1000 ±2mm
OVER 1000 AND UP TO 2500 ±3mm
OVER 2500 ±5mm
ANGULAR TOLERENCE UNLESS STATED ±2.5°
MACHINE TOLERANCES UNLESS STATED
UP TO 500 ±0.5mm
OVER 500 ±0.0mm



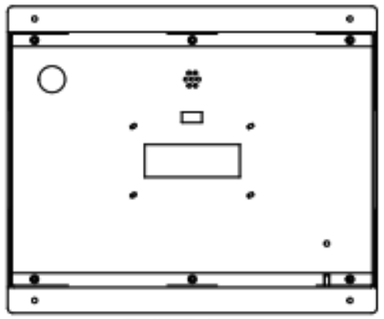
IF IN DOUBT ASK
DO NOT SCALE

DRG NO.
YFCON-102590 Electrical R0

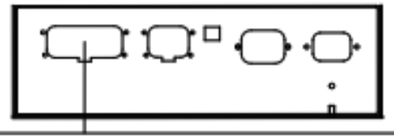
35–WAY

ALL TERMINATIONS:
Crimp: AMPSEAL 16AWG
IPU PT NO. X–EELC–101772
(770854–1)
TL: As required on build

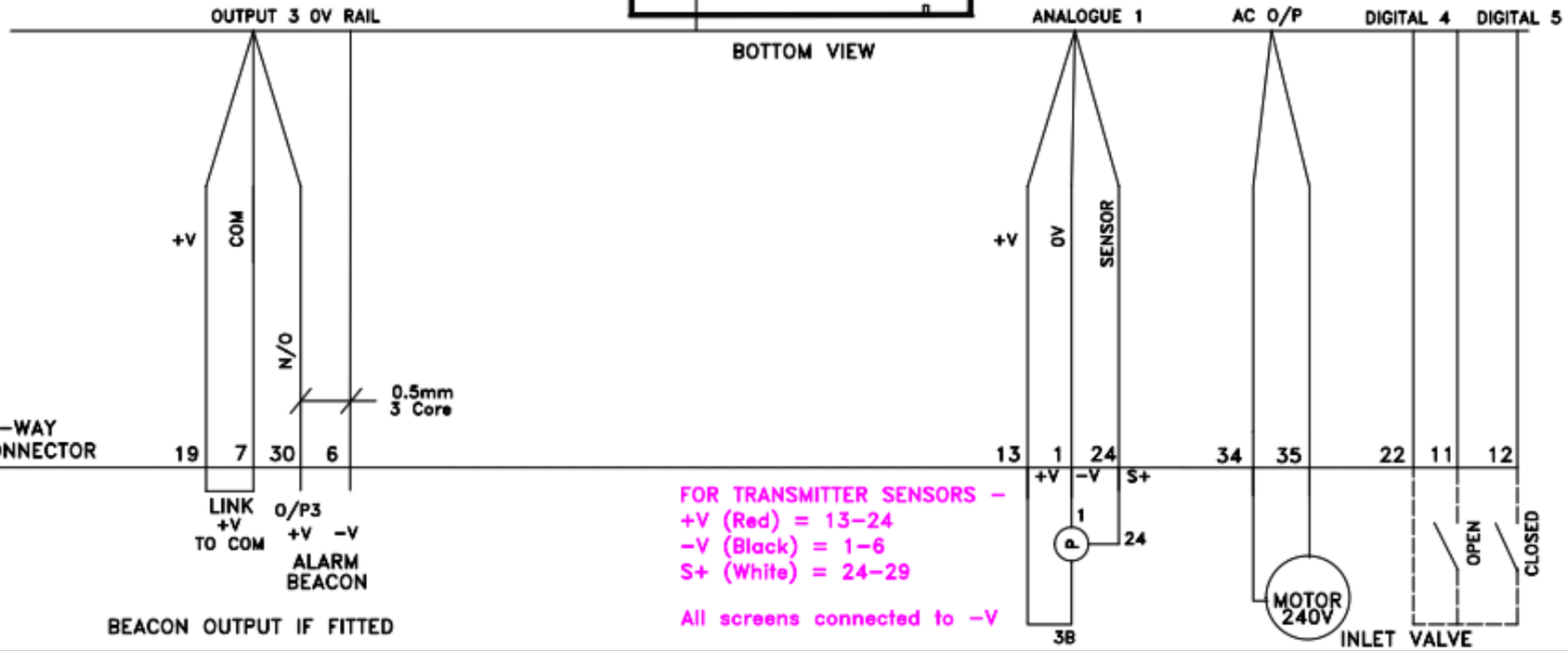
EKO CONTROL PANEL



FRONT VIEW



BOTTOM VIEW




FOR TRANSMITTER SENSORS –
+V (Red) = 13–24
–V (Black) = 1–6
S+ (White) = 24–29

All screens connected to –V

| | |
|---|---|
| Revised By: | Date: |
| Approved By: | Date: |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FABRICATION TOLERANCES UNLESS STATED

| | |
|---|---|
| UP TO 100 | ±1mm |
| OVER 100 AND UP TO 1000 | ±2mm |
| OVER 1000 AND UP TO 2500 | ±3mm |
| OVER 2500 | ±5mm |

ANGULAR TOLERENCE UNLESS STATED ±2.5°

MACHINE TOLERANCES UNLESS STATED

| | |
|---|---|
| UP TO 500 | ±0.5mm |
| OVER 500 | ±0.0mm |

DRAWING TITLE

# YFCON–102590, EKO CONNECTION DRAWING FOR DDF2

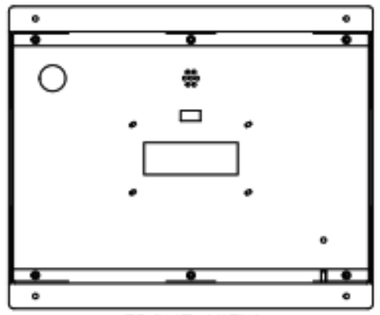


IF IN DOUBT ASK
DO NOT SCALE

| REV | ECD NO. | DRAWN J.S.P. | APPROVED #### |
|---|---|---|---|
| A | | DATE 14/02/2023 | SCALE NTS |
| | | CUSTOMER IPU GROUP LTD, STD PANEL | |
| | | PROJECT TITLE N/A | |
| | | PROJECT REFERENCE N/A | |

DRG NO.
YFCON–102590 Electrical R0

EKO CONTROL PANEL



FRONT VIEW

BOTTOM VIEW

Internal Panel Earths:
1: TL 120mm
2: TL 490mm
Connect from IEC Connector to Earth Tabs in enclosure (base & cover)

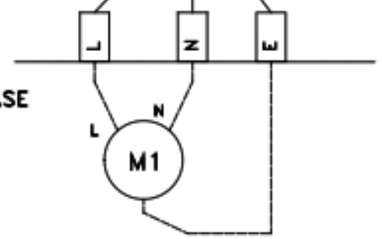
WIRES L,N,E:
TL: 5000mm
Strip – 25mm
TERMINATIONS:
IEC C13 Locakable Plug
Industrial 3–Pin Blue Plug

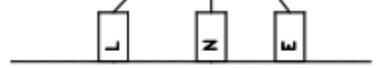
3183Y 1.0mm

WIRES L,N,E:
TL: 1000mm
Strip L/N – 25mm
Strip E – 12mm
TERMINATIONS:
IEC C14 Plug
Pump AC Connections

3183Y 1.5mm

SINGLE PHASE PUMP




AC INPUT
230V

SHEET 3

| | |
|---|---|
| Revised By: | Date: |
| Approved By: | Date: |

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FABRICATION TOLERANCES UNLESS STATED

| | |
|---|---|
| UP TO 100 | ±1mm |
| OVER 100 AND UP TO 1000 | ±2mm |
| OVER 1000 AND UP TO 2500 | ±3mm |
| OVER 2500 | ±5mm |

ANGULAR TOLERENCE UNLESS STATED ±2.5°

MACHINE TOLERANCES UNLESS STATED

| | |
|---|---|
| UP TO 500 | ±0.5mm |
| OVER 500 | ±0.0mm |

DRAWING TITLE
YFCON–102590, EKO CONNECTION DRAWING FOR DDF2



IF IN DOUBT ASK
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| REV | ECD NO. | DRAWN J.S.P. | APPROVED #### |
|---|---|---|---|
| A | | DATE 14/02/2023 | SCALE NTS |
| | | CUSTOMER IPU GROUP LTD, STD PANEL | |
| | | PROJECT TITLE N/A | |
| | | PROJECT REFERENCE N/A | |

DRG NO.
YFCON–102590 Electrical R0

# OPERATING INSTRUCTIONS

## General Operation

In normal operation when the pump is running, the system will be operating in either HAND mode or AUTO mode. In both modes:

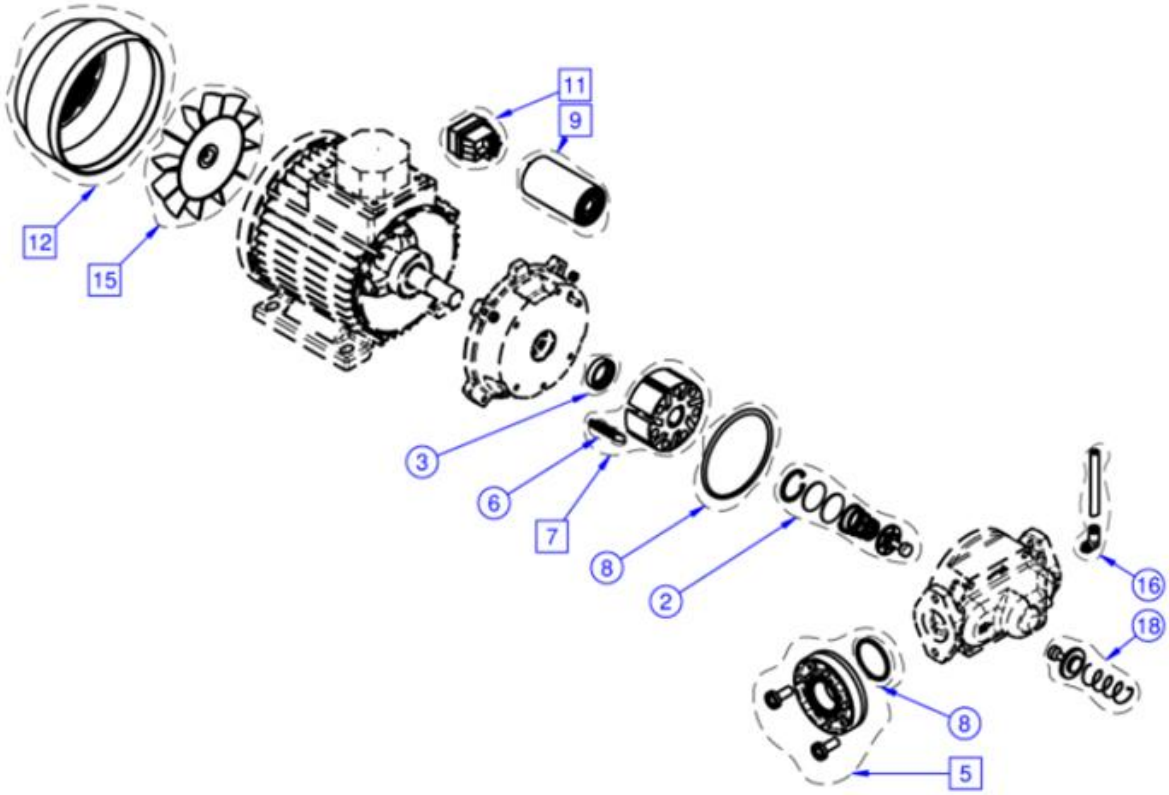
Fuel enters the system via the inlet and is drawn through the pump and is then pushed through the size 1 filter vessel to clean the fuel by removing water and particulates. The fuel then flows out of the machine and back into the tank. This cycle will repeat as defined by the schedule created via the control panel.

## Before Starting the Unit

Ensure that the unit is standing on or fixed to a firm surface and that it is in a vertical position. Never operate the unit in any position other than vertical. Always double-check the general condition of the unit before use, paying special attention to electrical cables, valve connections and hoses. **WARNING**: If there are any signs of damage or excessive wear, DO NOT USE IT.

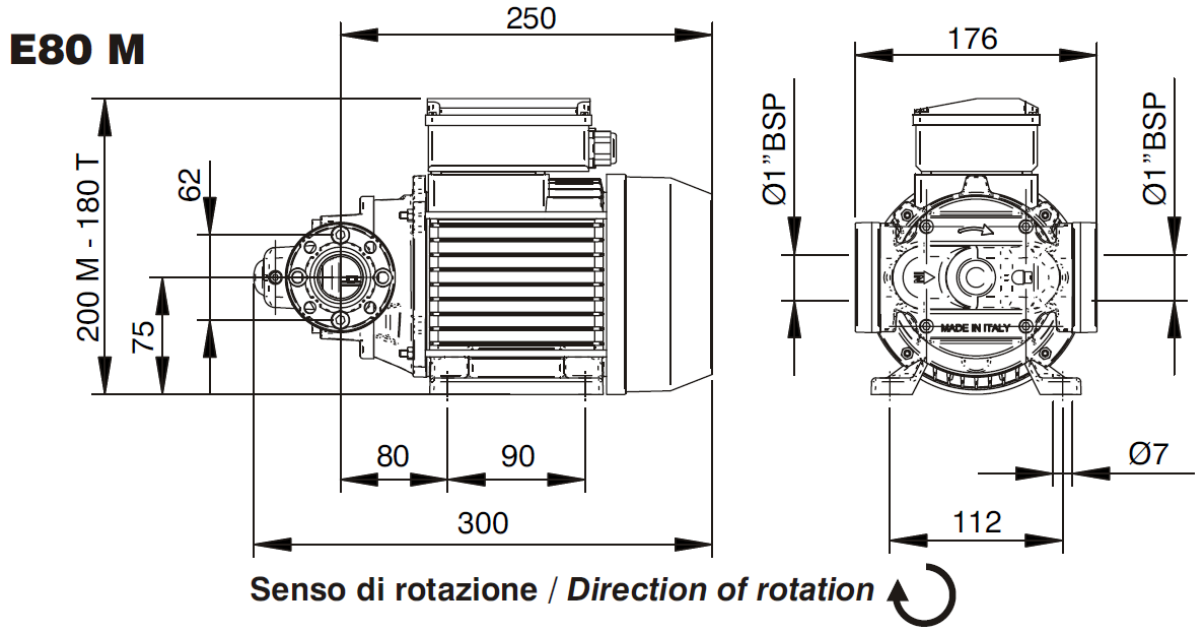
Before switching on the unit ensure pipework is connected to the inlet and outlet connections. Ensure inlet and outlet isolation valves are in the open position. It is important to check all connections and fittings to ensure they have not become loose in transit. Never run the pump dry, only start after it has been wetted. It is important to point out that the priming time can be as long as one minute.

## Pump Unit Exploded Diagram




| SPARE PARTS | | |
|---|---|---|
| **PART NR** | **REF. NR** | **DESCRIPTION** |
| R13851000 | 1 | GROUP PLUG 1G + GASKET |
| T-8772 | 3 | KIT SEAL BABSL 20/30/7 IN VITON |
| F0918000A | 5 | FIT FLANGE 1” PSB (2PCS) |
| R0700200A | 6 | KIT NR.7 PCS VANES E80/E120/S120 |
| Y-FSK-102045 | 7 | KIT ROTOR E80 WITH VANES |
| R08187000 | 10 | KIT TERMINAL BOX 400 V/50 |
| R08181000 | 12 | KIT FAN COVER MOTOR MEC71 |
| R15815000 | 2 | KIT BYPASS E80/E120 – MADE IN ITALY |
| Y-FSK-102045 | 8 | KIT GASEK O-RING |
| R08209000 | 15 | FAN MOTOR 0.7 HPS |
| F1392000A | 16 | KIT ANTI-SYPHON FOR P56/72 E80/120 |

## Dimensions




## Pump Noise Level

Under normal working conditions the noise emission from all models does not exceed the value of **70 dB at a distance of 1 meter** from the electric pump.

## Maintenance based on pump manual

**When installing the unit, consideration needs to be given to the pipework to minimise any back pressure.**
**For E80 Pump unit, minimum recommended nominal diameter**
**Suction line 1-1/4"**
**Delivery line 1"**

- On a weekly basis, check that the tubing joints have not loosened, to avoid any leakage.
- On a monthly basis, check the pump body and keep it clean of any impurities.
- On a monthly basis, check and keep the pump filter clean and any other filters installed.
- On a monthly basis, check that the electric power supply cables are in good condition.

**The following must also be adhered to:**
How often these pumps are inspected & serviced is very much dependant on how much fuel is passing through.

At a minimum we would expect the vanes and chamber seal to be replaced every **12 months.** Some customers choose to replace them @ 1million litres if it's not in a dispensing environment, however for DSEAR you should be checking the pump regularly (up to the site owner / manufacturer who puts the machine on the market), as the pump is only a part-completed equipment for certification purposes.

**The unit scheduling needs to be set as follows:**
**1 hour/day x 3 days/week.**
**This will be sufficient to turn over and polish the fuel.**
IPU would not proactively change the shaft seal unless there is a failure.
This would likely be from the following:

- Excess motor heat
- Cavitation on the inlet
- Over running the pump in increased back pressure or if the shaft / seal interface has been affected by grits/sands/sediments which may have worn the interface area.
- Any time a shaft seal fails there is normally a cause behind it which would need investigating based on the above.

The shaft seal is a wearable seal and like the vanes may eventually fail – however if used within the design parameters of the pump should afford years of trouble free operation.

## Filter change out times

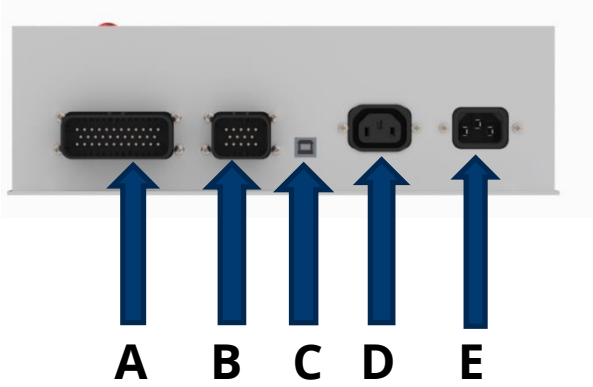
1) Alarm when filter blocked. Filterchange.
2) Alarm when 500.000 liters passed thorough filter. Filterchange.
3) Alarm 3 months use: Filterchange.

NOTE: IF ALARM SOUNDS CONTACT FUEL SERVICE-SERVICE **(PHONE: 02134)**

On Piusi E 120 diesel pump, the following parts may experience wear and should be inspected and replaced as necessary:

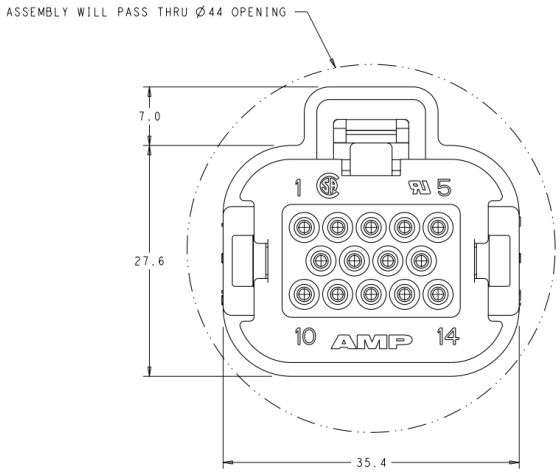
1. Pump chambers seals: these should be inspected every 500 hours of operation and replaced if they show signs of wear or damage.
2. Pump vanes: These should be inspected every 500 hours of operation and replaced if they show signs of wear or damage.
3. Suction filters: This should be inspected every 100 hours of operation and cleaned or replaced if necessary
4. Delivery Filter: This should be inspected every 500 hours of operation and cleaned or replaced if necessary
5. Motor Brushes: These should be inspected every 500 hours of operation and replaced if they are worn down to the minimum length indicated on the brush.

## Electrical Connections


| CONNECTION | DESCRIPTION |
|---|---|
| A – Input/Output Connections (35-Way AMPSEAL 776163-1) | Refer to Table 2 below |
| B – Input/Output Connections (14-Way AMPSEAL 776267-1) | Refer to Table 1 below |
| C - USB Type B Female Connection | USB Connection to PC for configuration and log downloading |
| D - C14 IEC Pump Power Connection | AC Connection to Pump |
| E - C13 IEC AC Inlet Connection | AC Inlet connection |

## 14-Way Input/Output Connector

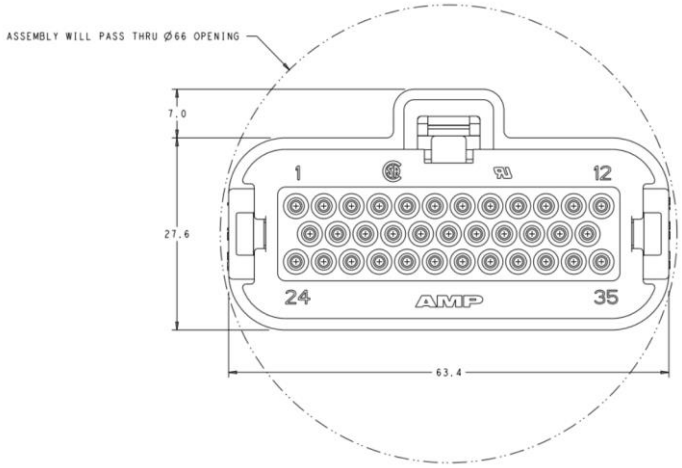



| PIN | DESCRIPTION | PIN | DESCRIPTION |
|---|---|---|---|
| 1 | +24Vdc | 8 | DI3: Digital Input, Close to +V input. Not configured |
| 2 | External Emergency Stop Return (open circuit on fault) | 9 | RS485 Data A |
| 3 | AC Earth connection | 10 | BMS1 Common signal |
| 4 | +24V Output | 11 | BMS1 N/O Change over signal (System Running, energise on run) |
| 5 | DI11: Filter 1 Differential Pressure switch return (Digital, Close to +V input, open circuit fault) | 12 | BMS2 Common signal |
| 6 | +24Vdc (External Bund/Float Switch feed) | 13 | BMS2 N/O Change over signal (System Fault, energise on fault) |
| 7 | DI2: Flow Switch (Digital, Close to +V input, open circuit on fault) | 14 | RS485 Data B |

*Table 1: 14-Way Connector.*

Notes: Mating connector (supplied) is AMPSEAL 776164-1, crimps to be used are 770854-1, maximum wire ø 1.5mm. Standard units are supplied with connections made to Pin 4, Pin 5, Pin 6, and Pin 7.

## 35-Way Input/Output Connector




| PIN | DESCRIPTION | PIN | DESCRIPTION |
|---|---|---|---|
| 1 - 6 | 0Vdc | 26 | Analogue Input 3 (0-5V, 0-10V, 4-20mA or Close to +V) |
| 7 | BMS 3 Common Signal | 27 | Analogue Input 4 (0-5V, 0-10V, 4-20mA or Close to +V) |
| 8 | BMS 4 Common Signal | 28 | Analogue Input 5 (0-5V, 0-10V, 4-20mA or Close to +V) |
| 9 | BMS 5 Common Signal | 29 | Analogue Input 6 (0-5V, 0-10V, 4-20mA or Close to +V) |
| 10 | BMS 6 Common Signal | 30 | BMS3 N/O Change over signal, Function not defined |
| 11 | DI4: Digital Input, Close to +V input. Not configured | 31 | BMS4 N/O Change over signal, Function not defined |
| 12 | DI5: Digital Input, Close to +V input. Not configured | 32 | BMS5 N/O Change over signal, Function not defined |
| 13-23 | +24V Output | 33 | BMS6 N/O Change over signal, Function not defined |
| 24 | Analogue Input 1 (0-5V, 0-10V, 4-20mA or Close to +V) | 34 | Output 7: AC Live Output (Max 3A) |
| 25 | Analogue Input 2 (0-5V, 0-10V, 4-20mA or Close to +V) | 35 | Output 7: AC Neutral Output (Max 3A) |

*Table 2: 35-Way Connector. Connector not fitted as standard. Consult IPU for further information.*

## Starting the Unit

**WARNING:** Do not attempt to open the mains panel or control panel unless you are qualified to do so, as there is an increased risk of electric shock and death.

When the LCD display shows System Ready then the unit can be started.

There are 4 possible ways that the system can be started:

| MODE | STARTING OPTION | NOTES |
|---|---|---|
| N/A | Front Panel by means of **GO** Button | |
| N/A | By Timeclock / Schedule | The system can be stopped manually until the next time the time clock/schedule triggers. |
| N/A | By +24Vdc Remote Signal if digital input is configured as remote start. | The system can be stopped annually until the next time the remote signal triggers. |
| N/A | On units with Modbus RTU (RS485) communications fitted, then remote start by means of a defined Modbus RTU register is available. | The system can be stopped manually until the next time the remote signal triggers. |

If the unit fails to start, refer to the Trouble shooting guide at the end of this manual.

To turn off the pump press the **STOP** button. This will return the system to standby mode. If the unit has been running due to the timeclock or a remote signal, then the pump will not start again until the next time cycle or until the remote signal is dropped and starts again.

The EKO control panel has 4 lines of text which will indicate system status, operation, and health.


**Line 1** will show System Date and Time along with the following symbols/icons:


| SYMBOL | DESCRIPTION |
|---|---|
| F | This will display when there is an active fault that is stopping the system running |
| ! | This will display when there is an active warning signal |
| 0 | This will indicate the reason to run, it will either be off (not shown) a **H** symbol (hand mode) an **S** symbol (Schedule Mode) or an **R** symbol (Remote Mode) |
| S | This symbol will indicate a service reminder is due |

**Line 2** will show the current system state and/or any alarms or warnings that may be active that are causing a system fault –


| STATE | DESCRIPTION |
|---|---|
| **System Initializing** | System is starting, any connected valves will close and all outputs will be off |
| **Emergency Stop Active** | The Emergency Stop Input is open circuit thereby denoting a break in the Emergency Stop Circuit. Pump output will be off |
| **Emergency Stop Manual Reset** | After a Emergency Stop Condition as shown above, a manual operation of pressing the GO button on the keypad is required to allow the system to return to normal operation |
| **System Ready** | System is ready to run but no active signal is telling it to run |
| **System Prestart Checks** | System will validate all inputs before starting, also allows a 5 second visual indication that the system is about to start, |
| **System Preparing to Start (Locally connected Valves)** | System is opening motorized ball valves (if connected) |
| **System Preparing Manifold Panel** | System is configuring motorized ball valves of manifold system (if connected) |
| **System Running** | System is running, pump output is on |
| **System Stopping due to fault** | A condition has met the system fault criteria and the system is stopping under a fault condition |
| **System Stopping (Normal Operation)** | A condition has met the system stop criteria and the system is stopping ready to return to system ready state |
| **System Stopped due to fault** | System has stopped under fault and is awaiting user reset |

Should any faults be active that cause a system stop condition these will rotate through every 2s –

**Line 3** will either display the reason to run (if active) as mirrored by the symbol on line 1, or depending upon system state, further information for the user.


| STATE | DESCRIPTION |
|---|---|
| **HAND/LOCAL CONTROL** | System has been started by using the Control Panels Keypad |
| **SCHEDULER ACTIVE** | System has been started/is due to start due to 1 of the systems time schedule slots |
| **REMOTE SIGNAL ACTIVE** | System has been triggered to start by a remote signal |

Should the system by configured with Motorised Ball Valves, and the EKO panel is attempting to open or close them, then this line will display the following:


Under a fault condition, that requires a system reset, whether an Input Fault or an external Emergency Stop being fitted, then line 3 will also act as a User Prompt:

**Line 4** is a scrolling list providing information on Inputs, Outputs, Panel Temperature, and any other key information –

| LINE | DESCRIPTION |
|---|---|
| DI: 1□ 2■ 3■ 4■ 5■ | Digital Input states<br>□ - Input not active (logic based)<br>■ - Input active (logic based) |
| AI: 1□ 2■ 3■ 4■ 5■ 6■ | Analogue Input states<br>□ - Input not active (logic based)<br>■ - Input active (logic based) |
| DO: 1□ 2■ 3■ 4■ 5■ 6■ | Outputs<br>□ - Output not active<br>■ - Output active |
| PANEL TEMP: 22.3°C | Panel Temperature |
| SERVICE REMINDER DUE | Should a service reminder be due, then this will also show along with the name assigned to the active service reminder. |

If configured to do so, the system will also flash the LED Beacon Alarm, and a buzzer will sound. The buzzer can be muted by pressing the mute button. To reset the alarm condition detected, resolve cause of alarm i.e. **BUND ALARM** and then press **GO** to reset.

## Operating instructions

To access the menu press and hold both the **UP** and **DOWN** buttons together for greater than 2 seconds, the available menu options are outlined below. To navigate through the system, use the **UP** and **DOWN** buttons to scroll up / down through the menu or to change the selected value, use the **GO** button to select or confirm a value change.

### Set Clock

This will allow the internal time clock to be set.

Note: The system is fitted with an internal super capacitor which provides backup power for the time clock. In a powered down condition, typical back up time is approx. 60 days. If the system is powered down longer than this the internal time clock will have to be reset. All other settings are saved on non-volatile memory and are not affected.

| MENU ITEM | DESCRIPTION |
|---|---|
| Day of Week | Set the Day of Week (Monday – Sunday) |
| Date | Set the Date In Month |
| Month | Set Month |
| Year | Set Year |
| Hours | Set Hours |
| Minutes | Set Minutes |
| Clock Format | Set Clock Format to be displayed on main screen:<br>UK: DD/MM/YYYY<br>US: MM/DD/YYYY |

Use the **UP** and **DOWN** keys to select settings day of week, date and time, use the **STOP** and **GO** buttons to enter editing and to confirm changes.

### Set Schedule

This will allow the run schedule to be set. To set the schedule for the selected day, enable the days required. In addition to single day options, groups such as (M-F – Monday to Friday) and (SS – Weekend only) are available to make configuration quick and simple. Once set, scroll down, and enter the start time and run time.

| MENU ITEM | DESCRIPTION |
|---|---|
| Slot | Set the Slot to Edit (1-25) |
| Run Days | Set Days to run the schedule time<br>M-F: Single 1 Day Operation<br>MTWTF--: Monday – Friday Operation<br>-----SS: Saturday & Sunday Operation<br>MTWTFSS; 7 Day Operation<br>M-W-F--: Alternative Weekday Operation |
| Start Time | Set Time to start (24 hour format) |
| Run Time | Set Time to Run in HH:MM format |
| Restore Defaults | Resets all schedules to default<br>(MTWTF, 08:00AM for 8 hours) |

Up to 25 different schedules can be configured, the system will look at all schedules enabled and if the time is within any of the schedules set then the system will run.

## Service Reminders

The system provides 5 configurable service reminders to be set. The active time of the service reminder will be shown on this screen.

| MENU ITEM | DESCRIPTION |
|---|---|
| Slot | Select the service reminder to edit (1-5) |
| Set Time | Set the target time in hours |
| Active Time | The current active time in hours |
| Name | Assign the service reminder a meaningful name |
| Restore Defaults | Resets all service reminders to default |

## System Information

This provides information on system up and system run time as well as system diagnostics and base firmware version.

| MENU ITEM | DESCRIPTION |
|---|---|
| View Timers | View Timers on the system:<br>This includes:<br>Up Time (Total Powered Time)<br>Run Time (Total Time System has ran)<br>Powered On Time (Total Time since last power up) |
| View Diagnostics | View information of all System Inputs and Outputs |
| Firmware Revision | View System Firmware Revision and Date |

Additional configuration of the unit, can be done via the EARL for EKO application, contact IPU for further information on downloading this.

## Fault Finding

The EKO system fuel polishing units have several alarm functions to protect itself.

When any alarm is activated, it is shown on the front of the control panel. Should the alarm trigger a system shut down, then this will need to be reset, follow LCD instructions.

Once the issue or fault has been resolved, to reset the alarm press the GO button on the front of the panel, the LCD display should read “System Ready”.

The unit monitors all the process and safety interlocks. Faults resulting from this monitoring can be viewed in a number of ways:

• Faults are reported on the control panel display inside the panel and are displayed until cleared by operator intervention

• The unit can be connected to a Building Management System via volt free contacts

• The unit can be connected to a Building Management System via Modbus RTU over RS485 serial communication

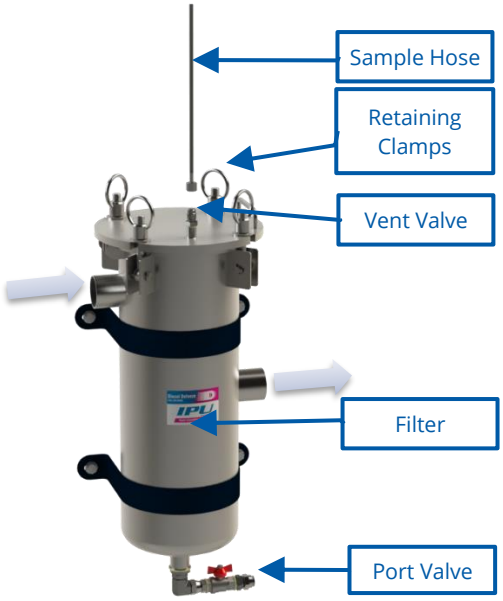
• Visual warning beacon and audible alarm highlighting an alarm condition has occurred.

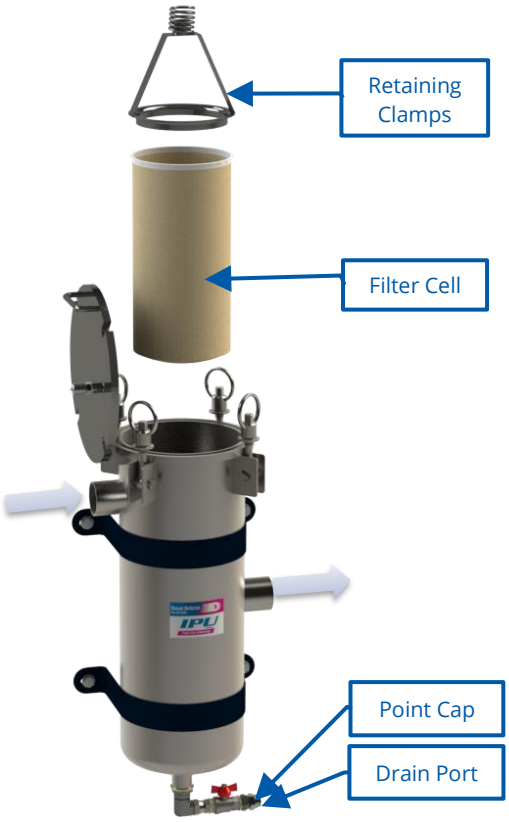
# MAINTENANCE

The unit has been designed to require minimal servicing and maintenance. The unit contains one filter unit, which has a replaceable filter element. The filter has a replaceable filter bag that will need to be replaced once the filter alarm detects a blockage. The frequency of this will depend on the condition of the fuel. There will also be a requirement to remove water collected in the filter bowl. **CAUTION**: PPE must be worn at all times when operating or servicing the machine.

To change the filter cell:

- Ensure that the pump has stopped running.
- Close the inlet & outlet ball valves. (See P&ID)
- Remove the drain point cap.
- Ensure secure connection to filter drain port.
- Place hose into suitable container.
- **CAUTION**: open all valves slowly to ensure fuel is not expelled quickly due to residual pressure in the system.
- Attach the sample hose to the vent valve on the top of the filter housing to allow for the pressure inside the canister to equalize.
- Open the drain port valve to allow for excess fuel to drain from the filter canister.
- Once the filter housing is fully drained, remove the sample hose and loosen the 4 retaining clamps on the filter lid.
- Remove the filter lid with caution it may be heavy and have residual fuel on the inside surface.
- Remove the Retaining Brace.
- Carefully lift out the existing Filter cell.
- Fit the new Filter cell ensuring it has been securely pushed down and seated inside the housing
- Replace the Retaining Brace.
- Replace the Filter Lid
- Secure the filter lid by tightening the 4 retaining swing bolt clamps
- Shut the ½“ drain valve and replace the valve cap



## General Maintenance

The unit has been designed to require a minimum amount of maintenance:

- On a weekly basis, conduct visual check of connections and joints to ensure they have not loosened. Visually check and then manually lift the float switch to ensure it is working correctly
- On a weekly basis, check pressure gauges as this can serve as an early indication of potential blockages
- Once a blockage has been detected, replace filters, as well as check and clean suction filter installed in the pump

## Particle Counter Operation (if fitted)


| Specification | Detail |
|---|---|
| Technology | Precision LED Based Light Extinction Automatic Optical Particle Analyser |
| Particle Sizing | >4,6,14,21,25,38,50,70 µm(c) to ISO 4406:1999 Standard |
| Analysis Range | ISO 4406:1999 Code 0 to 25 NAS1638 Class 00 to 12 AS4059 Rev.E. Table 2 Sizes A-F: 000 to 12 Lower Limits are Test Time dependent. |
| Reporting Formats | ISO 4406:1999 (ICM Default) NAS1638 AS4059E Table 2 AS4059E Table 1 ISO 11218 |
| Accuracy | ±½ ISO code for 4,6,14µm(c) ±1 code for 21,25,38,50,70 µm(c) |
| Calibration | Each unit individually calibrated with ISO Medium Test Dust (MTD) based on ISO 11171 (1999), on equipment certified by IFTS. |
| Test Time | Adjustable 10 - 3600 seconds (factory set to 120s) |
| Moisture & Temperature Measurement | % saturation (RH) and fluid temperature(°C) – Mineral Oil / Diesel version only |
| Data Storage | Approximately 4000 timestamped tests in the integral ICM memory |
| Fluid Compatibility | Standard unit: Mineral oil & petroleum-based fluids |
| Flow Rate | 20-400 ml/minute |
| Viscosity Range | <1000 cSt |
| Fluid Temperature | -25 to +85 °C (check for viscosity compatibility for low temperature) |
| Maximum Pressure | 420 bar static. For high frequency pressure pulse applications contact MP Filtri UK |
| Differential (Inlet/Outlet) | Typically 0.5 bar |

All ICM versions have a multicolour indicator2 on the front panel, which is used to indicate the status or alarm state. ICM-K versions also have a screen that changes colour. The alarm thresholds can be set from LPA-View via the serial interface.


Green indicates that the test result passed, i.e. none of the alarm thresholds were exceeded.

Yellow indicates that the lower cleanliness limit was exceeded, but not the upper one.

Red indicates that the upper cleanliness limit was exceeded.

Blue indicates that the upper water content limit was exceeded.

Red/Blue Alternating indicates both cleanliness and water content upper limits exceeded.

Violet indicates that the upper temperature limit was exceeded


Screen and multicolour indicators

The particle counter optional extra is utilized to measure the quantity of particles of a specified size. The display shown above identifies the following.

Quantity of particles between the sizes of >4micron = 21

Quantity of particles between the sizes of >6 micron = 18

Quantity of particles between the sizes of >14micron = 14

O 4406:1999 is the internationally recognised cleanliness code for measuring the solid particulate content of fuel samples and hydraulic fluid. It is also referred to as the ISO cleanliness code. For engines designed to achieve Euro 2, 3, 4 and 5 emission standards, clean fuel is important.

For diesel to be recognised as 'clean' the fuel must contain less than 200ppm of dissolved water (as indicated by EN 590) and a particulate cleanliness level of 18/16/13 (as stated by ISO 4406:1999

The cleanliness code is made up of three numbers that identify the number of particles that are present in one millilitre of fuel:

For the code quoted above:

The first number (18) indicates the level of contamination by particles greater than 4 micron.

The second number (16) indicates the level of contamination by particles greater than 6 micron.

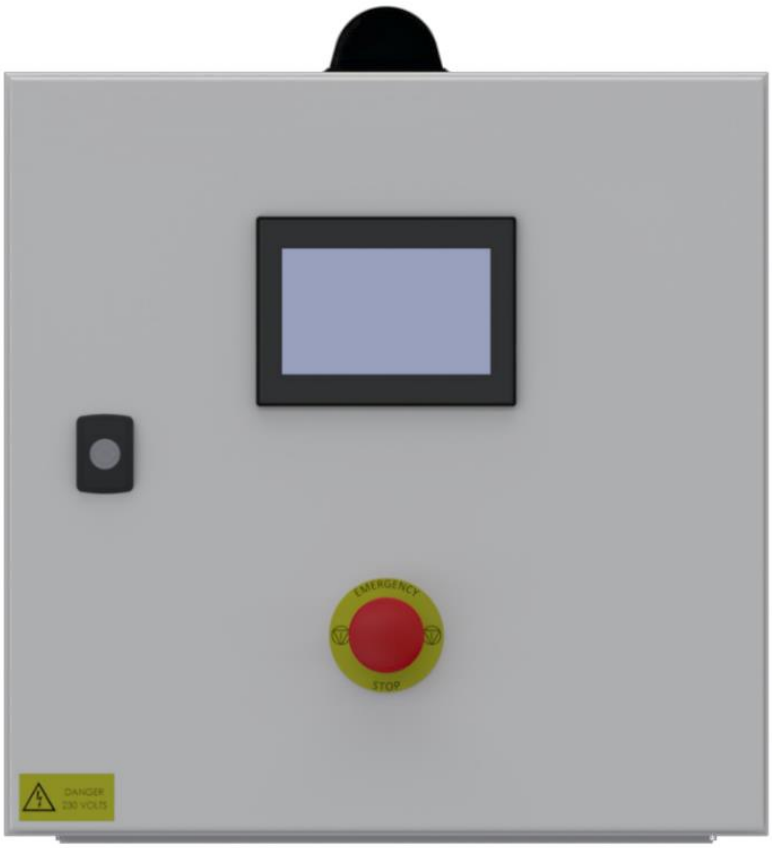
The third number (13) indicates the level of contamination by particles greater than 14 micron.

For the example given above (18/16/13) the following table shows what each of the range number translates to in terms of particle quantities:

| Range Number | Micron Size | Particle Count Range |
|---|---|---|
| 18 | 4+ | 1300 – 2500 |
| 16 | 6+ | 320 – 640 |
| 13 | 14+ | 40 – 80 |

## IPU HMI CONTROL PANEL

**See separate Manual (IPU HMI CONTROL PANEL - Rev6 Operational Manual)**



## Troubleshooting

| ISSUE | RESOLUTION |
|---|---|
| LCD DISPLAY IS NOT ON | • Check power supply to the unit.<br>**WARNING**: Risk of shock - this level of check should ONLY be carried out by a suitably qualified person. |
| NO FLOW ALARM | • Check inlet and outlet Isolation valves are fully open.<br>• Check switch located on pump is set to on.<br>• Check pipe work and connections to the unit to ensure there are no leaks or blockages downstream and upstream.<br>• The placement of the unit from the tank and the length of hose will affect the flow rate coming into the system.<br>• Low level in the suction tank. Refill the tank.<br>• Check filters for blockages.<br>• Extreme operating conditions can raise the motor temperature and, consequently, cause the thermal protection switch to stop it. Wait for it to cool before resuming use. The thermal protection automatically turns off when the motor is sufficiently cool. |
| FILTER CHANGE ALARM | • Pressure switch has detected pressure in the filter housing which indicates a blocked filter. |
| THE PUMP WILL NOT SELF PRIME | The priming phase can last from several seconds to a few minutes, as a function of the characteristics of the system. If this phase is prolonged, stop the pump and verify:<br>• That the pump is not running completely dry.<br>• That the suction tubing is not allowing air to leak in.<br>• That the suction filter is not clogged.<br>• That the suction height is not greater than 2 meters (if the height is greater than 2 meters, fill the suction tube with fluid).<br>• That the delivery tube is allowing the evacuation of the air.<br><br>The pump has run dry for too long a period/long periods of inactivity. In this case it is advisable to add liquid directly into the pump chamber before start-up. It is also advisable to add a drop of lubricating oil inside the pump only before running the pump.<br><br>Air leak at the suction pipe due to the following reasons:<br>• Possible cuts in the pipe, inadequate hose clamps, malfunctioning of the filter due to defective/worn seals or filter clogged.<br>• Air leak at the pump front plate cover due to the following reasons:<br>• Loose fixing screws or poor effectiveness of the seal.<br>• The presence of obstructions or restrictions in the suction or delivery pipes. |

| ISSUE | RESOLUTION |
|---|---|
| THE MOTOR TURNS SLOWLY WHEN STARTING | • Low voltage in the electric power line. |
| INCREASED PUMP NOISE | • Cavitation occurring. Reduce suction pressure.<br>• Irregular functioning of the by-pass. Dispense until the air is purged from the circuit.<br>• Air present in the diesel fuel. Verify the suction connections. |
| LEAKAGE FROM THE PUMP BODY | • Check and replace the mechanical seals. |

## Spares

| IPU Part Number | Description | Micron Rating |
|---|---|---|
| Y-1273 | PUMP 100 lpm 230V 50Hz (if fitted) | N/A |
| Y-1805 | PUMP 100 lpm 110V 60Hz (if fitted) | N/A |
| T-FA-01-002 | FILTERSORB 2 SIZE 1 FILTER CELL | N/A |
| T-19HE001-1GYEP | 1 MICRON HIGH EFFICIENCY, SIZE 1 | 1 |
| T-19HE005-1GYEP | 5 MICRON HIGH EFFICIENCY, SIZE 1 | 5 |
| T-19PP001-1GYEP | 1 MICRON NOMINAL, SIZE 1 | 1 |
| T-19PP005-1GYEP | 5 MICRON NOMINAL, SIZE 1 | 5 |
| T-19PP010-1GYEP | 10 MICRON NOMINAL, SIZE 1 | 10 |
| T-19PP025-1GYEP | 25 MICRON NOMINAL, SIZE 1 | 25 |
| T-CE-01-Z01 | ABSOLUTE ELEMENT | 1 |

## Revision History

| Date | Description | Revision |
|---|---|---|
| December 2020 | First Issue | 0 |
| April 2023 | Second Issue | 1 |

## Quality of Goods & Warranty

1.1. The Supplier warrants that on delivery, and for a period of 12 months from the date of delivery (Warranty Period), the Goods shall:

1.1.1. conform in all material respects with their description;

1.1.2. be free from material defects in design, material and workmanship;

1.1.3. be of satisfactory quality (within the meaning of the Sale of Goods Act 1979); and

1.1.4. be fit for any particular purpose expressly held out by the Supplier (but not any implied purpose).

1.2. Subject to clause 1.3, if:

1.2.1. the Customer gives notice in writing during the Warranty Period within a reasonable time of discovery that some or all of the Goods do not comply with the warranty set out in clause 1.1;

1.2.2. the Supplier is given a reasonable opportunity of examining such Goods (including, but not limited to permitting the Supplier to examine the Goods at the Customer's premises for the purposes of failure analysis);

1.2.3. the Customer (if asked to do so by the Supplier) returns such Goods to the Supplier's place of business at the Customer's cost; and

1.2.4. such defect shall be attributable to the Supplier,

the Supplier shall, at its option, repair or replace the defective Goods, or refund the price of the defective Goods in part or in full.

1.3. The Supplier shall not be liable for the Goods' failure to comply with the warranty in clause 1.1 if:

1.3.1. the Customer makes any further use of such Goods after giving a notice in accordance with clause 1.2;

1.3.2. the defect arises because the Customer or any third party (other than the Supplier) failed to follow the Supplier's oral or written instructions as to the storage, installation, commissioning, use or maintenance of the Goods or (if there are none) good trade practice;

1.3.3. the Customer cannot provide the Supplier with evidence that the Goods have been maintained in accordance with all of the Supplier's oral and written instructions;

1.3.4. the defect arises as a result of the Supplier following any drawing, design or specification supplied by the Customer;

1.3.5. the Customer alters or repairs such Goods without the prior written consent of the Supplier or uses non-Supplier sourced or approved spares;

1.3.6. the Customer has modified the Goods in any way without the prior written

consent of the Supplier, including, but not limited to, being painted;

1.3.7. the defect arises as a result of fair wear and tear, wilful damage, negligence, or abnormal working conditions; or

1.3.8. the Goods differ from their description as a result of changes made to ensure they comply with applicable statutory or regulatory standards.

1.4. Except as provided in this clause, the Supplier shall have no liability to the Customer in respect of the Goods' failure to comply with the warranty set out in clause 1.1.

1.5. Where the Goods' failure to comply with the warranty in clause 1.1 is as a result of the circumstances in 6.3, the Customer shall pay the Supplier's reasonable costs of examining the Goods, including travel costs, accommodation (when required), and labour costs at the prevailing hourly rates of the Supplier at the time the Goods are examined.

1.6. Except as set out in these Conditions, all warranties, conditions, and other terms implied by statute or common law are, to the fullest extent permitted by law, excluded from the Contract.

1.7. The terms of these Conditions shall apply to any repaired or replacement Goods supplied by the Supplier under clause 1.2.

1.8. Where the Supplier repairs or replaces the Goods, the Warranty Period is treated as continuing as if the repaired or replacement Goods were supplied at the original date of delivery set out at clause 4.3.

1.9. Where the Supplier attends the Customer's premises to inspect the Goods, the Customer shall use all reasonable endeavours to ensure that the Supplier's employees, representatives and agents are made aware of all applicable security, safety and other regulations at its premises, and of the relevant safety policy.

1.10. The Supplier shall offer technical support without additional cost via telephone, fax, or email during normal business hours in the United Kingdom, for the Warranty Period.

1.11. Outside of the Warranty Period, technical support is provided free of charge via telephone.

1.12. The Supplier shall only be able to provide technical support if the Customer is able to provide it with the following information:

Customer Name;

Customer Contact Details;

Device Type;

Device Serial Number;

Date of Supply; and

A clear description of the issue facing the Customer.

## Exclusion of Liability

In no event will the manufacturer be liable for direct, indirect, special, incidental, or consequential damages resulting from any defect or omission in this manual. The Manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all **IMPORTANT**, **WARNING** and **CAUTION** statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

## Caution

Prior to any maintenance or service work, the system pressure should be released.

The operator should ensure that they are fully familiar with the contents of the manual before carrying out any operational or maintenance procedures.

If in any doubt, contact IPU using the contact details on the front cover of this document.

## Risk Assessment

A full risk assessment has been carried out on this equipment by IPU Group Ltd.

The assessment was carried out according to the requirements and guidelines set out in BS EN ISO 12100:2010.

# DIRECTIVE PROVISIONS

EC Declaration as defined by Machinery Directive 2006/42/EC:

The equipment described above conforms to The EMC Directive 2014/30/EC, & Machinery Directive 2006/42/EC