Assistência Técnica ao
Ramo Petrolífero, S.A.

PETROTEC

CleanAIR – Vapour Recovering System

Technical Manual

*Edition **A** Revision **4***
June 2008

INDEX

THIS MANUAL CONTENT MIGHT BE CHANGED WITHOUT PRIOR NOTICE.

1. Introduction

1.1 Scope

CA-40/80 is a profitable system for recycling of petrol vapour into liquid petrol directly at the petrol station dispenser or vent stack. This process offers a favourable pollution and vapour loss solution that complies with the new EU regulations (Stage II VOC).

1.2 General Description

The CA-40/80 concept is dedicated to transforming energy, which previously was lost as pollution, into energy for sale, further distribution and use. Based on unique technology, the product's period of amortization can be short, providing the user with earnings as well as environmental benefits.

It is a well-known fact that vapour emissions occur when filling up petrol tanks.

This technology removes and recycles the vapour into liquid petrol. The condensed, cleaned petrol may be used in regular sales. Emissions from the air outlet pipes from the main tanks can be recovered by implementing the same technique.

The CA-40/80 is the result of this development.

This solution differs from others by transforming petrol vapour into liquid petrol directly at the dispenser. Costly return piping to the storage tank is not needed, in contrary to all the other vapour recovery systems. The recycled petrol may go directly back to the dispensing nozzle and/or the underground storage tank. Other solutions only remove the vapour from the dispenser to the storage tank, without any recycling.

This CleanAIR version is an add-on unit to the dispenser both for retrofit and new installations.

1.3 Principle

The system is based on thermodynamics (The Carnot Process) and the fact that the evaporation temperature (boiling point) for a medium will increase at increasing pressure.

Consequently, when the vapour pressure increases for a medium above saturation pressure (at constant temperature), the vapour will condense into liquid phase while releasing energy.

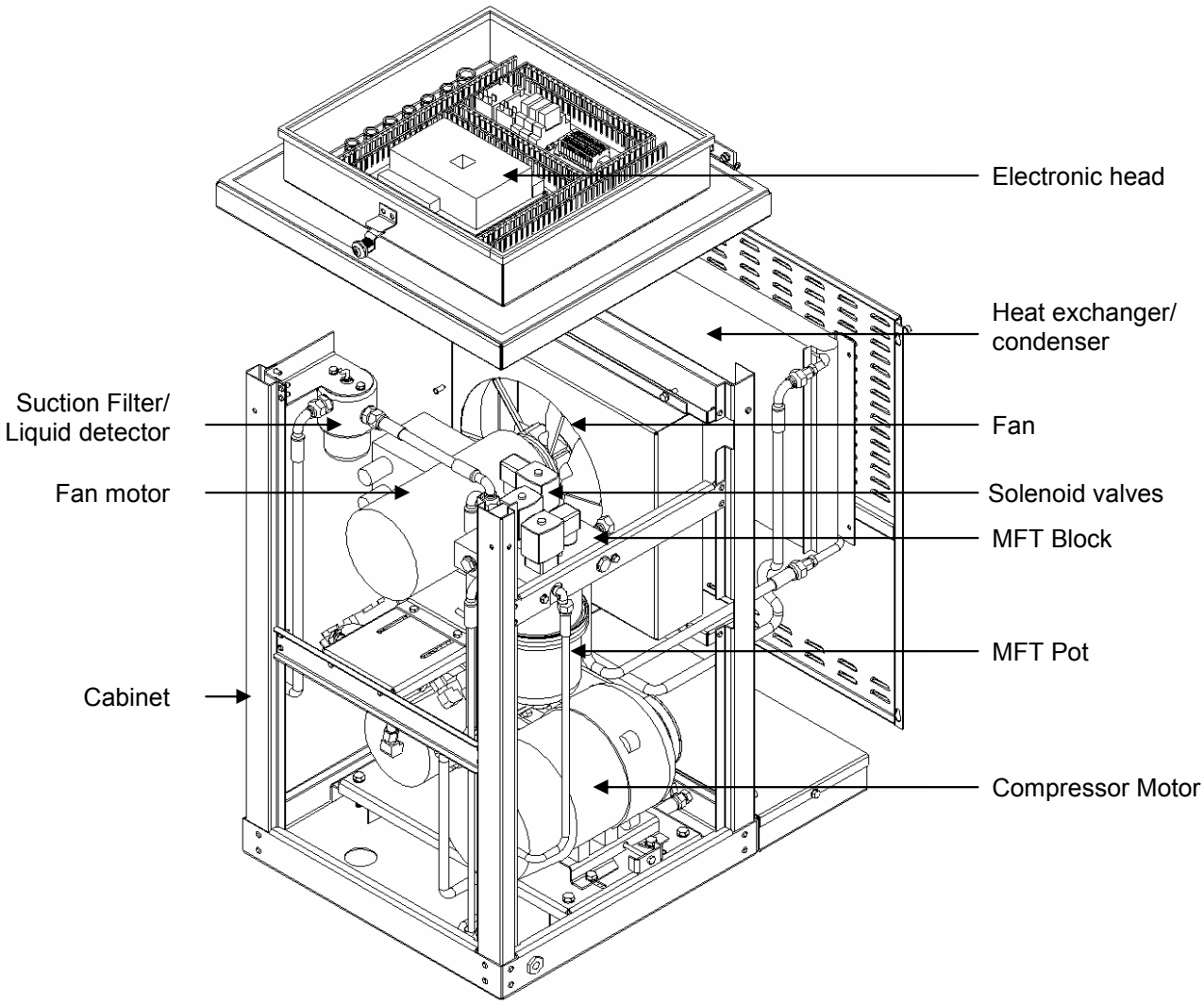
In the condensation phase there may also occur other inert gases, which do not condensate as easily as petrol vapour, ref. Dalton's 2nd law for gases (*).

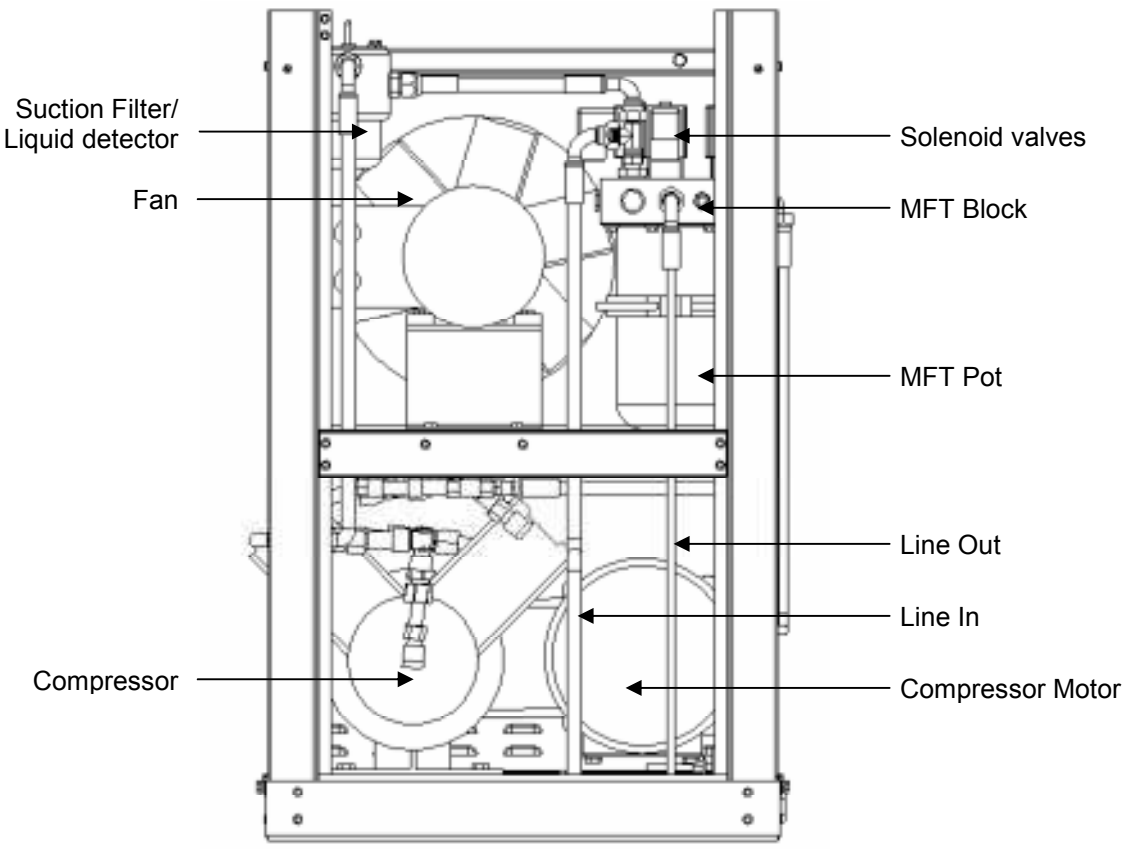
Therefore, to ensure sufficient partial pressure for petrol vapour in the condenser, we found that the operating pressure for the unit's high-pressure chamber should be > 0,28 MPa.

At this pressure, condensation will take place at normal ambient temperatures.

(In a closed volume, any gas will behave as if it is alone in the room, and the total pressure will be equal to the sum of partial pressures.)

1.4 Clean AIR Model Description





1.5 Operational Features

Max. vapour suction (Vs)	:	Ca. 84 l/min.
1) Recovery (nominal)	:	4,8 l/h
1) Power requirement	:	1,1 kW – 3 phase
	:	1,2 kW – single phase
Electrical supply	:	400 V – 50 Hz – 3 phase
	:	230 V – 50 Hz – single phase
Eex classification	:	II 2 G EEx dem[ia] IIA T3

- Applicable at continuous duty, Vs = 84 l/min., and 1-5% air and moisture at suction, Air temperature 15 °C

With reservations to alteration of data and capacity.

1.6 Weights and Measures

Weight	:	110 kg
Dimension (W x D x H)	:	526 x 511 x 857 mm

2. Safety Instructions

This chapter refers to maintenance work on equipment reinstallation and installation of additional equipments.

The strict fulfilment of these procedures is compulsory during all work performed at Stations, especially installation maintenance or repair work.

The installation and/or maintenance company is obliged to ensure that all its employees strictly comply with all laws, directives or regulations relevant to work execution.

The following instructions and specifications are vital for the safety of persons and equipment. Improper installation, use or servicing may not only cause serious injury or casualties and material loss, but also be prosecuted by law.

- The equipment must be installed, used and serviced as specified in this manual and in the technical manual only.
- The equipment must not be modified or used for other purposes than specified without prior permission by the manufacturer and/or the Certifying Body.
- No spare parts may be exchanged but those mentioned in the Maintenance section of this manual.
- Any other parts must be exchanged by the manufacturer or their designated service partner/s only.
- Any ATEX-certified parts may only be exchanged against similar equipment, and by the manufacturer or their designee/s only.
- Authorized personnel only must execute all piping and connections and all electrical installations to connect the CA-40/80 to the petrol station's existing pumps and tank installations.
- All necessary adapters to integrate the CA-40/80 into the petrol station's existing installations must have been provided, properly mounted and checked before installation may be initialised.
- For installations already equipped with a vapour recovery system, the nozzle's and existing piping line may be used.
- Check start signal from every petrol pump (the different octane types) by lifting out each filling nozzle one by one for all multi pumps to be used.
- The CA-40/80 will start automatically if one of the filling nozzles in a dispenser is lifted out and the pump for chosen octane starts. It will stop after a short delay when the last filling nozzle is replaced into the dispenser.
- Qualified, authorized personnel ONLY must carry out all maintenance and service operations.
- The power must be turned OFF before the service covers are removed. Otherwise, the unit will start automatically as soon as petrol filling starts. Operation without the covers properly mounted may cause serious injuries due to rotating parts inside the unit.
- The equipment must be safeguarded from damage and vandalism, if necessary by measures additional to those described in this manual. In case of damage, power must be switched OFF and remain OFF until the unit is released as OK by qualified service personnel.

3. Moving and Lifting

There is no specific procedure in what concerns the unit moving and/or Lifting.

It's recommended that it is moved and/or lifted by means of a forklift or a pallet truck. However, any other transportation means can be used as long as safety regulations are respected. In what concerns transportation beams and pallets, their removal from the equipment must be done in such a way that no risk of personal injury and material damage exists.

4. Installation Instructions

4.1 Introduction

Here are defined the necessary instructions to make an installation "type" of a recovering vapour unit CA-40/80 on a service station. These instructions must be followed step by step, to assure a correct installation.

The units must be install one after other: before the installation is placed on service, all must units should be completely installed

Important: Security

Only qualified personnel shall execute the pipes connection, as well the electrical connections of the CA-40/80 unit to the dispensers and/or supplying tanks.

Before start make sure that:

- **The unit is placed over plan surface, and correctly fix to the ground by nuts.**
- **All electrical connections are correctly made.**
- **All pipes are correctly connected.**
- **All cabinet external covers are correctly assembled on the unit.**

The unit shall start automatically after start the fuel supply.

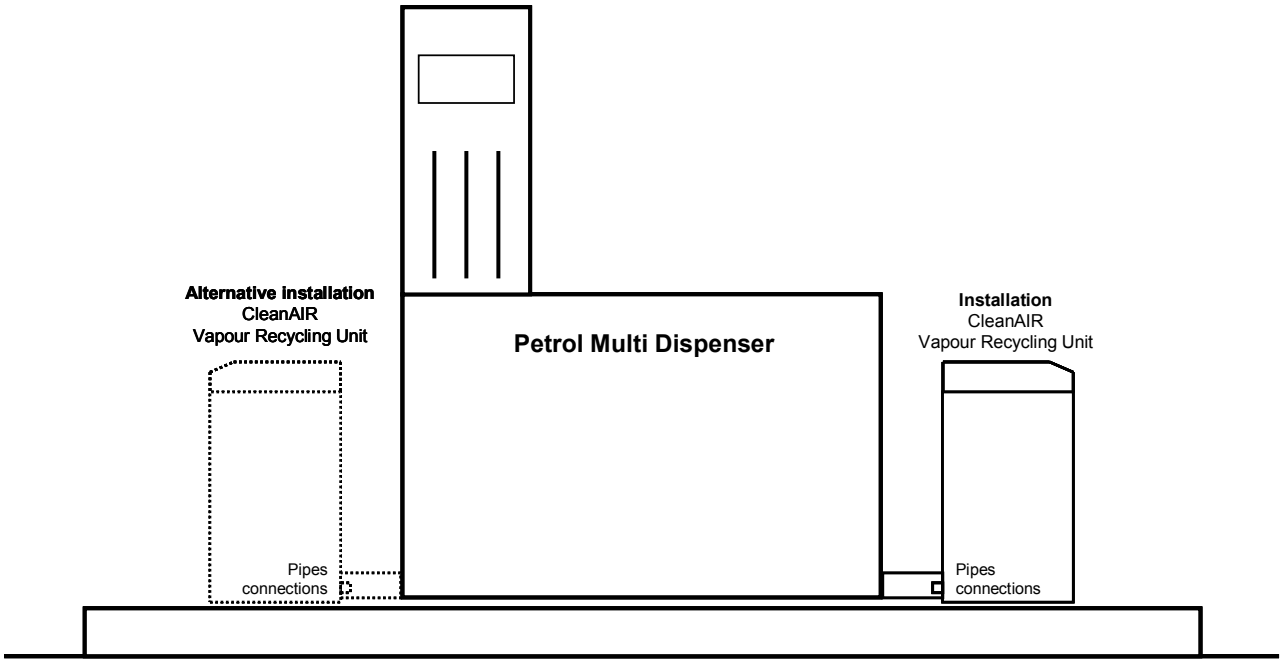
Work with the unit protecting covers incorrectly assembled, can lead to severe accidents, due the rotating parts inside of the unit.

Before disassemble protecting covers from the unit, must turn off the electrical current supply.

4.2 Implementation of the unit

The vapour recovering unit (VRU) shall be at a minimum distance of 140mm on the dispenser prolongation.

Should be verify if the security distances, between the unit and external perimeter of the dispenser island, are according the regulation in force. A protecting system for the island extremity can be considered at this point.



Location Drawing

Place the unit as it shows on picture below. The unit back should be turn to the dispenser at a minimum distance of 140 mm (this distance is due protecting cover for the unit exit pipe).

The unit is screwed to a concrete and plan surface, by four anchors M10. Should be used a level to adjust the unit fixation.

4.3 Electrical supply

The three phase CA-40/80 unit shall be supplied by an electrical connection 400V 50Hz protected by a 6 Amps circuit breaker, and the single phase unit shall be supplied by an electrical connection 230V 50Hz protected by a 10 Amps circuit breaker.

4.4 Electrical installation – Cables

A: The electrical diagram below, indicates on detail the electrical connections between the electronic module (out of the Ex area).

- Connection electrical scheme – Tri-Phase

See drawing B07-0129 in annex

- Connection electrical scheme – single-Phase

See drawing B07-0130 in annex

Others

B: 1 cable (4x1,5 mm^2 + earth) to supply the electronic module

C: 1 cable (4x0,5 mm^2 + earth) for the pumps starting signal (contact sec)

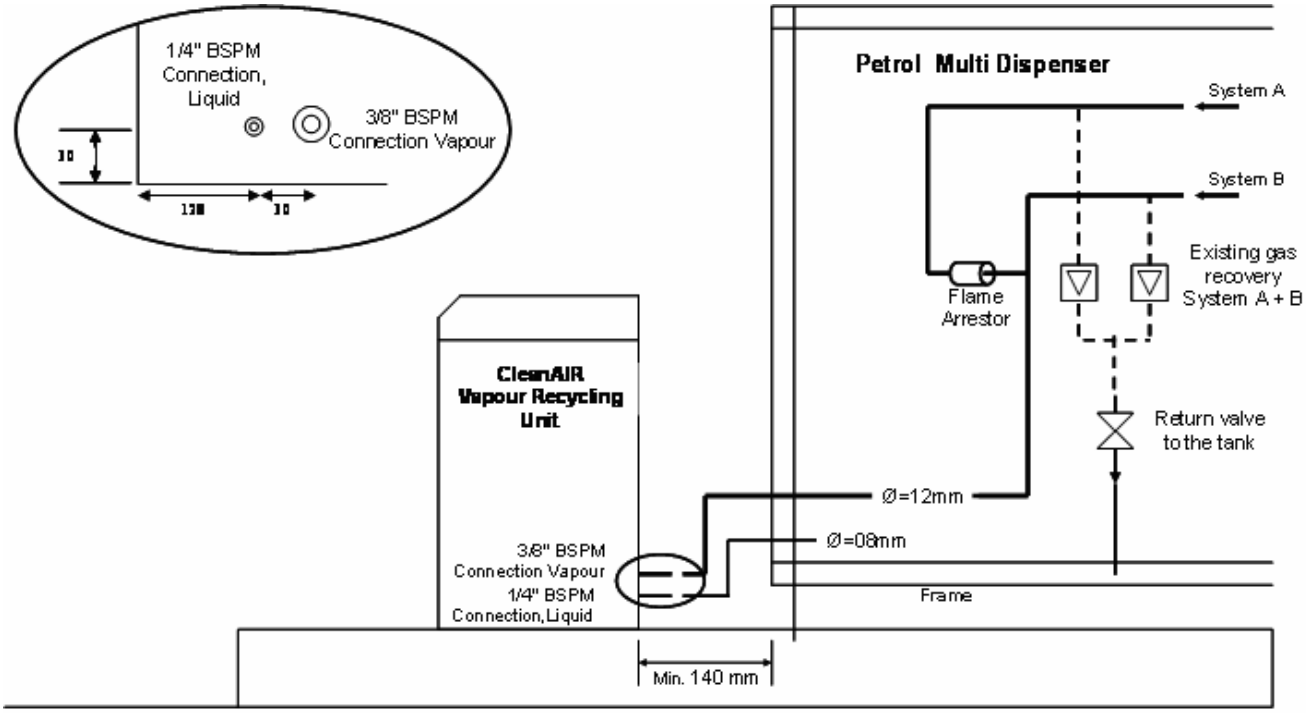
The CleanAir unit electronic module is equipped with a signal alarm (a lamp/LED indication of the unit malfunctions). This alarm can also be shown through a LCD display that can be connected to the unit. See point 5.3.4.1.

Note! The vapour recovering unit shall not be placed on service before all the cabinet covers are correctly assembled and the pipes connections finished.

Note: the cable type and section may vary according the country legislation

4.5 Installation of the pipes

All connections made to an existent recovering pump RV2, shall be elevated to the pump RV2 levels A and B. See picture below.



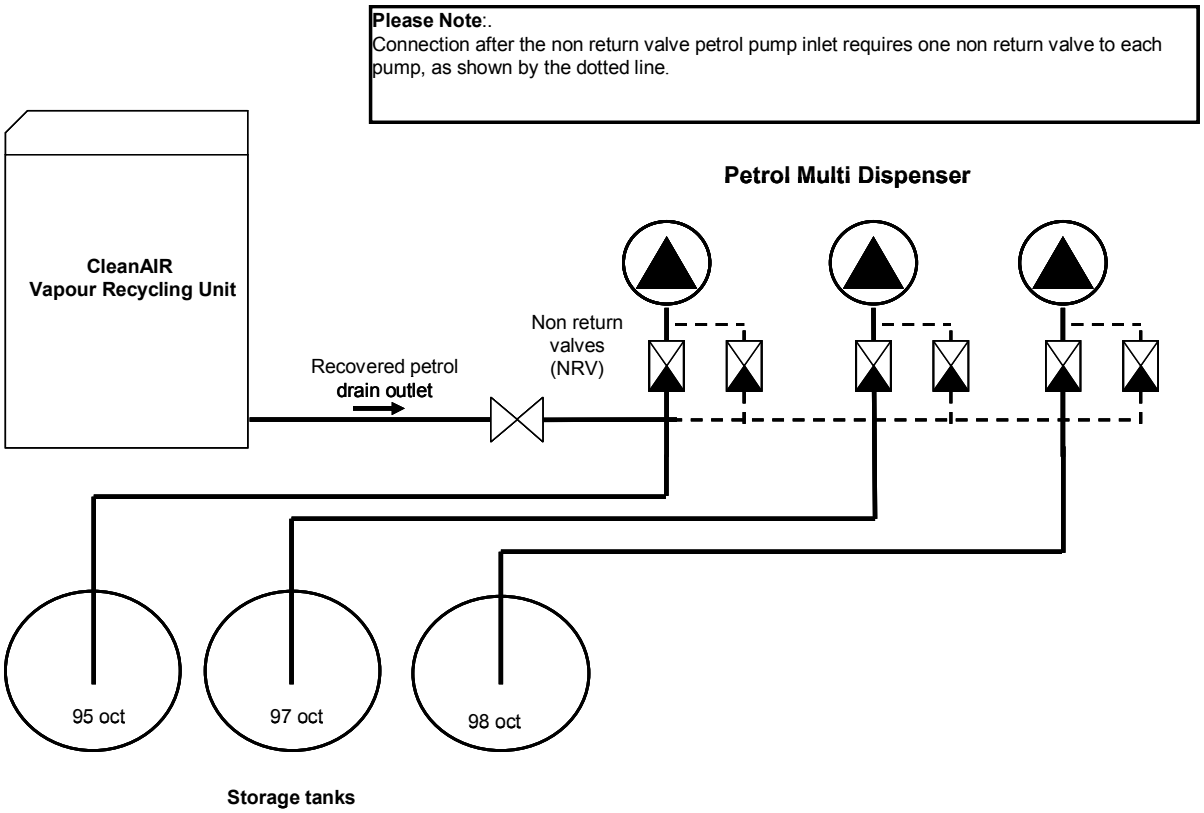
Piping diagram – Petrol returning to nozzle

The pumps RV2 entry and exit holes should be closed to protect the pump RV2.

The existent vapour return pipes, from the RV2 nozzles, shall be connected together (pipes 10-12mm), and connect to vapour entry connection from the CleanAIR unit (Connection 3/8" OD BSPM). Is necessary place a flame arrestor as indicate on the picture above to protect the unit against flame transmission from one active fuelling nozzle to another active fuelling nozzle.

The connection for the unit vapour entry is accessible from the unit back after disassemble the protecting cover which assure a minimum distance of 200mm between CleanAIR unit and dispenser.

In what concern to the recovered fluid purge (condensed), it shall be connected to a pipe 8-10mm on the CleanAIR unit exit connection (connection ¼" OD BSPM). This pipe could be now connected.



Piping diagram – Petrol returning to storage tank

Or on the return pipe from the recovered fluid storage tank.

Or to the aspiration pipe from each gasoline pump, see picture above (on this case the connection should be made between anti-return valve and the dispenser pump).

Or to the pipe (pressure 2-3 bar max) from the immersive pump.

4.6 Starting operation

The unit can't be started before all the work with the pipes connections; electrical installation and fixation to the ground are finished.

Important: Security

Before put, the unit working should be certified that:

- *The unit is placed over plan surface, and correctly fix to the soil by nuts.*
- *All electrical connections are correctly made.*
- *All pipes are correctly connected.*
- *All cabinet protecting covers are correctly assembled on the unit.*

The unit regulates automatically the vapour aspiration in function of the numbers of nozzles used.

The fan works simultaneously with the compressor, and it will stop at temperatures below to 3ºC (37,4 ºF).

The CleanAIR unit is started after the main supply is connected to the unit.

5. Operation Instructions

5.1 Function

A Flow Diagram in below shows how the system works.

During tanking, fuel vapour contaminated with some air is sucked through the vapour return line (1) of the dispensing nozzle by means of an oil-free compressor (4). Before entering the compressor, the vapour is filtered by a combined suction filter with a liquid detector.

The oil free compressor's (4) inlet and outlet are equipped with flame arrestors (13) for safety, and the outlet has a non-return valve (3) to prevent flow reversal.

Petrol vapour and water vapour from moist air enter an air-cooled heat exchanger (5) where these gases will condensate and transform to liquid state.

During compression, the vapour temperature will slightly increase. With an ambient temperature of 40°C, the pressure pipe temperature was measured to max. 55°C.

In the heat exchanger /condenser (5) gases like petrol and water vapour will release energy. Therefore, the heat exchanger is cooled by a fan, which is driven by a separate motor (6). The fan will automatically stop when ambient temperature drops below approx. 3°C.

Condensate and non-condensable gases, mainly air, will flow into the Multi Function Tank –MFT (7) where water, the component of highest specific weight, accumulates at the bottom of the pot. An optional heater cable (14) will prevent the water from freezing in the Tank at low temperatures.

A solenoid valve (9), which opens at compressor run times, will close the feedback line to the pressure regulators / part load line to prevent any leakage from the Multi Function Tank –pot at stop periods.

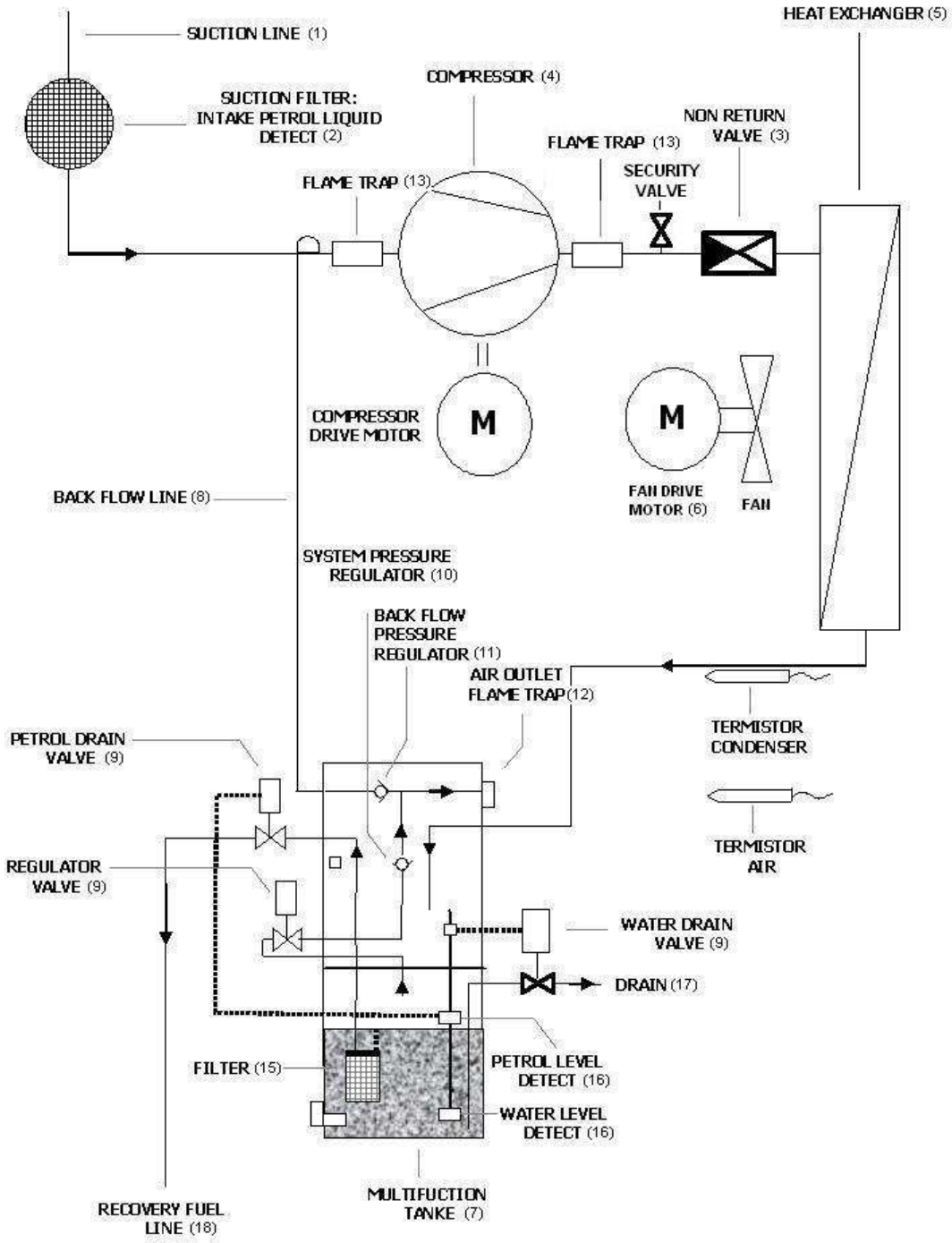
A pressure regulator (10) in the Multi Function Tank –block keeps the condenser pressure at a certain level > 0.28 MPa.

A two step float switch (16) will determine the level of water/petrol and operate solenoid valves (9), to drain off the water (17), while liquid petrol and air are separated and the fuel is drained via a fuel outlet filter (15) through a solenoid valve (9) into the petrol charging system (18).

Via the pressure regulator (10) in the Multi Function Tank –block, remaining gases like air, minor amounts of petrol vapour and water vapour will pass through to a small intermediate chamber and will be discharged through a combined bleeder nozzle/flame arrestor (12) into the air.

During reduced load, e.g. when only one fill-pipe is in use, more air will enter the system, and the pressure at the bleeder nozzle will increase. At a certain pressure level, a second pressure regulator (11) in the Multi Function Tank – block will open for air return to the compressor inlet. In this way, an automatic capacity control is achieved, and this will ensure efficient suction at the multi-pumps' filling nozzle.

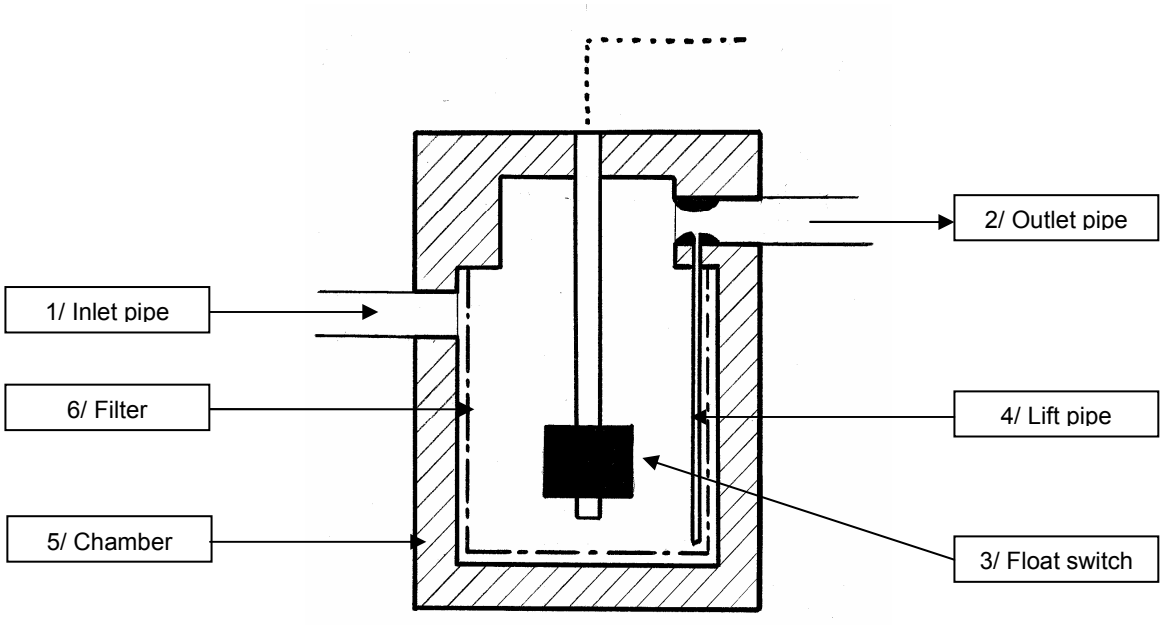
The bleeder nozzle (12) will release an insignificant amount of petrol vapour mixed with air.


SUCTION LINE (1)
HEAT EXCHANGER (5)
COMPRESSOR (4)
SUCTION FILTER:
INTAKE PETROL LIQUID
DETECT (2)
NON RETURN
VALVE (3)
FLAME TRAP (13)
SECURITY
VALVE
FLAME TRAP (13)
COMPRESSOR
DRIVE MOTOR
M
M
FAN DRIVE
MOTOR (6)
FAN
BACK FLOW LINE (8)
SYSTEM PRESSURE
REGULATOR (10)
BACK FLOW
PRESSURE
REGULATOR (11)
AIR OUTLET
FLAME TRAP (12)
TERMISTOR
CONDENSER
PETROL DRAIN
VALVE (9)
TERMISTOR
AIR
REGULATOR
VALVE (9)
WATER DRAIN
VALVE (9)
DRAIN (17)
FILTER (15)
PETROL LEVEL
DETECT (16)
WATER LEVEL
DETECT (16)
MULTIFUCTION
TANKE (7)
RECOVERY FUEL
LINE (18)

5.1.1 Filter and Suction Accumulator (FSA) Pot with Liquid Detection

The CA-40/80 VRU is equipped with an automatic liquid detection system. The liquid detection system stops the CA-40/80 when unwanted petrol droplets are found in the unit's suction line, and an alarm (lamp or LED) will appear.

Fig.: Filter and Suction Accumulator (FSA) Pot / Liquid Detection System



Petrol vapour and air enter the liquid detection system by inlet pipe 1.

After passing the mesh filter 6, petrol vapour and air leave the system by outlet pipe 2. The FSA-pot system is equipped with a float switch 3 to float on the petrol. As soon as a defined, small amount of petrol has entered the chamber 5, the switch will float, thereby being activated. A signal from the float switch will be sent to the VRU's control module, which will stop the unit. Simultaneously, a failure lamp will flash 1s on/ 1s off, the typical signal for a system stop caused by liquid detection.

Under normal working conditions, especially when car tanks are filled to max level, small petrol droplets may enter the chamber 5 and accumulate on the bottom. To prevent the VRU from stopping under normal conditions, such small amounts of petrol will rise up the lift pipe 4 by Venturi effect and enter the outlet pipe 2.

5.2 Start, normal operation, stop, emergency stop

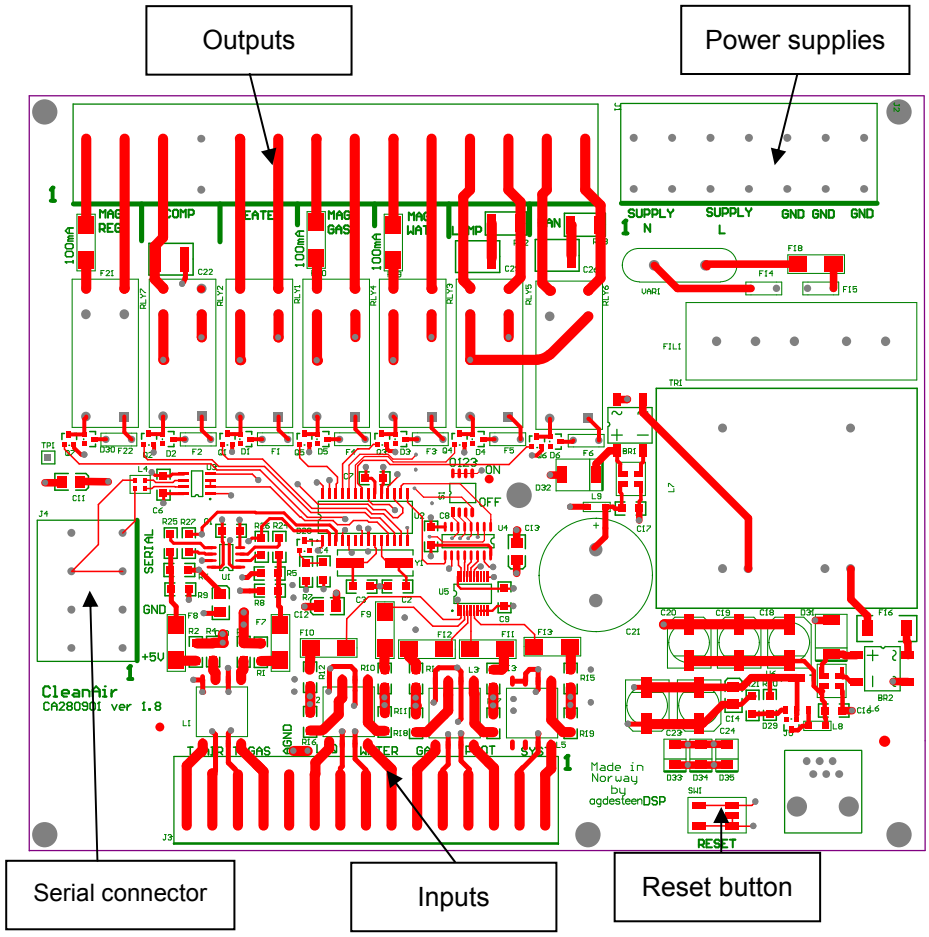
The CA-40/80 Safety panels must be in place and secured before power is connected to the installation. Once the power is turned on, no additional start-up sequence is to be performed.

The CA-40/80 will start automatically as soon as petrol filling is started. Whenever the last active filling nozzle is replaced into the dispenser, the unit will stop automatically.

5.3 Electronic control card

The CA-40/80 is fully electronically controlled. The electronic control card will handle all normal operation of the system and store data on recovered petrol.

Alarm function for operational failures is included in the card's software.



5.3.1 Hardware design considerations

The card has to comply with the following standards:

Standard	Part	Year	Name	Comment
EN 50081	1	1992	Electromagnetic compatibility – Generic emission standard	Residential, commercial and light industry
EN 61000	3-2	1995	Electromagnetic compatibility	Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)
EN 61000	3-3	1995	Electromagnetic compatibility	Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to 16 A
EN 61000	6-2	1999	Electromagnetic compatibility	Generic standards – Immunity for industrial environments

EX standards

Standard	Year	Name	Comment
EN 50014	1992	Electrical apparatus for potentially explosive atmospheres – General requirements	
EN 50019	1995	Electrical apparatus for potentially explosive atmospheres – Increased safety 'e'	
EN 50020	1995	Electrical apparatus for potentially explosive atmospheres- Intrinsic safety 'i'	

5.3.2 Checksum of internal counters

Each dataset is written into two different locations with checksum.

During start-up or reset, these two locations are checked with the following table:

Event	Location 1	Location 2	Comment
1	OK	Don't care	Location 1 copied to Location 2
2	Checksum Error	OK	Location 2 copied to Location 1
3	Checksum Error	Checksum Error	Both locations zeroed.

Event 2 may occur if power was interrupted during a write to eeprom.

Event 3 may occur if event 2 already has occurred and a power failure occurs during update of location2. The power glitch must be short enough to avoid triggering the Brown Reset function.

The board will output error messages during start-up if any checksum errors are detected.

5.3.3 Initialization of MCU

The following bits have been set in order to secure operation.

Bit	Name
Power up timer	Delays the start up sequence in order to secure stable power before operation
Brown out reset	Resets chip if supply voltage falls below a certain level
Start up timer	Ensure that oscillator is stable before operating
Watchdog	Always enabled

5.3.4 Maximum Error Lamp activity period

In order to limit the strain on the lamp output relay the lamp will cease reporting the error pattern after a period of 48 hours. After this period, the lamp will stay on continuously until the error is cleared and the unit is reset.

5.3.5 Card Operation

The operational behaviour is firmware dependent. First of all, if an error is detected all outputs are deactivated and error diode/lamp will blink in pattern listed under "error operation".

Important features:

- The compressor will start immediately when the system switch is engaged.
- The heater operates independently of the system switch.
- Water and petrol drain will not operate until the processor has run for a minimum of 20 seconds. This feature ensures a stable pressure.
- The intake liquid detect will operate until the condition has been preset for 60 seconds.
- The water and petrol drain system operates in cycles of 1 second.
- The water and petrol drain system has a timeout of 10 seconds, i.e. if the level switch is still activated an alarm is set.
- Remember that the water drain input is "normally closed".
- If an error occurs for more than 48 hours, the lamp will cease flashing and stay on until reset or error condition fixed.

Data stored on the card:

The following data is stored in the onboard eeprom:

- PCB runtime
- Compressor runtime
- Petrol drain counter
- Water drain counter

5.3.5.1 *Using a LCD for data readouts*

The card will transmit data on RS485 bus once every second. The data stream is formatted to suit our recommended LCD module, but may be displayed in a terminal program such as Hyperterminal (VT100 terminal mode).

The picture will not be formatted, but it is possible to read the values. The data is using the following format:

Baud Rate: 9600
Bits: 8
Stop bits: 1
Parity: None

Recommended LCD display is Seetron BPP-420L

Normally a standard RS232 port on a computer will detect the transmission. Connect the Rx pin of the serial port to terminals J4-3 and ground J4-2 on the board. If data errors are consistent then a computer should be used to log the data over time.

LCD Readout:

The following data is displayed:

W: Water count
R: Time since last petrol drain (seconds)
E: Errors
I: Inputs
F: Petrol count
T: Run Time Compressor (hours)
T: Air temp Petrol temp
O: Outputs

See on the table below the Errors, Inputs and Outputs codes meaning:

Code	Errors	Inputs	Outputs
1	Motor Protect (Not applicable)	System Start	Petrol Drain Relay
2	Liquid Detect	Motor Protect	Water Drain Relay
3	Petrol Drain	Petrol Drain	Compressor Relay
4	Water Drain	Water Drain	Fan Relay
5	Reduced Petrol Drain	Liquid Detect	Heater Relay
6	Condenser Temp	----------	Regulator Relay

5.3.5.2 *Error Operation*

When an error occur all other ongoing operations are halted, and the error lamp is activated

Operation	Error	Comments
Flash: 1s/1s	Liquid detected	Liquid detected in the intake
Flash: 3s/1s	Petrol_ Drain	Not able to drain the fuel storage
Flash: 6s/1s	Water_ Drain	Not able to drain the water storage
Flash: 6s/1s	Condenser_Temp	Condenser temperature too high.
Flash: 3s/3s	Reduced_ Petrol_ Drain	Not able to drain the fuel within a certain amount of time (3 hours)

5.4 Warning and Error Codes / Troubleshooting

The power must be turned OFF before any service covers are removed.

Otherwise, the unit will start automatically as soon as petrol filling starts. Operation without the covers properly mounted may cause serious injuries due to rotating parts inside the unit.

5.4.1 System does not start and failure lamp is not lit

Check that the main fuses F1 and F18 are OK.

Check that there is no nozzle malfunction: lift each gasoline nozzle to activate start signal.

If the system still does not work, please call a service technician.

5.4.2 System does not start and failure lamp is lit

Indication	Failure	Action
Flash 1s on / 1s off	Liquid detection activated: Level of Petrol in chamber detected max by float switch.	Check and drain the **F**ilter and **S**uction **A**ccumulator-pot by unscrewing it from FSA device. With pot dismantled, check that the compressor's suction filter is not blocked. Check that the automatic nozzle's valve for vapour return is not blocked. Check the coaxial hose to nozzle for no leaks. Check the float switch works properly.
Flash 3s on / 1s off	Petrol drain failure: Level of recycled petrol in Multi Function Tank-pot detected max by float switch, but not drained by petrol drain valve within 10 operation seconds	Check that an eventual valve in the return liquid pipe (between VRU and pump) is open. Check, that petrol outlet filter in Multi Function Tank-pot is not blocked. If blocked, renew filter (se procedure for opening Multi Function Tank-pot). Check petrol drain solenoid valve for power supply and function OK (Valve open when power supply). If no power supply, check that the float switch's upper ball moves freely and gives signal when switch activated (se procedure for opening Multi Function Tank-pot). If input signal from float switch is OK, check that electronic output power (220V) applies to petrol drain solenoid valve – OK.
Flash 6s on / 1s off	Water drain failure: Water level in Multi Function Tank-pot detected max by float switch, but not drained by water drain valve within 10 operation seconds	Check that water outlet pipe and hose are free from dirt or ice. Check water drain solenoid valve for power supply and function OK (Valve open during power supply). If no power supply, check that the float switch's lower ball moves freely and gives signal when switch activated (se procedure for opening Multi Function Tank-pot). If input signal from float switch OK, check that electronic output power (220V) applies to water drain solenoid valve OK.
Flash 6s on / 6s off	Condenser temperature high: Heat exchanger outlet temperature= petrol temperature>55°C	Check that the fan is running smoothly. Check that the heat exchanger air inlet is not blocked. Check that the temperature sensor works.
Flash 3s on / 3s off	Reduced petrol drain: Recycled petrol was not drained during 3 hours' VRU/compressor work time	Check piping for no leaks. Check that the automatic vapour return valves in the nozzles are not blocked. Check that compressor suction filter is not blocked. Check that the heat exchanger's air inlet is not blocked. Check that the fan motor runs smoothly. Remark: In low ambient temperature <1°C, the fan motor will not run Check petrol & water drain solenoid valves for no leaks. Check that the Flame arrestors aren't blocked Check compressor performance OK (suction capacity).

6. Maintenance

6.1 General

Maintenance requirements, CA-40/80

During the CA-40/80 designing was emphasized system operability and stability in order to secure a minimum need for maintenance. The goal was to achieve a maintenance rate as described below.

CA-40/80 consists of a number of mechanical parts. These parts will gradually be affected by wear and tear. The degree of wear will vary by the amount of time each unit has been operating. CA-40/80 have emphasised a service frequency that should prevent operating malfunctions.

WARNING

The equipment must be installed, used and serviced as specified in this manual and in the installation manual ONLY.

The equipment must not be modified or used for other purposes than specified without prior permission by the manufacturer and/or the Certifying Body.

No spare parts may be exchanged but those mentioned in the Maintenance section of this manual. Any other parts must be exchanged by the manufacturer or their designated service partner/s ONLY.

Any ATEX-certified parts may only be exchanged against similar equipment, and by the manufacturer or their designee/s ONLY.

This applies in particular to:

No.	Part description	Code	Certificate
1	Motor V80 0.75Kw 230/400V 50 Hz Trif. - Rael	MP M011432	-
2	Compressor VX 100 HS Thomas	MP M014178	Nemko – tillegg 1
3	Flame arrestor L-7214 - Ø in 302 / ¼" NPT (pressure side)	MP M014187	-
4	Flame arrestor L-7391 Ø in 433 / 3/8" NPT (suction side)	MP M014188	-
5	Damper 30x20xM8	MP M01519	-
6	V-Belt A28-12 PIX	MP M013228	-
7	Fan Motor RL63A 0,12Kw 1500 RPM 33	MP M014259	-
8	Heat exchanger	MP M014228	Roen EST
9	Solenoid valve type 6013 (Id.Nr. 162718B) with Base Plate (integrated to MFT)	MP M013954	PTB no. 00 ATEX 2129 X
10	Electronic Board CA280901	MP M014195	
11	Level Sensor C HFNI-020214	MP M013983	
12	Level Sensor Z HFNI-011212	MP M013967	
13	Filter DAHL – 66 W	MP M013965	
14	Temperature sensor ST-R24S	MP M014193	
15	Relay Finder 66.82.8.230.000	MP M013792	
16	Relay Finder 40-52 VAC	MP M013793	
17	Blue Neon Lamp 230 Vac	MP M014333	
18	Lock	MP M011548	
19	Catch Lock	PA P04579	

6.2 Maintenance instructions

Service

The CA-40/80 normal maintenance does not lead to any interruption of petrol tanking. In case of interrupted operation, petrol sales need not be interrupted, as the tanking can proceed without vapour recovery unless otherwise stated in national law or regulations.

The normal brief service of the CA-40/80 usually takes place twice a year, and a main service every 24 months. This may vary due to large volumes of petrol sales and local conditions. Service will be carried out by *authorized personnel only*, every 6 months.

The brief service includes a visual function control, leakage control, cleaning of condenser's fins (rear side of it), cleaning of suction filter and control of the electronic alarm functions.

Main Service includes the brief service in addition to compressor control and component test. Components exchange frequency depends on wear condition.

6.2.1 Routine inspections

The operator must carry out a daily visual inspection of the unit in accordance with the operating instructions.

6.2.2 Periodic maintenance

Authorized personnel should carry out all types of maintenance, except cleaning/exchanging the air inlet filter.

WARNING

The equipment must be installed, used and serviced as specified in this manual and in the installation manual only.
The equipment must not be modified or used for other purposes than specified without prior permission by the manufacturer and/or the Certifying Body.
No spare parts may be exchanged but those mentioned in the Maintenance section of this manual.
The power must be turned OFF before the service covers are removed. Otherwise, the unit will start automatically as soon as petrol filling starts. Operation without the covers properly mounted may cause serious injuries due to rotating parts inside the unit.

Cleaning

The condenser's fins on the rear side of the unit must be cleaned (brushed) regularly. The cleaning intervals will vary, but every 6 months should be sufficient for most operating conditions. This routine may be performed with the unit running, and by unauthorized personnel.

The suction filter inside the Suction Accumulator-pot (before the compressor) should be cleaned every 6 month by means of compressed air, or soaked in a suitable detergent. This filter is accessible through a service door at the front of the unit, by unscrewing the Suction Accumulator-pot from the device.

The filter gauze is made of stainless steel mesh, and may be re-used after cleaning.

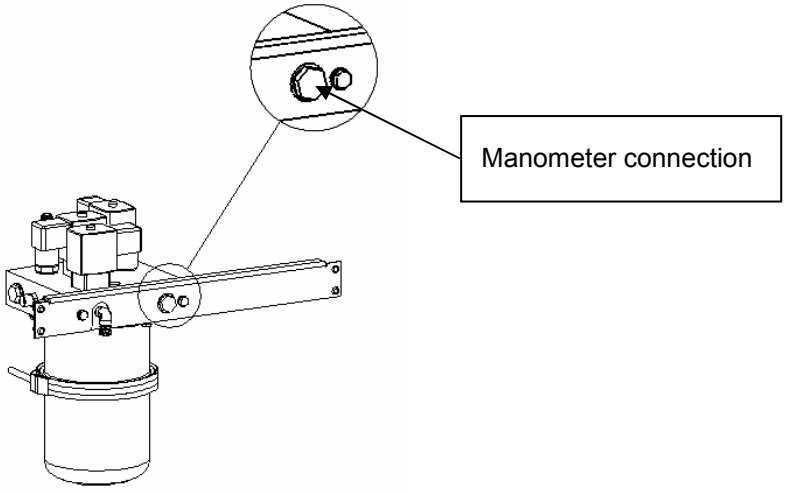
Adjustment

Adjustment of the operating pressure will normally not be necessary unless unauthorized personnel have misaligned the pressure regulator(s) no. 1, 2. The adjustment should only be executed by authorized personnel.

Each 6 months the system pressure should be check connecting a manometer to the MFT and verify if the pressure is between the following values:

4,4 bar < P < 4,6 bar

The manometer should be connected where it shows on the picture below:



Replacements

The suction filter will only be exchanged if necessary.

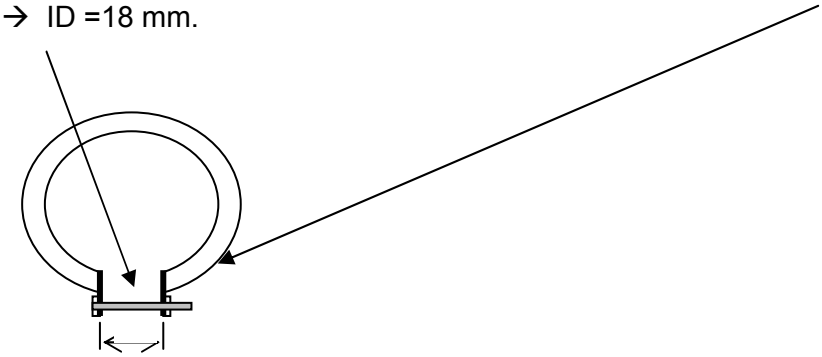
The petrol filter, in the Pressure and Capacity Control-pot, must be exchanged every 6– 12 months.

The petrol filter is located inside the MFT-pot. The bottom part to the MFT-pot must be removed to access the filter.

Procedure for opening the Multi Function Tank pot and removing the basic part

- Access by service doors on the front and left hand side of the unit.
- Before opening the Multi Function Tank pot, the pressure in the Multi Function Tank must be released by unscrewing the blind plug on the top of the MFT block.
- When all the excess pressure has bled off, carefully loosen the tension ring and remove it.
- Carefully remove the lower part of the Multi Function Tank pot that contains the recovered petrol (app. 1 litre).

- Check that the gasket (O-ring between lower and upper MFT-pot) is in good order and properly in place before re-tightening the tension ring → ID =18 mm.



Calibration

Control and, if necessary, calibration of vapour suction volume from the filling nozzle will be performed every 12 months.

6.3 Corrections and minor repairs

WARNING

The equipment must be installed, used and serviced as specified in this manual and in the installation manual only.

The equipment must not be modified or used for other purposes than specified without prior permission by the manufacturer and/or the Certifying Body.

No spare parts may be exchanged but those mentioned in the Maintenance section of this manual.

The power must be turned OFF before the service covers are removed. Otherwise, the unit will start automatically as soon as petrol filling starts. Operation without the covers properly mounted may cause serious injuries due to rotating parts inside the unit.

Repairs that can be performed locally:

1. The solenoid valves for petrol drain and water drain may be exchanged or cleaned. The solenoid valves coil may also be replaced.

   To replace the coil, switch off the power supply to the unit. Disconnect the cable for the coil from the terminals in the electronic card.

   After loosening the nut on top of the coil, the coil may be pulled straight loose.

   Replace the coil and reassemble in reverse order.

   If the solenoid valve is to be exchanged or cleaned, before the valve is opened, the system pressure must be released by cautiously opening the blind plug on top of the Multi Function Tank-block. Remove the coil and disassemble the valve by loosening the 2 fixing screws. In case the complete valve housing is to be replaced, make sure that the valve is assembled correctly.

2. The fan motor can be exchanged. In addition to electrical disconnection, the motor needs to be disassembled from the brackets. After removing the electromotor from the unit, the fan blade is still fastened to the motor.

   The fan blade may be refit to a new motor before installation in the unit.

3. Electrical components like relay, etc may be replaced by competent personnel (electricians).
4. Before exchange of piping /pipe fittings, the system pressure must be released by cautiously opening the blind plug on top of the Multi Function Tank-block.

   After exchange of piping or components in the pressurized system, we advise a pressure test up to 0,25 MPa (2,5 bar) and leak detection by means of soapy water. To perform the pressure test, use the unit's suction line coupling and test with compressed air or nitrogen.

Repairs that must be performed in a workshop:

Before starting the repairs, the system pressure must be released by cautiously opening the blind plug on top of the Multi Function Tank-block.

1. To overhaul the compressor according to the factory procedure, the compressor must be dismantled from the unit. First, the compressor's pressure connection and suction line connection are to be disconnected. Thereafter, all fixing bolts between the compressor and the bottom plate must be unscrewed.

   Then disconnect the electrical cable for the motor and slide the compressor to the left and out of the unit.

   NOTE! Do not use any oil in the compressor's ball bearings or any other moving parts.
2. The heat exchanger may be replaced by loosening the tube couplings (in/out), and the fixing screws to the rear side of the unit's body.

   Replacement heat exchangers are equipped with screw connections for the tubes.
3. To exchange the Multi Function Tank-block disconnect solenoid valves and pipe connections and if any heating cable is mounted on the pot, this must be removed before loosening the tank completely. Before installation, please make sure that the new MFT's pressure regulators are preset to correct values.

6.4 Verification of the recovering rate instructions

Below is described the procedure to verify and adjust the recovering rate of the CA-40/80 system.

Note: *this verification is only applicable to configuration with mechanical proportional valves*

6.4.1 Material requested

- Vessel – 20 L
- BURKERT volumetric meter (complete – 2 hoses)
- ELAFLEX EW-T key (to do the nozzle DRY-TEST)
- ELAFLEX EW-SK3 key (to adjust the nozzle regulation screw)
- Chronometer

6.4.2 Test procedure

1- Attach the nozzle to the BURKERT volumetric meter adapter. Is very important that the connection to the meter is well done, once if there is any leakage on the circuit the measuring result will not be correct.

2- Fill the vessel with more or less 2 litres of fuel that is used.

3- Shake the vessel during at least 2 minutes, to create a saturated fuel vapour atmosphere (the 2 min. were estimated for a temperature of 15ºC, if the ambient temperature is lower, it should be increased the shaking time). This procedure is crucial to a correct test, once the CA-40/80 system only adjust the suction flow rate when the system is sucking fuel vapour. If inside the vessel there isn't enough fuel vapour, the system will recover mainly air, and the proportional regulation system will not increase the suction flow rate, which will lead to a test with a recovering rate below the desired value.

4- Make a reset on the meter console and select the absolute volume measuring mode (in litres) (see manual).

5- Fill the vessel with 15 litres of fuel (don't use pre-setting and keep the nozzle always completly open). Mark down the value of delivered fuel (value marked on the calculator display), and the volume value of the recovered vapour (meter console). The recovering vapour rate should be between 95 and 105%.

***Note**: Due the VR system characteristics, the recovering rate only achieve the required values if inside the vessel and the pump piping system is saturated with fuel vapour. If the pump is without working for some time, or if it was made a Dry test in one of the nozzles, is possible that the VR piping system is full of air. Due this fact, is possible that the value obtained on the first test is below 95% even if the vessel is saturated with fuel vapour, because initially the system has to drain the air inside the pipes, and the proportional adjustment will only work after the fuel vapour reach the MFT. Therefore, if on the first test the recovering rate is slightly below 95%, the test should be repeated to verify if the first result was due the air inside of the pipes. If after the second test, the values still out of the required values, the system should be adjusted.*

6.4.3 RV system Adjustment

Important: Before start any adjustment; assure that the nozzle to the BURKERT volumetric meter is well done, once if there is any leakage on the circuit the measuring result will not correct.

6.4.3.1 *Nozzle valve adjustment*

If difference to the required value is below 5%, is possible to make a small adjustment of recovering rate on the nozzle proportional valve.

Using the ELAFLEX EW-SK3 key, is possible adjust the regulation screw, that changes the suction value recovering value.

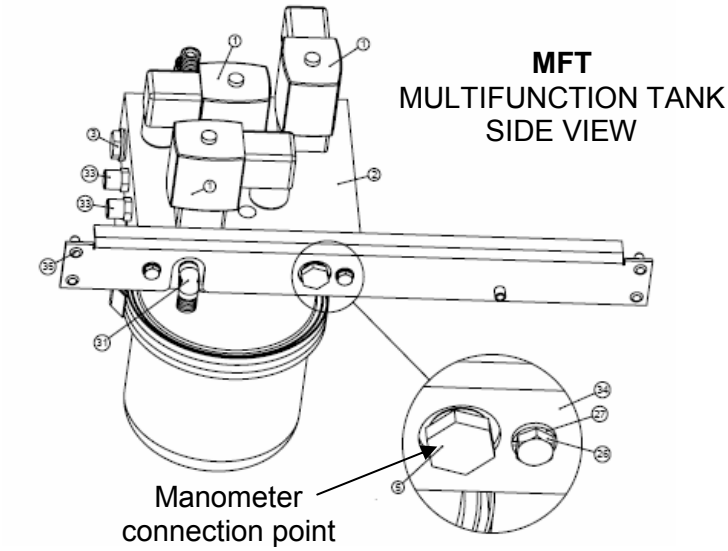
6.5 CA-40/80 suction adjustment

***Note:** this procedure is applied to all types of configuration*

If the adjustment described on the point above isn't sufficient, is necessary readjust the suction value of VR system. First place nozzle valve on the position "T" (make a bypass to the proportional valve), using the ELAFLEX EW-T key. Next put the meter console on the instantaneous flow rate measuring menu and verify what is the flow rate sucked by the system (wait until the suction value stabilize). On normal conditions, the suction value should be between 31 and 33 l/min.

If the obtained value isn't between the values, check the pressures of the VR system. For that remove, the plugs on the MFT side face and assemble a manometer with a 0 to 6 bar scale.

Attention: the MFT is under pressure; therefore remove slowly the MFT plug to release the pressure.



MFT
MULTIFUNCTION TANK
SIDE VIEW

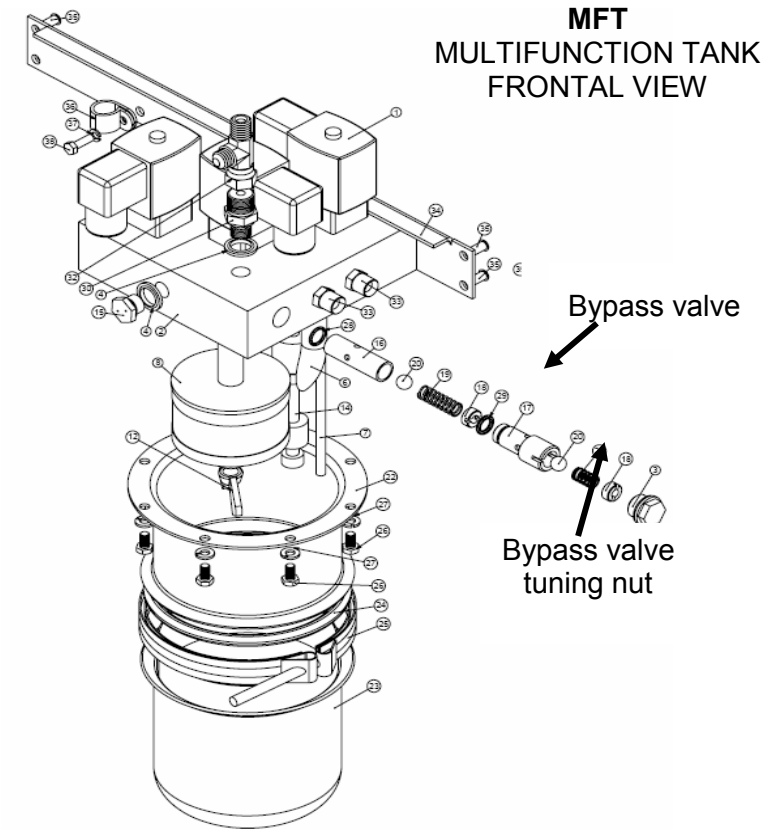
Put the system working (always with the nozzle valve on the position "T") and wait until the MFT pressure stabilize. Verify if the pressure is between 4,0 and 4,8 bar. With values of the suction flow rate and the pressure of the MFT is now possible to do a diagnostic of the system.

A – <u>Suction flow rate < 31 l/min & MFT Pressure < 4,8 bar</u>

Before proceed with the bypass valve adjustment, first check if the filter on the entry is cleaned. A dirty filter will lead to a huge reduction of the suction capacity, therefore is indispensable a periodical cleaning.

Other possibility is the obstruction of the flame arrester placed on the suction line before the entry filter, which divides the two suction lines coming from each side of the pump. A quick way to verify the flame arrester, is measuring the suction flow rate on both nozzles for the same product, one on each side of the pump. If the suction flow rate of both nozzles is considerable different, is because one of the flame arresters is obstructed, because only one suction line goes by the same flame arrester.

If none of these two possibilities is verified, then, is probably due a bad adjustment of the bypass valve. To readjust the bypass valve remove the plug on the MFT front side and with a screwdriver turn the tuning nut about ¼ of turn on the clockwise direction, to close the valve and increase nozzle suction (the measuring of the new suction value has to be done with the plug assembled). Closing the valve will also increase the MFT pressure, which can't be higher than 4,8 bar.



B – <u>Suction flow rate < 31 l/min & MFT Pressure > 4,8 bar</u>

If the bypass valve adjustment is unable to increase the suction flow rate is because there is a leak on the suction pipes or the compressor is loosing efficiency.

Retighten all the pipes fittings, from the nozzle to compressor inlet. From the MFT until filter entry can be linked a compressed air line to one of the filter entries and check if there is any leak using a soapy solution.

To verify if the problem is on the compressor, disconnect the hose that links the entry filter to the compressor and links the flow rate meter to the compressor entry. If the compressor is working properly then the suction value should be higher than 75 l/min for a pressure of 4,2 bar on the MFT.

C – <u>Suction flow rate > 33 l/min & MFT Pressure < 4,8 bar</u>

On this case, release the MFT bypass valve. For that remove the plug from the MFT frontal side and with a screwdriver turn the tuning nut ¼ of turn on the counter clockwise direction, to open the valve and decrease the nozzle suction flow rate (the measuring of the new suction value has to be done with the plug assembled). Opening the valve also decrease the MFT pressure, which shouldn't be lower than 4,2 bar.

If for some reason, opening the bypass valve doesn't decrease the nozzle flow rate suction is because there is a leakage on the pipes from the compressor until the MFT. For that remove, the plugs on the MFT side face and assemble a manometer with a 0 to 6 bar scale. Put the system working (always with the nozzle valve on the position "T") and wait until the MFT pressure stabilize. Stop the system and check if the pressure at the manometer is stable during

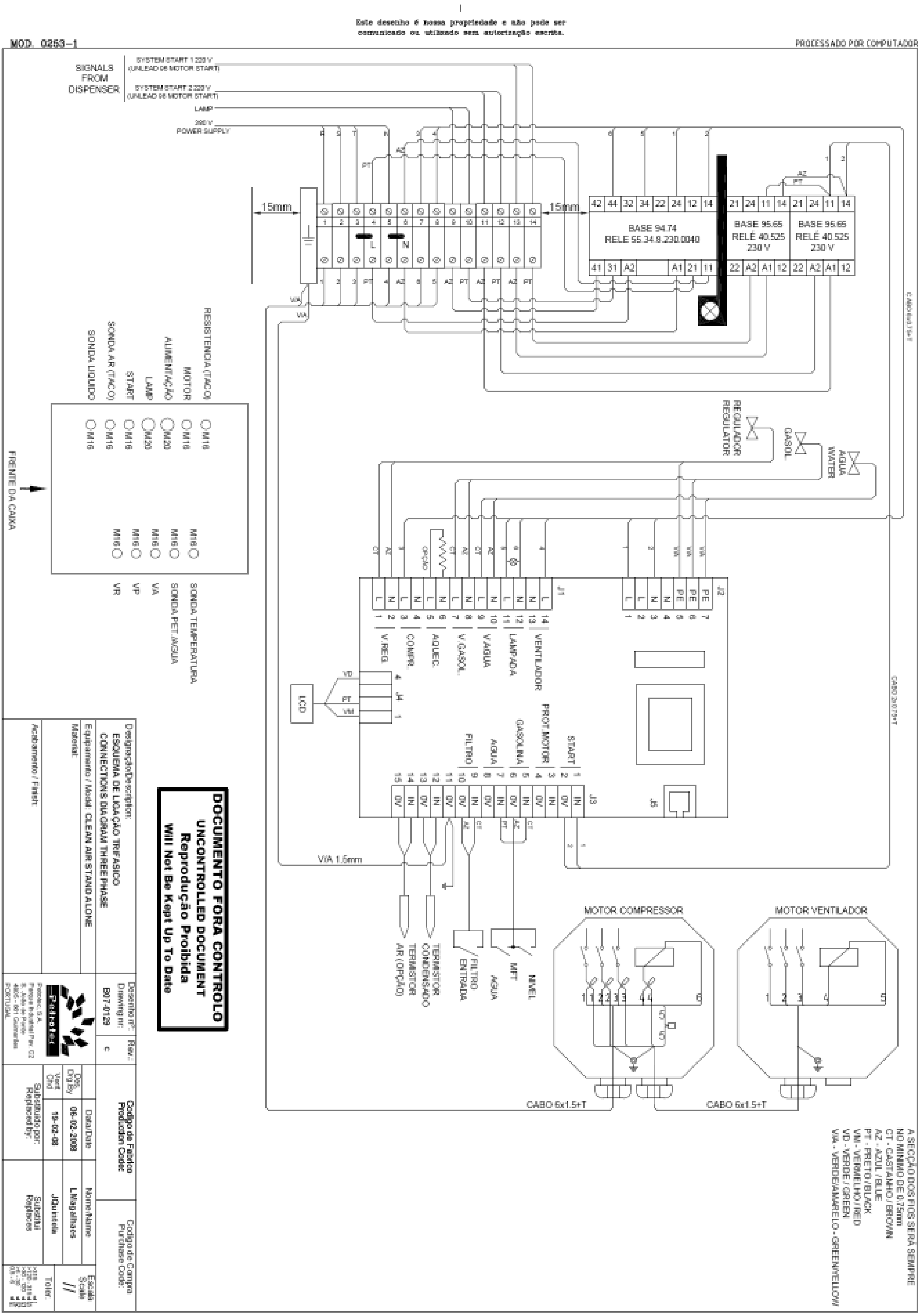
one minute. If is observed a gradual decrease on the pressure that means there is a leakage, which can be located between the anti return valve (placed immediately after the compressor) and the MFT. To detect the leakage put a soapy solution in all fittings and search the leakage point.

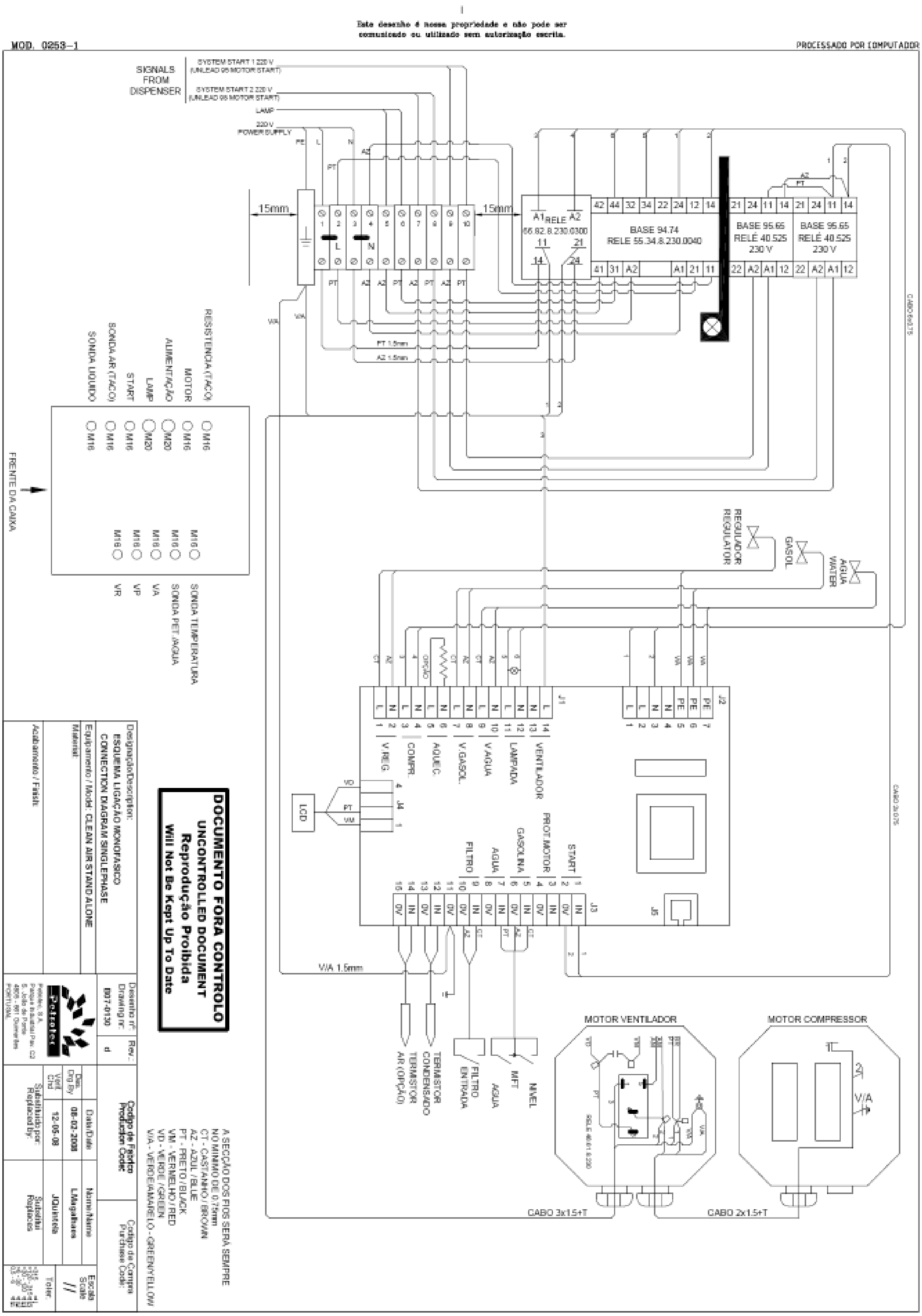
D – <u>Suction capacity OK and pressure stabile but low recovery rate</u>

If suction capacity is found to be good, and operation pressure stabile during stop period, but recovery rate is low (petrol drain counting shows low numbers compared with others), there may be a leak in the solenoid valve for petrol drain, located on the top of the MFT. Specially, after initial start up this may happen. The reason is small particles of dirt residues. Any minor leak in this solenoid valve will not drop the recovery amount of petrol, but the counting / drains will drop. To disconnect a solenoid valve is simple. Remove the coil to got access to the screws for the valve body. Only the tower and top plate have to be removed to clean the valve inside. The valve body may still stay in position. Do not turn the valve body in another position, and check that the two O-rings are in good order and position if the body is removed.

7. Annex

- **Connection electrical scheme – Thee-Phase**
- **Connection electrical scheme – Single-Phase**


Este desenho é nosso propriedade e não pode ser comunicado ou utilizado sem autorização escrita.
MOD. 0253-1
PROCESSADO POR COMPUTADOR
SIGNALS FROM DISPENSER
SYSTEM START 1 220 V (UNLEAD 95 MOTOR START)
SYSTEM START 2 220 V (UNLEAD 98 MOTOR START)
LAMP
380 V POWER SUPPLY
15mm
15mm
BASE 94.74
RELE 55.34.8.230.0040
BASE 95.65
RELÉ 40.525
230 V
BASE 95.65
RELÉ 40.525
230 V
RESISTENCIA (TACO)
MOTOR
ALIMENTAÇÃO
LAMP
START
SONDA AR (TACO)
SONDA LIQUIDO
FRENTE DA CAIXA
SONDA TEMPERATURA
SONDA PET./AGUA
REGULADOR
REGULATOR
GASOL
AGUA
WATER
V.REG.
COMPR.
AQUEC.
V.GASOL.
V.AGUA
LAMPADA
VENTILADOR
LCD
START
PROT.MOTOR
GASOLINA
AGUA
FILTRO
V/A 1.5mm
TERMISTOR AR (OPÇÃO)
TERMISTOR CONDENSADOR
FILTRO ENTRADA
AGUA
MFT
NIVEL
MOTOR COMPRESSOR
MOTOR VENTILADOR
CABO 6x1.5+T
CABO 6x1.5+T
A SECÇÃO DOS FIOS SERÁ SEMPRE NO MINIMO DE 0.75mm
CT - CASTANHO / BROWN
AZ - AZUL / BLUE
PT - PRETO / BLACK
VM - VERMELHO / RED
VD - VERDE / GREEN
V/A - VERDE/AMARELO - GREEN/YELLOW
DOCUMENTO FORA CONTROLO
UNCONTROLLED DOCUMENT
Reprodução Proibida
Will Not Be Kept Up To Date
Designação/Description:
ESQUEMA DE LIGAÇÃO TRIFASICO
CONNECTIONS DIAGRAM THREE PHASE
Equipamento / Model: CLEAN AIR STAND ALONE
Material:
Acabamento / Finish:
Desenho nº: Drawing nr:
B07-0129
Código de Fabrico Production Code:
Código de Compra Purchase Code:
Data/Date
Nome/Name
06-02-2008
L.Magalhaes
19-02-08
J.Quintela
Substituido por: Replaced by:
Substitui: Replaces:
Escala Scale
Toler.


Este desenho é nossa propriedade e não pode ser comunicado ou utilizado sem autorização escrita.
MOD. 0253-1
PROCESSADO POR COMPUTADOR
SIGNALS FROM DISPENSER
MOTOR VENTILADOR
MOTOR COMPRESSOR
CABO 3x1.5+T
CABO 2x1.5+T
DOCUMENTO FORA CONTROLO
UNCONTROLLED DOCUMENT
Reprodução Proibida
Will Not Be Kept Up To Date