



ID-220 SERIES MODEL

PS-220 Analog Leakwise Controller

Connected to
Any ID-220 Sensor

USER GUIDE

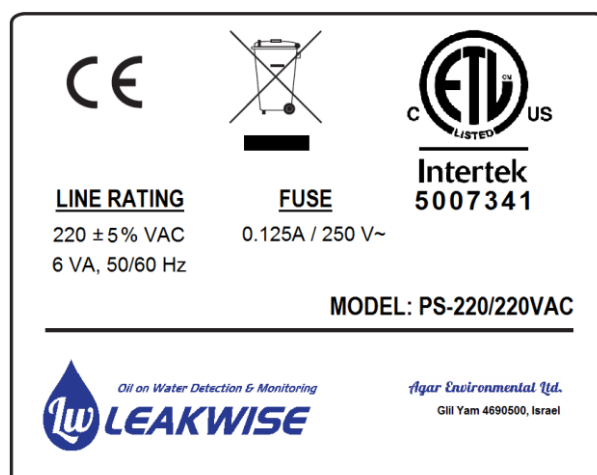
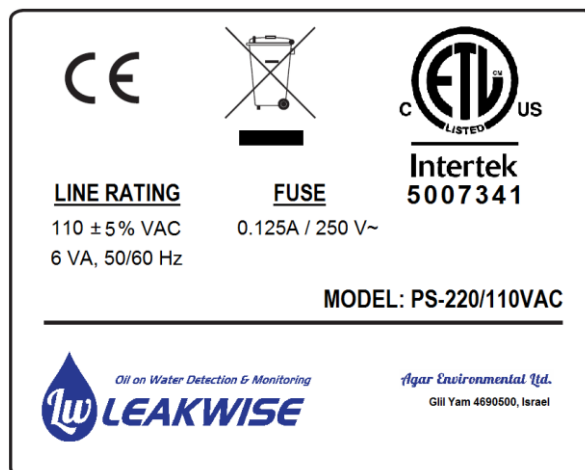
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Agar Environmental Ltd.

Important notes for using a Leakwise system

- Refer to the relevant Sensor User Guide for specific information about sensor certification, installation and operation.
- Consider the following during operation:
 1. Beware of high voltage 110 or 220 $\pm 5\%$ VAC inside the enclosure of the controller unit! Only qualified personnel may service the System.
 2. For a Signal Processor in a NEMA 7 or Exd enclosure installed in a Hazardous Area: The enclosure may be opened for service only when the surrounding atmosphere is known to be non-explosive! Consult your local Safety Officer!
 3. For a Signal Processor in a NEMA 4 (IP65) enclosure: Close the cover properly to attain the weatherproof properties of the enclosure.
 4. Ambient operating temperature: -40 to $+80^{\circ}\text{C}$ (-40 to $+176^{\circ}\text{F}$)
 5. Maximum relative humidity inside enclosure: 95%, non-condensing.
 6. Maximum altitude: 2000 m.



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Warnings

English

This is a Class A product. In a domestic environment, this product may cause electromagnetic interference in which case the user may be required to take adequate measures to correct the interference.

This is a measurement CAT I device. Do not use in CAT II, CAT III or CAT IV measurement circuits.

An external switch or circuit breaker (5 Amp) must be installed on the power input line of the instrument. This switch must disconnect both poles of the supply voltage. It should be rated, labeled and located appropriately.

INSTALLATION IN HAZARDOUS AREAS:

Do not open the controller enclosure when an explosive gas atmosphere may be present!

Keep enclosure cover tight while circuits are alive.

Seals are required within 3 inches of enclosure threaded holes.

Comply with local norms and regulations during installation and operation.

The power input, sensor input and system output connections should be installed by a qualified electrician.

PS-220 controller:

For personnel safety and to avoid damage to the instrument:

Disconnect AC/DC supply power before fuse replacement, Main board removal and before connecting / disconnecting any wires!

Leakwise sensors are floating devices.

The installation must allow their free floatation and avoid submergence.

Leakwise sensors are delicate instruments. Handle with care!

Do not drop.

Avoid damages to the cable/s during installation and operation, as this will void the IP67 sealing.

Installation: Follow mechanical and wiring instructions as detailed in the User Guide.

Do not use the system beyond its specifications.

If installed or used in a manner not specified in this User Guide, the protection provided by the instrument may be impaired.

The sensor is constructed of a plastic material that constitutes a potential electrostatic hazard. Do not rub! Clean only with a damp cloth.

Français

<p>Ceci est un produit de classe A. Dans un environnement domestique, ce produit peut provoquer des interférences électromagnétiques. Dans ce cas l'utilisateur peut être tenu de prendre des mesures adéquates pour corriger l'interférence.</p>
<p>Ceci est un dispositif de mesure CAT I. Ne pas utiliser dans CAT II, CAT III ou CAT IV circuits de mesure.</p>
<p>Un interrupteur externe ou disjoncteur (5 Amp) doivent être installés sur la ligne de l'instrument d'entrée de puissance. Cet interrupteur doit déconnecter les deux pôles de la tension d'alimentation. Il devrait être classé, étiqueté et situé de manière appropriée.</p>
<p>INSTALLATION DANS DES ZONES DANGEREUSES:</p> <p>Ne pas ouvrir le boîtier du contrôleur quand une atmosphère explosive de gaz peut être présente!</p> <p>Gardez le couvercle du boîtier étanche tandis que les circuits sont actifs.</p> <p>Des joints sont nécessaires dans les 3 pouces de l'enceinte des trous filetés.</p> <p>Se conformer aux normes et réglementations locales lors de l'installation et de l'exploitation.</p>
<p>Les entrées d'alimentation, entrée du détecteur et le système de sortie des connexions doivent être installés par un électricien qualifié.</p>
<p>Contrôleur PS-220:</p> <p>Pour la sécurité du personnel et pour éviter tout dommage à l'instrument:</p> <p>Déconnectez d'alimentation AC / DC avant le remplacement du fusible, avant de retirer la carte principale et avant de brancher/débrancher tous les fils!</p>
<p>Les détecteur Leakwise sont des dispositifs flottants.</p> <p>L'installation doit permettre leur flottation libre et éviter toute submersion.</p>
<p>Les détecteur Leakwise sont des instruments délicats a manipuler avec soin!</p> <p>Ne pas lacher!</p> <p>Tout dommage créé au câble/s lors de l'installation et de l'utilisation, annulerait automatiquement l'étanchéité IP67.</p>
<p>Installation: Suivre les instructions mécaniques et le câblage comme détaillé dans le Guide Utilisateur.</p> <p>Ne pas utiliser le système au-delà de ses spécifications.</p> <p>Si installé ou utilisé d'une manière non spécifiée dans ce Guide de l'utilisateur, la protection fournie par l'instrument peut être altérée.</p>
<p>Le détecteur est constitué d'un matériau plastique qui constitue un danger potentiel électrostatique. Ne pas frotter! Nettoyer uniquement avec un chiffon humide.</p>

1. System Description

LEAKWISE® system provides oil sheen detection and indication of oil layer thickness. A typical application is valve/pump control for an oil separator draining.

The system consists of two main parts:

- A. A single Sensor, model ID-221 / ID-223/ ID-225 / ID-227.
- B. PS-220 Analog Signal Processor / Controller for supporting a single sensor.

The Sensor Assembly consists of a Floating Sensor complete with electrical cable that connects to the PS-220.

The PS-220 signal processor is housed in a NEMA 4 (IP65) weather-proof or NEMA 7 or Exd Ex-proof enclosure, and powered by either 110 VAC or 220 VAC or 24 VDC or 12 VDC, at choice. The system may also be solar powered.

The Signal Processor converts supplied power into a stable 12 volts DC that feeds the Sensor. For ATEX approved applications, optional Zener Safety Barriers are used between Signal Processor and sensor. (Refer to Section 9 - Installation in Hazardous Area).

The antenna of Floating Sensor detects the signal difference between Air (no liquid), Oil, and Water. The Sensor transmits a raw current, proportional to this difference, to the Signal Processor.

The raw signal received from the sensor is amplified and filtered, and then used to activate status lights, relay outputs (dry contacts), and an optional 4-20mA current output. Adjusting the relays trip thresholds provides detection points of "WATER", "OIL", and "AIR / HIGH OIL".

The Floating Sensor floats on water surface in the well, sump or tank. Refer to the specific sensor User Guide for additional information and guidance.

The relay terminals, with a 4A (3A for Fail relay) maximum rating, are used to switch external devices. Normally opened and normally closed contacts are provided for maximum flexibility.

An optional 4-20mA output is used to produce a current equivalent to sensor signal, ranging from 4mA in WATER to 20mA in AIR. When an OIL layer on WATER is detected, the current increases above 4mA, and a thicker OIL layer produces an increase of this current toward 20mA. In maximal oil layer the output current will be about 18mA. This output can be routed through the contacts of the Fail relay, to cut the current to 0 mA during a failure.

To look through the PS-220 options, refer to Section 8 (Appendix A).

Local indicating lights on the front panel of the enclosure show current status of the Sensor in the well/sump/tank:

AIR / HIGH OIL (yellow light), **OIL** (red light), **WATER** (green light).

A red **FAIL** light is an additional indication on the front panel in case of a failure.

Another option is a Bar-Graph display, which visually indicates changes in oil layer thickness.

2. Installation and Wiring

Refer to the sensor User Guide for relevant drawings and instructions.
Refer to Sensor Test Certificate for wire colors of the cable.

Refer to the following wiring drawings:

/12 VDC or /24 VDC	- DWG W PSX 001 4
/110 VAC or /220 VAC	- DWG W PSX 003 4
Relay outputs wiring	- DWG S PSX 004 4

- 2.1 Open the cover of the well/sump/tank. Carefully pass sensor's cable via the conduit from the well/sump/tank to PS-220.

NOTE:

SENSOR CABLE CAN BE EXTENDED THROUGH AN IP65 JUNCTION BOX.
REFER TO DETAILS IN THE NEXT SECTION.

- 2.2 Pass a power cable through the conduit from PS-220 to the local power source.
- 2.3 Option: Pass the appropriate cable via the conduit between PS-220 and the central control room or remote controlled equipment.
- 2.4 Connect the Sensor to PS-220, as follows:

Wire color	TB6 point	TB6 function
Per test certificate	1	DET +12V
Per test certificate	2	DET GND
Per test certificate	3	DET SIGNAL

- 2.5 In case that a connection with control room or remote controlled devices is required (through relays and 4-20mA outputs), as well as hazardous area installation, refer to the wiring diagram.

If Safety barriers are supplied / added:

Wire Color	Safety Barrier Contact	Contact Function
Per test certificate	MTL 7715+ point 3	Sensor +12 VDC
Per test certificate	MTL 7715+ point 4	Sensor GROUND
Per test certificate	MTL 7710+ point 3	Sensor SIGNAL

Refer to the wiring diagram to see how to connect the Zener Safety Barriers to TB6.

Record the serial number of the sensor connected to PS-220.

- 2.6 Connect power to PS-220, as follows:

Power line	TB2 point	TB2 function
AC NULL, or –DC	1	N (or -)
AC PHASE, or +DC	2	L (or +)
EARTH GROUND	3	GND

NOTE:

Use wires of minimum 18AWG, specified to at least 110°C and 300V.

An external switch or circuit breaker (5 Amp) must be installed on the power input line of PS-220. This switch, located near PS-220, must disconnect both poles of the supply voltage. It should be rated appropriately and must be marked as the disconnecting device for PS-220.

BEWARE OF HIGH VOLTAGE 110 or 220VAC INSIDE ENCLOSURE!

- 2.7 Turn power on. *AIR / HIGH OIL* light on the PS-220 should be on. If *FAIL / DETECTOR DISCONNECTED* light is on, refer to Section 5.
- 2.8 Install the sensor properly in the sump. If there is water, *WATER* light on the PS-220 should be on.
- 2.9 Leave appropriate length of cable near the sump for ease of maintenance. Put the optional cover of well/sump/tank.

IMPORTANT!

DO NOT LEAVE TOO MUCH ROLLED SPARE CABLE NEAR THE SUMP OR NEAR PS-220 AS THIS MIGHT INTRODUCE SIGNAL INSTABILITY.

IMPORTANT!

KEEP SENSOR CABLE PROTECTED FROM MECHANICAL DAMAGES! A DAMAGED CABLE WILL VOID THE IP67 SEALING OF THE SENSOR.

IMPORTANT!

AFTER FINISHING PROCEDURES WITH OPEN ENCLOSURE, THOROUGHLY CLOSE COVER AND FASTEN SECURELY WITH SCREWS TO ATTAIN REQUIRED WATER / EXPLOSION PROTECTION!

3. Maximum Cable Length between Sensor and PS-220

The integral cable supplied with the sensor can be extended with another cable after a connection inside an IP65 junction box.

ID-221 and all ID-223 sensors:

1. For Gas Group IIC hazardous area (Hydrogen):
150 meters maximum if 20 AWG wires (or thicker wires) are used.
1100 meters maximum if 22 AWG wires are used.
2. For Gas Groups IIA or IIB hazardous area (Ethylene and Propane):
1800 meters maximum if 20 AWG wires (or thicker wires) are used.
1100 meters maximum if 22 AWG wires are used.
3. For non-hazardous area:
1800 meters maximum if 20 AWG wires (or thicker wires) are used.

ID-225 sensors:

1. For Gas Group IIC hazardous area (Hydrogen):
150 meters maximum if 20 AWG wires (or thicker wires) are used.
550 meters maximum if 22 AWG wires are used.
2. For Gas Groups IIA or IIB hazardous area (Ethylene and Propane):
1300 meters maximum if 18 AWG wires (or thicker wires) are used.
900 meters maximum if 20 AWG wires are used.
3. For non-hazardous area:
1300 meters maximum if 18 AWG wires (or thicker wires) are used.

ID-227 sensors:

1. For Gas Group IIC hazardous area (Hydrogen):
150 meters maximum if 20 AWG wires (or thicker wires) are used.
1000 meters maximum if 22 AWG wires are used.
2. For Gas Groups IIA or IIB hazardous area (Ethylene and Propane):
1600 meters maximum if 20 AWG wires (or thicker wires) are used.
1000 meters maximum if 22 AWG wires are used.
3. For non-hazardous area:
1800 meters maximum if 20 AWG wires (or thicker wires) are used.

The above maximum cable lengths refer to connecting the sensor to Safety Barriers. Safety Barriers are usually installed close to the signal processor in a safe area. A safe area may be an Explosion Proof enclosure installed in a hazardous area. The Safety Barriers may be installed in a longer distance from the signal processor, and the connecting cable between them and signal processor should have 16 AWG wires (or thicker).

If the installation is not in hazardous area (safety barriers are not used):

The cable should be a simple cable used for power purposes, for example 3 times 1 or 1.5 mm².

Do not use a communication cable with twisted wires or a coaxial type.

If the installation is in hazardous area (safety barriers are used):

Use a cable of 3 conductors (gauge as described above), non-twisted inside outer jacket (communication cables are not good).

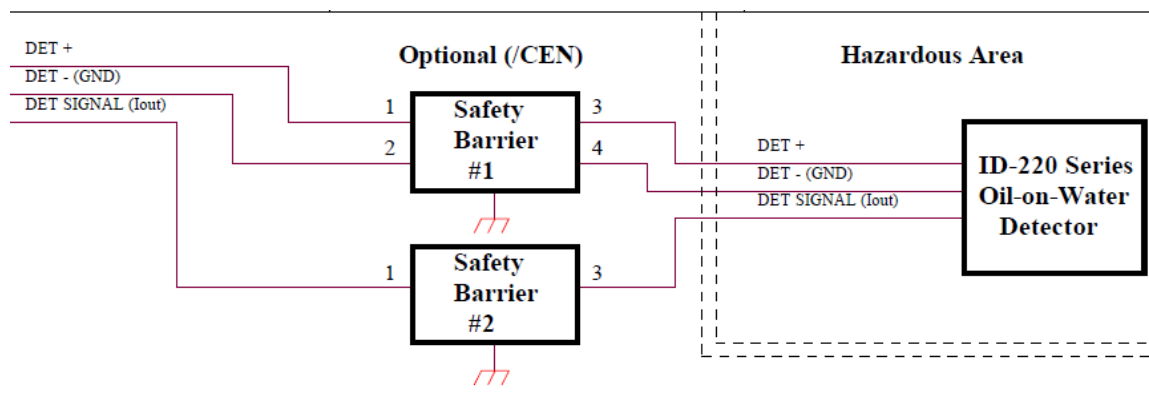
The jacket should withstand 500 V RMS.

The capacitance between each two wires should not exceed 200 pF/meter.

The inductance of each wire should not exceed 0.7 uH/meter.

Select such a cable from a catalog or test its capacitance and inductance.

A shielded cable is not required in most cases.

Zener Safety Barriers for installation in hazardous area:**Notes for Safety Barriers:**

1. Terminal numbers shown are for MTL Barriers.
2. Barriers should be earthed by a 4 sq. mm (minimum) wire .
3. Safety Barriers are installed in Safe Area.
4. Refer to drawing DWGV 220 001 2 for additional information.

Recommended Safety Barriers:

Vendor	Barrier #1	Barrier #2
MTL	715+	710+
MTL	7715+	7710+

Note: MTL 715+ and 710+ are obsolete. Use MTL 7715+ and 7710+.

4. Laboratory Calibration and Tests

Laboratory Calibration is a basic adjustment procedure to ensure correct operation of the system. Laboratory Calibration is carried out while the PS-220 enclosure is open, by adjusting the potentiometers inside.

This procedure should be performed either as the next step after installation, when fast field calibration cannot be performed, or when trouble is suspected in the system.

The system leaves the factory calibrated, but on-site adjustments may be required.

IMPORTANT!

**REFER TO THE SENSOR USER GUIDE FOR SPECIFIC NOTES
RELATED TO FLOATATION AND CALIBRATION**

**CALIBRATION SHOULD BE DONE EITHER ON SITE (AFTER
INSTALLATION) OR IN A SIMULATING TUBE / TANK USING
SITE WATER AND SITE OIL.**

IMPORTANT!

**AFTER FINISHING PROCEDURES WITH OPEN ENCLOSURE,
PROPERLY CLOSE COVER AND FASTEN SECURELY WITH SCREWS
TO ATTAIN REQUIRED WATER / EXPLOSION PROTECTION!**

Typical Signals of Leakwise Sensors

Each Leakwise sensor has a cable with three wires named: DET+, DET-, DET Sig.

DET+ : +12VDC supply in reference to DET-. Supplied current is the sum of the currents through the other two wires.

DET- : Power and signal ground. Returning current between 6 to 9mA, no matter if the sensor is in air or in water.

DET Sig. : Sensors' current output signal, value depends on sensor model and on liquid condition around the sensor, typically as follows:

Typical signal values are:

ID-221: In Air: 0.65 to 0.85 mA
In clean Water: 1.00 to 1.30 mA

ID-223 (all models): In Air: 0.90 to 1.10 mA if the sensor is 20 mm or more above bottom flange.

In Air: 0.65 mA when the sensor is resting on bottom flange.
In Oil layer of 30 mm or more: 0.97 to 1.10 mA
In clean Water: 1.60 to 1.90 mA

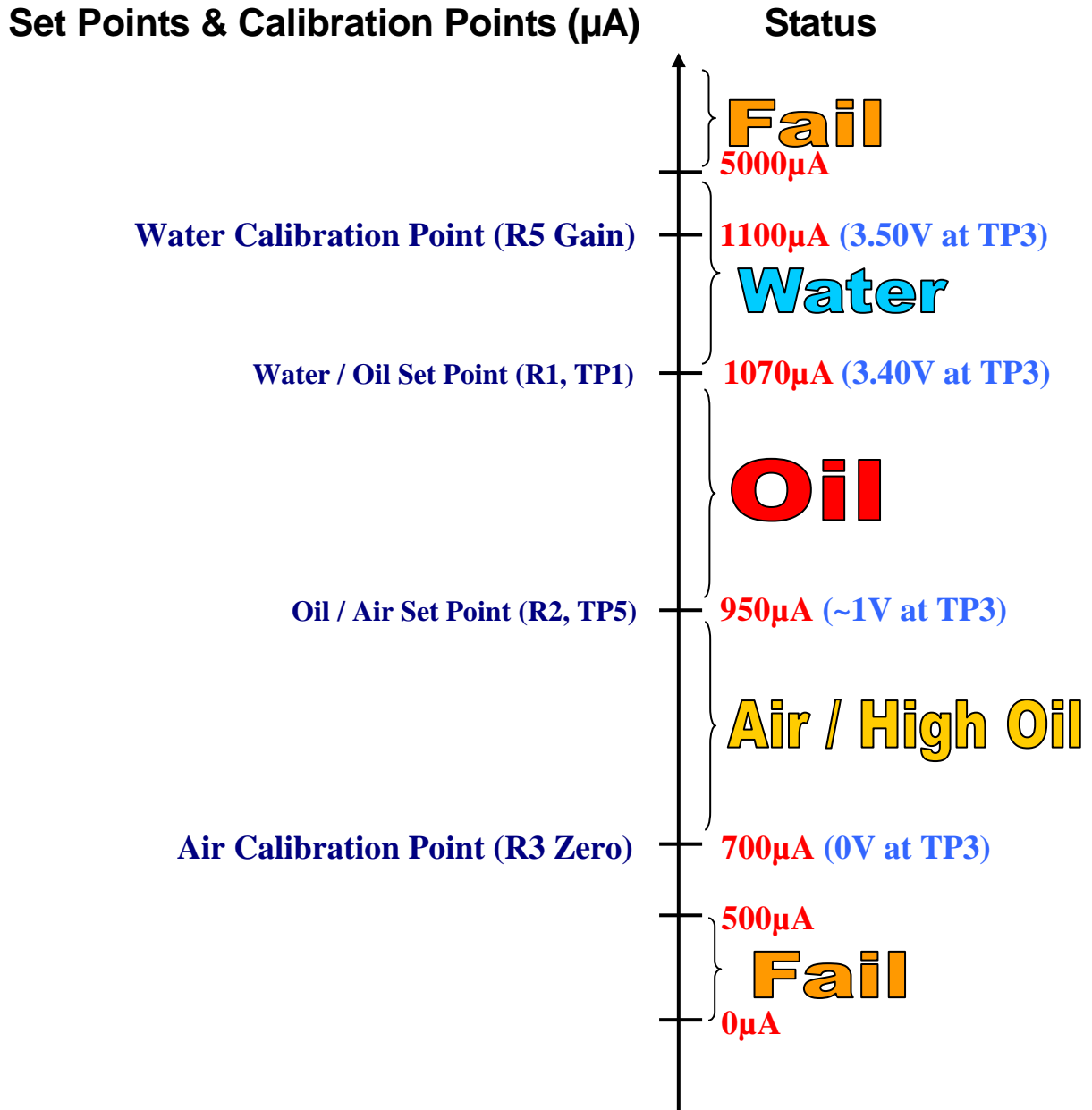
ID-225/100: In Air: 1.00 mA.
In Oil layer of 110 mm or more: 1.20 mA
In clean Water: 3.20 to 3.40 mA

ID-225/200: In Air: 1.10 mA.
In Oil layer of 230 mm or more: 1.44 mA
In clean Water: 4.30 to 4.50 mA

ID-227: In Air: 0.80 to 1.00 mA.
In clean Water: 1.35 to 1.80 mA

The signal gets lower below Water signal as oil layer increases.

The following diagram reflects the relation between sensor output signal, calibration points, set-points, and the status shown by the front panel lights. The signal values shown are typical values for ID-221.



Notes:

1. Set Point values are shown in µA (sensor raw signal) and also as volts between TP3 and TP2. All voltages are in reference to TP2 (ground).
2. Signal decrease means a thicker oil layer.
3. Oil detection sensitivity is determined by the distance between Water Calibration Point and Water / Oil Set Point. A larger distance means detection of a thicker oil layer (less sensitivity).
4. Oil / Air Set Point can be set as an Air indication threshold or as a Second Oil Alarm threshold. For Air indication set TP5 to 0.5V.

4.1 Laboratory Calibration Procedure

Calibration is carried out on the main board of PS-220 inside the open enclosure.

All voltages measured in PS-220 board are DC.

The negative probe of voltmeter is connected to TP2 (GND).

NOTE: *TP3 and TP4 measure the same signal, but TP4 is located after an additional buffer. It is better to measure at TP4.*

4.1.1 Sensor in the Air

Measure and set the voltage at **TP3** to $0.01 \div 0.03V$ using potentiometer **R3**.

Approach this value from the direction of a higher voltage only. Stop tuning immediately when the goal is achieved.

4.1.2 Sensor in Test Water (no Oil)

- If water is normally contaminated with a layer of oil, dip the sensor in oil. Take the sensor assembly out of oil, and let oil trickle down for 15-20 sec.
- Put the sensor in water (without cleaning), and let it float freely. Secure cable at the top of the vessel.
- Wait a few seconds, then measure and set the voltage at **TP3** to 3.50V using **R5**.
(For some demo units only: R5 is the calibration screw next to WATER light on the front panel).
- Measure the voltage at **TP1** and set it to 3.40V using potentiometer **R1**.

The difference between the voltages at TP3 and TP1 determines the minimum oil thickness detected. A difference of 0.1V (3.50 – 3.40) is the most recommended sensitive setting.

4.1.3 Oil Layer Detection

- Add a 2mm layer of the oil to be detected to the water.
OIL light should turn on.
If OIL light is on, turn **R1** counter-clockwise till WATER light turns on, then clockwise till OIL just turns on.
Otherwise, if OIL light off, turn **R1** clockwise until it turns on.
- If a layer other than 2mm should be detected, add the required oil layer.
Turn potentiometer **R1** clockwise (for layer less than 2mm) or counter-clockwise (for layer more than 2mm) till the point where OIL light just turns on and WATER light turns off.

4.1.4 Sensor in Oil (no Water)

This step provides *OIL* indication when the sensor is in a very thick layer of oil. If Second Alarm setting is desired (i.e. *AIR / HIGH OIL* indication when oil level is more than a certain value), skip directly to *Paragraph 3.1.5*.

- Verify that the sump or tube/tank is empty.
- Add oil until the Sensor floats properly.
OIL light should turn on.

If *OIL* light stays off, turn **R2** counter-clockwise until *OIL* light turns on.
(For some demo units only: R2 is the calibration screw next to *AIR / HIGH OIL* light on the front panel).

4.1.5 Second Alarm Point Change

This step provides *AIR / HIGH OIL* indication when oil layer is thicker than the predetermined value. If Second Alarm is not required, skip this paragraph.

- When the Sensor is floating on water, slowly add oil until the desired layer thickness for second alarm is reached.
- If *OIL* light is on, turn **R2** clockwise until *OIL* light turns off and *AIR / HIGH OIL* turns on.
Otherwise, if *OIL* light is off, turn **R2** counter-clockwise until *OIL* turns on and then clockwise just until *AIR / HIGH OIL* turns on.
(For some demo units only: R2 is the calibration screw next to *AIR / HIGH OIL* light on the front panel).

4.1.6 System Check

- Sensor in the air: *AIR / HIGH OIL* light on.
- Sensor in water: *WATER* light on.
- Sensor in water with an oil layer of 2mm (or a different thickness to which the Sensor was calibrated): *OIL* light on

4.2 Calibration Procedure for *OPTIONAL* 4-20mA OUTPUT and BAR-GRAPH

This procedure should be implemented *after* calibration of PS-220 main board.

All adjustments are performed on the accessory board with open enclosure. The accessory board is mounted on the backside of the front panel.

WHEN VOLTAGE IS MEASURED, THE NEGATIVE PROBE OF VOLTMETER IS CONNECTED TO TP10 (GND).

4.2.1 Sensor in the Air

- Measure voltage at **TP9**.
Using potentiometer **R4** set this voltage to a value between 3.47 and 3.50 V.
- Turn potentiometer **R9** two turns clockwise.
- Measure DC current between points 1 and 2 of TB4. Using potentiometer **R15** set the current to be 20.0-0.1 mA.
- Slowly turn potentiometer **R9** counter-clockwise until the current begins to decrease, and then set it back to 20.0-0.1 mA.

4.2.2 Sensor in Water (no oil)

Using potentiometer **R11** set the current between points 1 and 2 of TB4 to $4.0^{+0.1}$ mA.

4.2.3 Adjustment Loop

Repeat adjustment by **R15** (when Sensor in air) in order to attain 20.0-0.1 mA value, and then by **R11** (when Sensor in water) for $4.0^{+0.1}$ mA value. Repeat this loop until both values do not require further adjustment.

4.2.4 For Bar-Graph Option - Sensor in Maximum Oil Layer

OIL light should be on.

Using potentiometer **R6** set the Bar-Graph display to make the lower 19 LEDs turn on, and then until all 20 LEDs just turn on.

4.2.5 Final Check

- Sensor in water (no oil):

All Bar-Graph LEDs are off, output current is $4.0^{+0.1}$ mA.

- When adding oil to water:

A few Bar-Graph LEDs turn on, output current increases.

- Sensor in the air:

All Bar-Graph LEDs are off, output current is 20.0-0.1 mA.

NOTE:

The 4-20mA output can be wired to the control room through the contacts of the Fail relay. During a failure, the control room will receive 0 mA as an indication of the failure.

5. Field Calibration

Turn power on. One of the indicating lights on the front panel of PS-220 should turn on, and the *FAIL / DETECTOR DISCONNECTED* light should be off.

The System has been pre-calibrated at the factory.

The following is a fast field calibration procedure for small on-site adjustments. If only an oil detection sensitivity change is desired, refer directly to Paragraph 5.1.3.

Calibration should be done with site water and oil, in a sump or a simulation tank/tube.

If field calibration adjustments do not give satisfactory results, follow the LABORATORY CALIBRATION PROCEDURE (*Section 4.1*).

Bar-Graph and/or 4-20mA output adjustments may be done only with the LABORATORY CALIBRATION PROCEDURE.

IMPORTANT!

REFER TO THE SENSOR USER GUIDE FOR SPECIFIC NOTES RELATED TO FLOATATION AND CALIBRATION.

IMPORTANT!
**THE WINDOW OF THE *NEMA 7* or *Exd* ENCLOSURE MAY BE OPENED
 ONLY WHEN THE EXTERNAL ENVIRONMENT IS NONEXPLOSIVE!**

5.1 Calibration Adjustments

5.1.1 Water Detection

- If water is normally contaminated with a layer of oil, put the sensor in oil for 2 seconds, take it out of oil, and let oil trickle down for 15-20 seconds.
- Have a correct water level for proper sensor floatation.
- Put the sensor in the vessel (without cleaning), and let it float freely with the cable secured at the top of the vessel.

If *OIL* light is on:

Rotate **R5** counter-clockwise, until *WATER* light turns on.

(For some demo units only: R5 is the calibration screw next to *WATER* light).

If *WATER* light is on:

Rotate **R5** clockwise until *OIL* light turns on, and then slightly counter-clockwise until *WATER* light turns on.

5.1.2 Air Detection

Lift the Sensor Assembly up to the air.
AIR / HIGH OIL light should turn on.

5.1.3 Water/Oil Interface

- Put the Sensor Back in Water (without oil).
- Make sure that water level in the vessel is appropriate and the sensor floats freely.
- Add an oil layer of the thickness that is to be detected (1 mm for example).
OIL light should turn on.
- Adjust detection sensitivity by turning **R5** counter-clockwise till *WATER* light turns on and then slightly clockwise till *OIL* light is on.

This procedure (5.1.3) can be also implemented **on site** in order to change sensitivity of oil detection, as follows:

- To **decrease** sensitivity (i.e. start detection from a thicker oil layer), or to “out-calibrate” an oil layer of certain thickness which is not needed to be detected, use **R5** and rotate it counter-clockwise.
- To **increase** sensitivity (i.e. detect a thinner oil layer), **R5** should be rotated clockwise.

Detection of oil layer thinner than 1mm is maintained only in conditions similar to those in which the calibration process was performed. Changes such as water table variation, flow velocity, etc., may affect detection sensitivity.

5.1.4 Second Alarm Point

- Add an oil layer of the thickness that is to be detected as Second Alarm (10 mm for example).
- If *OIL* light is on:
 Slightly turn **R2** clockwise till *AIR / HIGH OIL* turns on and *OIL* turns off.
 (For some demo units only: R2 is the calibration screw located next to *AIR / HIGH OIL* light).

If *AIR / HIGH OIL* light is on:

Turn **R2** counter-clockwise till *OIL* light turns on and then slightly clockwise till *AIR / HIGH OIL* light turns on.

- Pull the Sensor Assembly out of the liquid.
AIR / HIGH OIL light should stay on.

5.1.5 Calibration Check

Check the system for proper detection of **Water, Air, Water/Oil Interface**, and **Second Alarm Point** (as described just above, except additional adjustments).

5.2 Built-in Test

5.2.1 TEST Button

The TEST button is located:

For the /N4 option - on a TEST board inside the enclosure;

For the /N7 and other enclosure options - on the front panel / under the window.

BEWARE OF HIGH VOLTAGE 110 or 220V INSIDE ENCLOSURE!

To check the PS-220, push TEST button for a few seconds, then release.

The PS-220 will receive a ramping test signal instead of real sensor signal, and the indicating lights will turn on consecutively: *AIR / HIGH OIL*, *OIL*, then *WATER*.

For the Bar-Graph and/or 4-20mA options, appropriate outputs should also react in a compatible manner.

5.2.2 FAIL / DETECTOR DISCONNECTED Indicator

This light is located on the front panel of PS-220.

The light indicates, when turned on, that at least one of the three wires coming from the Sensor is disconnected, or that Sensor signal is abnormal, or that the optional Safety Barriers has an open circuit (burnt internal fuse).

If this indication is **on**, refer to *Section 6 (PROBLEMS AND SOLUTIONS)*.

Relay RY3 is a Fail relay that works together with the Fail indicator. If everything is normal, the relay will be energized. If the sensor fails or power is interrupted, the relay will be de-energized (fail safe operation). The contacts are available at TB2 (see drawing DWGS PSX 004 4).

6. Problems and Solutions (Troubleshooting)

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
No lights, and/or no 4-20mA output, and/or no relay output change.	No power to unit.	Check connection to mains or power source.
	Improper power supply.	Verify conforming of power supply.
	Improper wiring.	Check wiring. Refer to wiring diagram.
	Blown fuse F1.	Replace fuse. Refer to PS-220 schematics.
	Faulty relay/s.	Replace relay/s.
O/L indication in the absence of oil.	Sensor does not float freely or is inclined.	Ensure free floatation of the sensor, and level interface between the sensor and water.
	Entangled cable, or cable too short below the sensor.	Carefully release any twisting. Release more cable as needed.
	Sensor “jumps” due to turbulence.	Install in a stilling tube.
	System is out of calibration.	Re-calibrate, as to <i>Section 4</i> or <i>5</i> .
Change of liquid interface does not result in appropriate light indication.	Liquid level is too low.	Make sure that liquid level is not less than that specified in the Test Certificate.
	System is not calibrated.	Re-calibrate. Refer to <i>Section 4</i> .
	Improper voltage to Sensor.	Check voltage between points 1 and 2 of TB6, which should be within the range 11.5-12.5 VDC. Otherwise, consult factory.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
FAIL / DETECTOR DISCONNECTED indicator is on.	Sensor is not properly connected.	Check field cable coming from the sensor. Refer to wiring diagram.
	Abnormal signal output from the Sensor because of Sensor malfunction.	Disconnect the Sensor from PS-220, and connect it to 12 VDC power supply ("+" to <i>DET+</i> wire, "-" to <i>DET-</i> wire). Measure DC current between <i>SIG</i> wire and <i>DET-</i> wire. The readings should match the ones written in the <i>Sensor Test Certificate</i> in water and air. <i>Otherwise</i> , consult factory.
	<i>If Safety Barriers are installed:</i> Safety Barrier failure.	Resistance between points 1 and 3 of Barrier should be: for MTL715+ or 7715+: <i>155 ohms maximum</i> ; For MTL710+ or 7710+: <i>85 ohms maximum</i> (refer to wiring diagram). <i>Otherwise</i> , contact your agent.
	<i>If 4-20mA output is used, and also Safety Barriers are installed:</i> Ground loop.	Use a 4-20mA device that is not grounded to earth, or connect a 50 Ohm resistor in series with TB4 point 2.
	Internal wire inside PS-220 enclosure is loose.	Check internal wiring (refer to wiring diagram). Re-connect loose wire.
No sequential lights after pushing TEST button. No full-scale Bar-Graph indication. No full scale 4-20mA output.	System is extremely out of calibration.	Re-calibrate, refer to <i>Section 4</i> .
	Internal wire inside PS-220 enclosure is loose.	Check wiring (refer to wiring diagram). Re-connect loose wire.
	Blown fuse F1.	Replace fuse.
Remote recorder does not receive 20mA.	Load is higher than 400 ohms.	Reduce load.

Additional information:

1. **Fuse F1 rating for 110 or 220 VAC version:** 125 mA, fast acting, 5 x 20mm.

Before fuse replacement, disconnect the power to the unit!

2. **Fuse F1 rating for 12 or 24 VDC version:** 2 Amp, fast acting, 5 x 20mm.
3. There are two jumpers on the Main board: **JP1 and JP2**. They are located near trimmer R3 (Zero). Only one of them should be shorted!
 - The default setting is JP1 shorted and JP2 opened. This gives quick response to oil detection, but also higher sensitivity to water turbulence.
 - If the sensor is installed in turbulent environment, it is advised to open JP1 and short JP2. This activates a low pass filter on the signal, which helps in avoiding false alarms, yet keeps a good oil detection response.
4. **Water / Oil / Air relay outputs (dry contacts):** Using these outputs with a low power AC load might give a problem of the load being activated even when the relevant relay contact is open. For example, it might happen if a 220VAC digital input of a PLC is connected to the relays. This is caused by the 0.015uF 275VAC capacitors installed in parallel with the relay contacts to protect them when high power loads are switched.

If such a problem is experienced with low power AC loads, the solution is to remove (un-solder) these capacitors from the Main board. The capacitors are located between the relays and TB2, and are marked C8, C9, C18, C19.

7. Appendix A: PS-220 Options

7.1 Enclosures

- /N4/ NEMA 4 / IP65 weather-proof enclosure
- /N7/ NEMA 7 explosion-proof enclosure
- /Exd/ Exd 7 explosion-proof enclosure
- /BP/ Back plate mounted (no enclosure)
- /19R/ 19" Rack mounted module

7.2 Outputs

- /RL/LI/ Relays, Lights (standard on all units)
- /420/ Optional 4-20mA current output (current source type)
- /BG/ Optional Bar-Graph display (in addition to /420/ option)
- /AUD/ Optional Audio Alarm (*Ex-proof* available)

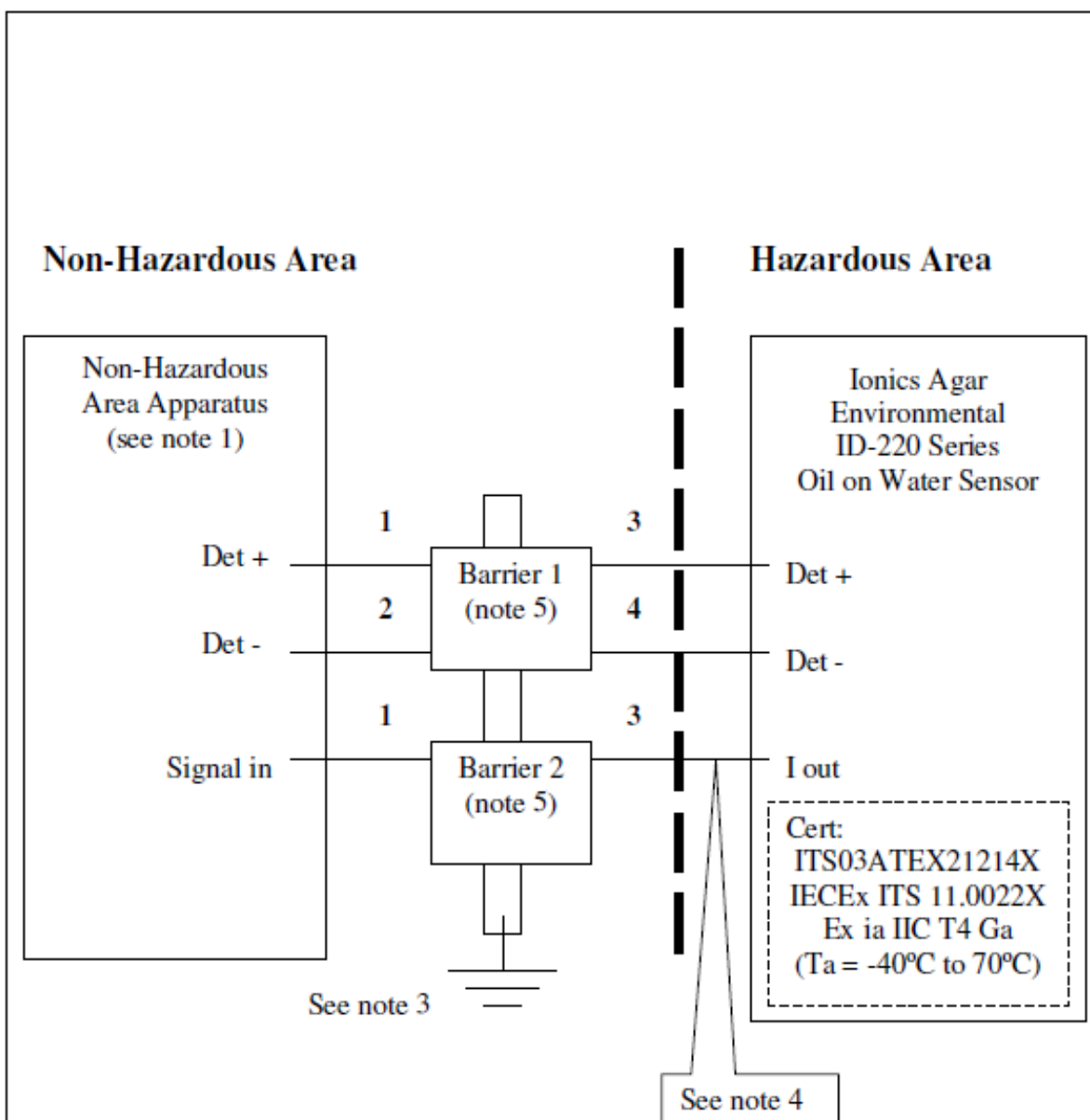
7.3 Operating Power, 6 VA consumption

- /12 VDC
- /24 VDC
- /110 VAC
- /220 VAC

7.4 Other

- /CEN/ Set of Zener Safety Barriers for Hazardous Area installation

8. Appendix B: Installation in Hazardous Area



Sheet 1 of 2



Ionics Agar Environmental

No modifications permitted
without the approval from ITS.

Date: 23 March 2011
Drawing by: S. David
Approved by: S. David

Title: ID-220 Series System Diagram

Drawing Number: DWGV 220 001 2 Revision: 3

Notes:

1. Non-hazardous area apparatus unspecified except that it must not be supplied from nor contain under normal or abnormal conditions a source of potential with respect to earth in excess of 250 volts R.M.S. or 250 volts D.C.
2. The electrical circuit and the interconnecting cables in the hazardous area must be capable of withstanding an A.C. test voltage of 500 volts R.M.S. to earth or frame of the apparatus for one minute.
3. The installation must comply with the requirements of EN/IEC 60079-14.
4. The Capacitance (C) and either the Inductance (L) or the Inductance-to-Resistance Ratio (L/R) of the hazardous area cables must not exceed the values shown in the following table:

Capacitance, Inductance or L/R Ratio

Group	C	L	L/R Ratio
IIC	0.45 μ F	0.14 mH	16 μ H/ Ω
IIB	3.42 μ F	0.94 mH	112 μ H/ Ω
IIA	13.87 μ F	1.94 mH	232 μ H/ Ω

5. Shunt Zener diode Safety Barrier certified by any EEC (ATEX) approved Notification Body or IECEx approved Certification Body to [Ex ia] IIC having the following or lower output parameters:

Barrier 1: $U_o = 15V$ D.C., $I_o = 150$ mA D.C., $P_o = 0.56$ W

Barrier 2: $U_o = 10V$ D.C., $I_o = 200$ mA D.C., $P_o = 0.5$ W

Both Barriers must be of positive polarity and the output current of each barrier must be limited by a resistor 'R' such that $I_o = U_o / R$.

Terminal numbers on the drawing are for MTL700 and MTL7700 series barriers.

Sheet 2 of 2



Ionics Agar Environmental

No modifications permitted
without the approval from ITS.

Date: 23 March 2011
Drawing by: S. David
Approved by: S. David

Title: **ID-220 Series System Diagram**

Drawing Number: **DWGV 220 001 2** Revision: 3

9. Appendix C: Ferrites for EMC Compatibility

Ferrites on PS-220 power cable

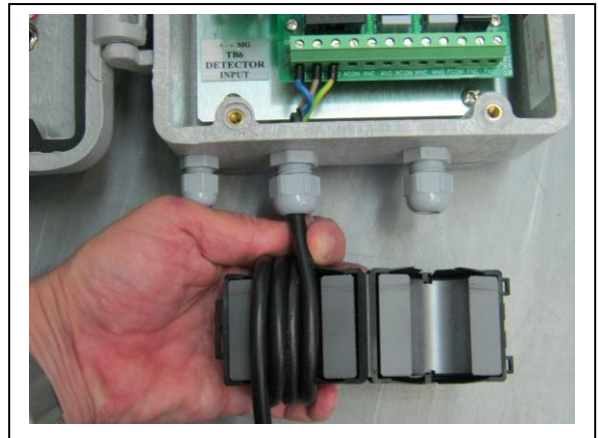
NOTE:

Addition ferrite/s should be installed closer to the sensor – Refer to Sensor User Guide.

Ferrite type: Laird 28A5131-0A2

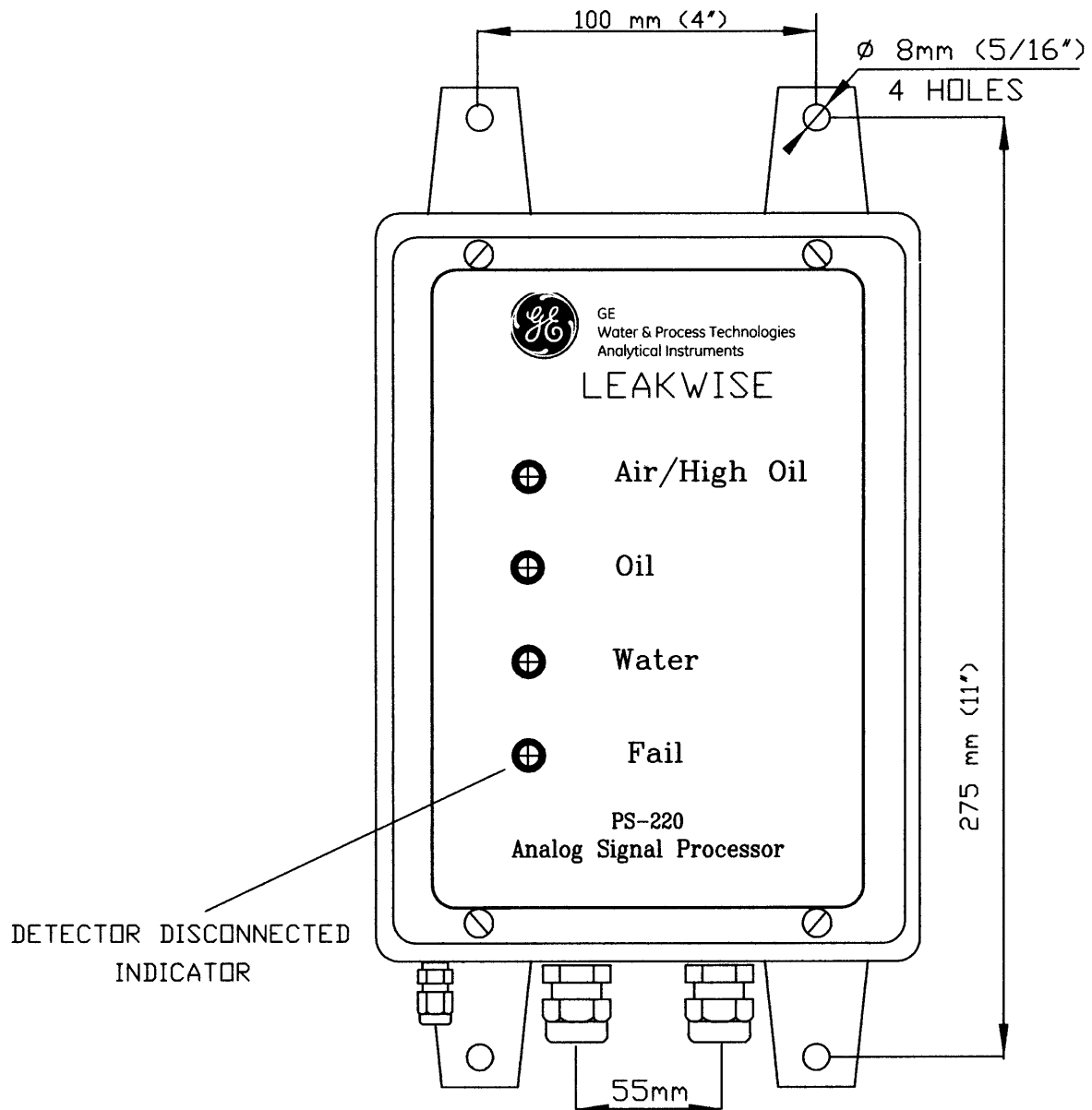
Qty: 1

Number of turns (as seen inside the ferrite core): 4



10. Appendix D: PS-220 Drawings

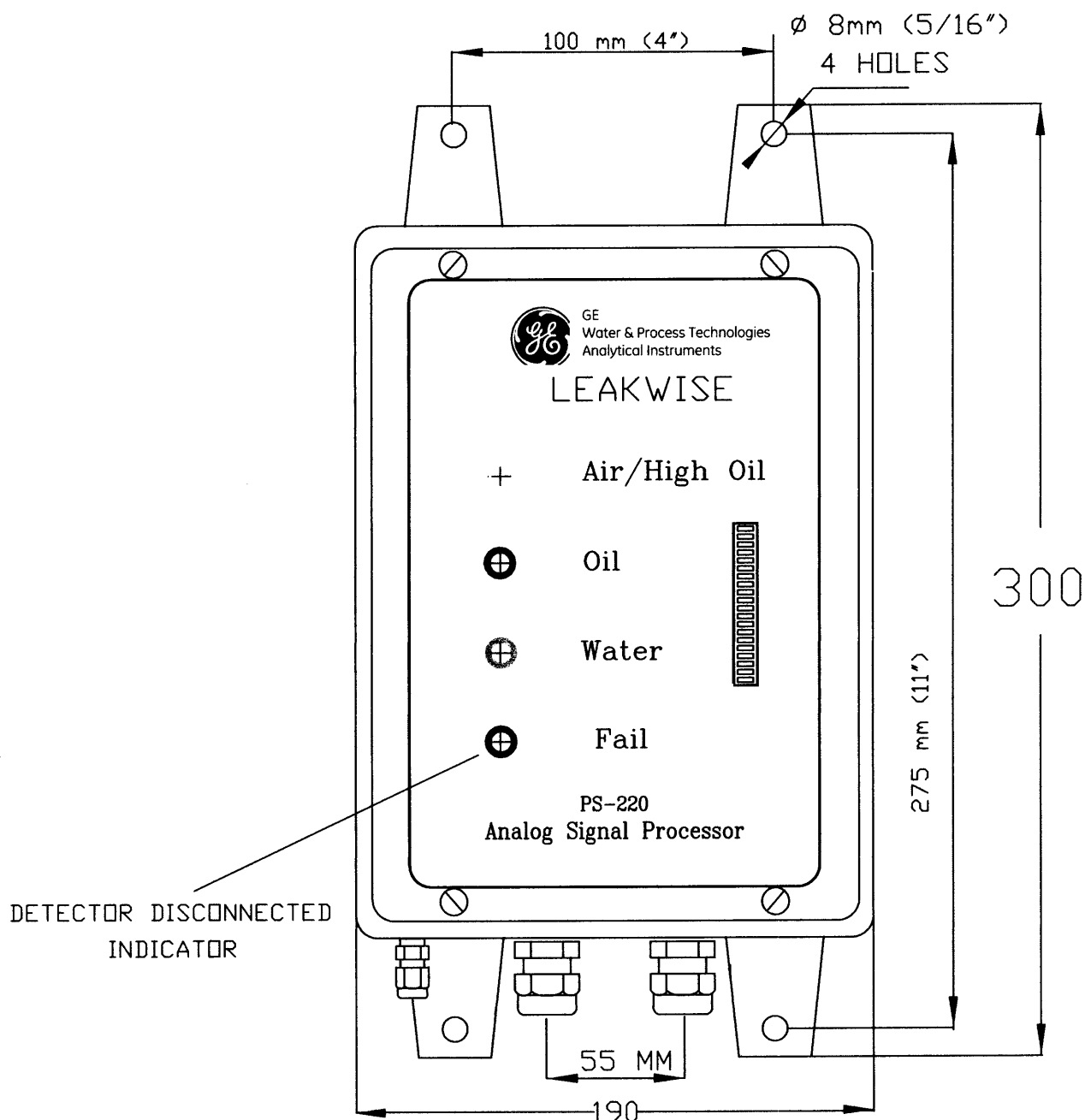
REV	APPD BY	DATE	DESCRIPTION
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	E.H.	07.APR.08	ECR. 020/2008





TWO PG-9 GLANDS FOR 6-8mm DIA. CABLE
 ONE PG-7 GLAND FOR DETECTOR CABLE
 ENCLOSURE DEPTH : 120mm

MATERIAL	SURFACE FIN.	HEAT TREAT.			USED ON		
SCALE FREE	UNLESS OTHERWISE SPECIFIED	A4				GE Water & Process Technologies Analytical Instruments	
	REMOVE ALL SHARP EDGES						
SHEET_1_OF_1	GEN.TOL'S	DESIGN	NAME	DATE	TITLE PS-220 N4/RL/LI		
NEXT ASSEMBLY	ANGELS ± 0°15'		E.H.	18.FEB.02			
	DIMENSIONS ARE IN MM	DRAWN	E.H.	18.FEB.02			
	This is the property of AGAR TECHNOLOGY LTD. (AT), and may not be used for any purpose unless authorized in writing by AT. This document may contain AT's confidential proprietary info. and shall not be copied used, transferred or disclosed to others	CHECK	S.D.	18.FEB.02			
		APPROV	E.H.	18.FEB.02	DRAWING NUMBER		REV.
					DWG A PS4 002 5		

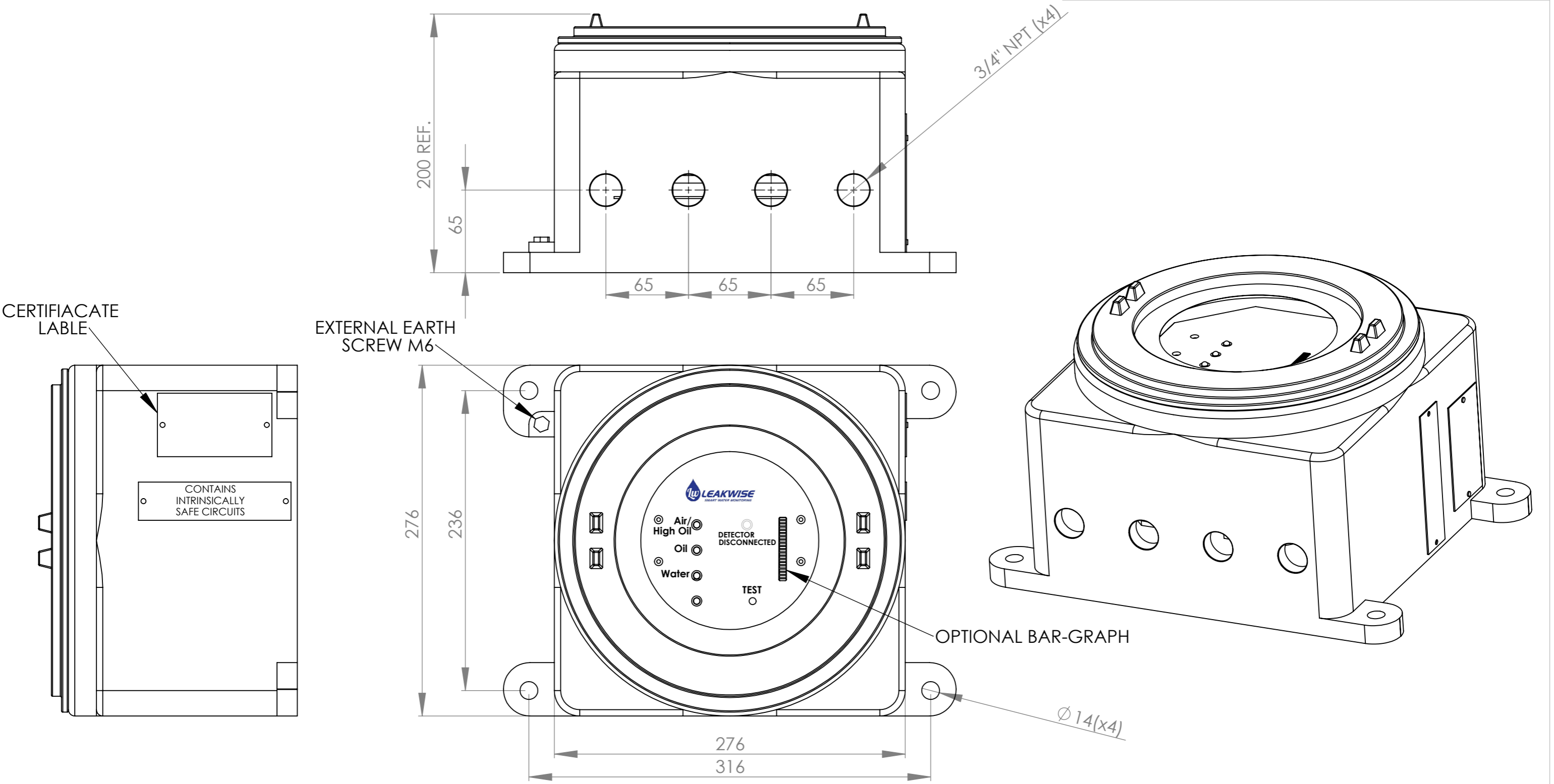
REV	APPD BY	DATE	DESCRIPTION



- * TWO PG-9 GLANDS FOR 6-8mm DIA. CABLE
- * ONE PG-7 GLAND FOR DETECTOR CABLE
- * ENCLOSURE DEPTH : 120mm

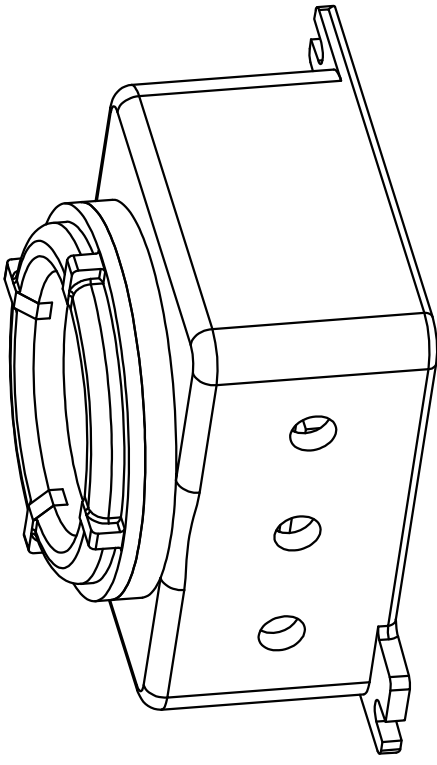
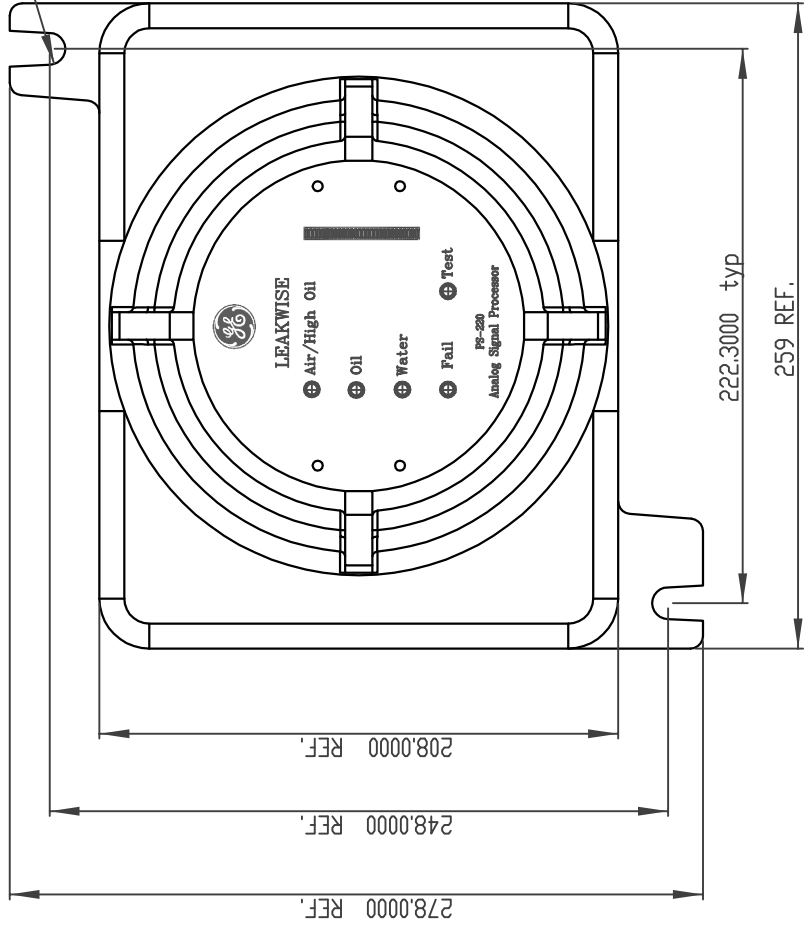
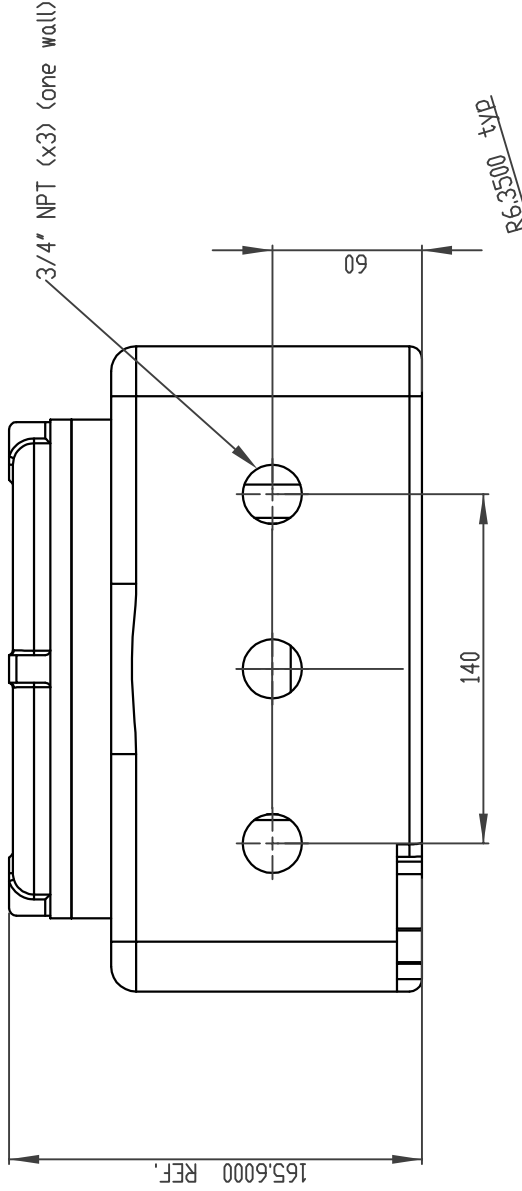
MATERIAL	SURFACE FIN.	HEAT TREAT.		
SCALE FREE	UNLESS OTHERWISE SPECIFIED	A4		 GE Water & Process Technologies Analytical Instruments
	REMOVE ALL SHARP EDGES			
SHEET_1_OF_1	GENTOL'S	DESIGN	NAME E.HARARI	DATE 6.NOV.96
NEXT ASSEMBLY	ANGELS ± 0°15'			
	DIMENSIONS ARE IN MM	DRAWN	E.HARARI	6.NOV.96
	This is the property of AGAR TECHNOLOGY LTD. (AT), and may not be used for any purpose unless authorized in writing by AT. This document may contain AT's confidential proprietary info. and shall not be copied, used, transferred or disclosed to others.	CHECK	E.HARARI	6.NOV.96
		APPROV	H. KOREN	05.12.00
		TITLE PS-220 N4/RL/LI/BG/420		
		DRAWING NUMBER DWG A PS4 002 7		
		REV.		

REV	APPR BY	DATE	DESCRIPTION
	H. KOREN	DD/MM/YY	ECR. No.

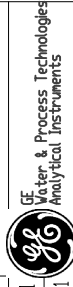


MATERIAL: CORTEM CAT. No.: GUB-03V*		TOLERANCES UNLESS OTHERWISE SPECIFIED		NAME	DATE	USED ON: PS-220/Exd
FINISH:		LINEAR	±0.2	DESIGN	H. KOREN	02/07/17
TREATMENT:		ANGULAR	±1°	DRAWN	H. KOREN	02/07/17
QT.: 1		SURFACE FINISH	N7	CHECK	H. KOREN	02/07/17
DATE DD/MM/YY		BREADEDGES	0.2x45	APPROV	H. KOREN	02/07/17
WT.	SIZE A3	SCALE: 1:5	SHEET 1 OF 1		DRAWING NUMBER: APS70130	

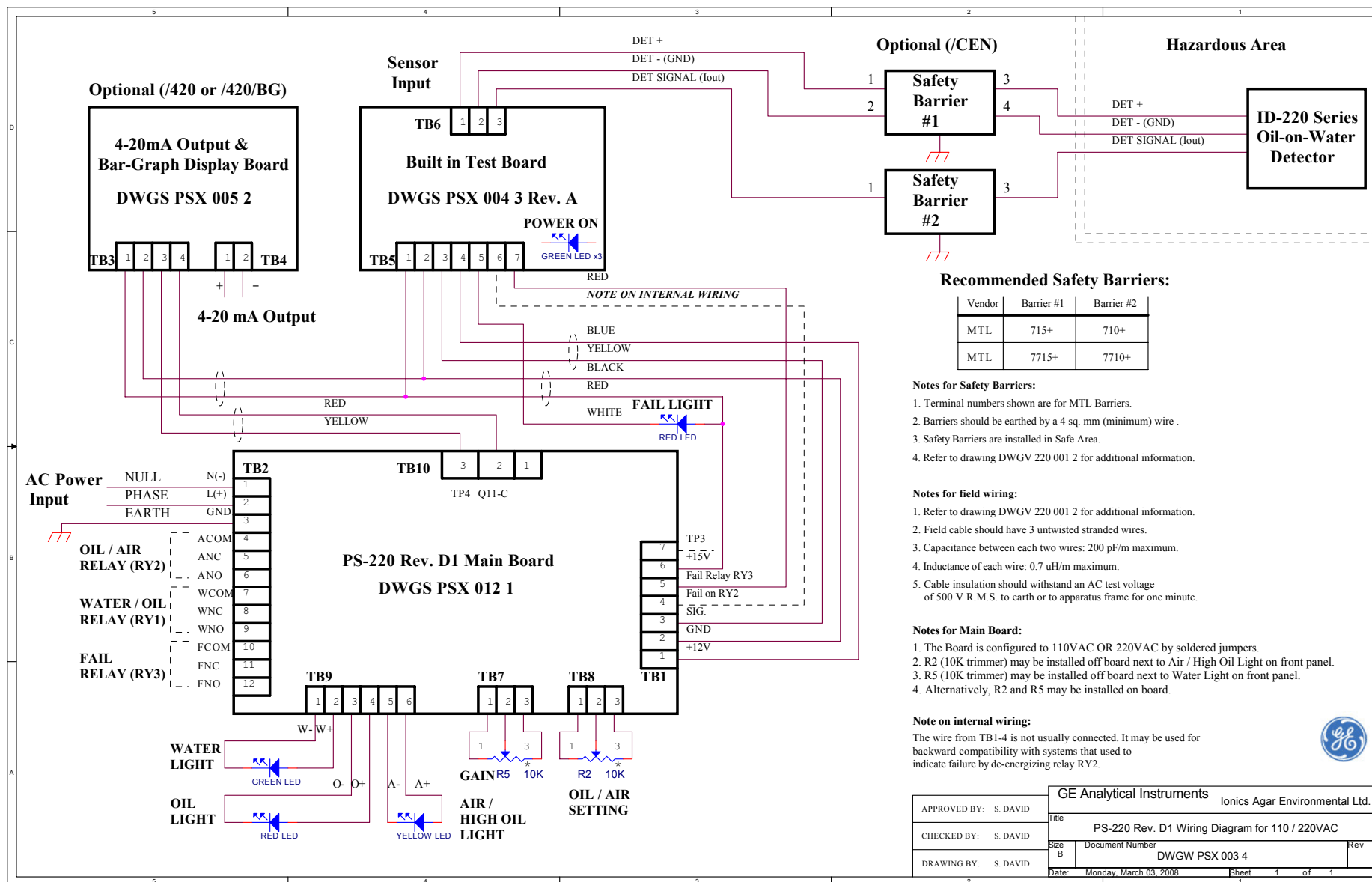
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	H. KOREN	DD/MM/YY	ECR. No.

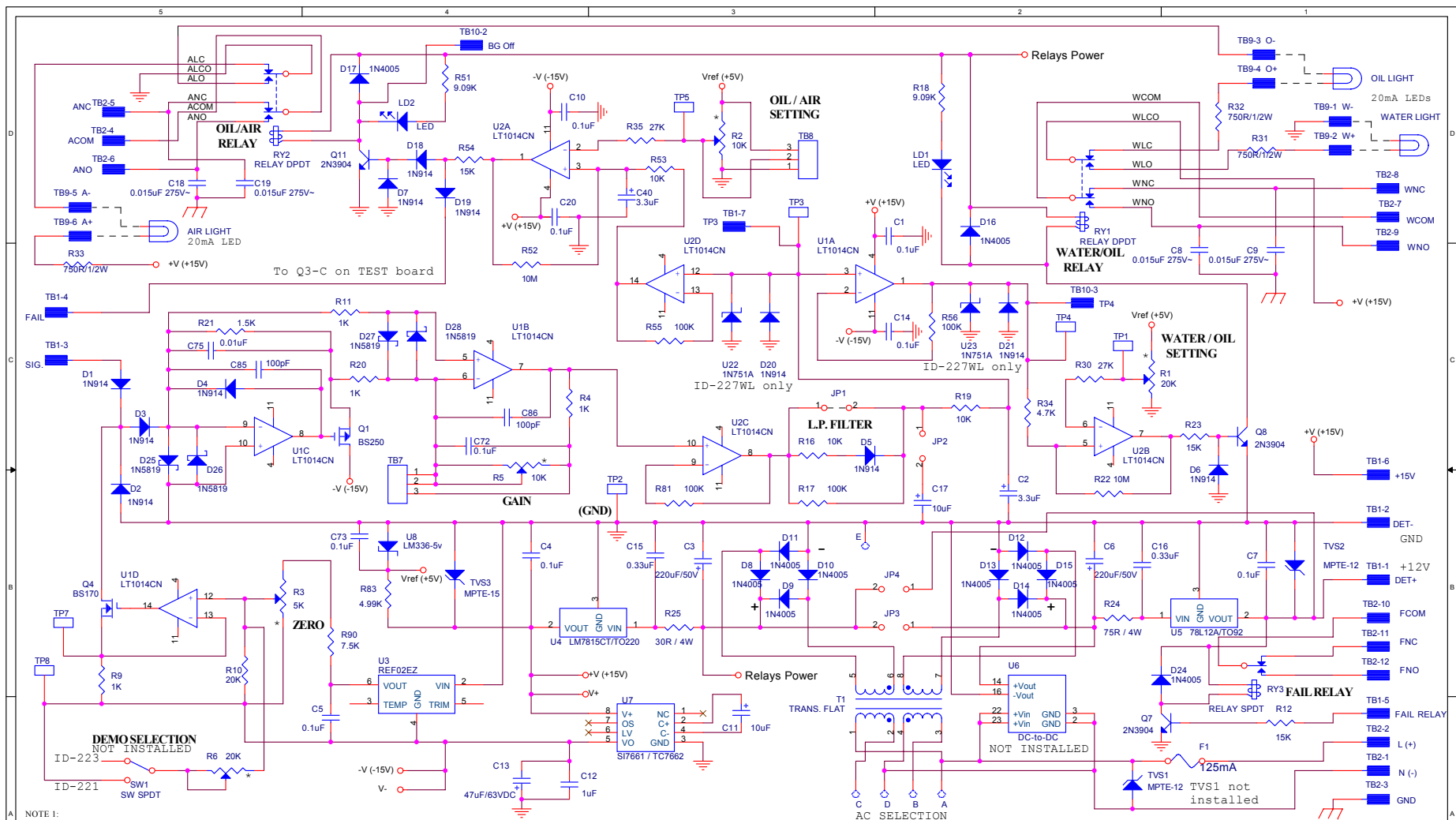


MATERIAL: ADALET - P/N: XJHAGCH N4	TOLERANCES UNLESS OTHERWISE SPECIFIED	NAME	DATE	USED ON: PS-220/N7
FINISH: .	LINEAR ± 0.2	DESIGN H. KOREN	21/06/11	
TREATMENT: .	ANGULAR ± 1°	DRAWN H. KOREN	21/06/11	
QT: 1	SURFACE FINISH N7	CHECK H. KOREN	21/06/11	
DATE DD/MM/YY	BREAKEDGES 0.2x45°	APPROV H. KOREN	21/06/11	
SIZE A3	SCALE: 1:5	SHEET 1 OF 1		
				DRAWING NUMBER: APS70186



TITLE: PS-220/N7/RL/LI/BG





NOTE 1:

ALL CAPACITORS ARE +10%/50V UNLESS NOTED;
ALL RESISTORS ARE +1%/0.125W UNLESS NOTED;
RELAYS: RY1 & RY2: OMRON G2RL-24 24VDC; RY3: OMRON G2RL-14 12VDC

NOTE 2: TRIMMERS R2 AND R5 MAY BE INSTALLED OFF BOARD, ON A PANEL.
AIR, OIL AND WATER LIGHTS ARE INSTALLED OFF BOARD, ON A PANEL.

NOTE 3: LOW PASS FILTER ENABLING BY SHORTING JP2 AND OPENING JP1.

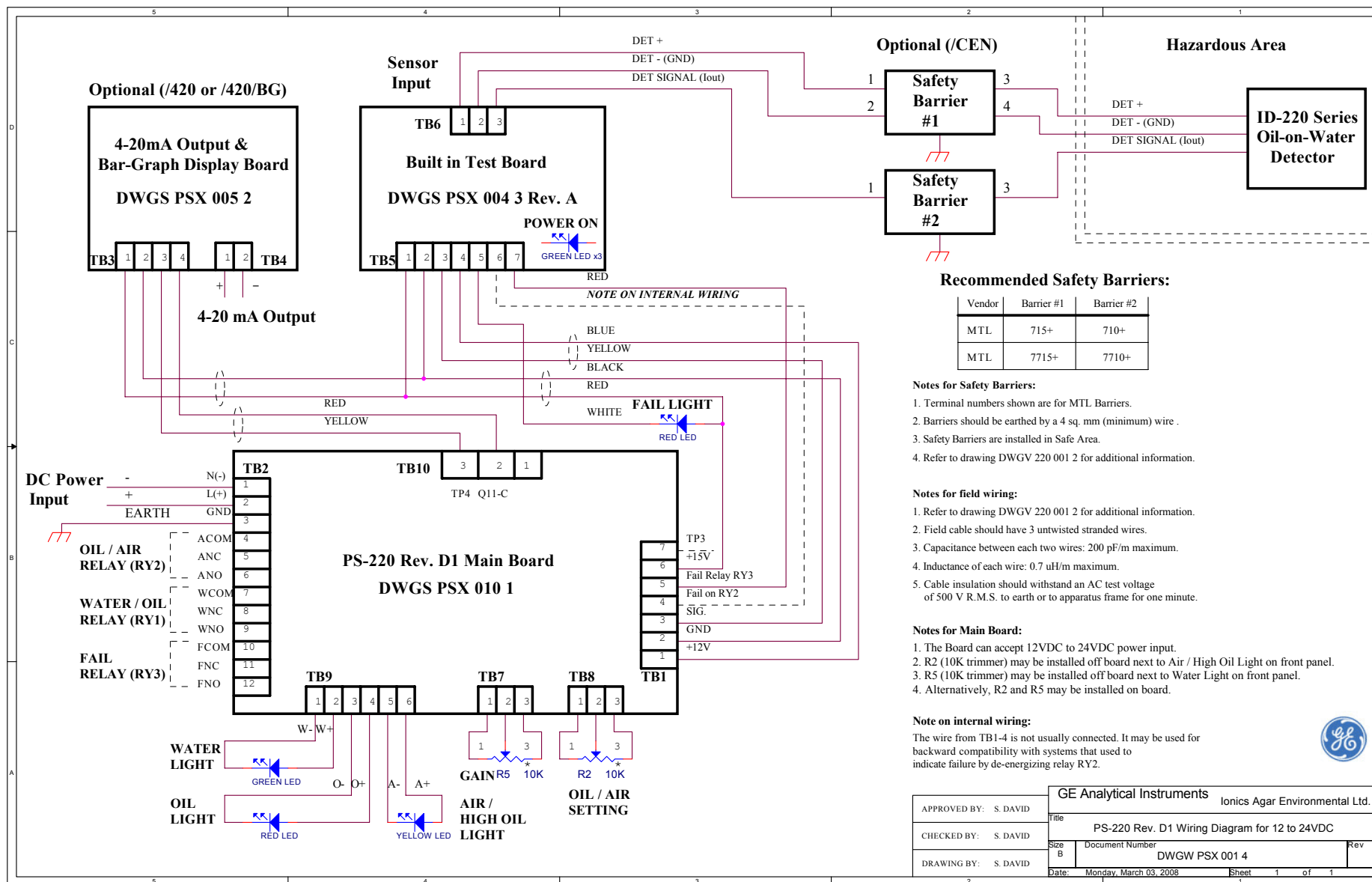
AC SELECTION:

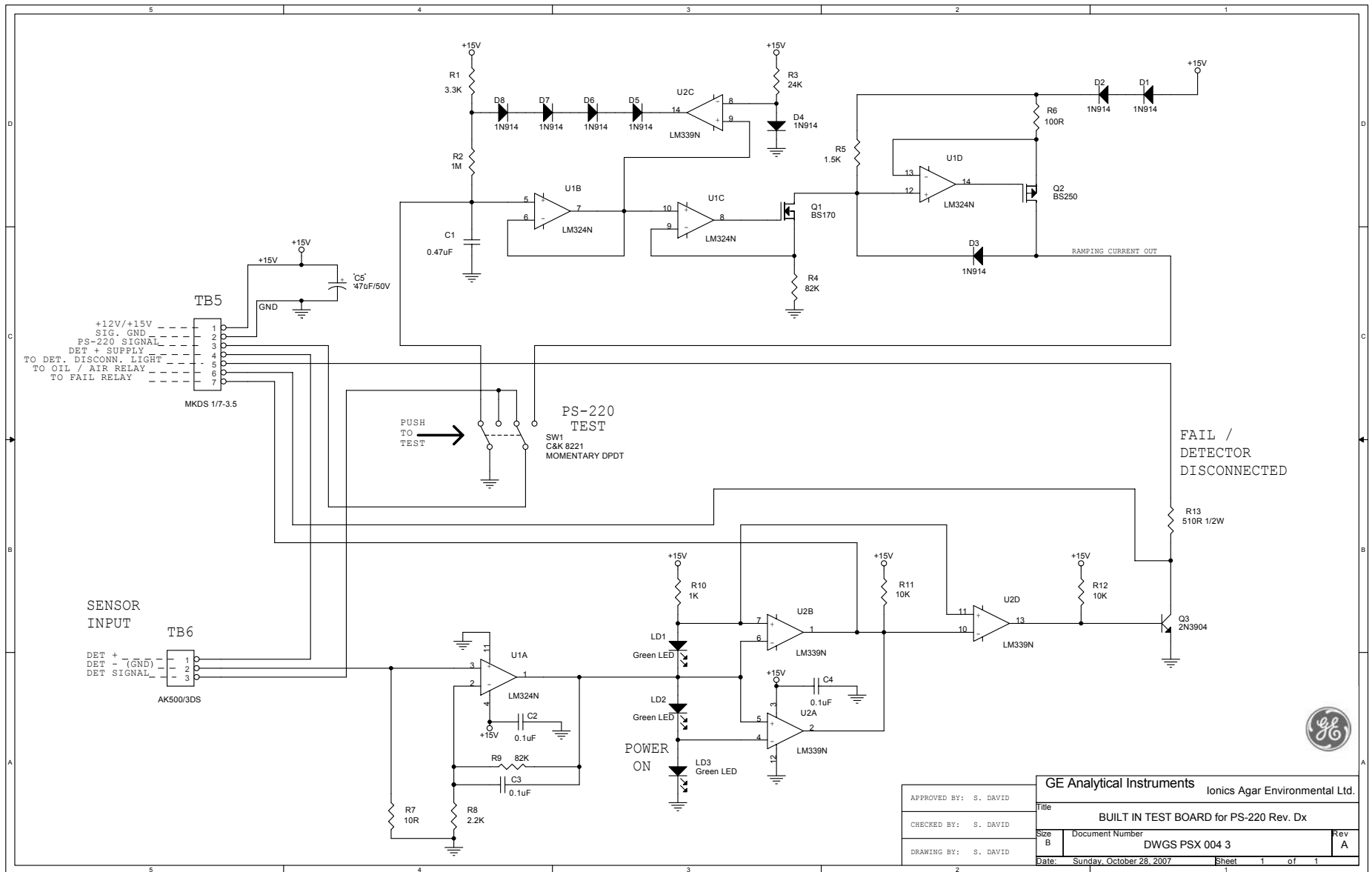
115VAC: Short A to B, and also C to D
230VAC: Short B to C only.

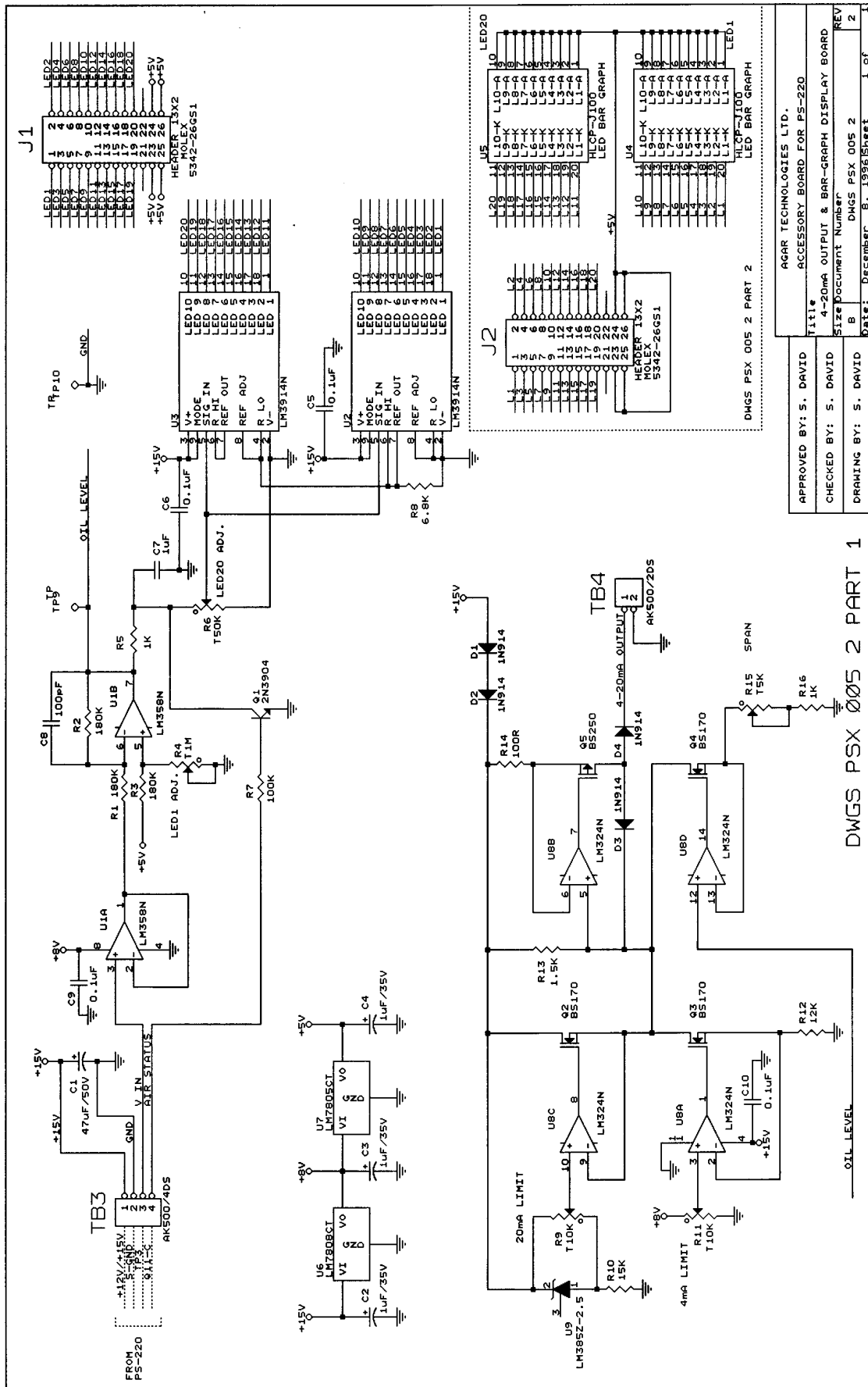


APPROVED BY: S. DAVID
CHECKED BY: S. DAVID
DRAWING BY: S. DAVID

GE Analytical Instruments		Ionics Agar Environmental Ltd.	
Title		PS-220 Rev.D1 Main Board, 115 / 230 VAC Powered	
Size	Document Number	DWGS PSX 012 1	Rev
B			0
Date:	Monday, March 03, 2008	Sheet	1 of 1







APPROVED BY: S. DAVID	TITLE: AGAR TECHNOLOGIES LTD.
CHECKED BY: S. DAVID	4-20mA OUTPUT & BAR-GRAPH DISPLAY BOARD
DRAWING BY: S. DAVID	Size Document Number
	REV 2
	DATE: December 8, 1996
	Sheet 1 of 1

DWGS PSX 005 2 PART 1

This connection is applicable for ID-221, ID-223, ID-225 and ID-227 sensors.

A load can be an audio alarm, a valve or a power relay connected to a pump.

LOAD #1 will be activated whenever WATER light is on.

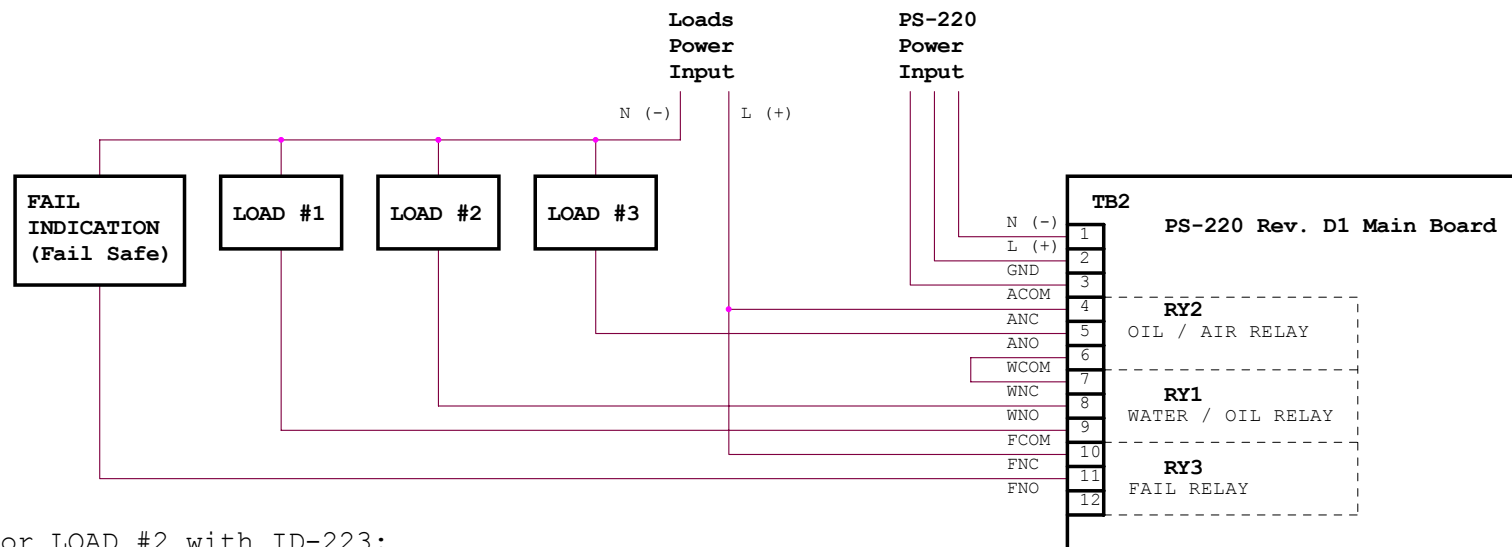
LOAD #2 will be activated whenever OIL light is on.

LOAD #3 will be activated whenever AIR/HIGH OIL light is on.

FAIL indication will be activated whenever FAIL light is off or PS-220 power is interrupted.

Relays RY1 & RY2 have "dry" contacts rated 4 Amp. at 30VDC and 250VAC. RY3 is rated 3 Amp.

Loads power input can be the same as PS-220 power input or different.



Notes for LOAD #2 with ID-223:

LOAD #2 can be activated temporarily (for less than a second) even without presense of oil when:

1. Sensor starts floating on rising water, or
2. Sensor stops floating as water level decreases, or
3. Sensor floates in turbulent conditions.

If this raises a problem in some applications then:

1. If the load is connected to a computerized system, add a 2 seconds delay by software.
2. Otherwise, connect the load through a "time delay relay" that operates in a "delay on operate" mode with a 2 seconds delay.
3. Use the delay option on PS-220 Main Board (JP1 and JP2).



APPROVED BY: S. DAVID		GE Analytical Instruments				Ionics Agar Environmental Ltd.	
CHECKED BY: S. DAVID		Title PS-220 Rev.D: Wiring Diagram of Relay Outputs					
DRAWING BY: S. DAVID		Size B	Document Number DWGS PSX 004 4				Rev 0
Date: Sunday, November 18, 2007			Sheet 1 of 1				