OPERATING AND INSTALLATION INSTRUCTIONS

Conductivity Operated Level Control System
Having SIRA Approved Intrinsically Safe Electrode Circuits
Conforming to the ATEX Directive 2014/35/EU
& IECEx certification scheme.

Controller type **P8/IS**
Certificate No:
IECEx SIR 17.0065X
Sira 17ATEX2270X

Electrode Holders
Certificate No:
IECEx SIR 17.0066X
Sira 17ATEX2271X

Conductivity Operated Level Control System
Certificate No: **Sira Ex 17Y2272**

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O&M 91
Issue B
Oct 2018

FM 10090

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HAWKER ELECTRONICS LTD.

The user should read this manual prior to installation or commissioning.

1. SYSTEM OVERVIEW

When used with Hawker electrodes, the P8/IS level controller forms an INTRINSICALLY SAFE Level Alarm or Control System. The controller is situated in the Safe Area and the electrodes in the Hazardous Area. This manual gives details of the P8/IS controller, electrode holders and the overall system.

2. OPERATING PRINCIPLE

The controller supplies a small AC current to the electrodes. The Level Controller detects this current when an electrically conductive liquid touches the measuring electrode. A.C is used to prevent electrolytic action between electrodes. When the presence of a liquid is detected the unit either de-energises or energises its internal relay dependent on the fail-safe setting, providing the user with a set of volt free S.P.C.O contacts. The unit may be used for High or Low alarm using the P1 connection and G, or for control using P1, P2 and G. The P1 electrode is the shortest and the G the longest electrode in the vessel.

- Intrinsically safe circuit allows use in explosion-hazardous area.
- Electrode circuits are electrically isolated from earth.
- Analogue electrode circuit with digital processing and switching.
- Adjustable sensitivity and close switching differential to ignore electrode fouling.
- Single and double electrode operation for alarm or control applications.
- Fail safe operation.
- Anti-splash delay ON, delay OFF Timer.
- Wide range of approved hardware for Cat 1 (Zones 0, 1 & 2) applications.

3.0 GENERAL DESCRIPTION AND INSTALLATION

IMPORTANT

The P8/IS Controller, Holder and Electrode products must only be installed by suitably trained personnel who have the necessary experience in installation, connection and commissioning of instrumentation in explosion-hazardous areas, and are familiar with the relevant codes of practice.

The units contain NO USER SERVICEABLE PARTS. Each product carries an identification label, which shows its type and other important information.

1. The P8/IS is a conductivity operated level controller having approved intrinsically safe electrode circuitry, which complies with European ATEX Directive and the IECEx certificate scheme.

2. The P8/IS controller must be installed in the 'safe' area in a control panel or other protective housing. To comply with the Certificate of Conformity to the System Standard the controller must only be used with approved Hawker level sensing electrode holders bearing the approved label, the holders may be used in the 'hazardous' area.

3. The maximum operating temperatures must be taken into consideration when using single and multiple systems in different enclosure configurations i.e. panels. Adequate spacing with an air gap, ventilation or cooling should be provided. Ambient operating temperature ranges other than -20°C to +40°C will be indicated on the product label. The controller is intended to be used only in dry, clean and well-controlled environments.

4. The certificate stipulates that the controller must always be housed in its enclosure, even when fitted in a control panel. Separate conduit entries must be used for I.S and mains/high voltage circuits.

5. The output relay gives the user a single pole volt free changeover contact, which its

   Load must not exceed 100VA
   Current must not exceed 5amps r.m.s.
   Voltage must not exceed 250V r.m.s.
   The volt free contact is for 'safe' area use

   Relay contact loads especially inductive can generate high voltages across the relay contacts when opened, fitting a suppression device across the load at the load end can guard against this.

6. The P8/IS controller requires the connection of a mains earth to its ⏚ (earth) terminal for safety and not for functionality. It should be noted that all other terminals including the electrode circuitry P1, P2 and G are electrically isolated from the earth terminal.

7. See system section and drawing 3454 for maximum number of holders which may be installed in any one tank, sump or vessel (system).
   For safety reasons the maximum values of Inductance and Capacitance for holders, electrodes and cables must not exceed that stated in drawing 3454. It is worth noting that there is also a maximum capacitance value for controller functionality. The P8/IS controller

and electrodes can be used independently. In such case only individual product certification will apply and not the Certificate of Conformity to the System Standard.

8. For different systems where a common multi-core is used for the outputs the cable must be a Type "A" or Type "B" as defined in IEC/EN 60079-25. If individual cables (or individual wires) are used for each controller output then they do not have to meet these requirements, see system section.

9. Supporting Standards used for certification. The electrical installation of the controller, electrode and electrode wiring must also comply -
"Hawker Electronics" drawing 3454
IEC/EN 60079-25
IEC/EN 60079-0
IEC/EN 60079-11

10. Hazards arising from power failure.
Where equipment and protective systems can give rise to a spread of additional risks in the event of a power failure, it must be possible to maintain them in a safe state of operation independently of the rest of the installation; this is the responsibility of the user.

11. Hazards arising from connections.
Equipment and protective systems must be fitted with suitable cable and conduit entries.
When equipment and protective systems are intended for use in combination with other equipment and protective systems, the interface must be safe. The user is responsible for the provision of suitable cable for connection to the supplied terminals.

12. Care should be taken not to clean with aggressive substances or substances that may damage the enclosure, terminals or label. Use of a mild detergent with a dampened cloth is recommended. Over time (years) exposure to the sun's UV light may cause label fading to help prevent this position any Electrode Holder product so its label is not exposed to direct sunlight.

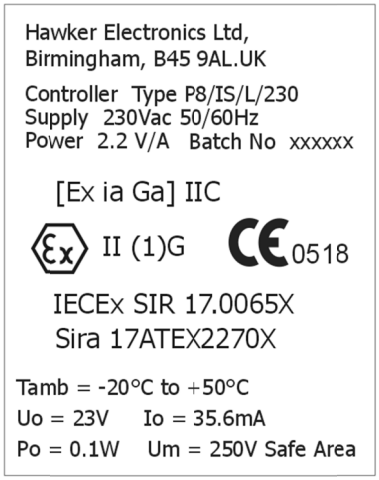
13. If the sign 'X' is placed after the certificate number, it indicates the equipment is subject to special conditions of safe use specified on the EC - Type Examination Certificate & IECEx Certificate of Conformity, details of which are included with this manual.

14. The crossed-out bin symbol, placed on the product, reminds you of the need to dispose of the product correctly at the end of its life

15. This product has been designed and complies with the relevant standards as listed in its IECEx Certificate of Conformity / EU Type Examination Certificate. The installer/user must ensure system compliance.

4.0 P8/IS CONTROLLER
4.1 Essential information
4.1.1 Identification

Controller Type P8/IS – Certificate No: Sira IECEx SIR 17.0065X, Sira 17ATEX2270X
The certification marking is as follows



Example label contains all relevant details for the particular model.
The parameters will vary between models.

4.1.2 General information

1. The equipment must only be installed in a non-hazardous (safe) area.
2. The equipment is only certified for use in ambient temperatures in the range -20°C to +50°C and should not be used outside this range.
3. The equipment has not been assessed as a safety-related device (as referred to by Directive 2012/34/EU Annex II, clause 1.5).
4. Installation of this equipment shall be carried out by suitably-trained personnel in accordance with the applicable code of practice.
5. Repair of this equipment shall only be carried out by the manufacturer or in accordance with the applicable code of practice.
6. The certification of this equipment relies on the following materials used in its construction:

Enclosure: Polycarbonate

If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

"Aggressive substances"- e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials.

"Suitable precautions"- e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.

4.1.2.1 Special Conditions for safe use

(denoted by an X after the certificate number)

The supply to the equipment is limited to overvoltage category I/II as specified in IEC/EN 60664-1.

4.1.3 Hazardous and safe area parameters

Hazardous Area Terminals

	P1 w.r.t G and P2 w.r.t. G	**P1 + P2 w.r.t. G**	**P1 w.r.t. P2**
Uo	11.5V	11.5V	23V
Io	17.8mA	35.6mA	17.8 mA
Po	0.05W	0.1W	0.1 W

	Group IIC	Group IIB	Group IIA
Co	0.143 µF	1.03 µF	3.71 µF
Lo	27.8 mH	102.0 mH	213.7 mH
Lo/Ro	250 µH/Ω	947 µH/Ω	1786 µH/Ω

Safe Area terminals

L, N	Um = 250V Supply 230VAC or 110VAC or 24VAC as appropriate
NC, C, NO	Um = 250V Internal relay contacts rated 277VAC / 30VDC, 10A These contacts shall not switch more than 5A r.m.s. or 250V r.m.s. or 100VA

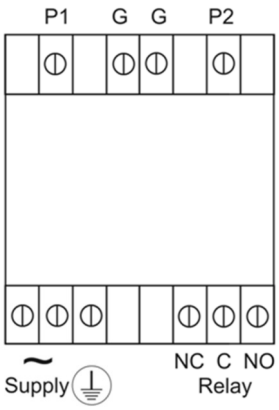
Terminals NC, C, NO are connected to internal relay contacts. These relay contacts must not switch more than 5A r.m.s or 250V r.m.s or 100 VA.

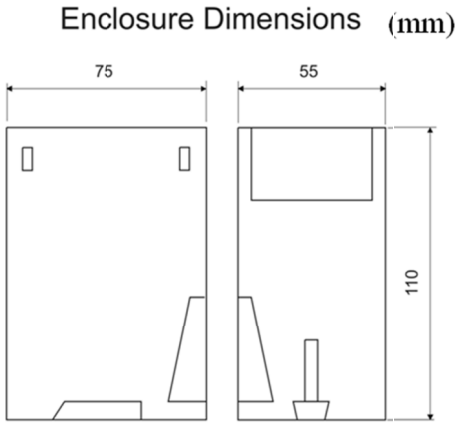
4.1.4 Electrical connection and housing

The electrical connections are made to the terminal blocks situated on the front of the enclosure via captive self-locking screws.

The “Hazardous Area” connections are on the top consisting of P1, P2 & G terminals; these go to the electrodes in the vessel. Various Hawker data sheets are available giving P1, P2 & G configurations for pumping in/out and alarms etc. they can also be found on the company web site.

The “Safe Area” terminals are on the bottom, which consist of the ac supply, Earth and Volt free relay contacts; these are for Safe Area use only.





Certified drawing 3454 included in this manual gives specific information for installation and additional requirements for multiple configurations, which should be strictly adhered to.

The housing can be mounted either by means of screws passed through two holes to DIN 46 121 and DIN 43 660 or by a snap fastener for fitting to DIN 46 277 and DIN EN50 022 assembly rails.

4.2 Setting up the P8/IS controller

Two different detecting sensitivity versions of the controller are available, one for sewage and one for cleaner water, see the P8/IS technical specifications for ordering information. Both versions have a factory set input supply, failsafe and timer, and a user adjustable sensitivity control.

Always check to ensure the controller specifications are suited to the supply and its application before installing. The controller's label will indicate the supply voltage, fail-safe as either FSH (H) or FSL (L) and timer option (T). Removing the front snap on trim will reveal the user adjustable sensitivity control and a LED indicating the relay state.

4.2.1 Fail Safe, Sensitivity Control and Timer

Failsafe

The controller is available as failsafe high or failsafe low, fixed at the factory. The failsafe refers to the relay state when a liquid is present or not.
Failsafe Low, the relay is de-energised when liquid is absent and energised when liquid is present.
Failsafe High, the relay is energised when liquid is absent and de-energised when liquid is present.
The relay state is shown by a led located under the snap on/off front cover. The relay is energised when the LED is 'ON'.

Sensitivity Control
Increasing the sensitivity control increases the detecting sensitivity of the unit, i.e. increasing the control will make the unit switch with cleaner liquids (less conductive), this is where we are not concerned with ragging etc. Turning the sensitivity control anticlockwise decreases the sensitivity,

giving optimum control and switching differential over dirtier liquids such as sewage, this is useful where ragging can be a problem.

If the liquid is too high a resistance (not very conductive) the unit may not switch even when the sensitivity control is turned fully clockwise. Conversely if the resistance is very low (very conductive), a few ohms, the liquid will be detected but with limited switching differential. It is worth bearing these few points in mind if having difficulty in sensing a liquid. Note: The controller may not detect any liquid regardless of its conductivity if the sensitivity control is turned fully anticlockwise; always set it between 1 and 10 when in service.

See technical data sheet for switching specifications. Please consult our sales department for guidance if unsure.

Timer

Some models may have an optional factory set time delay feature. If a time delay is present then liquid presence or absence will not be acknowledged until the delay has elapsed. The delay is auto resetting and the liquid state must be continuous for the full time period before it is acknowledged. This feature is particularly useful where splashes or turbulence may cause false triggering.

5.0 TESTING, GENERAL

Basic instructions are included on the facia trim, but it is recommended that this manual be used for optimum performance. No attempt should be made to remove this trim.

Precautions before testing.
Before disconnecting any mains leads or control wiring at the controller or in the system ensure that:

a) Mains supply to the controller is switched OFF.
b) The volt free contact wires supply is switched OFF.
c) The Safety Officer has declared it is safe for the equipment to be disconnected or removed and that it is safe to perform the following operations bearing in mind any hazardous area implications such as application and connections.

5.1 Basic controller testing

If necessary the controller can be tested without connecting to the electrode holders, this will check a basic switch function and confirm relay operation. This test <u>will not</u> test the unit's capacity to sense a liquid of a specific conductance. Remember if the model has an inbuilt timer to wait for the time period to elapse after linking or removing links from P1, P2 and G terminals.

<u>For fail to safe Low Unit:</u>

1. Disconnect all electrode wiring from the terminal block.
2. Turn on the mains supply to the controller.
3. Turn the sensitivity control to midway.
4. Short circuit P2 & G, the relay should be de-energised.
5. Short circuit P1 & G, the relay should energise.
6. Remove the P1 & G short, the relay should remain energised.

7. Remove the P2 & G short, the relay should de-energise.
8. Go to step 16.

For fail to safe High Unit:

9. Disconnect all electrode wiring from the terminal block.
10. Turn on the mains supply to the controller.
11. Turn the sensitivity control to midway.
12. Short circuit P2 & G, the relay should be energised.
13. Short circuit P1 & G, the relay should de-energise.
14. Remove the P1 & G short, the relay should remain de-energised.
15. Remove the P2 & G short, the relay should energise.

16. Testing the volt free contacts: -
Ensure the supply to the volt free contacts has been switched OFF and remove the wires from the terminal block. Use an ohmmeter to measure the contact resistance.

Check with the Relay de-energised (Led OFF) that the-
C & NO is greater than 1M Ohm and the C & NC is less than 1 Ohm.

Check with the Relay energised (Led ON) that the-
C & NO is less than 1 Ohm and the C & NC is greater than 1M Ohm

5.2 Single electrode applications P1 & G.

Instruction	Fail Safe High (FSH) Relay Condition	Fail Safe Low (FSL) Relay Condition
Fill the vessel until liquid is in Contact with the electrode.		
Turn sensitivity control to 'max'.	de-energised	energised
Turn sensitivity control slowly anticlockwise until relay changes state.	energises	de-energises
Turn the control at least 1 division clockwise, this is the optimum setting for the particular liquid.	de-energises	energises

5.3 Dual electrode applications P1, P2 & G

Instruction	Fail Safe High (FSH) Relay Condition	Fail Safe Low (FSL) Relay Condition
Fill the vessel until liquid is in Contact with the P2 electrode.		
Turn sensitivity control to 'max'	energised	de-energised
Using a piece of wire, place a momentary short circuit between P1 & G.	de-energises	energises
Remove Short circuit. Relay	de-energised	energised

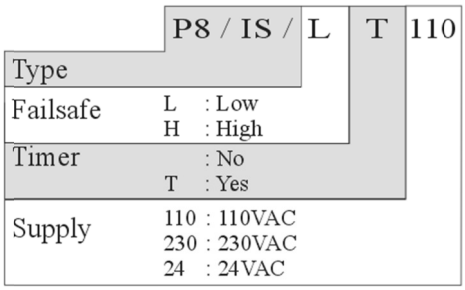
remains		
Turn sensitivity control slowly anticlockwise until relay changes state.	energises	de-energises
Turn the control at least 1 division clockwise, this is the optimum setting for the particular liquid.		

Note: If the above adjustment is not possible, the resistance of the liquid may be outside the range of the controller, in which case please consult Hawker Electronics sales department.
Increasing the sensitivity control by a division allows for slight changes in the liquid conductivity whilst still providing guard against rags and foam. If the liquid conductivity may vary then increasing the sensitivity by more divisions will give more detection safety margin but will reduce the controllers ability to ignore rags and foam. Following adjustment it is advisable to carry out a full operating cycle to ensure correct operation.

6.0 P8/IS CONTROLLER TECHNICAL SPECIFICATIONS

Taken@25°C, specifications subject to alteration.

Supply	
Supply voltage:	230VAC / 110VAC / 24VAC ±10% factory set (Intrinsically safe certification is valid to 250V max, Um=250V safe area)
Installation Cat:	Overvoltage Cat II
Supply frequency:	50/60 Hz
Power:	Approx. 2.2VA
Electrode	
Volts (max):	6Vrms, 8.5VP, Sine wave 50Hz, (open circuit electrodes, sense control min)
Current:	4mA max (short circuit electrodes)
Sensitivity:	Standard: Sensitivity for sewage (dirty water): approx. 200 Ohms to 13,000 Ohms Special by request: Higher sensitivity for cleaner liquids, approx. 500 ohms to 36,000 Ohms both have user adjustable sensitivity control
Switching Hysteresis:	approx. 5-15% depending on sensitivity control setting and electrode configuration
Switching response	<1s
Operating Temp	-20°C to +50°C
Cable	Typically 70m. See drawing 3454 for maximum permitted levels for intrinsic safety. Capacitance max before sensitivity is affected - 30nF @ 20KR, 100nF@500R, ignoring drawing 3454
Output Relay	Volt free contact S.P.C.O rated 240Vac @ 5A max, resistive. For intrinsically safe model- Load must not exceed 100VA Current must not exceed 5amps r.m.s. Voltage must not exceed 250V r.m.s.
Output Led	Red Led "On" when relay energised
Fail-safe	High or Low factory set
Timer	Anti-splash, 5s factory set (optional), delay ON/delay OFF (optional)
Enclosure	
Material	Polycarbonate
Mounting	Snap fastener for Din Rail mounting DIN 46 277, IP20
Weight	337g approx.
Terminals	Captive self-locking screws, accepts up to 4mm^2 conductor, max 0.4Nm tightening torque.
Dimensions	55 x 110 x 75mm W x D x H
Ordering Information	



Examples
P8/IS/H/110
failsafe High, no timer, 110VAC

P8/IS/L/T/230
failsafe low, timer, 230VAC

7.0 ELECTRODE HOLDERS

1. The equipment has not been assessed as a safety-related device (as referred to by Directive 2014/34/EU Annex II, clause 1.5).

2. Installation of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice.

3. Repair of this equipment shall only be carried out by the manufacturer or in accordance with the applicable code of practice.

4. If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

   "Aggressive substances" e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials.

   "Suitable precautions" e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.

The user must ensure the holder and installation is suitable for the application. The details on the product label will indicate its compliance parameters. If the sign 'X' is placed after the certification number, it indicates that the equipment is subject to special conditions for safe use as specified in the EC Type Examination Certificate & IECEx Certificate of Conformity and in this manual.

7.1 CAT 1 (Zone 0) Electrode Holders

7.1.1 Type identification

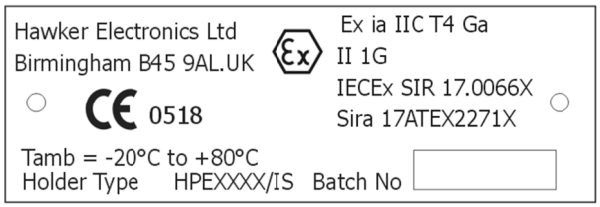
All CAT 1 and Equipment Protection Level (EPL) Ga certified Electrode Holders are identifiable by the following codes. All are suffixed **IS** e.g. HPE8/P/IS

Type's HPE5, HPE7, HPE7/P/F, HPE7/P, HPE7/PA, HPE8, HPE8/P, HPE12/P, HPE13A, HPE13A/P, HPE14/X, HPE22, HPE22/P/Fa, HPE22/P, HPE22/PA, HPE23, HPE23/P

7.1.2 Certification markings

Each Holder has a label affixed to its body that states its certification parameters, these are:

Type's, HPE7, HPE7/P/F, HPE7/P, HPE7/PA, HPE8, HPE8/P, HPE12/P, HPE13A, HPE13A/P, HPE14/X, HPE22, HPE22/P/Fa, HPE22/P, HPE22/PA, HPE23, HPE23P



Type HPE5

7.1.3 Conditions of use

1. The Electrode Holder Type's HPE7, HPE7/P/F, HPE7/P, HPE7/PA, HPE8, HPE8/P, HPE12/P, HPE13A, HPE13A/P, HPE14/X, HPE22, HPE22/P/Fa, HPE22/P, HPE22/PA, HPE23, HPE23P.
   (Certificate No: IECEx SIR 17.0066X, Sira 17ATEX2271X)
   may be used in zones 0, 1 and 2 with flammable gases and vapours with apparatus groups IIA, IIB & IIC and with temperature classes T1, T2, T3 and T4. The ambient temperature operating range is –20 to +80°C, and should not be used outside this range.

2. The Electrode Holder Type HPE5.
   (Certificate No: IECEx SIR 17.0066X, Sira 17ATEX2271X) may be used in zones 0, 1 and 2 with flammable gases and vapours with apparatus groups IIA, IIB & IIC and with temperature classes T1, T2, T3, T4, T5 and T6. The ambient temperature operating range is –20 to +40°C, and should not be used outside this range.

The certification of this equipment relies on the following materials used in its construction, and the special conditions for safe use are observed, section 7.1.4.

Hawker models HPEXXXX/IS only –

Holder type		Termination enclosure material	Electrode material
HPE5/X/IS		No termination enclosure, electrode is fitted in a UPVC (plastics) shroud	Low Carbon 316L S/S, Titanium Hastelloy C, Monel
HPE8/X/IS, HPE8/P/X/IS		Phenolic	Low Carbon 316L S/S, Titanium, Hastelloy C, Monel, Galvanised mild steel, (optionally polyester coated)
HPE12/P/X/IS		Cap: Di-cast aluminium powder Coated, Body: Phenolic	Low Carbon 316L S/S, Titanium, Hastelloy C, Monel, (optionally polyester coated)
HPE7/X/IS HPE7/P/X/IS HPE7/PA/X/IS HPE7/P/F/X/IS HPE13A/X/IS HPE13A/P/X/IS HPE14/X/IS	HPE22/X/IS HPE22/P/X/IS HPE22/PA/X/IS HPE22/P/Fa/ X/IS HPE23/X/IS HPE23/P/X/IS	All Polypropylene enclosure + HPE13 models uPVC spacers. HPE23 models uPVC, Acetal spacers/disks. HPE14 plastic spacers	Low Carbon 316L S/S, Titanium Hastelloy C, Monel, (optionally polyester coated)

7.1.4 Special conditions for safe use

(denoted by an X after the certificate number)

1. The holders cannot be considered as being capable of withstanding a 500V r.m.s. a.c. voltage test to earth according to Clause 6.3.13 of EN 60079-11:2012. This shall be taken into account in any equipment installation.

2. In any equipment installation, the following shall be provided with protection from impact or installed such that impacts cannot occur:

   - The cap of the Holder Type HPE 12/P/X/IS
   - The electrodes of holders that are fitted with titanium electrodes

3. The Holder Type HPE5/X/IS shall not be directly installed where it might be charged by the rapid flow of a non-conductive medium.

4. The electrodes of holders that have plastic coated electrodes and/or are fitted with plastic spacers between the electrodes, shall not be directly installed where they might be charged by the rapid flow of a non-conductive medium.

5. The holders shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on the surface of the termination enclosures (where fitted). In addition, the termination enclosures shall only be cleaned with a damp cloth.

6. Under certain extreme circumstances, any unearthed metallic parts of the termination enclosures may store an ignition-capable level of electrostatic charge. Therefore, the user/installer shall implement precautions to prevent the build-up of electrostatic charge, e.g. locate the equipment where a charge generating mechanism is unlikely to be present.

7. The user/installer shall ensure that the maximum ambient temperatures of the holders will not be exceeded when the equipment is installed.

7.2 Installation

Electrodes should preferably be mounted vertically in the vessel. Spacing between the electrodes and their distance from the side of the vessel is dependent on the likelihood of bridging due to floating matter and the degree of turbulence. For clean application the distances can be as low as 5 - 8cm but in the case of raw sewage the recommended distance is 23cm. Using plastic coated electrodes, which are available from stock, can eliminate bridging, always bare at least 50mm of the coating and have the reference ‘G’ electrode central.

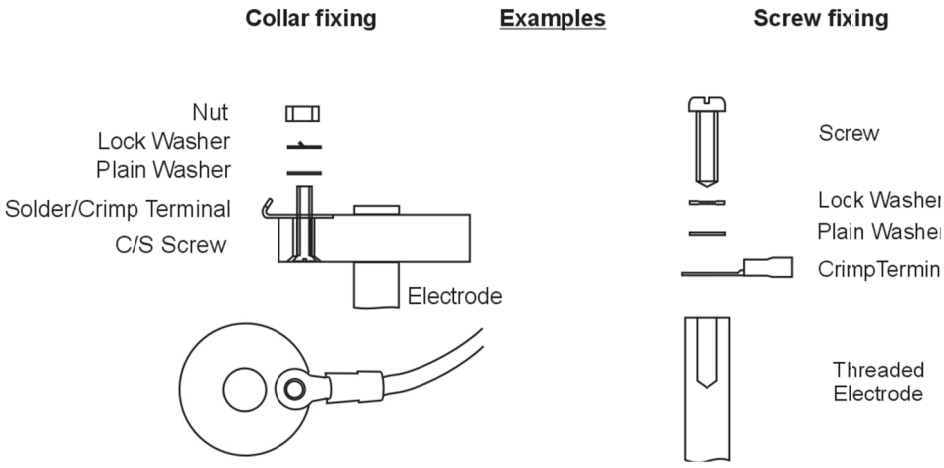
Wall mounted brackets are available for the electrode holders. Where turbulence is expected, electrodes of long length should be fitted with steady brackets. Separators can be used to keep the electrodes apart. Brackets and separators are available from Hawker Electronics Ltd.

Care must be taken when mounting to ensure that the electrode holder insulators protrude through the surrounding material e.g. concrete floors. If only the electrodes protrude they may find a conductive path through the concrete and not the liquid in the vessel.

It is advisable to clean electrode rods and insulators at periodic intervals.

The electrode holders' suitability should be confirmed as being correct for the hazardous location, and must carry the specific certification.
Using a centrally positioned 'G' electrode is recommended for optimum performance. When a 'G' electrode is positioned centrally to the other electrodes it provides the most direct conductive route for the electrical signals. An alternative is to use the tank wall provided it is made out of metal and continuous throughout. Although this does not give optimum performance it is usually sufficient provided the electrodes are reasonably close to the tank wall and not several metres away.

Termination consists of crimp/solder terminals, washers and nut or screw, this may be by collar or direct to the electrode, depending upon holder type. All connecting hardware is provided with the holder. The user should ensure a good connection, which does not interfere, contact or stress any other connection if present. Adequate clearance must be maintained between the terminals if using multi-holders to prevent them from touching one another. When using collars they are placed over the electrode and fixed using the Allen key provided; the terminating cable is then attached, or a screw is used for direct connection.



8.0 CABLE PROPERTIES

8.1 Cable selection guide

Single or multicore cables can be used for the installation, when using multicore it is normal to use the cores for the P1, P2 & G connections. Cable screens are not normally used for P1, P2 or G connection. If a screened cable is being used and the screen is connected to earth then this is normally at one end only, usually the controller end. There are special considerations when installing multiple systems. The installation should comply with IEC/EN 60079-14 *'Explosive atmospheres. Electrical installations design, selection and erection'.*

All cables have an inherent capacitance and inductance, these values must be limited to ensure the circuits in the hazardous area are intrinsically safe. The total allowable capacitance and inductance should be strictly adhered to so as not to infringe the certification, this is shown on drawing 3454, see also section on "system".
The capacitance and inductance values stated in drawing 3454 are for the total amount of cable of all the controllers in any one sump, tank or vessel. The cable capacitance, inductance value and L/R ratio can usually be found on the cable manufactures' datasheet, or physically measured with a LCR meter. An L/R ratio can be used instead of an inductance value.

In addition for functionality it is important not to exceed each controllers maximum input capacitance as it will affect the controllers sensitivity to detect liquids, these can be found in the controllers technical specifications. If cable length is restricted using S.W.A cable consider using single cables or instrument cables since these generally have a lower capacitance.

The overall system capacitance/inductance can be calculated or directly measured, then checked using a calibrated capacitance/inductance meter. This can be used to confirm the total maximum table values in drawing 3454 have not been exceeded.

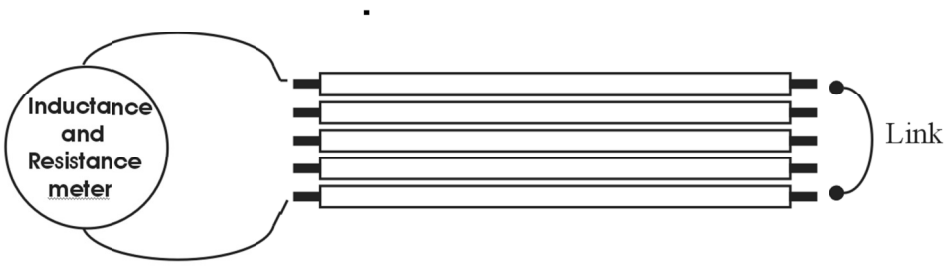
8.2 Cable inductance & L/R ratio

Example of measuring cable inductance

For inductance use the highest loop inductance value of any two cores, the outer cores will give the highest inductance reading.

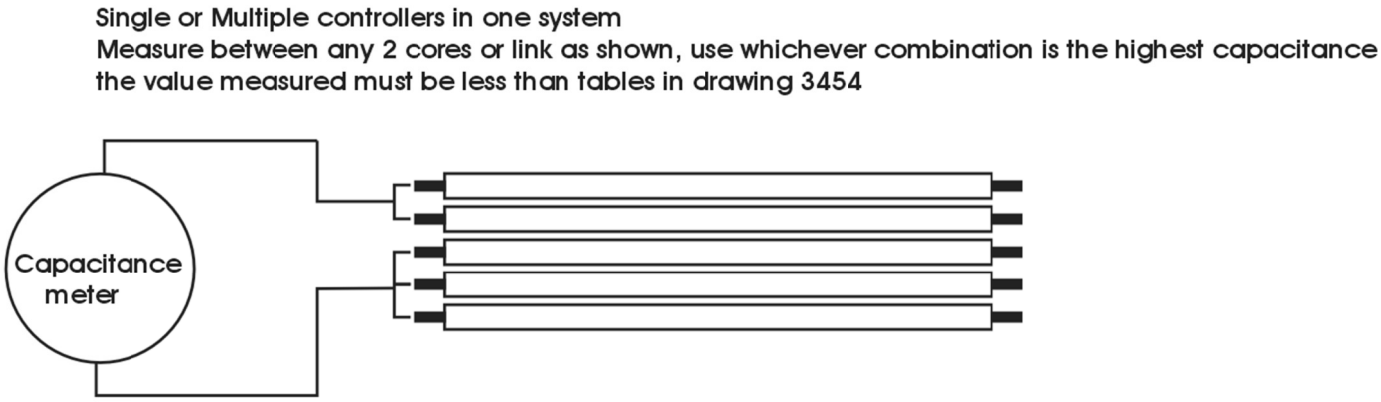
Single or Multiple controllers in one system
the value measured must be less than tables in drawing 3454

Single or Multiple controllers in one system
The L/R value measured must be less than tables in drawing 3454



8.3 Cable capacitance

Example of measuring cable capacitance



8.4 Electrode capacitance

The electrodes will also contribute to the overall capacitance of the system by a tiny amount, which is normally negligible; allowing up to 200pF between any two electrodes will present no problem in normal practice. For example heavy-duty electrodes such as the HPE8 when mounted 230mm apart may be up to 18m in length before this figure is exceeded. Light duty electrodes such as the HPE7, mounted 75mm apart may be up to 15m in length, which is far beyond normal requirements.

Table 1. PARAMETERS OF SOME COMMERCIALLY AVAILABLE CABLES.

This table shows some parameters of 600/1000V-armoured cable. P.V.C. insulated. P.V.C. Inner sheathed steel wire armoured and P.V.C. Over sheathed.

	2 Core			**3 Core**			**unit**
Nominal area of conductor	1.5	2.5	4.0	1.5	2.5	4.0	mm^2
Inductance per core per 1000m cable	0.33	0.32	0.31	0.33	0.32	0.31	mH
Maximum capacitance per 1000m between one conductor and the other conductor and armour earthed at 50Hz	0.39	0.43	0.51				µF
Maximum equivalent star capacitance per 1000 of cable				0.46	0.51	0.61	µF
Nominal L/R Ratio	28	45	70	28	45	70	µH/Ohm

9.0 SYSTEM DESCRIPTION

9.1 Equipment located in a Non-Hazardous (Safe) Area

i. Equipment which is unspecified except that it must not be supplied from, nor contain, under normal or abnormal conditions, a source of potential with respect to earth (ground) in excess of 250V a.c. r.m.s or 250V d.c.

and

ii. Controllers Type P8/IS/X – Certificates IECEx SIR 17.0065X and Sira 17ATEX2270X. The supply circuits to the controllers shall be limited to overvoltage Category I/II as defined in IEC 60664-1.

9.1.1 Equipment located in a Hazardous Area

i. Any of the following holder types – Certificates IECEx SIR 17.0066X and Sira 17ATEX2271X:

HPE5/X/IS
HPE7/X/IS, HPE7/P/X/IS, HPE7/PA/X/IS, HPE7/P/F/X/IS
HPE8/X/IS, HPE8/P/X/IS
HPE12/P/X/IS
HPE13A/X/IS, HPE13A/P/X/IS
HPE14/X/IS
HPE22/X/IS, HPE22/P/X/IS, HPE22/PA/X/IS, HPE22/P/Fa/X/IS
HPE23/X/IS, HPE23/P/X/IS

9.1.2 Configuration

Up to ten controllers may be used within a system with up to three holders per controller connected i.e. three single electrode type holders connected to each of the controller terminals ‘G’. ‘P1’ and ‘P2’. Multiple controllers systems may employ a common ‘G’ holder with the controllers connected together via links between the controller ‘G’ terminals.

Where a multiple controller system incorporates a Holder Type HPE5/X/IS as a common ‘G’ holder the maximum number of holders than can be connected to controller ‘P1’ / ‘P2’ terminals is five.

The applicable hazardous area temperature classes and ambient temperature ranges for a particular multi-holder IS system are as follows:

Holders incorporated	Temperature Class	Ambient temperature range
HPE5/X/IS only	T6	-20°C to +40°C
Any type apart from HPE5/X/IS	T4	-20°C to +80°C
Any type	T4	-20°C to +40°C

9.1.3 Permissible interconnecting cables

For multiple systems where cable cores associated with the outputs from controllers from different systems are contained within the same cable then such cables shall be either:

i. Type A in accordance with IEC/EN 60079-25
or
ii. Type B in accordance with IEC/EN 60079-25

The capacitance and either the inductance or the inductance to resistance (L/R) ratio of the interconnecting cables shall not exceed the following values:

System with up to 6 controllers:

Group	Capacitance (µF)	Inductance (mH)	L/R Ratio (µH/Ω)
IIC	0.143	0.77	31
IIB	1.03	2.33	125
IIA	3.71	6.20	250

System with up to 10 controllers:

Group	Capacitance (µF)	Inductance (mH)	L/R Ratio (µH/Ω)
IIC	0.143	0.25	18.2
IIB	1.03	0.76	56
IIA	3.71	2.03	145

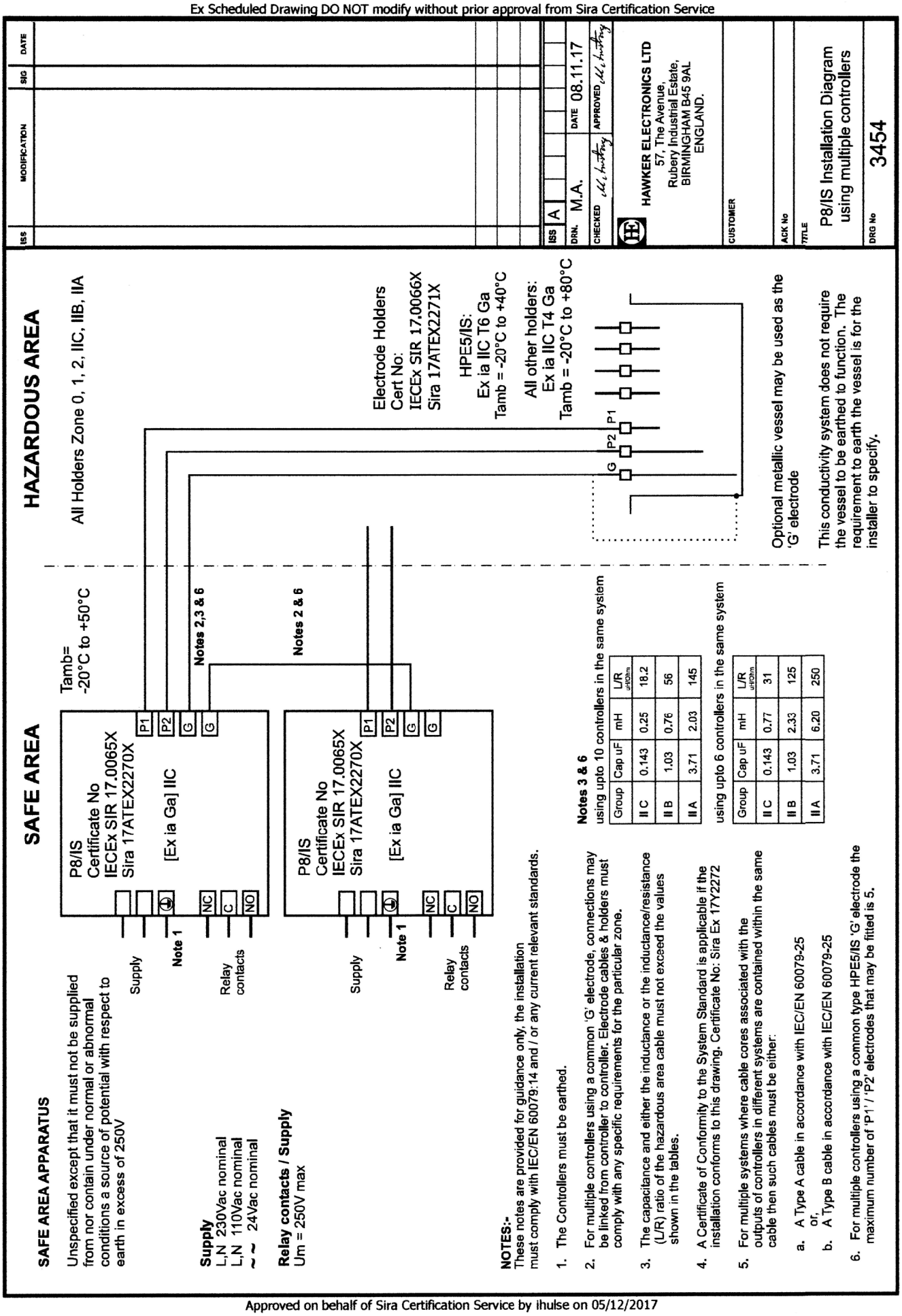
9.2 Conditions of Certification

i. In affixing the certificate number Sira Ex 17Y2272 to the system the certificate holder / user / installer attests on its own responsibility that the system conforms to the documents listed herein.

9.3 Documents

Drawing	Sheets	Rev.	Date (Sira Stamp)	Title
3454	1 of 1	A	05 Dec 17	P8/IS Installation Diagram

9.5 System Drawing



Approved on behalf of Sira Certification Service by ihulse on 05/12/2017

10.0 Declaration of Conformity

EU DECLARATION OF CONFORMITY

Product Model: P8/IS Conductivity Controller and Electrode Holder types -
HPE5/IS, HPE7/IS, HPE7/P/F/IS, HPE7/P/IS, HPE7/PA/IS, HPE8/IS, HPE8/P/IS, HPE12/P/IS, HPE13A/IS, HPE13A/P/IS, HPE14/X/IS, HPE22/IS, HPE22/P/Fa/IS, HPE22/P/IS, HPE22/PA/IS, HPE23/IS, HPE23P/IS

Manufacturer: Hawker Electronics Ltd, 57 The Avenue, Rubery Industrial Estate, Rubery, Birmingham, B45 9AL

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of the declaration:

The object of the declaration described above is in conformity with the relevant **Union harmonised legislation:**

- ATEX Directive (2014/35/EU)
- EMC Directive (2014/30/EU)
- RoHS Directive (2011/65/EU)

Reference to the relevant **harmonised standards** used in relation to which conformity is declared:

Certificates:

- **ATEX** **P8/IS Controller**
Sira 17ATEX2270X, dated 30/11/17, issue 0
Electrode Holders:
Sira 17ATEX2271X, dated 01/12/17, issue 0
Supporting standards - EN 60079-0:2012/A11:2013, EN 60079-11:2012

- **EMC** Overall Specification EN 61000-6-3: 2007 EN 61000-6-2:2005
- **RoHS** EN 50581:2012

Notified Body: For ATEX certification only. NB 0518, CSA Group Unit 6, Hawarden Industrial Park, Hawarden, DEESIDE, CH5 3US.

Additional Information:

- IECEx **P8/IS Controller**
IECEx SIR 17.0065X, dated 30/11/17, issue 0
Electrode Holders:
IECEx SIR 17.0066X, dated 01/12/17, issue 0
Supporting standards - IEC 6007-0:2011 Ed. 6.0, IEC 60079-11:2011 Ed. 6.0
IECEx Certification Body, SIRA Certification Service, CSA Group, see 7 above

Product Conformance Certificate - System, P8/IS Controller & Approved Holders
Sira Ex 17Y2272, dated 07/12/17, Supporting Standards - IEC/EN 60079-25:2010
Certification Body: Sira Certification Service, see 7 above.

The product named above complies with the parts of the standards listed. The company operates an internal production control system that ensures compliance between the manufactured products and the technical documentation.

Signed for and on behalf of:
Hawker Electronics Ltd on 12th December 2017

John Slevin (Managing Director)