



# **Automatic Diesel Engine Shutdown System and Flameproof Alternator for hazardous area applications**

**Selection, Application and Maintenance**

Series 210

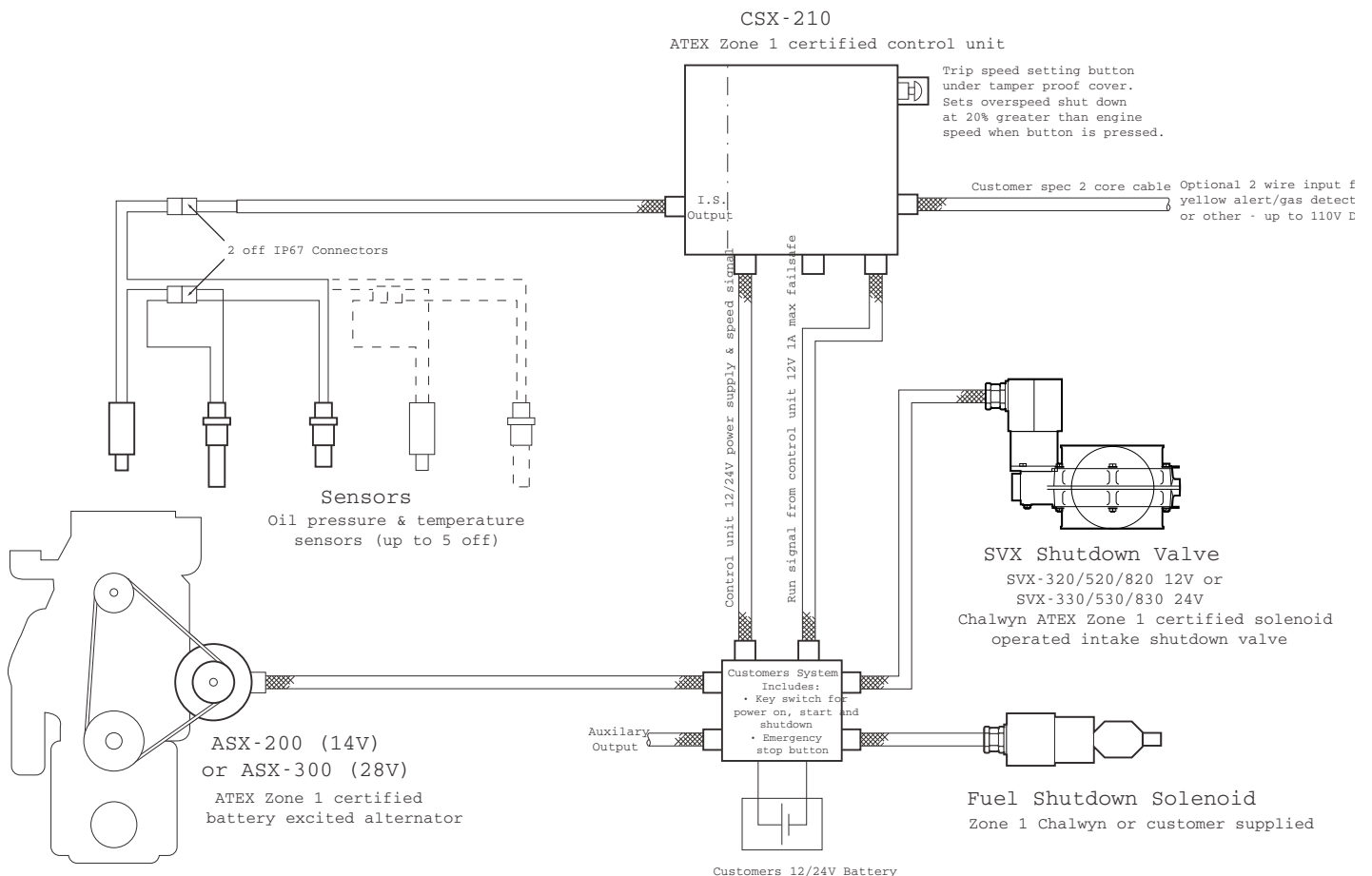
## SYSTEM DESCRIPTION

The Series 210 System monitors engine speed, temperatures and oil pressure. Should any one of these fall outside of preset limits the power supply to the air intake valve and fuel shut down solenoids is cut off thereby closing down the engine. Additionally the system will also react to a shut down signal from an external system such as a Gas Detection System or Yellow Alert.

The temperature and pressure sensors are preset. Overspeed shut down speed is set after system installation using a simple push button located under a tamper proof cover. No calculations or knowledge with respect to drive ratio of the alternator is required.

Approved for Zone1/Group IIB/T4 hazardous area applications, the Series 210 System is designed to interface with other 12 or 24 volt flameproof electrical systems fitted to the engine installation. Output from the Chalwyn alternator supplied as part of the System is sufficient to charge the starting battery of a medium sized diesel engine.

## Series 210 Schematic



## COMPONENT DESCRIPTION

### Chalwyn CSX-210 Control Unit

Cast and machined aluminium enclosure and cover housing the system micro-processor, associated electronics and terminals together with the zener barrier interface with the sensor circuit. All input/outputs are via ATEX approved glands. The overspeed Trip Speed Setting Button is accessed by removal of a protective screw - see diagram below. A gasket bonded to the enclosure completes the sealing between cover and enclosure. Overall dimensions are given below.

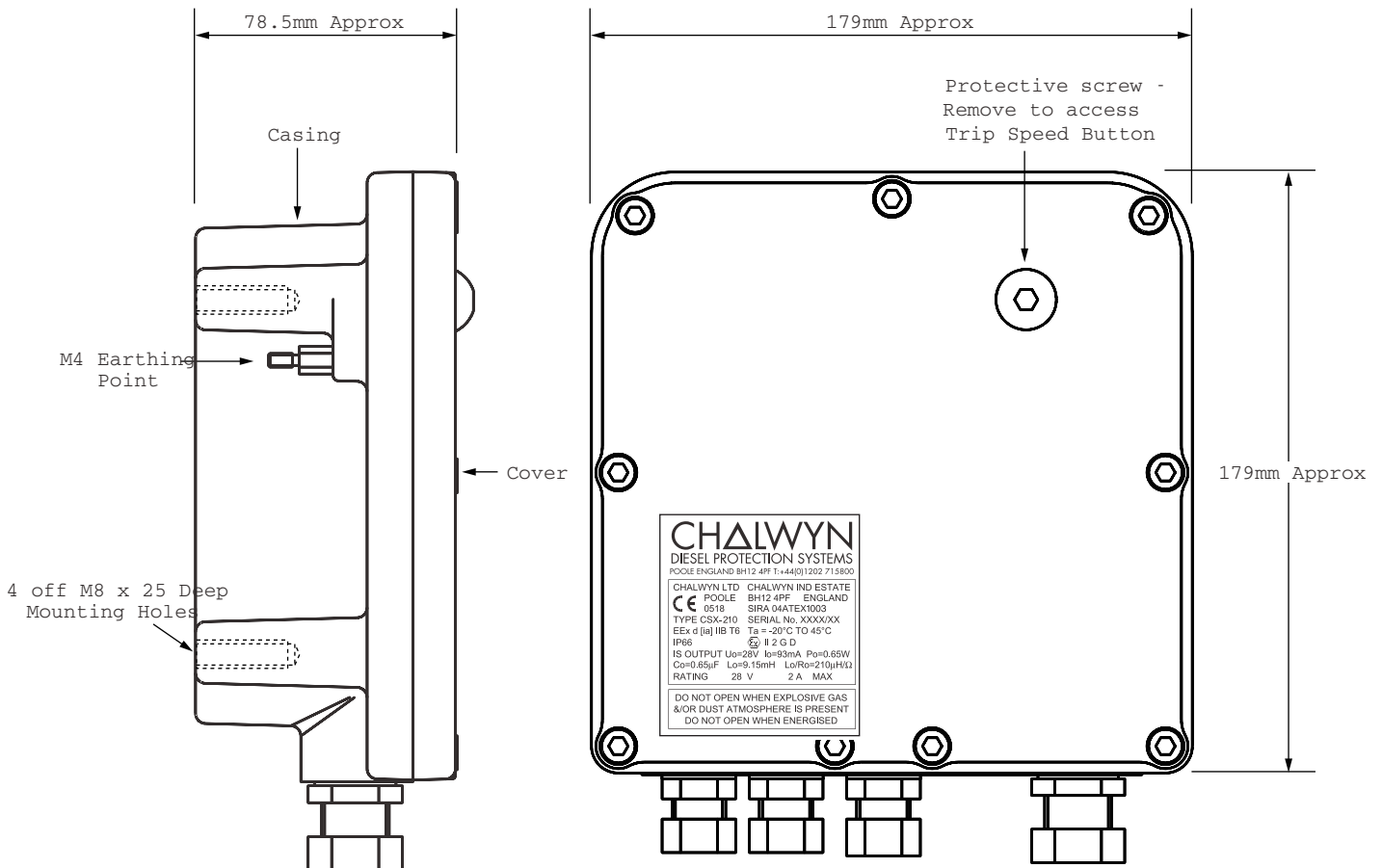
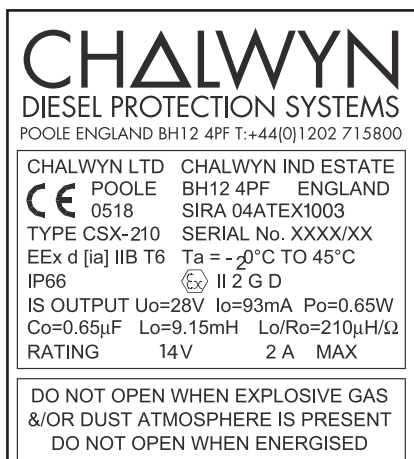
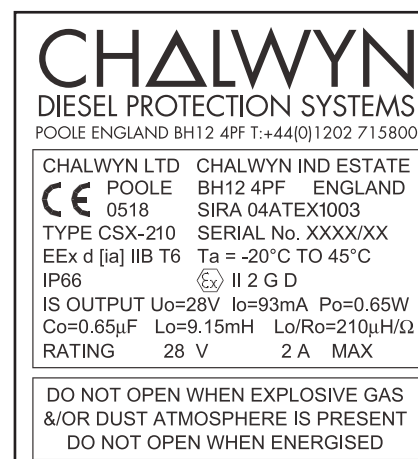


Diagram 1  
Overall dimensions of CSX-210

Marking of CSX-210 (12 volt input)



Marking of CSX-210 (24 volt input)



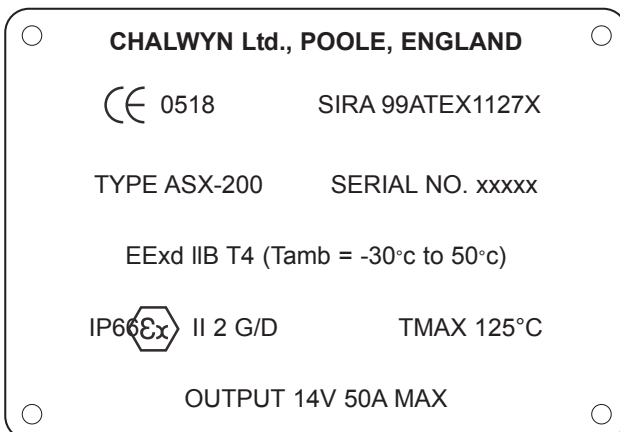
- **Inputs / Outputs**
  - Power and speed signal from alternator via customer's system. 12 or 24 volts. Maximum current 2 amps.
  - Optional shut down signal (eg yellow alert, gas detector) 6V to 110V DC. Factory set to either shut down on signal detected or on loss of signal.
  - Run signal to customer's system. 12 volts. Maximum current 1 amp.
  - I.S. sensor circuit.
- **Shut Down Speed Settings**
  - Maximum set to 20% above speed at which overspeed button is released during setting.
  - Minimum speed 800 rpm (alternator) - not adjustable.
- **Overspeed trip setting range**
  - 1300 rpm to 15000 rpm (alternator)
  - Factory setting 6000 rpm (alternator)
- **Maximum combined number of temperature and oil pressure sensors**
  - 5
- **Timeout at engine start up**
  - Speed signal must be detected within 20 seconds of supplying power to the system. If not run signal will cease.
  - Following detection of an acceptable speed signal the sensor circuit is not activated for a further 15 seconds to allow engine oil pressure to build up. (This time delay is not applicable to overspeed detection and shut down).

**Important Note:** Silicone and nitrile seals are fitted in the Control Unit and cable glands. Ethyl cyanoacrylate and Araldite 2014 epoxy adhesives are used to bond the lid seal and the product label respectively. The characteristics of these materials, together with the characteristics of the basic constructional materials of the Control Unit and the zinc plated steel fasteners, with regard to attack by aggressive substances shall be taken into account when installing or using the product in a hazardous area.

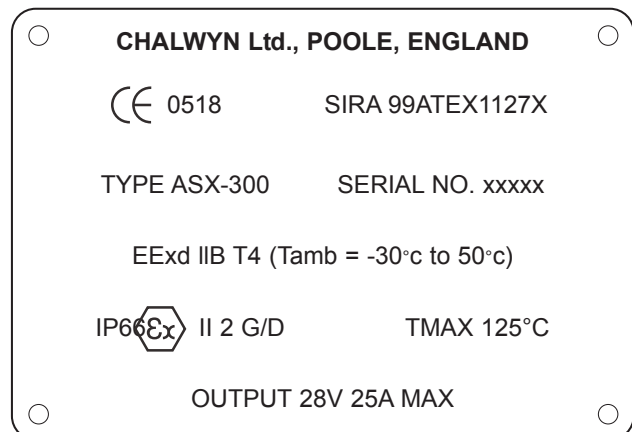
## Chalwyn ASX-200 or ASX-300 Alternator

Twelve pole, rotating field coil battery excited alternator enclosed within a machined die cast aluminium body and end covers. These alternators are marked:

ASX-200:



ASX-300:



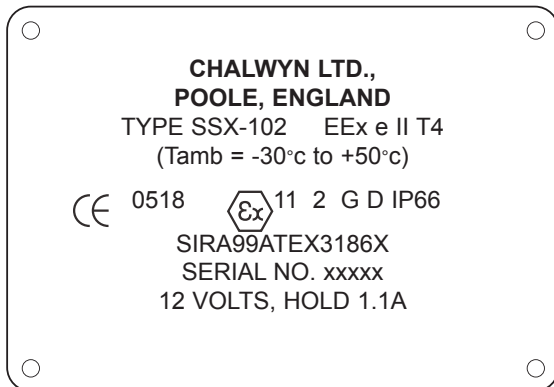
Full details of these alternators are given in Chalwyn publication CE211.

**Important Note:** Elastomeric cable seals are fitted to the Alternator. The characteristics of this material with regard to attack by aggressive substances shall be taken into account when installing or using the product in a hazardous area.

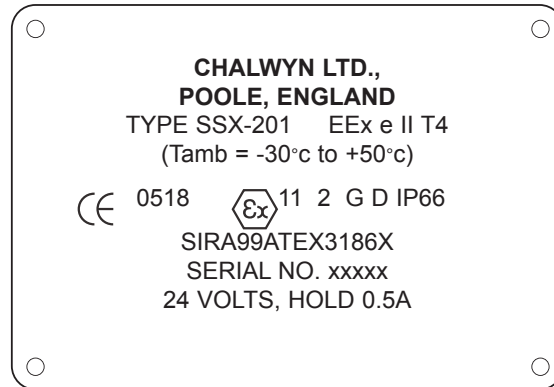
## Chalwyn SVX-320/SVX-330/SVX-520/SVX-530/ SVX-820/SVX-830 Air Intake Shut down valves

12 or 24 volt energised to run solenoid operated 3, 5 or 8" bore butterfly valves suitable for mounting between flanges or supplied fitted with hose adaptors. Valve bodies and discs manufactured in corrosion resistant hard anodised aluminium. Valve spindle made from 316 grade stainless steel. These valves are marked as follows:

Marking for 12 volt valves:



Marking for 24 volt valves:



### IMPORTANT NOTES: SOLENOIDS FITTED TO SVX VALVES

Araldite epoxy adhesive and an elastomeric cable seal are used in the construction of these solenoids. The characteristics of these materials with regard to attack by aggressive substances shall be taken into account when installing or using the product in a hazardous area.

Full details of SVX-320/SVX-330/SVX-520/SVX-530/SVX-820/SVX-830 valves are given in Chalwyn publication CE219.

## Chalwyn Temperature Switches TSX-100, TSX-135, TSX-150 and TSX-200

Immersion type temperature switches with pneumatically sealed electrically isolated cases. Designed for monitoring coolant and exhaust temperatures. Standard settings are 100°C, 135°C, 150°C and 200°C.

Full details of the Temperature Switch range are given in Chalwyn publication CE304 and CE306.

## Chalwyn Pressure Switches PSX-010

Low oil pressure switch with electrically isolated body pre-set to 10psi (falling).

Full details of the PSX-010 are given in Chalwyn publication CE305.

**Note:** If required Chalwyn also supply a range of flameproof solenoids for fuel pump shut down lever operation. See Chalwyn publication CE212.

## SELECTION

The Series 210 System is designed for Zone 1/Group IIB/T4 hazardous area applications.

Select either 12 or 24 volts to match the existing power supply/battery voltage in use on the engine (If neither battery or other power system supply is available, consider using the Chalwyn Series 110 or Series 111 Systems).

Select either 3", 5" or 8" diameter bore SVX air

intake shut down valve. If hose adaptors are required for the SVX valve, identify the size from range in table below (see also Installation Mechanical).

Note that these intake shutdown valves have separate "pull" and "hold" coil connections. A suitable timer circuit will need to be provided to ensure rapid switching from "pull" to "hold" connections when valve opens.

### Hose Adaptor Options

Valve Type	Hose Adaptor	Hose Adaptor Nozzle Outside Diameter (mm)
SVX-320 SVX330	HAX-3 Range	Various sizes from 51(2") to 102(4")
SVX-520 SVX530	HAX-5 Range	Various sizes from 89(3.5") to 152(6")
SVX-820 SVX830	HAX-8 Range	178(7") or 203(8")

## INSTALLATION (Mechanical)

### CSX-210 Control Unit

Using the four M8 x 25 tapped holes in the base of the unit, mount the Control Unit to a sturdy plate.

[NOTE: The length of the fastener into tapped holes must not exceed 22mm.] Ensure the mounting plate is supported and positioned to:

- a) Minimise vibration transmitted to the Control Unit.
- b) Give good access to the Trip Speed Setting Button without causing a hazard whilst the engine is running.
- c) Enable the electrical cables to be routed away clear of hot surfaces and moving parts.
- d) Ensure that the Control Unit is not subject to an effective ambient temperature exceeding 45°C.

### ASX-200 or ASX-300 Alternator

1. Remove any existing non flame proof alternator from the diesel engine.
2. Check the alternator drive pulley ratio. In the case of fixed speed applications the pulley drive should be arranged to give a continuous alternator speed of between 5,000 rpm and 7,000 rpm. In the case of variable speed applications the pulley ratio should be selected to give an alternator speed of 2000 to 2,500 rpm at the engine low idle. This typically equates to a normal operating alternator speed range of about 3,500 rpm to 8,000 rpm.
3. Prepare to fit the Chalwyn alternator in place of the standard alternator by modifying the support bracket and belt tensioning link as necessary. Check that adequate belt adjustment is available. Ensure that with the selected cable entry position, the alternator cable can be routed away from the alternator in such a way as to avoid potential mechanical or heat damage.
4. Ensure that the Alternator is not operated in an ambient temperature exceeding 50°C.

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## SVX Air Intake Shut Down Valve

1. In the case of a naturally aspirated engine, the Chalwyn SVX shut down valve should generally be fitted as close to the engine air intake manifold as possible. If an air intake flame trap is also fitted, the SVX valve must be installed upstream (air cleaner side) of the flame trap.
2. If the engine is turbocharged, fit the SVX downstream (engine side) of the turbocharger if space permits. Any flame trap must be installed between the SVX valve and engine.
3. Where more than one SVX valve is installed on an engine, as in the case of an engine with multiple intake pipes, the shut down valve control system must be arranged to ensure all valves close simultaneously.
4. This valve may be installed either horizontally or vertically.
5. Ensure that when installed the effective ambient at the SVX valve solenoid will not exceed 50°C.
6. If hose adaptors are used, the mating hose should be of a reinforced type, provide adequate support for the valve and prevent excessive vibration. If necessary, additional support brackets mounted from the engine should be considered.
7. Particular care must be taken to ensure the integrity of the intake pipework between the Chalwyn valve and intake manifold. Ideally metal pipework should be used and any gaps kept as short as possible, taking into account any relative movement, and closed by re-inforced hose.
8. Any engine crankcase breather connections into the intake system between the SVX valve and engine, or any internal crankcase breather arrangement venting directly into the engine intake ports must be sealed and replaced by an external breather system venting either to atmosphere or to the intake system upstream of the shut down valve. External breather system kits for various engine types are available from Chalwyn.

## TSX Temperature Switches and PSX Pressure Switches

Fit into the exhaust, coolant and oil pressure systems as appropriate. Ensure that the flying leads can be routed to the CSX Control Box avoiding hot surfaces and moving parts.

## INSTALLATION (Electrical - Customer Supply)

1. The customer part of installation to be arranged to:

- a) Provide a 12 or 24volt/2 amp supply to the Chalwyn CSX-210 Control Box when the system ignition switch is in the run and start position only.
- b) Power the air intake valve solenoid and fuel pump shut down solenoid when the “run” signal from the CSX-210 Control Box is present and remove power when the “run” signal is not present.

**Note: Chalwyn Air Intake and Fuel Pump Shut Down Solenoids**

- Pull Current at 23°C : 46 amps (12 volt types) or 25 amps (24 volt types)
- Hold Current at 23°C : 1.1 amps (12 volt types) or 0.5 amps (24 volt types)
- Pull coil should not be powered for more than 0.5 seconds continuously.
- Yellow/Green wire is the pull coil supply
- Brown wire is the hold coil supply
- Blue wire is the common return
- The solenoid should be earthed using the earth tag of the cable gland.

- c) Include a timer switch for “pull” to “hold” current within 0.2 seconds of the “pull” coil being powered.

**Note:** A back up safety device must be incorporated to de-energise the pull coils of the solenoids if they are energised for more than 14 seconds continuously.

- d) Include an ignition switch between the battery (or other power supply) and the supplies to the CSX-210 and D+ terminal of the alternator. The ignition switch should be designed such that between starting attempts it is not necessary to de-energise the solenoids. If the engine is an unattended unit fitted with an automatic start arrangement, the control system providing the power to the solenoid must be designed to restrict the number of times the pull coil is energised to a maximum of 6 times per 30 minutes followed by a 30 minute rest before repeating the cycle.
- e) Include a warning light or equivalent 300 ohm resistor between the ignition switch and the D+ terminal of the Chalwyn alternator.
- f) Include a manual emergency stop button to directly isolate the supply from the shut down solenoids.

**Note:** The Series 210 system shall be installed in accordance with IEC 60079.14 or relevant local and national regulations.

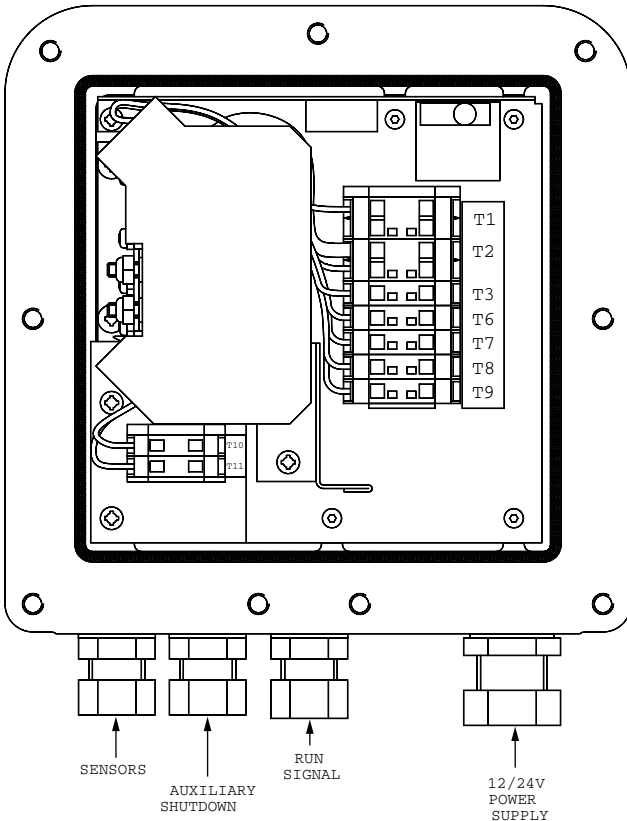


## INSTALLATION (Electrical - Chalwyn System)

Diagram 2

### CSX-210

Control Unit with cover removed



1. After mounting the Control Unit check it is satisfactorily grounded to the engine frame. Use the M4 earth connection point provided. An M4 ring connection and a minimum cable core section of 4mm<sup>2</sup> is required.

2. Use the IP67 connectors supplied to connect the flying leads of the sensors via a twin core cable (outside sheath diameter between 6mm and 12mm) and the appropriate gland to terminals T10 and T11 of the Control Unit. Fit uninsulated bootlace ferrules to the cable ends before inserting into terminals. See Diagrams 2 and 4. Fit a cable clamping device as close as possible to the cable gland.

3. Connect any auxiliary shut down signal input via twin core cable (outside diameter 6mm to 12mm) and the identified Control Unit gland to terminals T8 and T9. See Diagram 4. Fit a cable clamping device as close as possible to the gland.

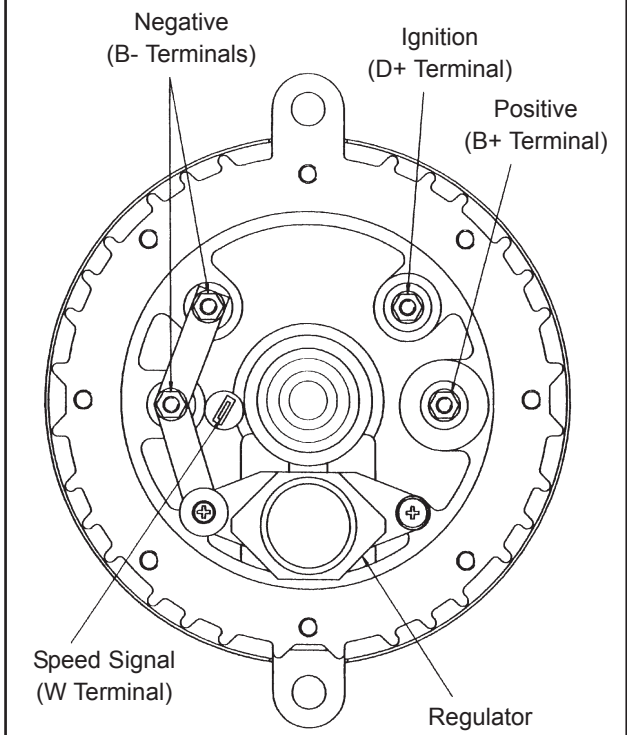
4. Connect the run signal terminals T6 and T7 via the run signal gland to the customer supplied part of the system. Use twin core cable with an outside diameter between 6mm and 12mm. Fit a cable clamping device as near as possible to the cable gland.

5. Remove rear cover of alternator. Prepare correctly rated cable for connecting to the customer supplied system. Armoured cable with four cores of minimum cross section of 4mm<sup>2</sup> and an inner sheath diameter between 12mm and 20.5mm is required. See also "Special Note" below. The standard alternator gland fitted is intended for sealing on the cable inner sheath. Note that the B+, B- and D+ terminals of the alternator are designed for M5 ring connections. When slackening or tightening the "Nyloc" terminal nuts, particular care should be taken not to slacken the M5 nuts at the base of the terminal posts. Check these are tight after removing the "Nyloc" nuts. When tightening the Nyloc nuts prevent the terminal post nuts from rotating by holding with an open end spanner. The speed signal connection should be made using a right angle spade connector to avoid bending the cable (eg. RS part 161-2008). Use ties to restrain the cables to prevent mechanical damage.

Diagram 3

### ASX-200/ASX-300

Rear Cover removed to show Terminals



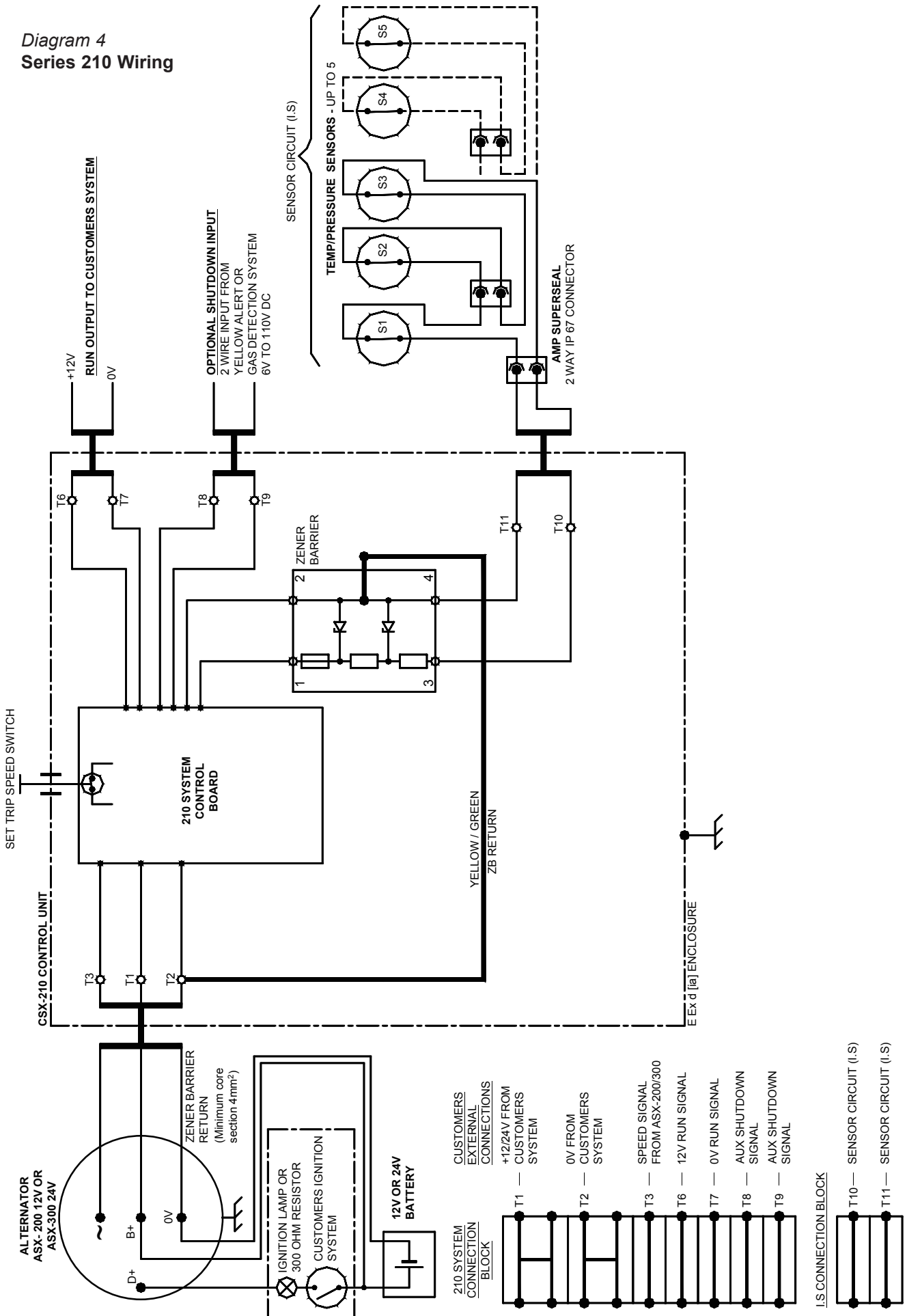
#### Special Notes:

The cable entry point exceeds 70°C under rated conditions, therefore, in accordance with EN 50014:1997 clause 16.8, suitably rated cable shall be selected for installation.

When preparing cable for fitting through cable glands always follow the gland manufacturers instructions.

- 6.** Refit the alternator rear cover after ensuring the 'O' ring seal is undamaged and is properly seated in the seal groove. Torque the rear cover fasteners to 15Nm.
- 7.** Bond the alternator cable armour to earth at the non-alternator end of the cable.
- 8.** Fit a cable clamping device as near as possible to the alternator entry gland.
- 9.** Connect the alternator speed signal, power supply (2 amps) and return between the customer's system and the CSX-210 Control Unit. Use 3 core armoured cable with an outer sheath of 12mm to 21mm diameter and an inner sheath of 8.5mm to 15.5mm diameter. The wire cores must be a minimum of 4mm<sup>2</sup> section. Smaller section must not be used as the return is also the zener barrier return. Bond the cable armour to earth at the CSX-210 Control Unit gland only.
- 10.** On completion of wiring check that the system is isolated from the engine frame by completing a continuity check between each terminal inside the Control Unit and the casing.
- 11.** Fit the cover to the CSX-210 Control Unit and torque fasteners to 12Nm.

Diagram 4  
Series 210 Wiring



## OPERATION

1. On first start after installation the overspeed trip point must be set up as follows:
  - a) Remove the Protective Screw from the Control Unit Cover to expose the Trip Speed Setting Button.
  - b) Turn ignition on and immediately start engine.

**Note:** Between start attempts do not de-energise solenoids by turning ignition off. If the engine fails to start within 20 seconds after turning ignition on, the solenoids will then automatically de-energise and the ignition will need to be turned off and on to re-energise. Do not re-energise the solenoids more than six times in any 30 minute period followed by a 30 minute rest before repeating the cycle.

- c) Run engine for about 15 to 20 seconds to allow oil pressure to build up.
- d) Initially for checking purposes set the overspeed trip to a speed in the normal operating range of the engine by slowly increasing the engine to a mid range speed and then pressing and releasing the Trip Button. The engine will shut down indicating that the trip point has been programmed.
- e) Re-start the engine. After running for 15 seconds, slowly accelerate the engine and check shut down occurs at exactly 20% above the speed at which the Trip Button was released.
- f) Using the same procedure as above, reset the overspeed trip point to the final value required for operation in the field.

**Notes:** If at any time during this set up procedure a problem arises the engine may be stopped by turning off at the ignition key or pressing the emergency stop button  
To increase the trip speed setting from a lower to a higher value, the Trip Speed Setting Button must be continuously held in from engine start up and then released at the appropriate speed as per the above setting instructions.  
For many applications a suitable overspeed shut down setting will be 20% above the engine high idle (full throttle, zero load) speed.

- g) Refit the Protective Screw to cover the Trip Speed Setting Button. The engine may now be re-started. Check the operation of the manual emergency stop. Check the operation of the sensor circuit by breaking at one of the connection blocks but only after leaving the engine running at least 15 seconds after start up. This should give immediate shut down.
2. Once set up, normal engine start up procedure is as per 1(b) and Note.

## MAINTENANCE

Carry out the following maintenance schedule. Any problems identified must be rectified prior to returning the equipment to service.

**Note:** *Further maintenance data can be found in the Chalwyn publications for the individual items – see “Component Description”.*

### Monthly:

Check that the fasteners locating the SVX valve and any associated intake system or support brackets are tight.

Check that any flexible pipework between the SVX valve and engine is free from damage and suitable for further service.

Ensure all electrical and mechanical cables are properly supported and free from damage.

Check alternator drive belt is in serviceable condition and correctly tensioned. Check alternator mounting fasteners are tight.

Start engine. Run at or just above low idle speed. Carry out a manual emergency stop. The engine should stop within a few seconds.

### Three Monthly:

Check all glands and cable clamping devices are tight.

Check end float of the alternator cooling fan. This must not exceed 0.2mm when the alternator is cold.

Check the alternator fan to cowl clearance. At its worst point this must be greater than 1mm.

### Six Monthly:

Remove cover and carry out an internal inspection of the CSX-210 Control Unit. Check all visible wiring is in serviceable condition and terminations are tight. Ensure there is no sign of dust or moisture ingress and that the lid seal is in a serviceable condition. Check system isolation is maintained by completing a continuity check between each terminal point inside the Control Box and casing. Refit cover and torque fasteners to 12Nm.

Remove temperature and pressure sensors. Check operation and calibration. Refit.

Start engine. Run at or just above low idle speed. After 15 seconds break the sensor circuit at one of the connectors. The engine should immediately shut down.

### Yearly:

Remove alternator rear cover. Loosen the two fasteners locating the regulator carefully noting the

position of the insulating and steel washers (see Diagram 3). Replace regulator and brush assembly with a new assembly ensuring the various washers are replaced correctly. Note that particular care is required to ensure that the surfaces of the insulating washers remain clean. Clear any dust from the rear cover. Check cable condition is acceptable for further use and terminals are tight. Check rear cover ‘O’ ring seal is serviceable and properly located in the seal groove. Refit rear cover torquing fasteners to 15 Nm. Tighten cable gland. Check air passages under the fan cowl are clear of any significant build up of foreign matter.

### Important Maintenance Notes

The M6 socket head cap screws utilised for fastening the end covers of the alternator must only be replaced by cap screws with a yield strength better or equal to 830 N/mm<sup>2</sup> in accordance with EN50018:1994 clause 11.3.

Always consult Chalwyn if a defective item/system is identified or return defective parts to Chalwyn Ltd for repair.

Never open electrical enclosures when hazardous gas or dust may be present.

Only properly qualified staff are permitted to service hazardous area equipment.







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