

Congratulations !

Your new **proCHEM-DI** controller is the latest in simple, reliable process control instrumentation. With correct operation and maintenance, your **proCHEM-DI** will give you many years of reliable service.

The **proCHEM-DI** is a breeze to operate. This manual has been designed to help you get started, and also contains some handy application tips. If at any stage you require assistance, please contact either your local TPS representative or the TPS factory in Brisbane.

The manual is divided into the following sections:

1. Table of Contents

Each major section of the handbook is clearly listed. Sub-sections have also been included to enable you to find the information you need at a glance.

2. Introduction

The introduction has a diagram and explanation of the display and controls of the **proCHEM-DI**. It also contains a full listing of all of the items that you should have received with the unit. Please take the time to read this section, as it explains some of items that are mentioned in subsequent sections.

3. Main Section

The main section of the handbook provides complete details of the **proCHEM-DI**, including operating modes, calibration, troubleshooting, specifications, and warranty terms.

4. Appendices

Appendices containing background information and application notes are provided at the back of this manual.

proCHEM-DI Process Controller

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1. Introduction

1.1 Overview

The dryness of sugar is an important factor in the handling, storage, and pricing of the product. It is desirable that the Dryer does not remove too much of the moisture (or if it does, that the correct moisture level be re-established with sprays). Sugar dryness is measured in terms of a Dilution Indicator (DI), which increases with moisture content. Typical values lie between 30 and 50 %.

Water content can be measured Gravimetrically by drying techniques of selected samples, but Conductivity offers an on-line measurement procedure which allows automation by a closed-loop process control system.

Water content, as measured by conductivity, depends on the dissolved salts in the water of the sugar itself, plus the dissolved salts in the water which may be used for misting after the dryer. For any one general geographic area, the salts content of the water is sufficiently fixed to allow conductivity techniques to work well. Conductivity also varies with temperature. The TPS controller includes an Automatic Temperature Compensation system which normalizes the measurement against temperature effects. The display is then one of sugar moisture content, plus impurities.

The sensor is a 2 arm Conductivity electrode which includes a Temperature sensor for Automatic Compensation in one of the arms. The electrodes are brass which has good wear resistance and is almost fully self-cleaning in the sugar flow. The sensor can be mounted rigidly in most cases. It can also be provided with pivot points, so that it can trail in the sugar on the belt if desired. The sensor cable is 5 Metres in length, but this can be ordered for longer lengths if required.

The controller provides a Linear, Temperature Compensated readout of the D.I. The full scale span can be adjusted over a large range to accommodate the dissolved solids moisture content of the local application. Heavy filtering of the signal removes the fine fluctuations in the data.

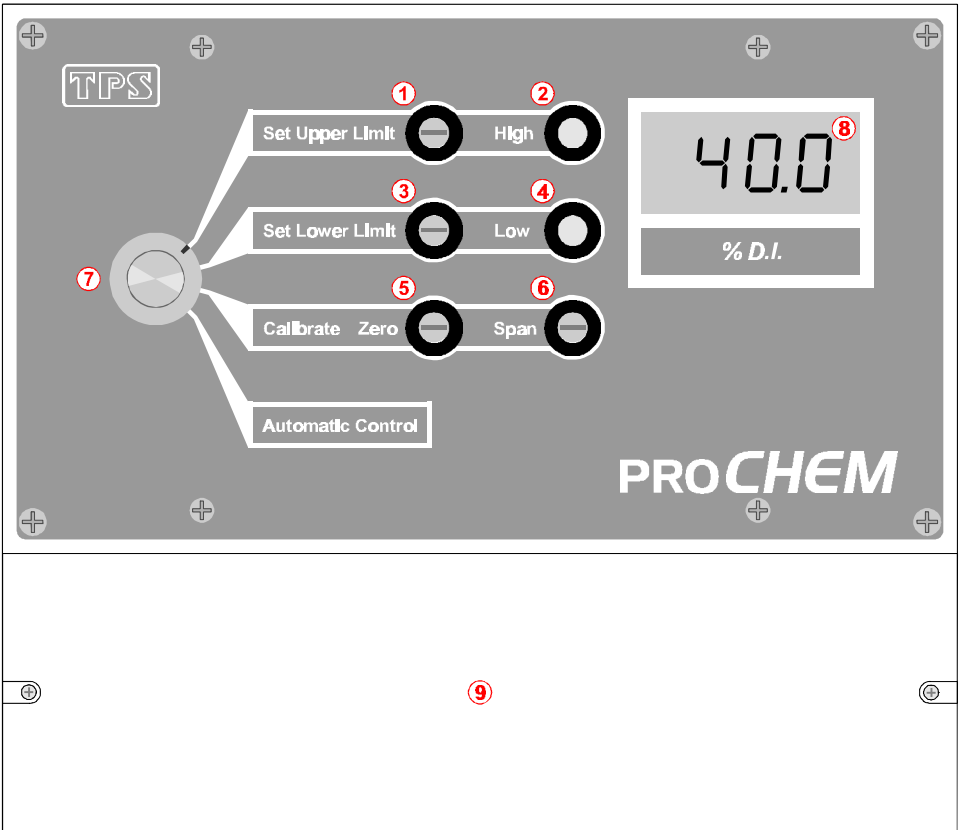
The **proCHEM-DI** has an adjustable LOWER LIMIT setting. When the D.I.

falls below this value, a control relay and lamp are actuated. The relay can be used for alarm purposes, or for initiating a water spray system located prior to the sensor, to again raise the sugar D.I. level. Control of the water sprays would be by a customer supplied solenoid valve. The result is a closed loop control system, with the D.I. being levelled out.

A recommended sprayer consists of four nozzles (Spraying Systems Co. Part No. 1/4 T730077, which sprays water into the exit area of the dryer at 0.07 Gal/Min at 40 PSI).The dryer rate should be progressively reduced until only occasional spraying is necessary, in order to minimize the dryer fuel costs.

A well controlled system achieves on/offs of the sprays every 30 seconds or so, eliminating physical blockages due to poor sugar flow, as well as the sugar dust nuisance. Over-wet sugar will cause the **proCHEM-DI** to go off-scale, but no damage occurs to the unit. The sensor should be protected from direct rainfall. A complete system should incorporate some provision for Flow sensing to ensure that sugar is moving on the belt from the dryer, and is deep enough to ensure that the bottom of the sensor is immersed. Without such a detector, the sensor could ride clear of the sugar, thus giving a false signal of a sample which was too dry. The sprays would then run continuously. The flow detector should inhibit the power to the solenoid valve. Similarly, if the conveyor belt stops, the power to the valve should also be inhibited. The correct type of flow/depth sensor should protect against both situations.

1.2 proCHEM-DI Illustration



① **Set Upper Limit Control**

Adjust this control to the D.I. value at which the High LED and relay output are activated. Factory-set to activate when the reading is **above** the Upper Limit. See section 3.5.

② **High LED**

The High LED provides visual indication of when the Upper Limit has been exceeded. Factory-set to light up when the reading is **above** the Upper Limit. See section 3.5.

③ **Set Lower Limit Control**

Adjust this control to the D.I. value at which the Low LED and relay output are activated. Factory-set to activate when the reading is **below** the Lower Limit. See section 3.5.

④ **Low LED**

The Low LED provides visual indication of when the Lower Limit has been exceeded. Factory-set to light up when the reading is **below** the Lower Limit. See section 3.5.

⑤ **Zero Calibrate Control**

Adjust this control to calibrate the **proCHEM-DI** with the sensor dry and in air. See section 4.

⑥ **Span Calibrate Control**

Adjust this control to calibrate the **proCHEM-DI** in a typical sugar sample. See section 4.

⑦ **Function Switch**

The Function Switch is used to select the mode of operation. See section 2.

⑧ **Display Window**

The **proCHEM-DI** has a large, easy to read LCD display. The units of measurement are clearly shown in the window beneath the display.

⑨ **Terminal Cover**

The terminal cover provides easy access to all of the connections, relay output fuses, configuration jumpers and user-adjustable trimmers. The cover is water resistant to IP65.

1.3 Unpacking Information

Before using your new **proCHEM-DI**, please check that the following accessories have been included:

	Part No
1. proCHEM-DI Process Controller	111122
2. proCHEM-DI Handbook	130050

Sensor and cable:

1. Sugar Moisture Probe, for proCHEM-DI	112204
2. Cable for Sugar Moisture Sensor, 5m	130047
3. Extra cable for sensor (order by the metre)	130040

Instrument options:

1. Option to run unit on 12V DC	130072
2. 4-20mA loop-powered, remote LCD	130080
3. 420-Toolbox module to customise 4-20mA output	130118
(e.g. isolate, reverse or otherwise alter the standard 4-20mA output)	

1.4 Specifications

Range.....	0 to 50.0 % D.I.
Resolution.....	0.1% D.I.
Accuracy.....	±0.1 D.I.
Ambient Drift.....	<0.1% D.I. PE 10 °C change
Long term drift	<0.1% per year
Temperature Compensation	Automatic, 0 to 100.0 °C
Sensors	Insulated solid brass rods
Enclosure.....	Polycarbonate, waterproof to IP65
Display.....	12.7 mm LCD (optional remote 4-20mA loop powered display available)
Analogue Outputs.....	4 to 20mA (500 Ohms max. loop resistance) 0 to 1 V DC (min. load 1000 Ω) 0 to 10 V DC optional (min. load 1000 Ω)
Control Outputs	2 x Clean contact changeover relays, rated to 2A at 240V AC
Isolation	Galvanic isolation of sensor input Analogue outputs are not isolated.
Power	240V AC, 50/60Hz (120V AC optional)
Dimensions.....	215 x 190 x 115 mm
Mass	Instrument only : Approx 900g Full Kit : Approx 1.5kg
Operating Environment:.....	Temperature : 0 to 45 °C Humidity : 0 to 95 % R.H.

2. Operating Modes

The function switch is used to select the required mode. The four operating modes available are...

1. **Set Upper Limit** : Switch to **Set Upper Limit** when setting the D.I. value at which the High LED and relay output are activated. The relay output is not operational in this mode.

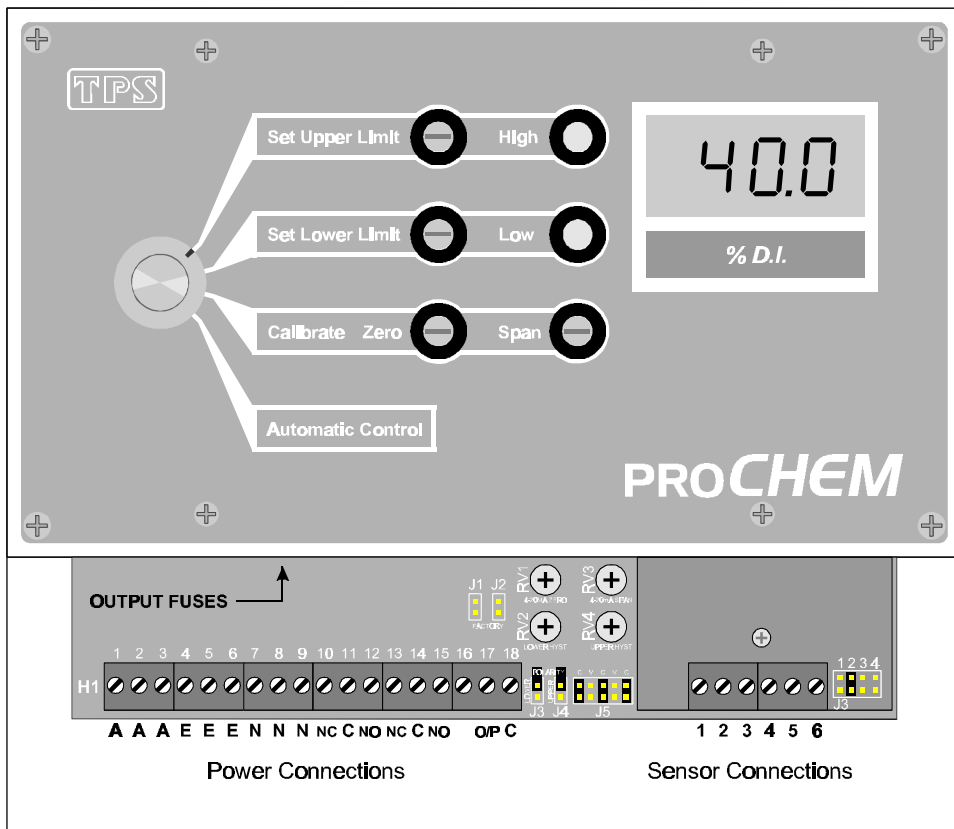
Factory-set to activate when the reading is **above** the Upper Limit. Can be user set to be a activate when the reading is **below** the Upper Limit. See section 3.5.
2. **Set Lower Limit** : Switch to **Set Lower Limit** when setting the D.I. value at which the Low LED and relay output are activated. The relay output is not operational in this mode.

Factory-set to activate when the reading is **below** the Lower Limit. Can be user set to be a activate when the reading is **above** the Lower Limit. See section 3.5.
3. **Calibrate** : Switch to Calibrate mode to place the **proCHEM-DI** into standby (eg. when calibrating). This mode disables the two output relays to avoid unintentional activation of control outputs.
4. **Automatic Control** : Switch to **Automatic Control** to enable the Alarm LED's and relay outputs. These will be activated when the D.I. is outside the Upper and Lower limit values. See section 3.5.

3. Installation and Set-up

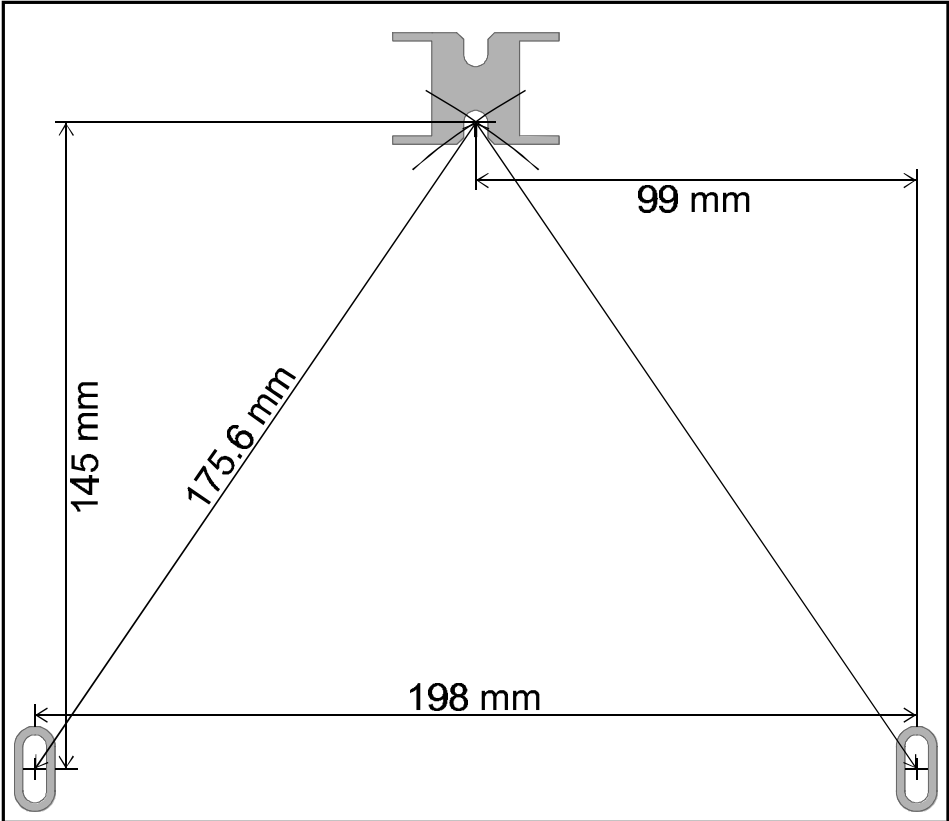
3.1 Connection and Configuration Diagram

The diagram below is provided as a reference for the terminal connections, configuration jumpers and user-adjustable trimmers that are discussed throughout this section.



3.2 Mounting the Enclosure

The **proCHEM-DI** can be wall-mounted with 3 screws. Two mounting points are located underneath the terminal cover, and are positioned so that they do not affect the waterproofing of the enclosure. The third mounting point is centrally located near the top of the rear of the enclosure, and has been designed to hook over a screw-head. The dimensions for the mounting screw centres are provided on the rear of the enclosure, and are also illustrated below...



3.3 Mounting the Sensor

The sensor should be protected from direct rainfall. A complete system should incorporate some provision for Flow sensing to ensure that sugar is moving on the belt from the dryer, and is deep enough to ensure that the bottom of the sensor is immersed. Without such a detector, the sensor could ride clear of the sugar, thus giving a false signal of a sample which was too dry. The sprays would then run continuously. The flow detector should inhibit the power to the solenoid valve. Similarly, if the conveyor belt stops, the power to the valve should also be inhibited. The correct type of flow/depth sensor should protect against both situations.

3.4 Terminal Connections

3.4.1 Power Connections

All power connections are on the main terminal block (H1), which has 18 terminals.

Note: The power connections detailed below are for normal mains power. Refer to section 10.1 for power wiring details when the 12V DC power option is fitted.

Terminal No.	Connection	Colour
1	220 / 240V AC Active input	Brown (standard colour)
2	Duplicate 240V AC Active contact.	Brown (standard colour)
3	Duplicate 240V AC Active contact.	Brown (standard colour)
4	220 / 240V AC Earth input	Green (standard colour)
5	Duplicate 240V AC Earth contact.	Green (standard colour)
6	Duplicate 240V AC Earth contact.	Green (standard colour)
7	220 / 240V AC Neutral input	Blue (standard colour)
8	Duplicate 240V AC Neutral contact.	Blue (standard colour)
9	Duplicate 240V AC Neutral contact.	Blue (standard colour)
10	Normally Closed contact of Lower relay output	Customer Defined
11	Common contact of Lower relay output	Customer Defined
12	Normally Open contact of Lower relay output	Customer Defined
13	Normally Closed contact of Upper relay output	Customer Defined
14	Common contact of Upper relay output	Customer Defined
15	Normally Open contact of Upper relay output	Customer Defined
16	No Connection	
17	+ve of current or voltage output	Customer Defined

18	-ve of current or voltage output	Customer Defined
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3.4.2 *Sensor Connections*

All sensor connections are on the 6-way terminal block which is on the right hand side of the enclosure.

Terminal No.	Connection	Colour
1	D.I. Sensor ATC	Red
2	D.I. Sensor ATC	Black
3	No Connection	
4	Guard	Braids of cable
5	D.I. Sensor Rod	Green
6	D.I. Sensor Rod	Yellow

3.5 Setting the Control Limit

The Upper and Lower control limits can both be set over the full scale of the **proCHEM-DI**. The unit is set up in the factory for the Upper Limit LED and relay to be activated when the reading rises **above** the Upper Limit. Similarly, the Lower Limit LED and relay are factory set to be activated when the reading drops **below** the Lower Limit.

See section 3.5.3 for details on how to re-set the Upper or Lower limits for the reverse of the default direction.

The hysteresis around the set point can be also be adjusted if necessary. See section 3.5.4 for an explanation of hysteresis.

3.5.1 *Setting the Upper Limit value*

1. Switch the **proCHEM-DI** to **Set Upper Limit**.

The Upper Limit value is now displayed. Note that the Alarm LED and output relays are now disabled. The 4-20mA or 0-1V outputs are still active, and proportional to displayed value.

2. Adjust the **Set Upper Limit** control until the display reads the desired set point value.

3.5.2 *Setting the Lower Limit value*

1. Switch the **proCHEM-DI** to **Set Lower Limit**.

The Lower Limit value is now displayed. Note that the Alarm LED and output relays are now disabled. The 4-20mA or 0-1V outputs are still active, and proportional to displayed value.

2. Adjust the **Set Lower Limit** control until the display reads the desired set point value.

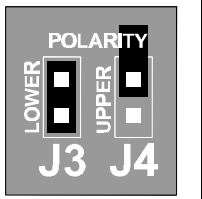
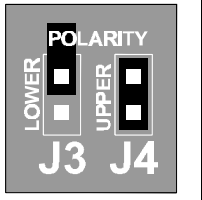
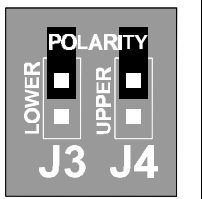
3.5.3 Reversing the default control direction

The Upper Limit control action can be reversed to activate the Upper Limit LED and relay when the reading drops **below** the Upper Limit.

Similarly, the Lower Limit control action can be reversed to activate the Lower Limit LED and relay when the reading rises **above** the Lower Limit.

Having two Limits acting in the same direction can be very useful for processes where the readings always drift in one direction. It allows the operator to set the first Limit as a control point (eg to open a solenoid valve), and the second limit beyond that as an alarm point, in case the control action was not effective.

The **proCHEM-DI** must be switched OFF before changing jumper settings.

<p>To reverse the action of the Lower Limit, and have two Limits that activate the High and Low LED's and relays when the reading rises above the Limits, set the J3 and J4 jumpers as shown.</p>	 <p>The diagram shows two jumpers, J3 and J4, under the heading 'POLARITY'. Jumper J3 is positioned in the 'LOWER' slot, and jumper J4 is positioned in the 'UPPER' slot.</p>
<p>To reverse the action of the Upper Limit, and have two Limits that activate the High and Low LED's and relays when the reading drops below the Limits, set the J3 and J4 jumpers as shown.</p>	 <p>The diagram shows two jumpers, J3 and J4, under the heading 'POLARITY'. Jumper J3 is positioned in the 'UPPER' slot, and jumper J4 is positioned in the 'LOWER' slot.</p>
<p>To re-set the action of the Upper and Lower limits to factory defaults, set the J3 and J4 jumpers as shown</p>	 <p>The diagram shows two jumpers, J3 and J4, under the heading 'POLARITY'. Jumper J3 is positioned in the 'LOWER' slot, and jumper J4 is positioned in the 'UPPER' slot.</p>

3.5.4 Adjusting the Hysteresis

The hysteresis is the D.I. range over which the alarm/control output remains switched on, once the trip point has been exceeded.

For example, if the Lower Limit is set to 40.0 D.I., with a hysteresis of ± 1.0 D.I., the alarm/control output is switched ON when the reading goes to 39.0 (i.e. $40.0 - 1.0$). The output is not switched OFF until the reading goes back up to 41.0 (i.e. $40.0 + 1.0$).

The hysteresis stops the relay “chattering” around the set point, by providing a buffer between the points at which the output is switched ON and OFF. This feature can significantly increase the life of pumps and solenoid valves.

The factory-set hysteresis is approximately ± 1.0 D.I. (regardless of decimal point location), as in the example above. The hysteresis can be increased to as high as ± 4.0 D.I. with the relevant **LOWER HYST** (RV2) or **UPPER HYST** (RV4) trimmers in the terminal area. Turning the trimmer clockwise increases the hysteresis and turning it anti-Clockwise decreases the hysteresis.

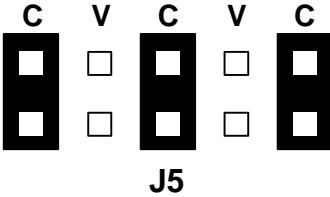
TPS DOES NOT recommend that this setting be altered, unless it is absolutely necessary.

The hysteresis trimmer should only be adjusted a little at time. The process being controlled should then be closely monitored over a time to ensure that the desired control is being achieved.

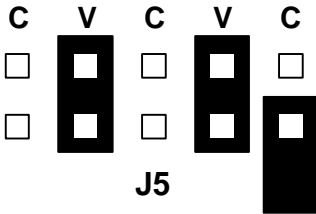
3.6 Selecting Current or Voltage Output

The **Current/Voltage Output** jumpers in terminal section can be user-set for either 4 to 20mA or 0 to 1V DC output. The **proCHEM-DI** must be switched OFF before changing jumper settings.

The jumper settings for 4 to 20 mA output are:



The jumper settings for 0 to 1V DC output are:

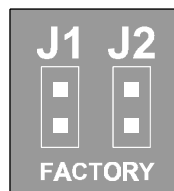


Note that the spare jumper has been fitted to a spare **Current/Voltage Output** jumper pin. This is a safe place to keep it, in case the **proCHEM-DI** needs to be reset to current output in the future.

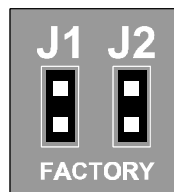
3.7 Selecting Standard or Custom 4 to 20 mA Output

The **proCHEM-DI** is normally supplied to provide 4 to 20 mA for the full scale of the readout. If a custom 4 to 20 mA output (eg. 4 to 20 mA output for 700 to 1000 counts) is supplied, the user can still change between this custom output and the normal 4 to 20 mA output for full scale.

The jumper settings for the standard 4 to 20 mA output are...



The jumper settings for the custom 4 to 20 mA output are...



3.8 Calibrating the 4 to 20mA Output

The 4 to 20mA output of the **proCHEM-DI** is factory calibrated. However, TPS has provided calibration controls for the 4mA and 20mA points in case this requires adjustment in the field.

Calibrating the 4 to 20mA output...

1. Connect a Digital Milliamp Meter between terminals 17 and 18.
2. Switch the **proCHEM-DI** to **Set Upper Limit**.
3. Adjust the **Set Upper Limit** control until the display reads 0.0 (for the standard 4 to 20mA output) or the D.I. that corresponds to 4 mA (for a custom 4 to 20 mA output).
4. Adjust the **4-20mA ZERO** (RV1) trimmer in the terminal area until the Digital Milliamp Meter reads 4 mA.
5. Adjust the **Set Upper Limit** control until the display reads 50.0 (for the standard 4 to 20mA output) or the D.I. that corresponds to 20 mA (for a custom 4 to 20 mA output).
6. Adjust the **4-20mA SPAN** (RV3) trimmer in the terminal area until the Digital Milliamp Meter reads 20 mA.

*In the event that the **LIMIT** control does not have sufficient adjustment to reach 0.0 or 50.0, calculate the expected output level and use this for calibration. Remember that the difference between 0.0 and 50.0 is to be made 16mA.*

4. Calibration

4.1 Calibration Procedure

1. Switch the **proCHEM-DI** on.
2. Ensure that the D.I. sensor is correctly connected (see section 3.4.2).
3. Set the function switch to **Calibrate**, to ensure that the relay outputs are not activated during calibration.
4. Rinse the D.I. sensor in distilled water and blot dry. In particular, ensure that the area of plastic joining the two brass rods is clean and dry.

Zero Calibration

5. With the sensor dry and in air, adjust the **Zero** control until the display reads exactly zero.

Span Calibration

6. There is no specific “calibration standard” available for D.I. sensors. Calibration is therefore by reference to a measured value. Measure the D.I. value of the sugar on the conveyor by gravimetric or other laboratory technique.
7. Adjust the **Span** control until the display reads the measured value.
8. Continue to monitor the moisture content of the sugar by laboratory methods periodically, to ensure that the required D.I. level is being maintained.

4.2 Calibration Notes

1. The Zero calibration is quite stable long term, and only needs to be performed monthly as a routine check.
2. The Span calibration settings will be effected by the condition of the brass rods. The sugar on the moving conveyor will actually keep these rods quite clean, so Span calibration should be stable long term. A monthly calibration check should be performed as a routine check.
3. To check the operation of the **proCHEM-DI**, the following resistances can be applied to terminals 5 & 6 instead of the sensor. The ATC connections in terminals 1 & 2 must still be in place.
22 Meg-Ohms : 50.0 D.I.
44 Meg-Ohms : 38.7 D.I.

5. Process Monitoring

Once the **proCHEM-DI** has been installed, connected and calibrated, it can be used for continuous monitoring. To monitor the process, WITHOUT any control or alarm functions switch the function switch to **Calibrate**.

6. Automatic Control

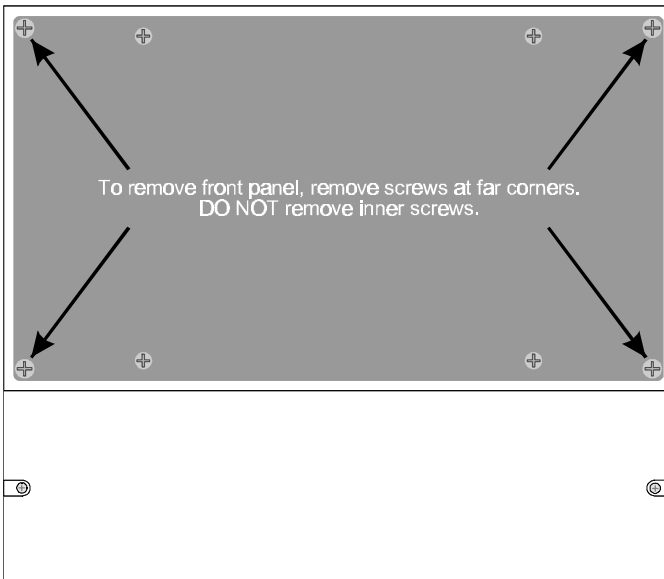
For Automatic Alarming or Control, switch the function switch to **Automatic Control** to enable the Alarm LED's and the relay outputs. These will be switched ON while the D.I. exceeds the limit value, and will switch OFF once the D.I. is back within the limit.

7. Fuse Replacement

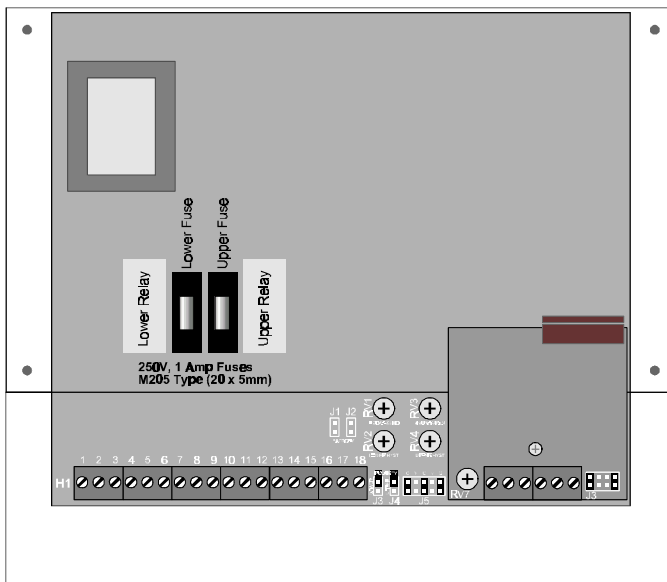
If the current drain from any device connected to the output relay exceeds 1 Amp, the output protection fuse will blow.

To replace the fuse...

1. SWITCH THE **proCHEM-DI** OFF.
2. Remove the main front panel by unscrewing the 4 screws at each corner and pulling out. Caution : The front circuit board is connected to the rear circuit board with a ribbon cable, so care must be taken.



3. Locate the fuse holders, and pull out the black fuse carrier of the blown fuse.



4. Replace the blown fuse with a 250V 1 Amp, M205 type. M205 fuses are 20 x 5 mm.
5. Push the fuse carrier with the new fuse back into place.

ALWAYS REPLACE THE FUSE WITH A 1 AMP, 240V FUSE. USING A FUSE WITH HIGHER CURRENT RATING MAY DAMAGE YOUR CONTROLLER, VOIDING THE WARRANTY.

Before switching the **proCHEM-DI** back to **Automatic Control** mode, ensure that the cause of the blown fuse has been eliminated.

If the current drain of the device connected to the relay output is greater than 1 Amp, an external contactor should be used. Please consult an electrical contractor or TPS for details.

8. Troubleshooting

8.1 Instrument Function Troubleshooting

Symptom	Possible Causes	Remedy
No display	<ol style="list-style-type: none"> 1. Mains power input not switched on. 2. Mains power input incorrectly connected. 3. Instrument is faulty. 	<p>Switch power ON.</p> <p>Check connections (see section 3.4.1).</p> <p>Return to TPS for repair.</p>
Alarm LED or relay output do not operate when limit is exceeded.	<ol style="list-style-type: none"> 1. Limit not set correctly for “too high” or “too low” alarm/control. 2. Hysteresis too large. 3. Fuse has blown. 4. Instrument is faulty. 	<p>Set the J3 or J4 Polarity jumpers correctly (see section 3.5.3).</p> <p>Check and adjust the Hysteresis trimmer (see section 3.5.4). If in doubt, set this to minimum level.</p> <p>Check and replace fuse if necessary (see section 7).</p> <p>Return to TPS for repair.</p>
Incorrect analogue output signal.	<ol style="list-style-type: none"> 1. Current/Voltage Output jumpers incorrectly set for required output. 2. 4-20mA loop resistance too high. 3. Load on 0-1V DC output is too low. 4. 4-20mA output is not calibrated. 5. Instrument is faulty. 	<p>Check that the Current/Voltage Output jumpers are correctly set for 4-20mA or 0-1V, as per requirements. Adjust if necessary (see section 3.6).</p> <p>Ensure loop resistance does not exceed 500 Ohms.</p> <p>Ensure load is 1000 Ohms minimum.</p> <p>Calibrate 4-20mA output (see section 3.8).</p> <p>Return to TPS for repair.</p>

8.2 D.I. Troubleshooting

Symptom	Possible Causes	Remedy
Zero calibration fails (insufficient range with ZERO control).	<ol style="list-style-type: none"> 1. Electrode has Zero error. 2. Sensor is faulty. 	<p>Thoroughly rinse electrode in distilled water and allow to completely dry in air before attempting zero calibration.</p> <p>If instrument does not calibrate at Zero with electrode disconnected, then the instrument is faulty. Replace sensor.</p>
Span calibration fails, reading is too low and cannot be adjusted high enough.	<ol style="list-style-type: none"> 1. Electrode may have a build-up of dirt or oily material on electrode rods. 2. Electrode is faulty. 	<p>Clean electrode with distilled water, methylated spirits or other cleaning agent that will not harm brass.</p> <p>Return electrode to factory for repair or replacement.</p>
Standard calibration fails, reading is too high and cannot be adjusted low enough.	<ol style="list-style-type: none"> 1. Electrode may have a build-up of conductive material, such as salt. 2. Electrode is faulty. 	<p>Clean electrode with distilled water, methylated spirits or other cleaning agent that will not harm brass.</p> <p>Especially clean the plastic bridge between the two rods.</p> <p>Return electrode to factory for repair or replacement.</p>

9. Warranty

TPS Pty. Ltd. guarantees all instruments and electrodes to be free from defects in material and workmanship when subjected to normal use and service. This guarantee is expressly limited to the servicing and/or adjustment of an instrument returned to the Factory, or Authorised Service Agent, freight prepaid, within twelve (12) months from the date of delivery, and to the repairing, replacing, or adjusting of parts which upon inspection are found to be defective. Warranty period on electrodes is three (3) months.

There are no express or implied warranties which extend beyond the face hereof, and TPS Pty. Ltd. is not liable for any incidental or consequential damages arising from the use or misuse of this equipment, or from interpretation of information derived from the equipment.

Shipping damage is not covered by this warranty.

PLEASE NOTE:

A guarantee card is packed with the instrument or electrode. This card must be completed at the time of purchase and the registration section returned to TPS Pty. Ltd. within 7 days. No claims will be recognised without the original guarantee card or other proof of purchase. This warranty becomes invalid if modifications or repairs are attempted by unauthorised persons, or the serial number is missing.

PROCEDURE FOR SERVICE

If you feel that this equipment is in need of repair, please re-read the manual. Sometimes, instruments are received for "repair" in perfect working order. This can occur where batteries simply require replacement or re-charging, or where the electrode simply requires cleaning or replacement.

TPS Pty. Ltd. has a fine reputation for prompt and efficient service. In just a few days, our factory service engineers and technicians will examine and repair your equipment to your full satisfaction.

TO OBTAIN THIS SERVICE, PLEASE FOLLOW THIS PROCEDURE:

Return the instrument AND ALL SENSORS to TPS freight pre-paid and insured in its original packing or suitable equivalent. INSIST on a proof of delivery receipt from the carrier for your protection in the case of shipping claims for transit loss or damage. It is your responsibility as the sender to ensure that TPS receives the unit.

Please check that the following is enclosed with your equipment:

- **Your Name and daytime phone number.**
- **Your company name, ORDER number, and return street address.**
- **A description of the fault. (Please be SPECIFIC.)**
(Note: "Please Repair" does NOT describe a fault.)

Your equipment will be repaired and returned to you by air express where possible.

For out-of-warranty units, a repair cost will be calculated from parts and labour costs. If payment is not received for the additional charges within 30 days, or if you decline to have the equipment repaired, the complete unit will be returned to you freight paid, not repaired. For full-account customers, the repair charges will be debited to your account.

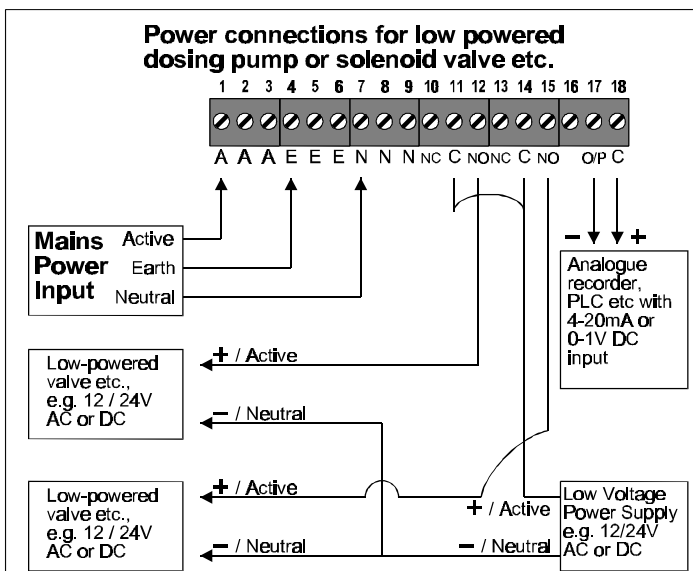
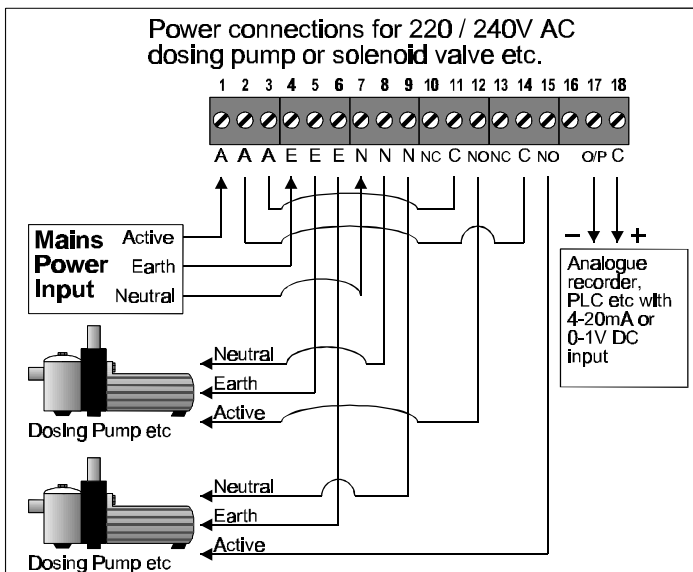
- **Always describe the fault in writing.**
- **Always return the sensors with the meter.**

10. Appendices**10.1 Power Terminal connections when 12V DC option is fitted**

Terminal No.	Connection
1	Negative of 12V DC Input
2	No connection for 12V DC version.
3	No connection for 12V DC version.
4	No connection for 12V DC version.
5	No connection for 12V DC version.
6	No connection for 12V DC version.
7	Positive of 12V DC Input
8	No connection for 12V DC version.
9	No connection for 12V DC version.
10	Normally Closed contact of Lower relay output
11	Common contact of Lower relay output
12	Normally Open contact of Lower relay output
13	Normally Closed contact of Upper relay output
14	Common contact of Upper relay output
15	Normally Open contact of Upper relay output
16	No Connection
17	+ve of current or voltage output
18	-ve of current or voltage output

10.2 Relay Output Wiring Examples for mains powered units

The diagrams below provide some examples of wiring the relay outputs for standard mains powered **proCHEM Series** units.



10.3 Relay Output Wiring Examples for 12V DC powered units

The diagrams below provide some examples of wiring the relay output for **proCHEM Series** units with the 12V DC power option.

