TROLEX

TX9130 SERIES
PROGRAMMABLE TRIP AMPLIFIER

INSTALLATION & OPERATING DATA

GROUP I
HAZARDOUS AREAS

UNDERGROUND MACHINERY PROTECTION

PUMP & COMPRESSOR MONITORING

ITP MONITORING

ON-BOARD UNDERGROUND MACHINERY

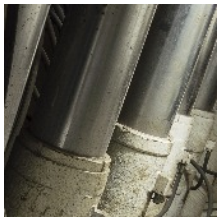
contents...

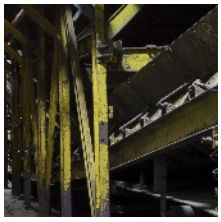
1 PRINCIPAL OPERATING FEATURES

The TROLEX TX9130 series of Programmable Trip Amplifiers offer complete versatility of sensor monitoring through an easy to use, fully programmable menu system, with a large range of operating options.

Developed specifically for monitoring sensors in the mining industry, we have exploited our years of experience in the field of industrial controls and sensor applications to produce a system that offers unparalleled simplicity of operation.

The Trip Amplifier will accept input signals from a variety of analogue sensors. The input signal is conditioned and processed, by a microprocessor, to control two independent output relays with indicating LEDs and a dot matrix data display.





Some versions are provided with a repeater output signal for communicating with remote data systems.

All functions of the Trip Amplifiers can be programmed, by the user, through the 4-way keypad. A simple, easy to use, menu system guides the user through the programming sequence and all settings are retained under power failure.

External control functions are also available for POWER ON DELAY which can be used to inhibit the output relays during the warm-up or start up period of a machine or process, and an external reset input is provided to reset any latched alarm functions.

Further technical application data is available on request and our Applications Department will be pleased to provide any technical advice and support that you may require.

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2 APPLICATION

Underground machinery protection.
Pump and compressor monitoring.
ITP monitoring.
On-board underground machinery monitoring.

There are two mounting formats:-
DIN Rail Mounting.
19" Rack Mounting (TX9139 only).

The modules can be incorporated into existing equipment or fitted into the standard range of TROLEX housings.

To comply with certification requirements, the Trip Amplifier must be mounted in an enclosure offering ingress protection better than IP54.

The TX9130 Programmable Trip Amplifier is certified Intrinsically Safe for use underground, when used with an approved power supply and input devices.

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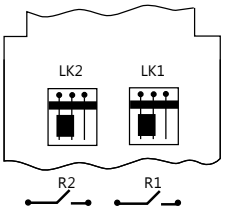
3 PREPARATION

3.1 Check that the supply voltage is correct (ie. 7.5 to 16.5 V).

Check that the power supply is an approved Intrinsically Safe source.

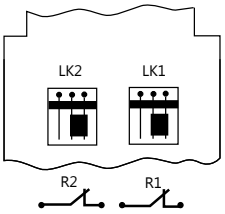
Check that the INPUT signal format is compatible with the sensor or system being used.

Check that the OUTPUT contact/signal format is compatible with the system being used.



3.2 The conventional fail safe mode for relay output contacts is NORMALLY OPEN so that if a power supply failure occurs or an output fails, the contact of the relay will OPEN.

The Trip Amplifier is supplied with output contacts set NORMALLY OPEN when the output relay is DE-ENERGISED.



The contacts can be changed to NORMALLY CLOSED if required:-

a. Remove the back cover.

b. Two miniature plastic connectors on the bottom PCB the contact mode. Change either or both as required.

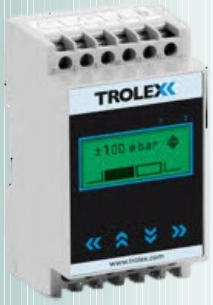
c. Replace the back cover.

This does not affect the ELECTRICAL operation of the relay. This also can be programmed for a RISING or FALLING alarm function.

Refer to Sections 6.2 & 14.3

3.3 When the Trip Amplifier is supplied fitted into a standard TX9200 series metal enclosure, check that an easily visible, legible and permanent IS label has been fastened to the outside of the enclosure.

IMPORTANT
When the Trip Amplifier is fitted in a special or proprietary metal enclosure, the IS label will be provided loose and MUST be permanently fitted to the outside of the enclosure in a position that is clearly visible.



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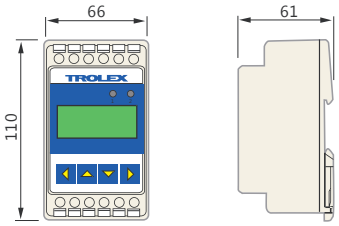
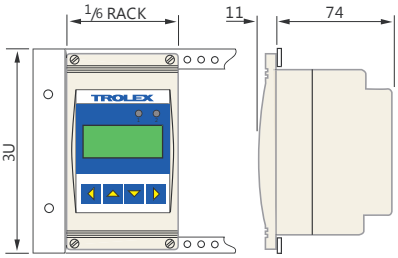
4 DIMENSIONS

4.1 DIN RAIL MOUNTING



4.2 19" RACK MOUNTING (TX9137 ONLY)

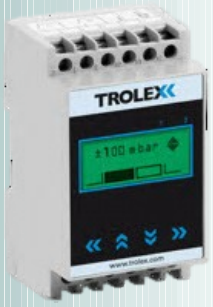


The TX9130 MUST be installed within a protective metal enclosure of IP rating better than IP54, to ensure compliance with Intrinsically Safe certification requirements.

It is permissible for the enclosure to incorporate a polycarbonate window to permit viewing of the TX9130 display panel. The window area must not be exceed 100 cm^2.

Terminal identification labels must be fitted in a visible position, adjacent to the connecting terminals.

Refer to Section 3.3



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5 TECHNICAL DETAILS

Display Accuracy:	±0.5% (analogue channels).
Set Point Accuracy:	±0.5%.
Ambient Temperature Limits:	–10 to +50°C.
Electrical Connections:	4 mm barrier/clamp terminals.
Housing Material:	ABS.
Nett Weight:	300 gms.
Information Display:	High contrast dot-matrix LCD
Mounting:	DIN Rail (EN 50022) or 19" Rack.
Operation:	Microprocessor controlled, menu operation with non-volatile data retention.
Set Point Adjustment:	0 to 99%.
Hysteresis Adjustment:	0 to 99%.
Power ON Delay Adjustment:	0 to 255 seconds.
Output Delay Adjustment:	0 to 25 seconds.
Engineering Units Menu:	mV, V, mA, A, °C, °F, g, kg, mbar, bar, Pa, kPa, PSI, %, ppm, %RH, mm, m, m/s, mm/s, m3/s, ft, ins, ft/sec, rpm, pps, Hz, kHz, g, m3, %LEL, %v/v, (ASCII code user entry).
Input Signal Averaging Period Adjustment:	0 to 250 seconds.
Input Signal Failure Alarm:	Open or Short Circuit signal line will de-energise both output relays and display HIGH or LOW SIGNAL ERROR.
Supply Voltage:	7.5 to 16.5 V dc. (Derived from an approved Intrinsically Safe power supply).
Supply Current:	60 mA at 12 V with both relays energised.
Output Relays:	Two encapsulated reed relays with function programming.
Relay Contact Rating:	200 V, 0.25 A, 3 W ABSOLUTE MAX. Changeover contacts. IMPORTANT. Circuits switched by the contacts of the output relays MUST emanate from a certified Intrinsically Safe power source and the circuit parameters must be within Intrinsically Safe requirements.
Contact Format:	NORMALLY OPEN or NORMALLY CLOSED (user selectable).
Repeater Output Signal:	4 to 20 mA Analogue (Max. load resistance 250 ohms). 0.4 to 2 V Analogue (Min. load resistance 1 K ohms). 5 to 15 Hz pulse output (Opto - isolated transistor).

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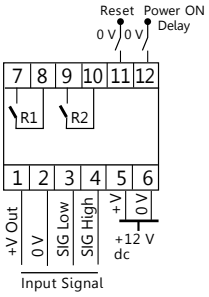
6 CONNECTIONS

The TX9130 Series Trip Amplifier offers the choice of the following analogue input signals.

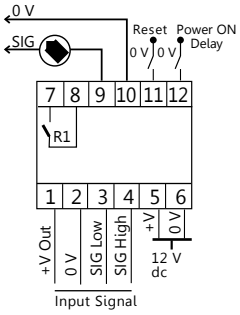
TX9131 Current signals: 4 to 20 mA.
TX9132 Voltage signals: 0.4 to 2 V.
TX9134 PT100 signals.
TX9136 Balanced bridge signals.
TX9137 ac input signals.

Versions are also available with a repeater output signal in place of the second relay, R2, in three standard output formats.
4 to 20 mA 0.4 to 2 V 5 to 15 Hz

6.1 CONNECTIONS



2 OUTPUT RELAYS



1 OUTPUT RELAY +
REPEATER OUTPUT SIGNAL

6.2 Relays are shown de-energised
– i.e. POWER OFF or setpoint EXCEEDED.

Refer to Section 3

6.3 Terminal 12 is used to control the POWER ON DELAY facility.
0 V = INHIBIT.
Open Input = Start the POWER ON DELAY time period
(leave open if not used).

Refer to Section 12

6.4 Terminal 11 is used to RESET any LATCHED relays and to reset the count display from an external contact impulse.
0 V = RESET.

Refer to Section 14.6

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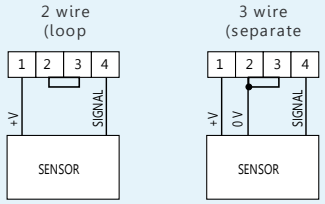
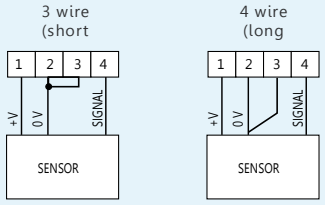
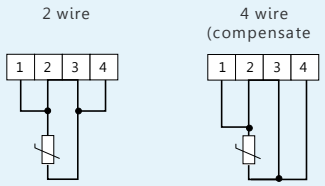
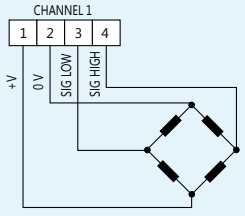
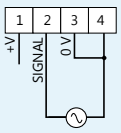
HAZARDOUS AREAS

6 CONNECTIONS continued

INPUT CHANNEL CONFIGURATION

		RANGE	CONNECTIONS
6.5	**TX9131 Current** A Fully floating differential input.	0 to 20 mA. 4 to 20 mA. Impedance: 10 R.	
6.6	**TX9132 Voltage** Fully floating differential.	0.4 to 2 V. Impedance: 100 K.	
6.6	**TX9134 Resistance Temperature Device** Standardised to DIN43760 and BS1904.	PT100 –50 to +200°C. –50 to +400°C.	
6.8	**TX9136 Bridge** Balanced four arm bridge input. Pellistor. Strain gauge. Pressure.	0.1 mV/V to 10 mV/V. Programmable bridge energising voltage 2 to 6 V.	
6.9	**TX9137 ac Voltage** Load cells, ac generators, Accelerometers, Velocity sensors and Power measuring instruments.	Peak detection. 10 Hz to 100 kHz. 10 V pk/pk. RMS detection 10 Hz to 10 kHz. 1 V rms.	

6 CONNECTIONS continued

6.10 Cable Distance Calculation for Loop Powered, 4 to 20 mA Sensors

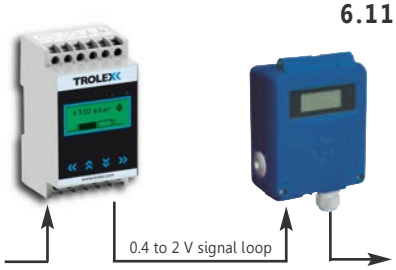
Maximum cable distance. = $\frac{Vs - Vms}{0.02 \times R\ cable}$ km.

Vs = Supply voltage.

Vms = Minimum acceptable sensor voltage (eg 20 V).

R cable = Total resistance of connecting cable in ohms/km.

6.11 Adding a Digital Display into a 0.4 to 2 V Signal Loop



It is sometimes necessary to provide readout at a remote point somewhere along a 0.4 to 2 V signal loop.

A Trolex TX9181 digital display can be added into the loop at any point to display the signal value.

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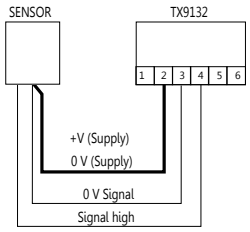
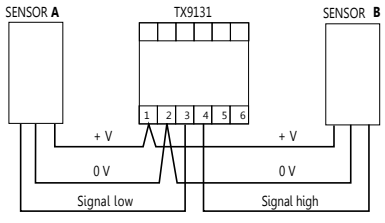
6.12 Cable Distance Calculation for Voltage Inputs (0.4 to 2 V)



The input impedance of the Trip Amplifier is very high, so cable distance is usually not a problem. Voltage drop in the power supply line is the critical factor, particularly on a three wire system where the 0 V of the power supply line is 'common' with the signal line.

Use a 4 wire system on distances above 100 m to minimise this effect.

6.13 Dual Input Signals (Differential)



The differential input stage of the 0.4 to 2 V version of the Trip Amplifier also enables it to monitor two input signals simultaneously and respond to the difference between the two. This technique is frequently used to monitor differential temperature, differential pressure and differential speed. It is important, however, that the two sensors or input signals are calibrated to the same operating parameters.

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6 CONNECTIONS continued

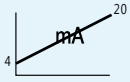
6.14 Repeater Output Signal

Where a repeater output signal is fitted it will displace output relay R2.

There are three options available, and in each case, the magnitude of the signal is proportional to the display value (Lower to Upper).

Refer to Sections
13.4 & 13.5

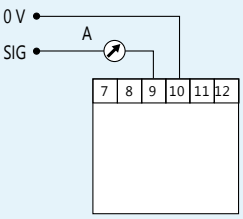
4 to 20 mA



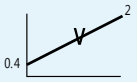
Standard current regulated signal loop.

Maximum loop impedance: 300 R @ 12 V supply.

Supply voltage:
7.5 to 16.5 V dc.



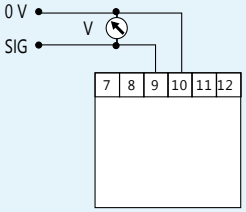
0.4 to 2 V



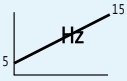
High impedance 2 wire voltage output.

Minimum loop resistance: 1 K ohms.

Supply voltage:
7.5 to 16.5 V dc.



5 to 15 Hz

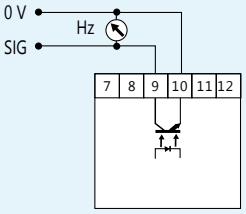


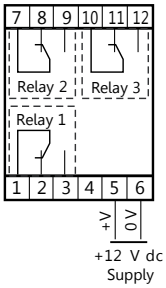
Square wave frequency variable output with galvanic isolation.

Maximum voltage: 30 V dc.

Maximum current: 15 mA.

Isolation: 10,000 V dc.



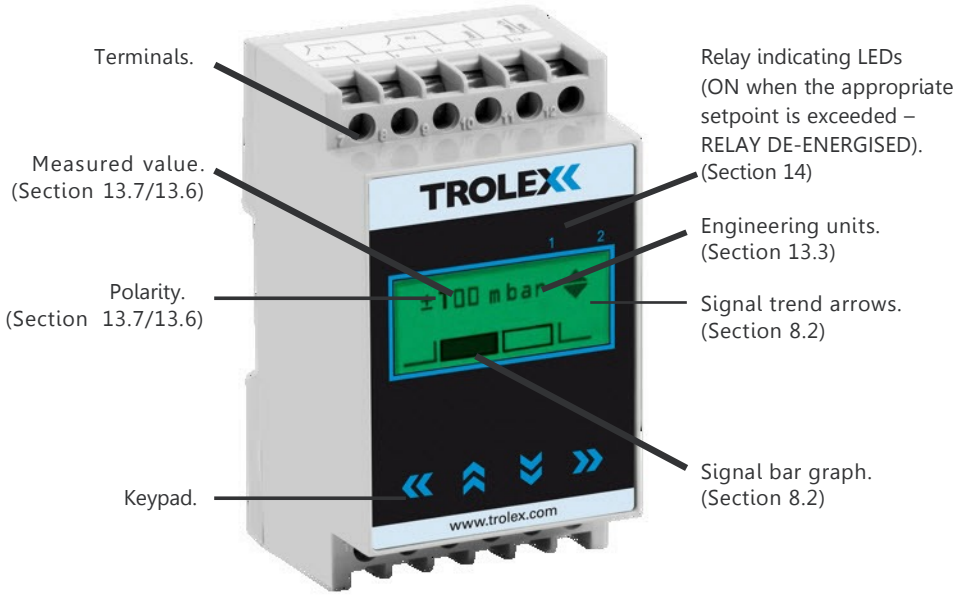


6.15 TX9139 Interposing Relay

The TX9139 Interposing Relay is a repeater unit, providing three independent changeover output relays, driven directly from the input supply voltage. The unit does not offer the programmable functionality of the standard TX9130 Series Trip Amplifiers.

7 CONTROLS AND INDICATORS

7.1



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7.2 Keypad Functions

MENU OR ESCAPE | SCROLL UP | SCROLL DOWN | CONFIRM DATA

Hold the SCROLL Keys down for two seconds for rapid self keying. 

DATA MEMORY

The data memory is permanent and all settings are retained with power failure.

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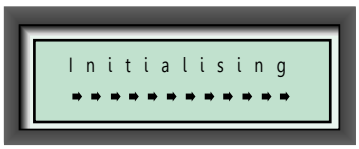
8 INFORMATION DISPLAY

8.1 Switching ON



When first switched on, the processor will initialise previously programmed settings and any default values.

Refer to Section 9

See the MENU OF FUNCTIONS for default values

8.2 Signal Display

The display will now show the main SIGNAL DISPLAY.

Refer to Section 7

The 'trend' of the input signal to increase or decrease will be indicated by the tendency arrows:

= : Steady unchanging input signal.

▲ : Rising tendency input signal.

▼ : Falling tendency input signal.

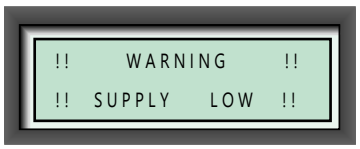
Slowly changing sensor signals under suspicion may be assessed.

If any POWER ON DELAY has been previously programmed, the display will initially show the length of delay in seconds.

Refer to Section 12

The displayed time will count down until the POD period is complete then the display will revert to the SIGNAL DISPLAY.

8.3 Measuring the Supply Voltage



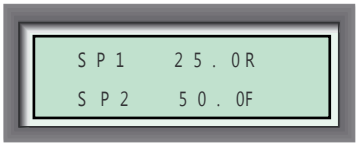
The incoming supply voltage to the Trip Amplifier can be checked.

Key » to DISPLAY the voltage.

(The display will also show the software version: Vx.x.).

A warning will be given if the supply falls below 7.0 V.

8.4 Relay Setpoint Review



The programmed relay setpoint levels can be reviewed on the display.

Refer to Section 14.1

Key » to DISPLAY the setpoint levels.

R. Denotes a RISING alarm function.

F. Denotes a FALLING alarm function.

Refer to Section 14.3

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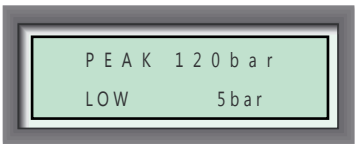
HAZARDOUS AREAS

8 INFORMATION DISPLAY continued

8.5 Peak/Low Review



PEAK: The stored value of the MAXIMUM Signal value since last reset.

LOW: The stored value of the MINIMUM Signal value since last reset.

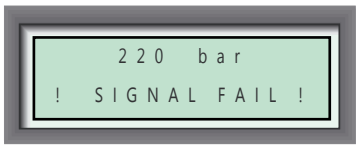
Key ⌄⌄ to DISPLAY PEAK and LOW.

Key « then » to RESET PEAK/LOW values.

Any stored values of PEAK and LOW will automatically reset to zero when the power supply is first switched on.

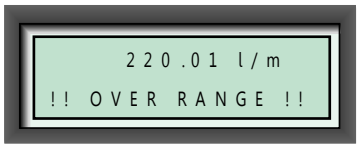
8.6 Signal Error Information

Versions with a conditioned input will also display information about any input signal ERROR condition that has occurred.
A signal that transgresses beyond its normal operating boundaries (i.e. above 2 V or below 0.4 V on a 0.4 to 2 V input) will initiate warnings at preset levels of discrepancy and trigger exclusive ERROR signals.



5%

Signal exceptionally HIGH (>2.2 V).



OVER RANGE

Signal OVER the calibrated range (i.e. > 2.1 V).

NORMAL

Signal Minimum/normal/maximum (i.e. 0.4 to 2 V).

UNDER RANGE

Signal UNDER the calibrated range (<0.3 V).

–5%

Signal exceptionally LOW (<0.2 V).

Error signals will de-energise Relay 1 and Relay 2.

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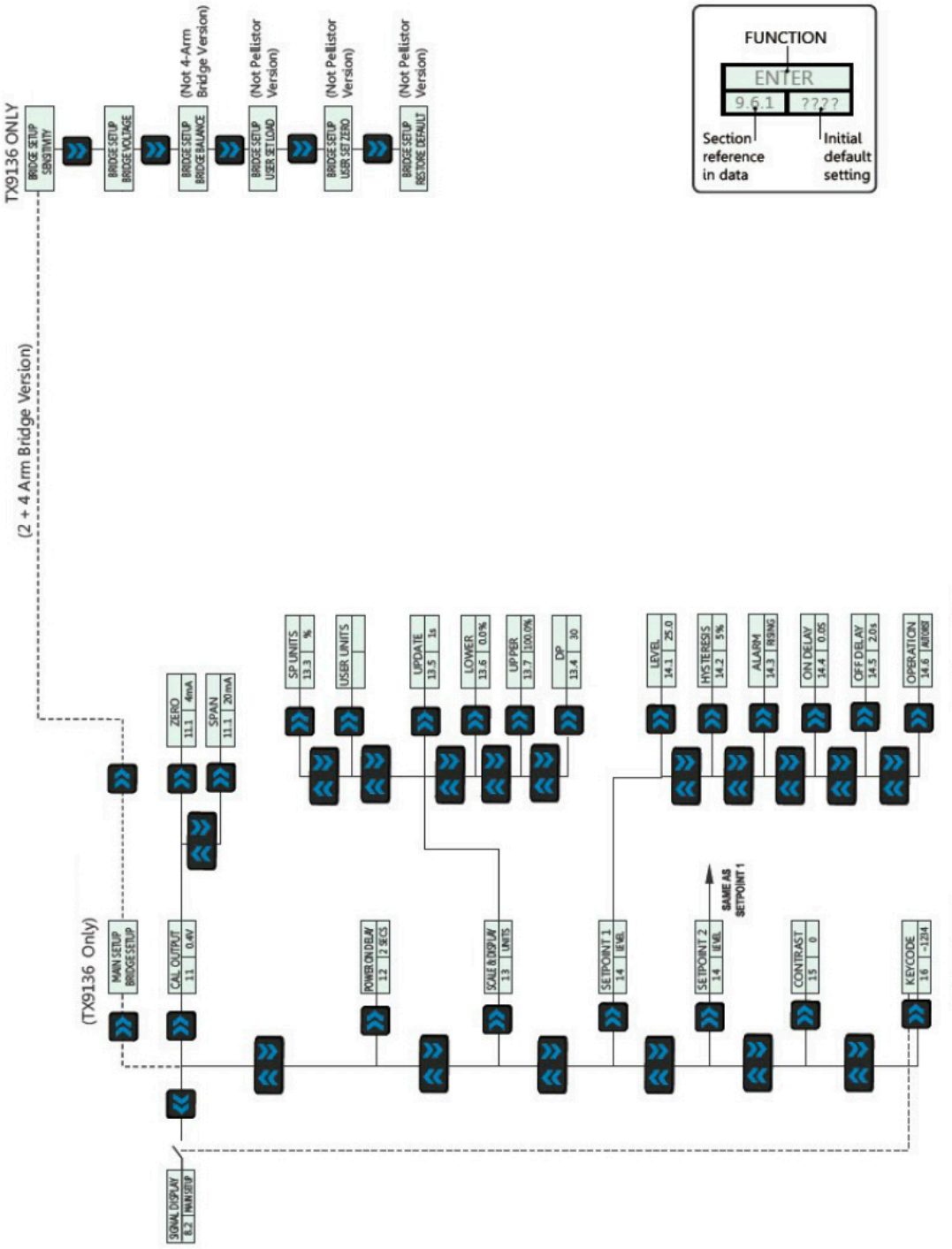
9 THE MENU OF FUNCTIONS

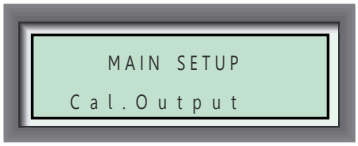


GROUP I
HAZARDOUS AREAS

10 ENTERING THE MAIN SETUP

All the operating functions can be programmed through the keypad by entering into the MAIN SETUP menu.

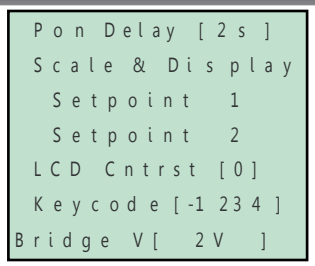
10.1 ENTER



Key « to ENTER the MAIN SETUP menu.

The bottom line of the display will show the first of the options available in the MAIN SETUP menu.

(Previously programmed settings will be displayed in brackets where appropriate).



TX9136 ONLY

If selected, the KEYCODE security lockout will deny entry into the MAIN SETUP until the correct entry code is confirmed.

Refer to Section 16

Key » to TRAVERSE the cursor along the digits.

Key ^ to SCROLL the number.

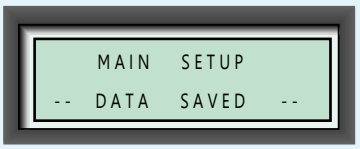
Key » to CONFIRM.

Key ^ to v SCROLL up and down the menu.

Key » to CONFIRM.

(Previously programmed settings will be displayed alongside each item in a menu).

Function changes can now be programmed as described in the following sections.



DATA SAVED will flash briefly on the display whenever a new value is entered during function programming.

NOT SAVED will flash briefly on the display if a value is not entered during function programming.

The display will automatically return to the MENU being used after a value or selection has been entered.

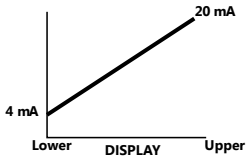
10.2 ESCAPE

Key « to ESCAPE from any position in the MENU sequence. Each operation of the key will revert the display one step back until the SIGNAL DISPLAY is reached.

The display will progressively step back at 10 second interval if no keys are operated.

11 CALIBRATE THE REPEATER OUTPUT SIGNAL

Some versions will have an output signal in place of Relay R2. There are three output options and the output signal level is directly proportional to the display value.



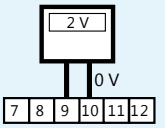
The signal will be calibrated during manufacture to concur with the LOWER and UPPER programmed values:

Refer to Sections 13.4 and 13.5

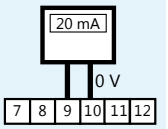
	LOWER	UPPER
0.4 to 2 V version	0.4	2
4 to 20 mA version	4	20
5 to 15 Hz version	5	15

To re-adjust the repeater output signal.

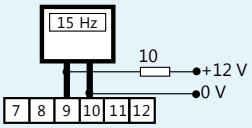
The repeater signal should not normally require re-adjustment. Recalibration can be carried out if required by connecting an accurate test instrument to the output circuit, set to the appropriate measuring range (voltage/current/frequency).



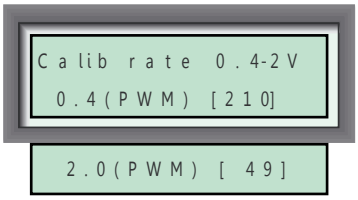
0.4 to 2 V Output



4 to 20 mA Output



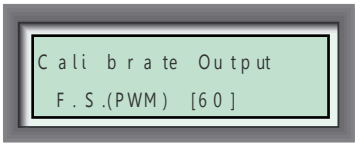
5 to 15 Hz Output



Key ⏫ or ⏬ to select.

Key ⏩ to CONFIRM.

Key ⏫ or ⏬ to ADJUST the reading.



Range: 0 to 2.5 V

The display value shows a representation of the pulse width modulation generated by the internal processor to produce the analogue output signal and can be used as a guide depicting the increase/decrease of the signal during adjustment.

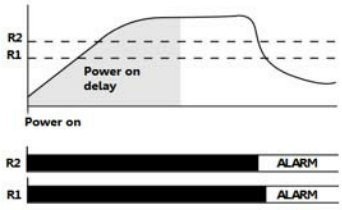
eg.				
	210 ⎓	0.4 V	4 mA	5 Hz
	49 ⎓	2 V	20 mA	15 Hz

Key ⏩ to CONFIRM.

The procedure is the same for the corresponding 2 V value.

GROUP I
HAZARDOUS AREAS

12 POWER ON DELAY PERIOD



The setpoint output relays R1 and R2 can be inhibited for an adjustable time period after the power is switched on.

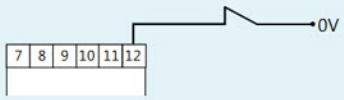
This feature is useful for an initial start-up override when a machine is running up to speed or a process is stabilising.

Range: 0...255s

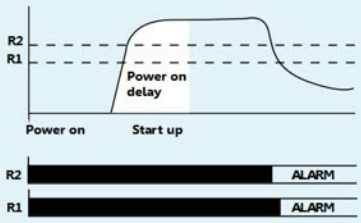
Key ⏫ or ⏬ to SCROLL the value.

Key ⏩ to CONFIRM.

GROUP I
HAZARDOUS AREAS



In a situation where the Trip Amplifier is powered from an independent power source, the commencement of the *Power On delay period* can be controlled by a remote contact.



A 0 V signal on terminal 12 prevents the delay timer from starting.
The *Power On delay period* can only commence when instructed from a control contact associated with the machine or process being initially started up.
(The *Power On delay* will reset when the power supply is removed).

Refer to Section 6.3

GROUP I
HAZARDOUS AREAS

13 SCALE AND DISPLAY SETTINGS

The various characteristics of the signal scale and display can be determined.

The contents of the menu will vary, depending upon the input version. See the menu of functions for individual menu listings.

Refer to Section 9

Key ⏫ or ⏬ to SCROLL the menu.
Key ⏩ to CONFIRM.

13.1 Units

A menu of standard engineering units is available for adding to the signal value display.

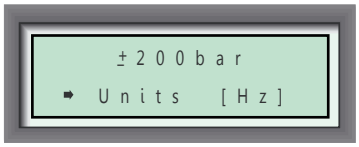
e.g. bar, mA, m/s, °C, °F.

Refer to Section 5

(On temperature input versions, TX9133, TX9134, TX9135 the choice will be limited to °C, °F or °K).

Key ⏫ or ⏬ to SCROLL the units.
Key ⏩ to CONFIRM.

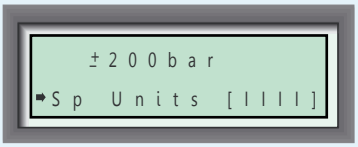
°C
°F
bar
mV
%
mm



Range: (Section 5)

Specific Units.

Non standard or special units can be entered at the next position in the menu.
There are 192 different characters available and up to 4 characters can be entered by a simple ASCII programme routine.
Please ask for programming details if you have a specific requirement.

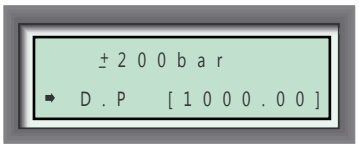


Range: 192 characters per position

13.2 Decimal Point

Once the numerical value of the UPPER and LOWER display reading has been set – the decimal point can be TRAVERSED along to any desired position in the number.

Refer to Sections 13.4 and 13.5

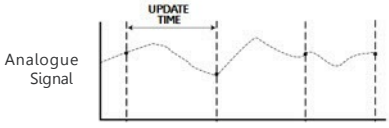


Range: x 0.100000 to 100000.0

Key ⏫ or ⏬ to TRAVERSE the decimal point.
Key ⏩ to CONFIRM.

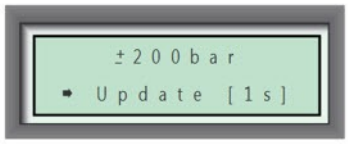
13 SCALE AND DISPLAY SETTINGS continued

13.3 Update



The input signal is sampled at a pre-determined interval.

The value of an ANALOGUE signal is averaged and up-dated at periodic intervals and the up-date period is adjustable. A low setting will give rapid reaction to the input signal and higher settings may be entered where damping of a fluctuating input is necessary, or simply as a means of applying a delay to the input. This is particularly appropriate in electrically noisy environments.



0...250 seconds

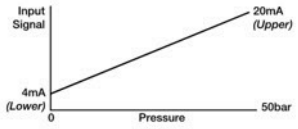
For maximum accuracy, sampling takes place at the front end, prior to pre-scaling.

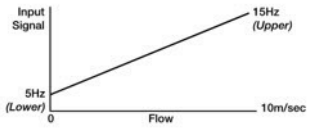
Analogue signals levels are AVERAGED between samples.

Key ⏫ or ⏬ to SCROLL the value.

Key ⏩ to CONFIRM.

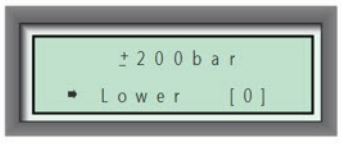
13.4 Lower
13.5 Upper

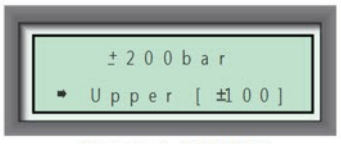




Independently adjustable, these two parameters are closely inter-related.

They set the desired LOWER LIMIT and UPPER LIMIT of the display reading for a given input signal.
The 'range' of the display can be programmed to show 'true' unit values incorporating multiplication constants, zero offset values or negative values.



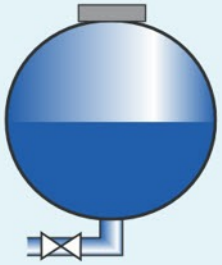


Range: ± .9999999

Key ⏬ to TRAVERSE the cursor along the digits.

Key ⏫ to SCROLL the digit with the cursor under.

Key ⏩ to CONFIRM.



The signal response between LOWER and UPPER will be assumed to be linear.

Signals from non conforming devices such as thermocouples will be automatically linearised to the appropriate standard.

Non linear relationships such as square law signals from DP sensors and polynominals can also be incorporated in software to specific requirements.

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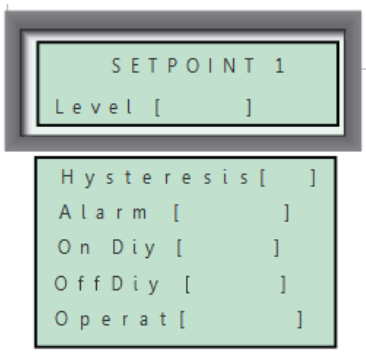
GROUP I
HAZARDOUS AREAS

14 SETPOINT CHARACTERISTICS

The Trip Amplifier has two SETPOINT output relays or alarm points R1 and R2 and the various operating characteristics of each can be individually determined.

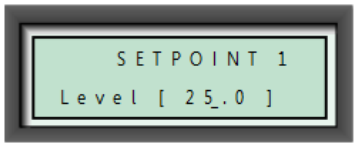


Relays are normally *energised*, and *de-energised* when a setpoint is exceeded.

Key or to SCROLL the menu.

Key to CONFIRM.

14.1 Level



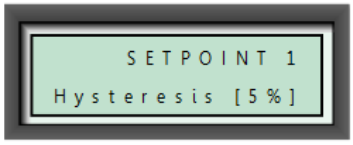
Range: 0...Full scale value

The operating LEVEL or setpoint of each RELAY can be set.

Key to TRAVERSE the cursor along the digits.

Key to SCROLL the value of the digit.

Key to CONFIRM.



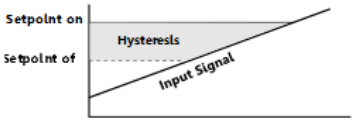
Range: 0...Full scale value

Hysteresis

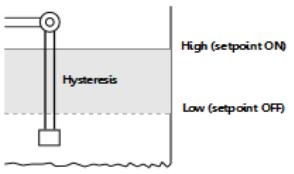
The Hysteresis is the DEADBAND between the relay switching OFF and switching ON at the SETPOINT, as the input signal rises and falls. This can be set as a percentage of the SETPOINT LEVEL.

Key or to SCROLL the value.

Key to CONFIRM.



A low value of hysteresis, say 5%, is often used to override fluctuating signal levels and to prevent 'hunting' in closed-loop control systems.

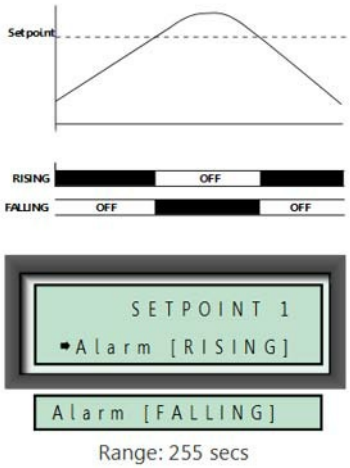


A high value of hysteresis can also be used as a control function as when controlling the operation of pumps. The pump will start at high level and continue pumping until low level is reached at

GROUP I
HAZARDOUS AREAS

14 SETPOINT CHARACTERISTICS continued

14.3 Alarm (Rising/Falling)



Range: 255 secs

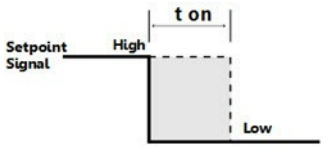
The relays can be arranged to de-energise on a RISING input signal or a FALLING input signal.

For example, when monitoring excess vibration or high gas concentration, the relay can be set to de-energise on a RISING signal to give a failsafe alarm function.
Conversely, when monitoring flow failure or low pressure, the relay can be set to de-energise on a FALLING signal.

Key ⏫ or ⏬ to SELECT RISING/FALLING.

Key ⏩ to CONFIRM.

14.4 ON Delay



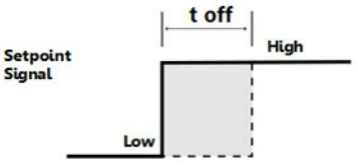
The operation of the setpoint signal can be delayed by an adjustable time period, t on.

This is useful for alarm verification, to apply time delay in a process control action, or to override a spurious fluctuation of the input signal.

Refer to Section 14.6

If the input signal falls below the setpoint before the programme time has elapsed, the timer will reset to zero ready to start again.

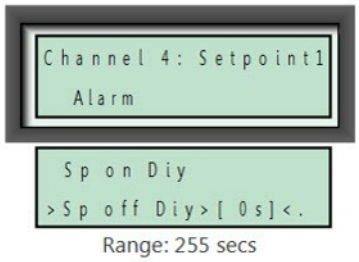
14.5 OFF Delay



The resetting of the setpoint signal can also be delayed by an adjustable time period, t off.

Refer to Section 14.6

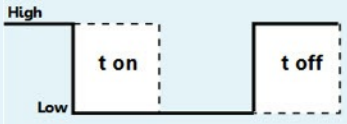
If the input signal exceeds the setpoint before the programme time has elapsed, the timer will reset to zero, ready to start again.



Range: 255 secs

Key ⏫ or ⏬ to SCROLL the value.

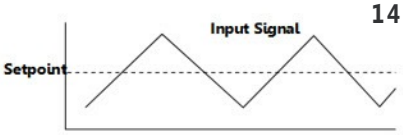
Key ⏩ to CONFIRM.



Both the setpoint ON Delay and the setpoint OFF Delay can be combined, if required, and are independently programmable.

14 SETPOINT CHARACTERISTICS continued

14.6 Operation



The relay can be set to function in four different ways at its setpoint.

AUTO RESET

The relay will de-energise when the input signal *exceeds* the setpoint value and will reset when the input signal *recedes.*
t = Any delay that is programmed.

Refer to Section 14.4 / 14.5

LATCH UNTIL RESET

The relay will de-energise when the input signal *exceeds* the setpoint value and *latch* until reset.
t = Any delay that is programmed.

Refer to Section 14.4 / 14.5

TOGGLE

The relay will energise/de-energise each time the setpoint value is *exceeded.*
t = Any delay that is programmed.

Refer to Section 14.4 / 14.5

PULSE

The setpoint signal will give an impulse equal to time t_2 each time the setpoint value is *exceeded.*
t = Any delay that is programmed.

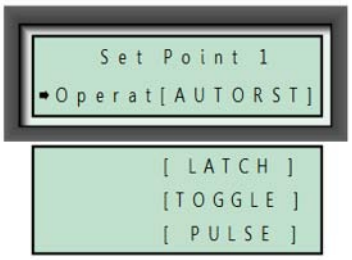
Refer to Section 14.4 / 14.5

The commencement of the pulse will be delayed by a time equal to t_1 after the setpoint value is exceeded.

METHODS TO RESET	COUNT DISPLAY	LATCHED RELAY
0/1/0 Impulse on Input 2	✓	N/A
0 V Impulse on Terminal 11	✓	✓
Key and hold »», then « then release	✓	✓
Temporarily remove the power supply	✓	✓

Refer to Section 6.1

Refer to Section 6.4



Key ⌃⌃ or ⌄⌄ to SCROLL the function.
Key » to CONFIRM.

GROUP I
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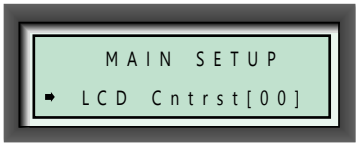
15 CONTRAST CONTROL

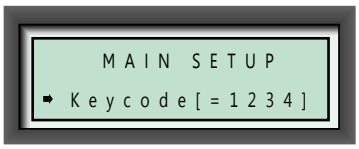


Range: 0 to 50
0 = Max contrast at 20°C

The contrast of the LCD can be varied to compensate for the effect of local ambient temperature conditions.

Key ⏫ or ⏬ to SET the contrast.
Key ⏩ to CONFIRM.

16 KEYCODE



– = Keycode OFF (unrestricted access)
+ = Keycode ON (restricted access)
Range : 0 to 9999

All programming in the MAIN SETUP can be denied by a prescribed security code. It is a selectable option and the code can be changed at any time.

Refer to Section 10.1

Key ⏬ to TRAVERSE the cursor along the digits.
Key ⏫ to CHANGE the value of the digit with the cursor under.
Key ⏩ to CONFIRM.

17 ACCESSORIES

TX6641 Exd/INTRINSICALLY SAFE POWER SUPPLY

For use underground.

Choice of 24, 110, or 230 V ac supplies.

Available with relays in the Ex d compartment for direct switching of pilot circuits.

Total compatibility with the complete range of Trolex mining sensors, controllers and standby batteries.

TX9204 ENCLOSURE

18 BRIDGE VOLTAGE SUPPLY

TX9136 STRAIN GAUGE VERSION USER SET UP.

The Strain Gauge version is factory calibrated to the input signal specified in the Works Order.

However, by following a few simple keypress operations, the user can re-calibrate the unit in situ to suit the application. No specialised equipment is required. It is also possible to restore the original factory calibration at any time.

However, to avoid gross mis-calibration errors, the 'User' options shown below are limited to an adjustment range of ±10% of the 'Upper' value shown in the 'Scale & Display' menu.

The menu options specific to this version are described below. To clarify the procedures, a typical example is described where appropriate.

The remaining options, eg: setpoints etc., should be set up as described in section 9.2 of this document.

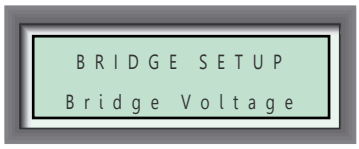
18.1 Bridge Voltage

The bridge voltage normally factory set to 5 V to to give maximum output from the strain gauge bridge. If required, the voltage can be checked and set up using the bridge voltage menu. From the main display screen,

Key « to ACCESS the MAIN SETUP menu.

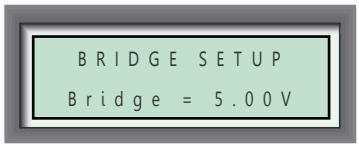
Key » to SELECT the 'Bridge Setup' menu.

From the 'Bridge Setup' menu,



Key ^ or v to SELECT the 'Bridge Voltage' item.

Key » to ACCESS the item.



Key ^ or v to SET the VOLTAGE required.

Key » to ACCEPT and STORE the value.

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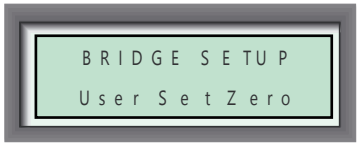
18 BRIDGE VOLTAGE SUPPLY continued

18.2 User Set Zero

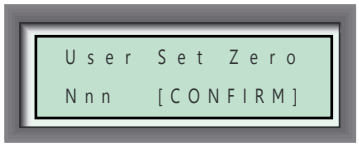
This option allows the user to zero the unit to cancel out any strain gauge zero error or system pre-load. A typical example would be the calibration of a weighbridge. An offset due to the weight of the platform would be shown on the display. By using the 'User Set Zero' option, the indication can be trimmed to zero without affecting the factory span calibration.



From the Bridge Setup' menu,

Key ⏫ or ⏬ to SELECT the 'User Set Zero' item.

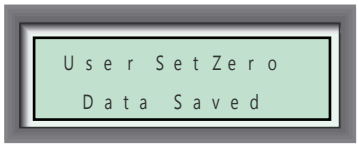
Key ⏩ to ACCESS the item.



With zero load,

Key ⏩ to CONFIRM. The value Nnn is not important.

During the auto zero operation, the values nn will be seen to change but are not important.



'Data Saved' is shown when the operation is complete.

NB: If an OVER LIMIT or UNDER LIMIT warning is seen, the required zero offset adjustment is outside the permitted range. (see above).

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HAZARDOUS AREAS

18 BRIDGE VOLTAGE SUPPLY continued

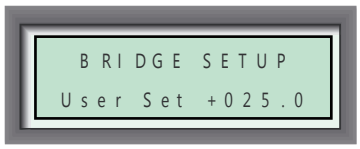
18.3 User Set Load

This option allows the user to calibrate the span of the unit using a known input from the application.

Using the weighbridge example again, the user would apply a known weight (load). The units 'Set Load' option would then be used to enter the value of the known weight. The TX9136 will relative to the full scale setting.

From the 'Bridge Setup' menu,

Key  or  to SELECT the 'User Set Load' item.



Key  to ACCESS the item.

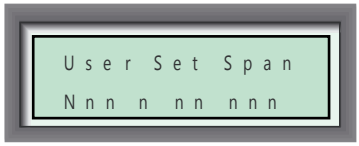
Key  or  to ENTER the known input load value.

Key  to SAVE the value.

The screen opposite will now be seen.

With the known load applied,

Key  to CONFIRM. The value Nnn is not important.



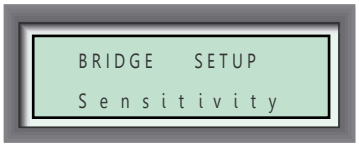
During the auto calibration operation, the values nn will be seen to change but are not important.

'Data Saved' is shown when the operation is complete.

NB: If an OVER LIMIT or UNDER LIMIT warning is seen, the span adjustment required is outside the permitted range. (see above)

18 BRIDGE VOLTAGE SUPPLY continued

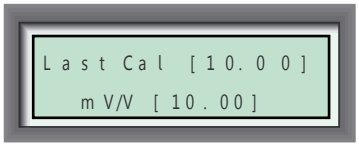
18.4 Sensitivity



From the 'Bridge Setup' menu,

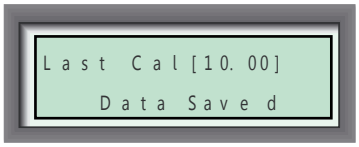
Key ▲▲ or ▼▼ to SELECT the 'Sensitivity' item.

Key ▶▶ to ACCESS the item.



The top line of the display shows the existing sensitivity value.

Key ▲▲ or ▼▼ to ENTER the known mV value as determined above. (not the mV/V value from the calibration certificate)



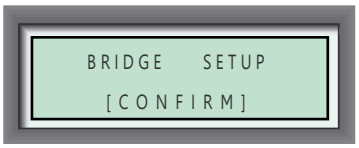
Key ▶▶ to SAVE the value.

18.5 Restore Defaults

This option allows the user to restore the TX9136 back to its original factory calibration settings.

From the 'Bridge Setup' menu,

Key ▲▲ or ▼▼ to SELECT the 'Restore Defaults' item.



Key ▶▶ to ACCESS the item.

Key ▶▶ to CONFIRM the restore action.

'Data Saved' is shown when the operation is complete.

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19 APPROVALS AND CERTIFICATION

Certified for use in underground mines susceptible to firedamp:

20.1 European Union - ATEX

Sira 99ATEX2136X
I M1
EEx ia I (Ta = -20°C to +70°C)

19.1 Specific Conditions of Use

The TX913x Trip Amplifiers shall be installed in an outer enclosure that provides an ingress protection of at least IP54 to EN 60529:1991. Metallic enclosures shall also comply with clause 8.1 of EN 50014:1997.

The outer enclosure shall be marked in a visible, external location with an additional label that displays at least the following information:
Contains Trolex TX913x Programmable Trip Amplifiers
EEx ia I (Ta = -20°C to +70°C)
Sira 99ATEX2136X

If the enclosure is manufactured from plastics or incorporates a plastics component with a surface area in excess of 100 cm2, then it shall also be marked with a static warning label:
"STATIC HAZARD! DO NOT RUB WITH A DRY CLOTH"

If the outer enclosure has a carries a static warning label, then it shall not be installed in a location where it is likely to be subjected to conditions that may induce static charges, e.g. high velocity dust laden air.

This certificate only relates to the TX913x Trip Amplifiers and does not cover the function of any other electrical apparatus installed in the outer enclosure.

The internal temperature of this apparatus may rise above 150oC under normal or fault conditions; therefore, care shall be taken when the enclosure is opened to ensure that no dust enters the apparatus.

19.2 Australia and New Zealand.

ANZEx 11.3004X
Ex ia I (Ta = -20°C to +70°C)

20.2.1 CONDITIONS OF CERTIFICATION

Entity parameters for the terminals shall be taken into account during installation - refer to the certificate for details.

All the circuits connected to different set of terminals shall be treated as separate intrinsically safe circuits and adequate provision of segregation shall be provided between them.

The apparatus shall be installed in an enclosure which complies with IEC 60079-0:1998 Clauses 7.3 and 8.1 and which provides an ingress protection of at least IP54. The enclosure shall be marked in a clearly visible external location with the information specified in drawing P5460.128 and with the Australian certificate number ANZEx 11.3004X.

Where the external enclosure may have a plastic window, it is a condition that surface area of the window shal not exceed 100 cm2.

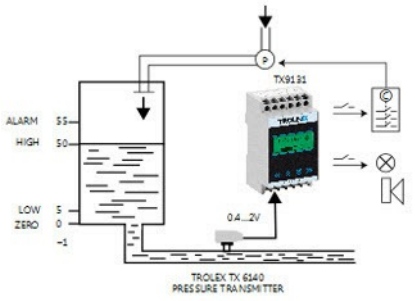
19.3 South Africa

MASC M/11-220X
EEx ia I (Ta = -20°C to +70°C)

20.3.1 SPECIAL CONDITIONS OF USE
See ATEX section above with MASC M/11-220X number required on the external label.

20 APPLICATION EXAMPLES

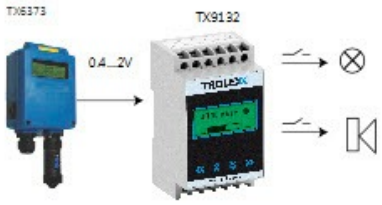
20.1 Control and Alarm



A pump is used to replenish the liquid stock in a tank each time the level falls too low.
There is turbulence in the tank due to an agitator operating continuously.
Display of tank contents in gallons is required – the tank section is constant.
Alarm warning is required if the pump fails to stop at high level or fails to start at low level.
A Trolex TX6140 Pressure Transmitter is used to measure hydrostatic pressure head in the tank.
Range 0 to 0.25 bar gauge.
Unauthorised users must not have access to the settings.

SET UP	SCALE	R1	R2
POWER ON DELAY	0		
LOWER SCALE (4 mA)	–1		
UPDATE PERIOD	5 s		
LCD CONTRAST	25		
UNITS	gallons		
DECIMAL POINT POSITION	10.0		
UPPER SCALE (20 mA)	60		
SET POINT VALUE		50	55
LATCH		NO	YES
DELAY		2 s	1 s
HYSTERESIS		90%	5%
RELAY PHASE		RISING	RISING
RELAY OUTPUT CONTACTS		NORMALLY CLOSED	NORMALLY OPEN
KEYCODE	ON	(1435)	

20.2 A TX9132 Trip Amplifier Monitoring a Gas Sensor



Two level setpoints R1 and R2 give WARNING and ALARM on a RISING gas concentration.

SET UP	SCALE	R1	R2
POWER ON DELAY	15 s		
LOWER SCALE (4 mA)	0		
UPDATE PERIOD	3 s		
LCD CONTRAST	25		
UNITS	ppm		
DECIMAL POINT POSITION	100.0		
UPPER SCALE (20 mA)	200		
SET POINT VALUE		100	80
LATCH		OFF	ON
DELAY		2 s	2 s
HYSTERESIS		5%	5%
RELAY PHASE		RISING	RISING
RELAY OUTPUT CONTACTS		NORMALLY CLOSED	NORMALLY OPEN
KEYCODE	ON	(1435)	

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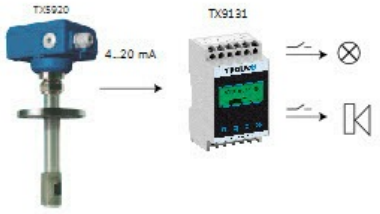
20 APPLICATION EXAMPLES continued

20.3 A TX9132 Trip Amplifier Monitoring an Airflow Sensor

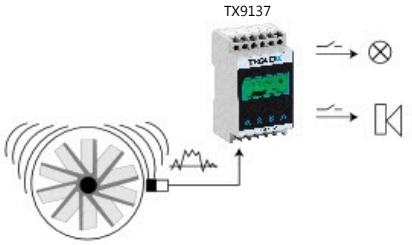


A similar system using a Trolex TX5920 Air Flow Sensor.

The current input version of the Trip Amplifier (TX9131) will accept the analogue output of the sensor and the setpoint outputs can be programmed to detect flow failure.

The RELAY 'failure mode' would be set for a FALLING signal.

20.4 Fan Vibration Monitoring



A Vibration Monitor can also be used to check the condition of the fan by using a TX9137 ac input Trip Amplifier in conjunction with a Trolex TX5633 Vibration Sensor.

SET UP	
POWER ON DELAY	10 s
LCD CONTRAST	25
UPDATE PERIOD	0.5 s
SET POINT 1	1 g
SET POINT 2	2 g
ALARM	RISING
UNITS	g
RELAY OPERATION	LATCH
KEYCODE	ON

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