9325-NU User Manual

9325-NU

Portable Sensor Display

interface
FORCE MEASUREMENT SOLUTIONS

Introduction / Overview

The 9325-NU (Portable Sensor Display Standard) for strain bridge sensors is a microprocessor based portable display instrument designed to interface with any full bridge sensor with an output sensitivity of up to 480mV/V. Bridge resistances from 85 ohms upwards can be used with the 9325-NU.

This module can be either used as a handheld device or, using the optional mounting accessories, or attached to equipment, dashboards, walls, or desks.

Configuration and calibration of the 9325-NU is achieved by using the front panel keypad menu system.
User functions available on the 9325-NU include:

- Range Selection
- Gross/Net indication selection
- Min/Max
- Units
- TEDS support

The 9325-NU is powered by two internal non-rechargeable AA alkaline batteries.

Key Concepts

Calibration Ranges

There are six calibration ranges available that can be individually calibrated for use with strain bridges that do not have TEDS capability.
These ranges can be used for connecting to different strain bridges or for different sections of the same strain bridge i.e., one for compression and one for tension. The ranges are user selectable and independent of what is physically connected to the handheld.
The number of ranges available and the ability to switch between these ranges can all be controlled when configuring the handheld.
Each of these ranges will remember settings that contribute to the user experience so for settings such as selected units and tare values etc. these will be remembered and reused as each range is selected again.
Note: The 9320-NU only allows for calibrations with a live load. If mV/V entry calibration is needed, please contact Interface Inc, and we will provide you with a method to achieve this.

In addition, there is also support for TEDS calibration tables in TEDS capable connected devices where the calibration information is held in the connected sensor. The user experience settings will be remembered for the last twenty connected TEDS sensors. There is an option to disable TEDS support on a particular TEDS enabled sensor so the handheld calibration ranges can then be used instead.

Decimal Point Position and Resolution

Because the 9325-NU can handle so many engineering units out of the box and allow conversion between suitable units the way it handles decimal point positions and resolution (For displays) needed a complete overhaul compared to the original 9320.
On the original having only two calibration ranges (And no concept of engineering unit conversion), each range had its own formatting settings for decimal points and resolution and these ranges were very often used to deliver results from the same strain bridge sensor in two different engineering units.
The new 9325-NU has six calibration ranges available where each can automatically convert between the calibrated units and any other unit the user wants to display the values in. Therefore, because each calibration range can display a whole range of engineering units (Although this can be limited by the user it still has that capability) setting the decimal position and resolution per range does not work anymore. I.e. changing from grams to tons would be nonsensical if they both shared the setting for 1 decimal place for example. This is even worse for resolution settings when switching between kg and lbf as the display would no longer count in increments suitable for both units.

So, the 9325-NU now supports settings for both decimal point position on a per unit basis and resolution on a per calibration range basis.

Out of the box the decimal point position for all units has a sensible default but these can easily be changed using the keypad (until the user chooses to disable that feature) by long presses on the left and right keys. When you are viewing a particular unit simply adjust with the keys and this setting will be remembered any time that unit is selected in any calibration range, or a TEDs device is connected showing that unit. Decimal places can be set from zero to seven. The resolution is disabled by default and is unwieldy to allow changing via the keypad or menu system.

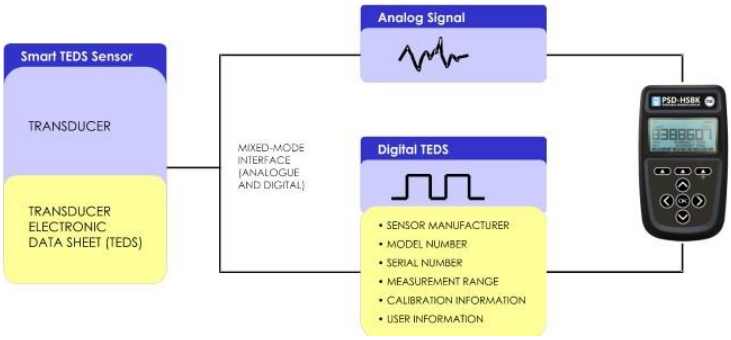
Resolution is stored against each Calibration Range (Or in the case of a TEDS device, per device) and is set in the base calibrated units for that range at the factory. For the chosen display units resolution snaps to the nearest appropriate 1,2 or 5 multiple in that unit. i.e.(.0001, .001, .01, .1, 1, 10, 100, .0002, .002, .02, .2, 2, 20, 200, .0005, .005, .05, .5, 5, 50, 500.)
This selection works across all display modes.

TEDS (Transducer Electronic Data Sheet)

"Plug and play sensor hardware and software make configuring a smart TEDS sensor as easy as plugging a mouse into a PC. The technology has greatly improved efficiency and productivity by completely eliminating manual sensor configuration."

Basic concept

TEDS is at the heart of the universally accepted IEEE 1451.4 standard for delivering Plug and Play capabilities to analogue measurement and test instruments. In essence, information in a Transducer Electronic Data Sheet provides interfacing devices with the critical sensor calibration information in order to perform accurate and precise measurements every time.
TEDS works in a similar way in which USB computer peripherals immediately work as they are connected. TEDS enabled equipment maybe swapped and changed without recalibration, saving time and money.
TEDS holds information such as a sensor manufacturer, model and serial numbers, and more importantly all the calibration settings determined by the manufacturer.



How it works

Plug and play is a data acquisition technology that can simplify the configuration of automated measuring systems by making a sensor's unique identification data available electronically. As implemented according to IEEE 1451.4, data in the form of a transducer electronic data sheet (TEDS) is burned on an electrically erasable programmable read-only memory (EEPROM) chip located on the sensor, so when a properly adapted signal conditioner interrogates the sensor, it can interpret the self-identification data. This technology provides a great benefit by eliminating the need for paper calibration sheets. And because all sensors produced according to the standard will carry the same basic identically formatted self-identification information, you will be able to mix and match sensors and applicable signal conditioners across manufacturers.

Advantages

Plug and play sensors are revolutionizing measurement and automation. With Transducer Electronic Data Sheets (TEDS), your data acquisition system can detect and automatically configure sensors. This technology provides:

- Reduced configuration time by eliminating manual data entry
- Better sensor tracking by storing data sheets electronically
- Improved accuracy by providing detailed calibration information
- Simplified asset management by eliminating paper data sheets
- Reliable sensor location by identifying individual sensors electronically

9325-NU Specifics

All standard TEDS devices contain a basic 2-point calibration. TEDS devices can also optionally hold more than one extended calibration table; template ID=40 (multi-point calibration) or template ID=41 (polynomial calibration). When you first connect a new TEDS device to the 9325-NU a message will be displayed stating that a new TEDS device has been detected and that default settings have been used.
The first detected, valid calibration table from the TEDS device will be selected.
The user can select an alternative calibration table from the menu or Toolkit and this selection will be remembered and the table will be re-selected next time the device is plugged in.

The 9325-NU will remember the last twenty connected TEDS devices so will automatically select the most recently used calibration table and will re-use the User Experience parameters such as Units and tare values.

There is also an option to ignore TEDS on specific devices so that the 9325-NU Calibration Ranges can be used instead of any Calibration Tables held in the connected TEDS device.
In this case the User Experience parameters will be used from the selected Calibration Range. i.e. The device will act as if there is no TEDS chip until the user re-enables TEDS for this device. When a TEDS disabled device is connected again it will automatically switch to the last used 9325-NU Calibration Range.

Supported TEDs Hardware Devices

DS2431 and compatible devices **DS2433** and compatible devices **DS28EC20** and compatible devices

A 4 Kbit (or larger) device is recommended where additional TEDS calibration templates are to be included.

Extended TEDS Calibration Options

The 9325-NU supports up to five extended TEDS calibration tables in addition to the standard 2-point calibration. These can be any combination of template ID=40 (multi-point calibration) or template ID=41 (polynomial calibration). This could be used to provide multiple calibrations for the transducer, for example high range, low range, tension & compression.

Typically, a TEDS-enabled transducer would be supplied with one additional calibration template. The default behavior is to select the first calibration template, or the standard 2-point if a calibration template is not found. The user can cycle between all the available calibrations unless this feature has been restricted.

The TEDS standard allows very large or complex calibration templates to be defined. For practical reasons the 9325-NU imposes restrictions on the size and complexity that is allowed.

Multi-Point Calibration (template ID=40)

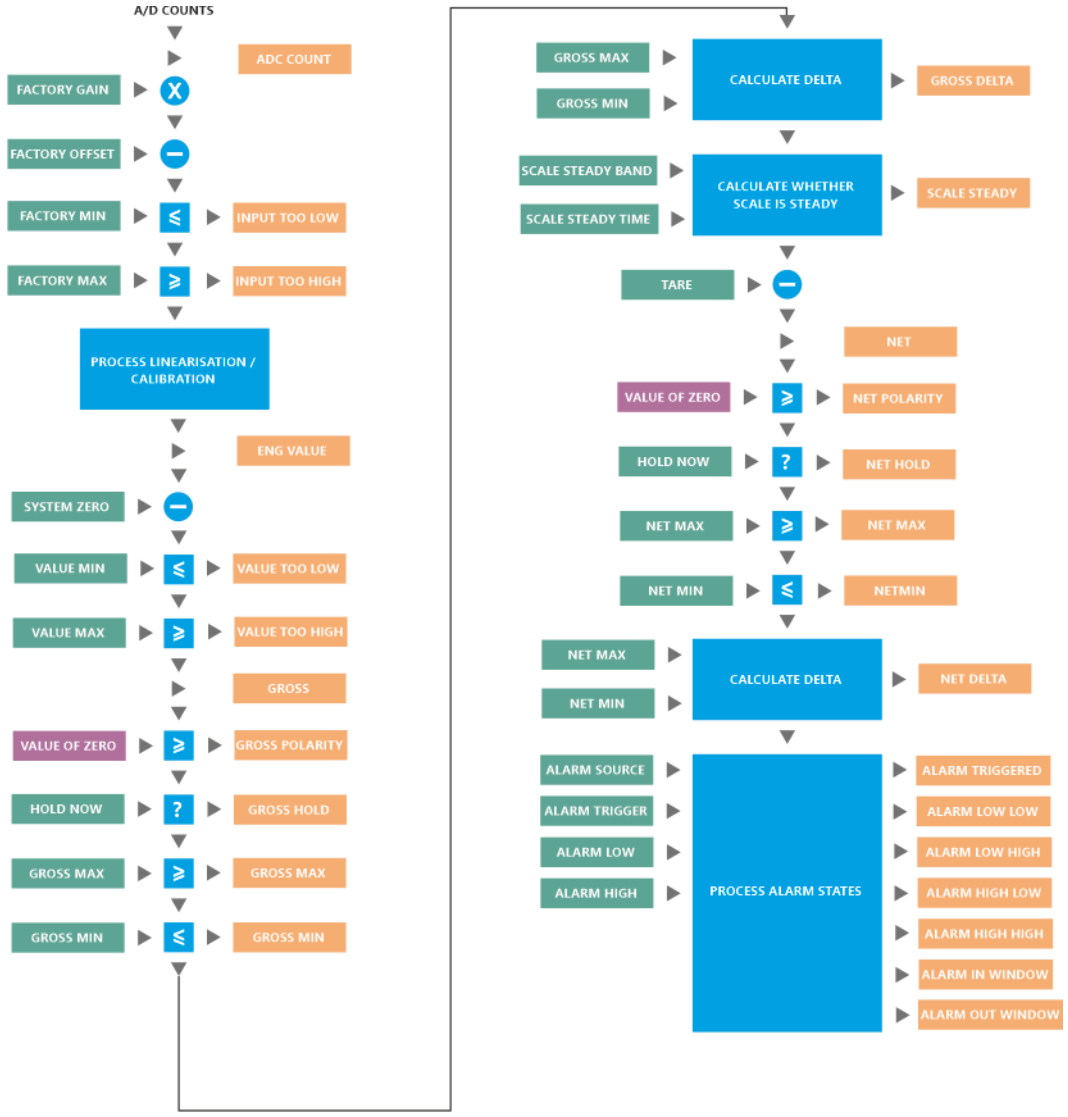
- Maximum calibration points = 10

Polynomial Calibration (template ID=41)

- Maximum number of segments = 1
- Maximum number of coefficients = 10 (10th order polynomial)

Measurement Block

The following diagram shows how values and flags are generated. This entire block is processed at the **Measurement Rate** selected. Some processes (such as the calibration and linearization) are only shown as a single block due to their complexity.

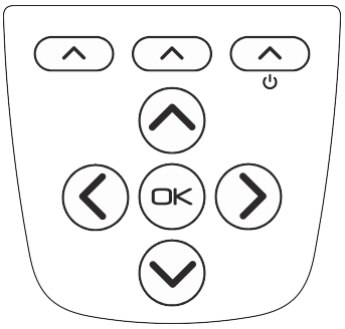


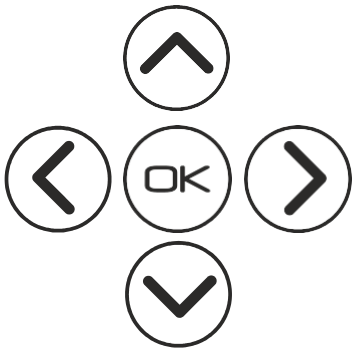
Key:

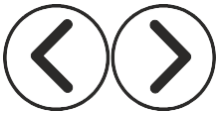
User Operation

Keypad

The keypad has some functionality that is fixed and some that can be configured and some that changes depending on what is on the LCD display. The handheld can optionally sound a beep when keys are pressed.



Key	Function
	The top right key doubles as the power key. Hold this for approximately two seconds to turn on or off the handheld.
	The three keys along the top of the keypad are **soft keys** and relate to the three descriptions shown directly above them on the LCD display. The action of these keys will depend on what is currently being viewed.
	The navigation keys are used for various purposes such as selecting the current calibration range, selecting the current display, navigating the menu system or editing string and numeric values. The **OK** key is used to open the menu (If that has been allowed in the configuration) and to select menu items and complete editing sessions. Later we will explain how to use the keys to navigate the menu system.
	When not in a menu the **Up**/**Down** keys can perform one of a few user definable functions but the default is to cycle through all available calibration ranges. If a TEDS device is attached then these keys will cycle through any valid Calibration Tables held in the device. If There is no TEDS device (or manual override for that particular TEDS device has been set) then the keys will cycle through the internal device Calibration Ranges. In both the menu and the toolkit the user may also select an action for a long press. A long press is where the key is held down for over a second before being released.

	When not in a menu the **Left**/**Right** keys can perform one of a few user definable functions but the default is to cycle through all available display modes. In both the menu and the toolkit the user may also select an action for a long press. A long press is where the key is held down for over a second before being released.
	The **OK** key is used to open the menu (If that has been allowed in the configuration) and to select menu items and complete editing sessions. The **OK** key can also be held down for a long press (Approx one second then released) to cancel any current editing of values and data.

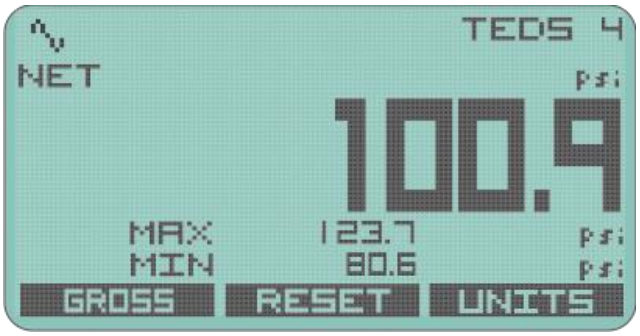
Display

The 9325-NU has a monochrome dot matrix backlit display and the display may change depending on the display mode. However, the basic operation and positions of items should remain intuitive.

Display Mode

The handheld comes with a set Display Mode

This display shows the min and max values underneath the large normal value display.



Soft keys allow you to toggle between Zeroed and Gross values and to Reset the min and max to the current value. The usual Units selection is also available.

Icons

The set of icons displayed along the top left of the display are common to all display modes and have the following meanings.

A warning is detected. Further investigation of the warning may be required either via the keypad or software.
Also displayed when alarm is triggered.

Battery is low.

The keypad has been locked because some critical processes are being performed by the Toolkit or other software.

The measurement system is operating in 4-wire mode instead of 6-wire mode. (This feature is only available in certain versions and is not available to change by the user.)

The main display is showing the Net value because a Tare has been executed.

The temperature is now too low to operate the LCD at its normal update rate. A slower update rate has been applied. Note that internal measurement (such as peak detection) will not be affected.

External USB power has been applied.

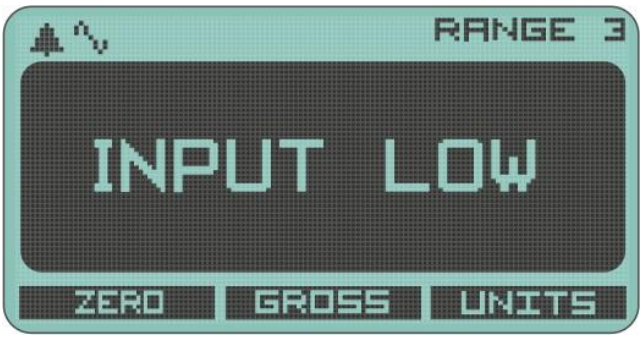
The Scale Steady functionality is active but the reading is not steady.

A TEDs device is detected as being connected.

The TEDs device is using an internal calibration range rather that its own calibration table.

Full Screen Messages

Some errors may be so severe that the value displayed cannot be trusted. In these cases a full screen message is displayed which will obscure the value displays to ensure that a potentially invalid value is not acted upon.



Message	Reason
INPUT HIGH	The mV/V input exceeds the upper limit for the selected sensitivity range of the current calibration range.
INPUT LOW	The mV/V input is below the lower limit for the selected sensitivity range of the current calibration range.
OVERLOAD	The input value exceeds the user level set as overload.
UNDERLOAD	The input value is below the user level set as underload.
TEDS DISCONNECTED SESSION RESTORED	A TEDs device has been disconnected so the handheld is reverting to the last selected calibration range. (Click OK)
MULTIPLE TEDS ARE NOT SUPPORTED!	More than one TEDs device has been detected and this is not allowed.
NEW TEDS DEVICE USE SESSION DEFAULTS	A new TEDs device has been detected so default values will be used for all settings not held in the TEDs device itself.
KNOWN TEDS DEVICE SESSION RESTORED	A TEDs device has been reconnected so all the user settings from the previous session will be applied. (Click OK)
TEDs ERROR Code 0x0000	An error has been detected in the connected TEDs device. See displayed error code and refer to the error code table in this manual.
BATTERY TOO LOW REPLACE IMMEDIATELY	Battery is too low to start the handheld.

Menu

Menu Basics

The menu is accessed by holding the OK key for around one second. It is possible to lock out the menu system so if your handheld does not display a menu it may be that your supplier has locked this feature.
Individual features may also have been hidden by your supplier.

The currently selected menu item is displayed on a dark background and this selection can be changed by using the up and down keys. Pressing OK will select that item and can either:

- Perform an action (Such as increasing LCD contrast)
- Edit a value (Such as editing an alarm level value)
- Display the items sub menu (Indicated by a following > symbol)

The menu system is a standard hierarchal one but does have some visual clues to help you navigate.

- If a menu item leads to a sub menu (Another list of items) it will display a ► to the right.
- If a menu item is part of a list where only one item can be selected at a time then the current active selection is indicated by a leading dot • to the left. All items that this can apply to are shown as a • below for clarity.
- Some items will lead to a displayed value or text which may be edited. See the next section regarding Editing Values where this is described. Shown as a following ••• for clarity.

Menu Structure

MENU	Menu is activated by holding the OK key for 1 second.
SYSTEM ►	System Menu contains settings for display and user interface and other system wide settings.
DISPLAY	Handles settings to do with the display and backlight.
CONTRAST ►	Allows the LCD contrast to be configured.
INCREASE	Instantly increases LCD contrast.
DECREASE	Instantly decreases LCD contrast.
BACKLIGHT ►	Allows the backlight settings to be configured.
INCREASE	Instantly increases brightness.
DECREASE	Instantly decrease brightness.
MODE ►	Select this item to choose the backlight operation mode.
• OFF	Backlight is always off.
• ON	Backlight is always on.
• AUTO	Backlight is on but will turn off after a certain duration when no keys are pressed. Any key press will turn the backlight on again.

DURATION ●●●	If Backlight Mode is set to Auto this sets the duration after which the backlight will turn off.
AUTO-OFF ►	Controls whether the handheld turns itself off after a duration without key presses.
MODE ►	Select Auto Off mode of operation.
● DISABLED	Disable Auto Off.
● ENABLED	Enable Auto Off.
TIMEOUT●●●	Display and edit the duration before the handheld turns off without a key press when Auto Off is enabled. (Only visible when mode is enabled.)
USER INTERFACE ►	Allows changes to be made to the way the user interface behaves.
KEY ACTIONS ►	Select this item to choose what feedback occurs when a valid key press is detected.
● NONE	No feedback.
● BEEP	The sounder will issue a beep.
KEYS UP/DOWN ►	Select this item to choose the action when the up and down keys are pressed (When not in the menu).
● RANGE SELECTION	Select the next Calibration Range.
● DISPLAY SELECTION	Select the next Display Mode.
● DECIMAL PLACES	Increase or decrease the number of decimal places displayed for all displayed values using the same units as the main display.
● DISABLED	No Action
KEYS LEFT/RIGHT ►	Select this item to choose the action when the left and right keys are pressed (When not in the menu).
● RANGE SELECTION	Select the next Calibration Range (Only for non TEDS devices).
● DISPLAY SELECTION	Select the next Display Mode.
● DECIMAL PLACES	Increase or decrease the number of decimal places displayed for all displayed values using the same units as the main display.
● DISABLED	No Action
LONG UP/DOWN ►	Select this item to choose the action when the up and down keys are pressed and released after around one second (When not in the menu).
● RANGE SELECTION	Select the next Calibration Range (Only for non-TEDS devices).
● DISPLAY SELECTION	Select the next Display Mode.
● DECIMAL PLACES	Increase or decrease the number of decimal places displayed for all displayed values using the same units as the main display.
● DISABLED	No Action
LONG LEFT/RIGHT ►	Select this item to choose the action when the left and right keys are pressed and released after around one second (When not in the menu).
● NONE	No action.
● RANGE SELECTION	Select the next Calibration Range (Only for non-TEDS devices).
● DISPLAY SELECTION	Select the next Display Mode.
● DECIMAL PLACES	Increase or decrease the number of decimal places displayed for all displayed values using the same units as the main display.

TIME & DATE ►	Allows setting of time and date.
TIME NOW ●●●	Display time and date.
SET DATE ●●●	Display and edit the date.
SET TIME ●●●	Display and edit the time.
DATE FORMAT ►	Choose the format for displayed dates.
● YYYY/MM/DD FORMAT	
● DD/MM/YYYY FORMAT	
● YYYY/MM/DD FORMAT	
ABOUT ►	Displays information about this product.
ALARM ►	Configure settings for the global alarm.
** ALARM CANCEL **	Only appears when a latched alarm state is present. Click to retry alarm state.
ALARM SOURCE ►	Select the source value the alarm is based on.
● GROSS	Base Alarm on Gross value.
● NET	Base Alarm on Net value.
ALARM MODE ►	Select the alarm mode.
● NORMAL	Alarm only active while value matches trigger criteria.
● LATCHED	Alarm remains active until reset once triggered.
ALARM THRESHOLDS ►	Set the alarm low and high thresholds.
● ALARM LOW ●●●	Edit Low Alarm value.
● ALARM HIGH ●●●	Edit High Alarm value.
ALARM TRIGGER ►	Select how the alarm is triggered.
● DISABLED	The Alarm is disabled.
● OUTSIDE LIMITS	Alarm is triggered when the source value is below the Alarm Low level **or** above the Alarm High Level.
● INSIDE LIMITS	Alarm is triggered when the source value is higher than the Alarm Low level **and** lower than the Alarm High Level.
● ABOVE HIGH	Alarm is triggered when the source value is above the Alarm High level.
● BELOW HIGH	Alarm is triggered when the source value is below the Alarm High level.
● ABOVE LOW	Alarm is triggered when the source value is above the Alarm Low level.
● BELOW LOW	Alarm is triggered when the source value is below the Alarm Low level.
ALARM ACTION ►	Select one of these actions to occur when the Alarm is triggered.
● NONE	No action. (Will still trigger warning icon and Pass/Fail Display Mode will still operate)
● BEEP	Play beep sound.
● FLASH	Flash the main display.
● BOTH	Do both.
MEASUREMENT ►	Allows configuration of the various measurement settings
MEASUREMENT RATE ►	Select the required Measurement Rate at which new values will be generated. The faster the rate the more this affects battery life. (SPS = Samples Per Second)
● 1 SPS	One per second.
● 3 SPS	Three per second.
● 10 SPS	Ten per second.
● 50 SPS	Fifty per second.

● 100 SPS	One hundred per second.
● 1200 SPS	One thousand two hundred per second.
● 2400 SPS	Two thousand four hundred per second.
MEASUREMENT QUALITY ►	Select the desired quality. This will affect the noise free resolution and battery life.
● LOW	Lowest quality.
● HIGH	High Quality.
CURRENT RANGE ►	Configure the System Zero options
SYSTEM ZERO ►	Configure the System Zero options
VIEW/EDIT ZERO ●●●	Display and edit the current Zero value
ZERO NOW	Perform a System Zero now
REMOVE ZERO	Remove any existing System Zero value
TARE VALUE ►	Configure the Tare options
VIEW/EDIT TARE ●●●	Display and edit the current Tare value
TARE NOW	Perform a Tare now
REMOVE TARE	Remove any existing Tare value
SCALE STEADY ►	Configure the Scale Steady values
BAND ●●●	Display and edit the Scale Steady ± band
INTERVAL ●●●	Display and edit the time interval over which the value must be within the band to constitute Scale Steady
SET ZERO MASK ●●●	Display and edit the Zero Mask value. This is entered in base calibrated units for this range and when the value is less than this level a zero will be displayed.
SET RESOLUTION ●●●	Display and edit the Resolution value in base calibrated units for this range. The display will change in increments of this value.
SET MIN LIMIT ●●●	Display and edit the Minimum user level in base units for this range. When the value falls below this a full screen **Underrange** message will be displayed.
SET MAX LIMIT ●●●	Display and edit the Maximum user level in base units for this range. When the value falls below this a full screen **Overrange** message will be displayed.
CALIBRATION ►	This menu contains settings regarding Calibration.
CALIBRATION INFO ►	Shows information about the currently selected calibration range. Information: Name, Mode, Units, Type and last calibration date.
USER CALIBRATION ►	Only available when no **active** TEDS device is attached
RANGE NAME ►	Only available when no **active** TEDS device is attached
RANGE 1	Select a Calibration Range item to display and edit its text description. Some Calibration Ranges may not be available.
RANGE 2	
RANGE 3	
RANGE 4	
RANGE 5	
RANGE 6	
SELECT RANGE ►	Only available when no **active** TEDS device is attached. This allows you to select the current Calibration Range to use. Some ranges may not be available.
● RANGE 1	Select Calibration Range 1.
● RANGE 2	Select Calibration Range 2.
● RANGE 3	Select Calibration Range 3.
● RANGE 4	Select Calibration Range 4.
● RANGE 5	Select Calibration Range 5.
● RANGE 6	Select Calibration Range 1.
LIVE CALIBRATION ►	Only available when no **active** TEDS device is attached.
MODE	Select the physical wiring mode for the attached strain bridge.
● 4-WIRE MEASUREMENT	The measurement is 4-wire with no compensation for the length of the cable.

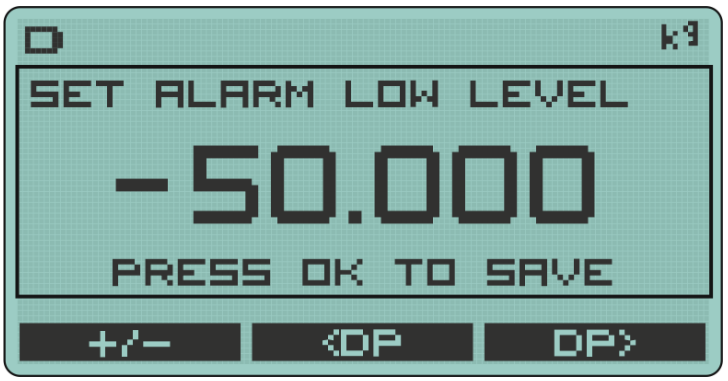
● 6-WIRE MEASUREMENT	The measurement is 6-wire with compensation for the length of the cable.
SENSITIVITY	Select the desired sensitivity. Select an input range that covers the strain bridge being connected.
● 7.5 mV/V	Select the desired sensitivity.
● 15 mV/V	
● 30 mV/V	
● 60 mV/V	
● 120 mV/V	
● 240 mV/V	
● 480 mV/V	
UNITS	Select the units that the calibration is to be performed in.
● KILOGRAMS	Select desired units.
● GRAMS	
● TONNES	
● POUNDS	
● OUNCES	
● KILOPOUNDS	
LOW/HIGH CALIBRATION	Configure the low and high points to perform calibration. Only a two-point calibration can be performed using the keypad.
SET OUTPUT LOW	Enter a value in the units (selected above) as the low point of the known two-point calibration.
SET OUTPUT HIGH	Enter a value in the units (selected above) as the high point of the known two-point calibration.
CAPTURE mV/V LOW	Capture the inputs for mV/V to represent the two outputs entered above. If you actually apply the known force to the input when selecting these options, the detected mV/V will be displayed ready to either select OK or to manually edit.
CAPTURE mV/V HIGH	
APPLY ●●●	Use all of the information captured above to perform the actual calibration.
TEDS ►	Only available if a TEDS device is attached.
RANGE NAME ►	Displays and edits the global name to give each TEDS Calibration Table. This applies to **all** TEDS devices
TEDS CAL TABLE 1	Select a Calibration Table item to display and edit its text description. Some Calibration Tables may not be available.
TEDS CAL TABLE 2	
TEDS CAL TABLE 3	
TEDS CAL TABLE 4	
TEDS CAL TABLE 5	
TEDS CAL TABLE 6	
SELECT TEDS RANGE ►	Only available when an **active** TEDS device is attached. Select which of the Calibration Tables held in the TEDS device to use.
● CAL TABLE 1	Select TEDS Calibration Table 1.
● CAL TABLE 2	Select TEDS Calibration Table 2.
● CAL TABLE 3	Select TEDS Calibration Table 3.
● CAL TABLE 4	Select TEDS Calibration Table 4.
● CAL TABLE 5	Select TEDS Calibration Table 5.
● CAL TABLE 6	Select TEDS Calibration Table 6.
TEDS MODE ►	Select whether a TEDS device is enabled / **active** or disabled / inactive
● ENABLED (TEDS)	Enable TEDS support on the connected device.
● DISABLED (9325-NU)	Disable TEDS support on the connected device.

Editing Parameter Values

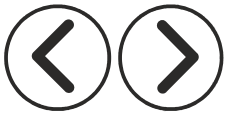
Some menu items allow you to edit / enter a numeric value or text.

Editing Numeric Values

The following example screen shows what would be displayed for editing the Alarm Low level.



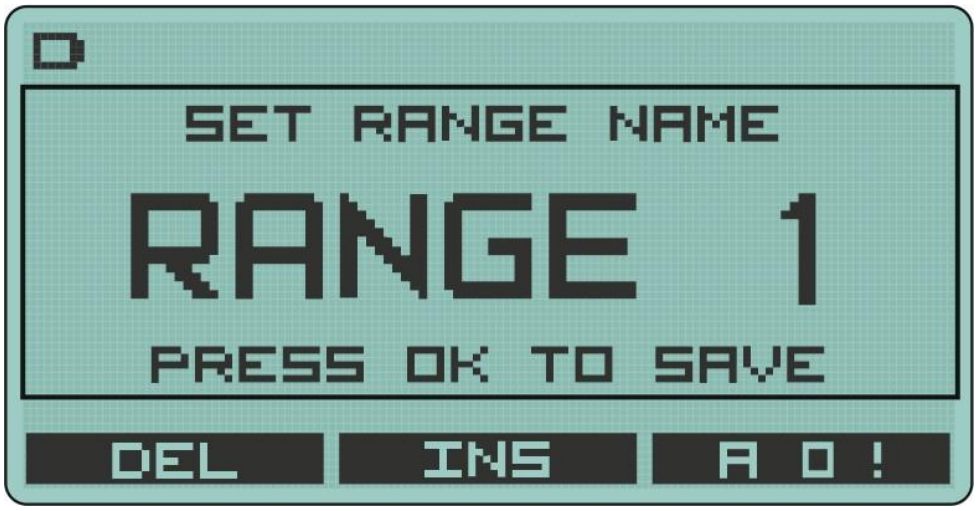
The text at the top right states the engineering units of the value being entered. The text at the top inside the box states what parameter is currently being edited.
One of the digits will be the current selection and this digit will flash alternatively displaying its character and an underlined space.

Key	Function
	These keys are used to change the currently selected (Flashing digit or character).
	These keys will increment or decrement the currently selected digit. In the case of text the letters of the alphabet will be cycled through.
	The soft keys at the bottom will (where appropriate) allow you to:
+/-	Toggle the sign between positive and negative.
<DP	Move the decimal place to the left.
DP>	Move the decimal place to the right.
	Click the OK key to stop editing and save the value.

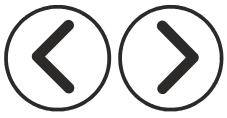
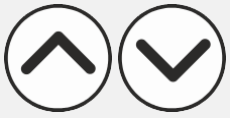
> *Pressing and holding this key for over a second then releasing will cancel the current edit.*

Editing Text

The following example screen shows what would be displayed for editing the name of a calibration range.



The text at the top inside the box states what parameter is currently being edited.
One of the characters will be the current selection and this character will flash alternatively displaying its character and an underlined space.

Key	Function
	These keys are used to change the currently selected (Flashing digit or character).
	These keys will increment or decrement the currently selected digit. In the case of text the letters of the alphabet will be cycled through.
	The soft keys at the bottom will (where appropriate) allow you to:
	Delete the current character selection.
	Insert another character to the left of the flashing cursor.
	Cycle between character modes. Alpha, numeric and symbol.
	Click the OK key to stop editing and save the value.

> *Pressing and holding this key for over a second then releasing will cancel the current edit.*

Connections

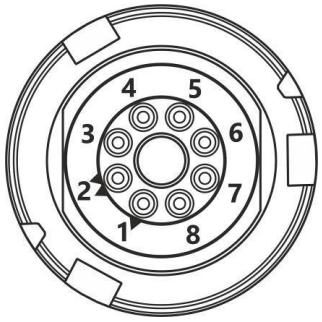
Strain Bridge Sensor Field Cable Connector Wiring

To attach this connector to the handheld, align the white arrow on the connector with the white line on the handheld socket then rotate the locking collar as indicated on the connector.
The connector fitted to 9325-NU Standard Product is BINDER 770-8. The cable fitted mating connector is a BINDER 771 8-way male connector. This male connector is available under three different BINDER Order Codes determined by the field cable diameter.

Field cable diameter (mm)	Binder Order Code
2.5 to 4.0	99 0771 000 08
4.0 to 6.0	99 0771 001 08
6.0 to 8.0	99 0771 002 08

Recommended cable BELDEN 9504 4-pair cable. Max cable size 0.25 mm^2 , AWG 24.
List of conductor identification and functions.

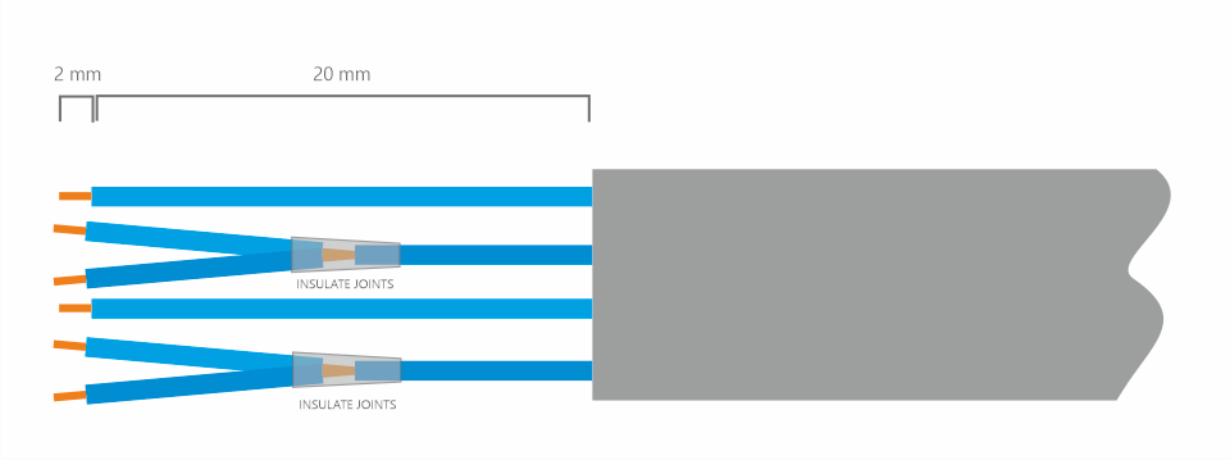
Connector Pin	Function
1	Bridge Sensor Reference +ve
2	Bridge Sensor Reference -ve
3	Bridge Sensor Signal +ve
4	Bridge Sensor Signal -ve
5	Bridge Sensor Excitation +ve
6	Bridge Sensor Excitation -ve
7	TEDS
8	Ground
	Cable screen should *only* be connected to chassis of the sensor. If this cannot be achieved, then it should be connected to Excitation –ve.



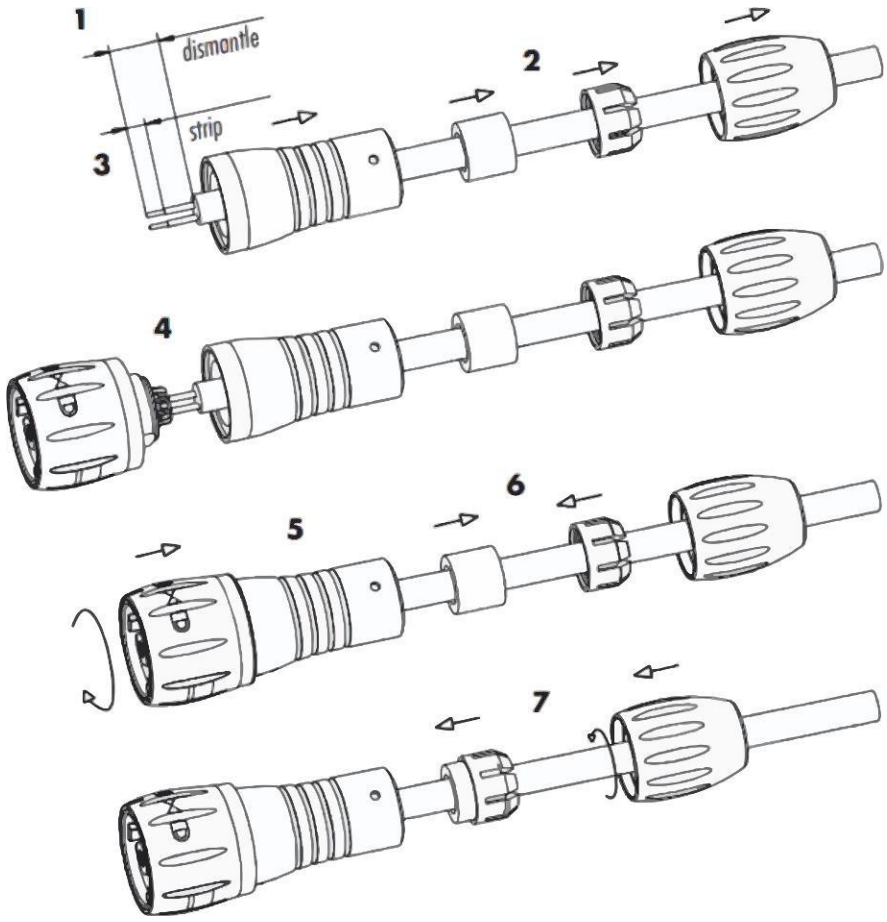
View from solder connector side of the connector

Field Cable Preparation (4-Wire Shown)

Strip 15 to 20mm of outer sheath. Strip 2mm of insulation from each conductor. Conductor diameter of Belden 9504 cable is at the maximum accommodated by connector solder buckets, so check fit before tinning. Note that pin one is identified with a single triangle and pin two by dual triangles.
The diagram below shows the recommended wire lengths to fit inside the plug body. This also shows the recommended method to use when one wire is required to connect to two connector pins:



Connector Assembly



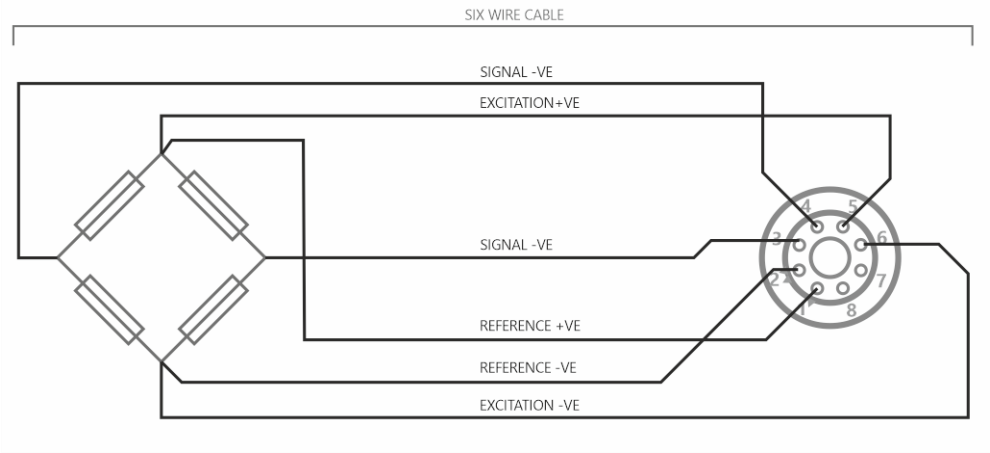
If a cable is already connected to the connector remember to unscrew the cable clamp before unscrewing the main body of the connector otherwise, you risk twisting the cable and breaking the connections.
If the main body is difficult to unscrew it may be easier to lock the connector to the handheld then grip and unscrew the main body in an anti-clockwise direction.

Six Wire Measurement Explained

The 9325-NU utilizes a six-wire measurement system to achieve maximum accuracy when connecting to a strain bridge sensor.
Four wire strain bridge sensor can still be used but please review the recommendations below to get the best out of the measurement system.
A six-wire measurement system has one very big advantage over a four-wire measurement system in that the length of the cable connecting the handheld to the strain bridge sensor can be compensated for in terms of losses along its length. Meaning that even after calibration the sensor's cables may be lengthened or shortened without affecting the integrity of the calibration.
The disadvantage is that the handheld needs all six wires connecting even if using a four wire strain bridge sensor.

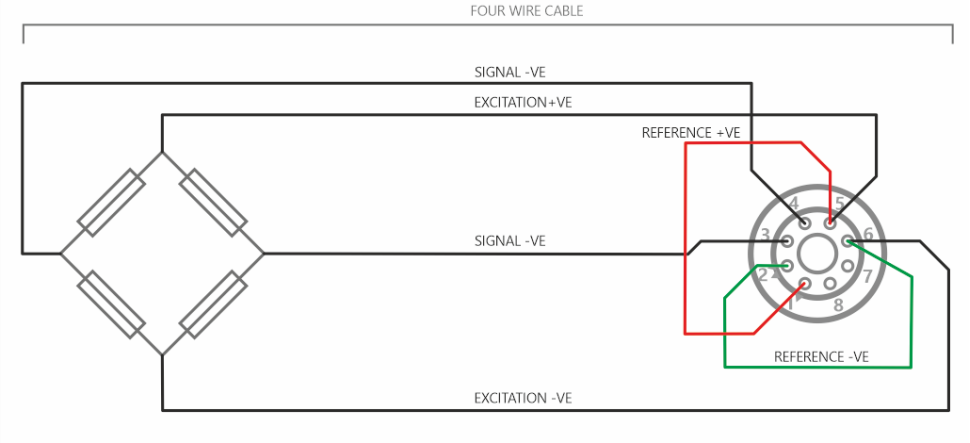
Wiring a Six Wire Strain Bridge Sensor

Where possible six core cable should be used to connect the strain bridge sensor directly to the 9325-NU connector. If the cable has twisted pairs refer to the wiring table above where it is indicated which connections should share a twisted pair. Note that shield connections are described further on in this section. Also note that the extra two cores required for TEDs connection (If used) are not shown in the diagram.



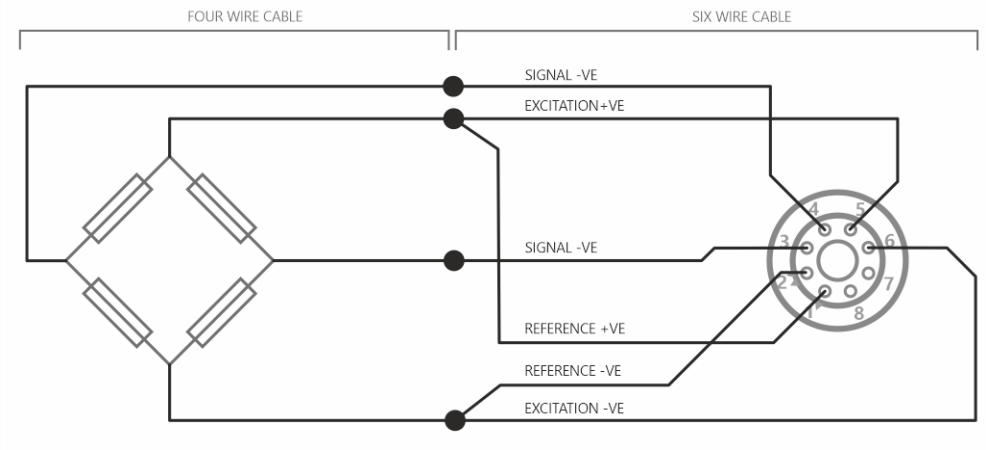
Wiring a Four Wire Strain Bridge Sensor (Existing four wire cable)

If is not possible to run six conductor cable direct to the strain bridge sensor, or the strain bridge sensor is supplied with four core cable connected, then the sense connections will need to be made at the 9325-NU connector end. See previous section for recommended method of connecting a single core cable to two connector pins.
If the cable has twisted pairs refer to the wiring table above where it is indicated which connections should share a twisted pair. Note that shield connections are described further on in this section.


FOUR WIRE CABLE
SIGNAL -VE
EXCITATION+VE
REFERENCE +VE
SIGNAL -VE
REFERENCE -VE
EXCITATION -VE
1
2
3
4
5
6
7
8

Wiring a Four Wire Strain Bridge Sensor (On extended six wire cable)

If a strain bridge sensor has four core cable fitted and a longer cable is needed to be attached, then six core cable should be used to route up to the four cores.
If the cable has twisted pairs refer to the wiring table above where it is indicated which connections should share a twisted pair. Note that shield connections are described further on in this section. Also note that the extra two cores required for TEDs connection (If used) are not shown in the diagram.

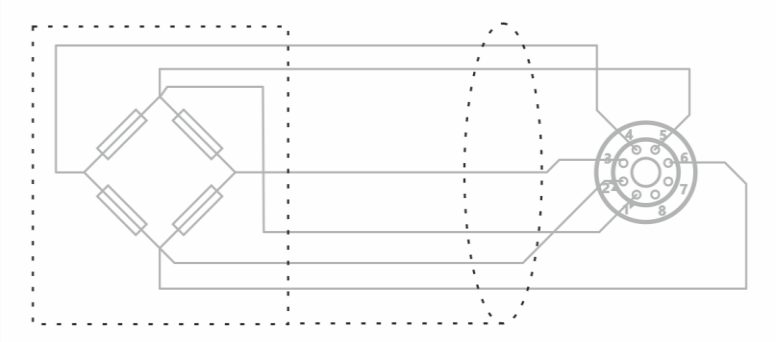


Shield Connection

All connection cables should be shielded / screened, and the recommended shield connection point is as follows:

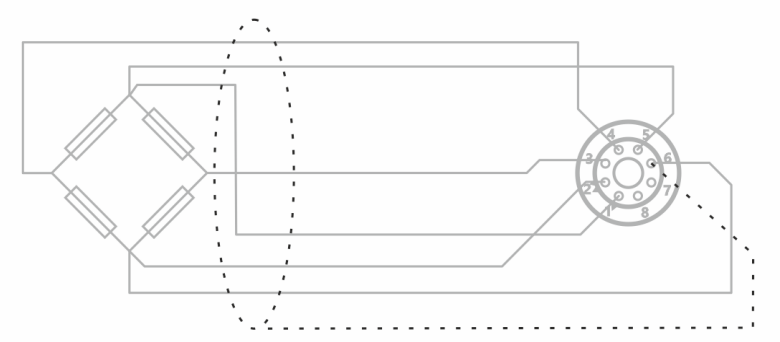
Where Strain Bridge Sensor Chassis is Metallic (or surrounding strain bridge sensor structure)

Cable shield should be connected to the strain bridge sensor chassis and remain unconnected at the 9325-NU end.



Where There is No Option to Connect to Strain Bridge Sensor Chassis

Cable shield should be connected to the 9325-NU **Excitation -ve** and remain unconnected at the strain bridge sensor end.



Setting up the 9325-NU

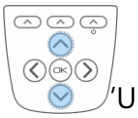
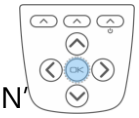
Setup is possible by following the below examples.

Calibration

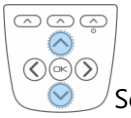
> Please note that this must be done in the correct order for the calibration to work correctly. Changing the **Sensitivity** after inputting mV/V readings will cause the calibration to be void. Always make sure you finish with **Apply**

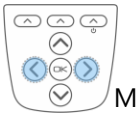


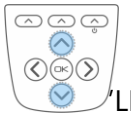
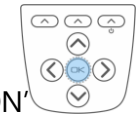

'CALIBRATION'

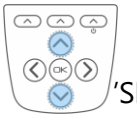

'USER CALIBRATION'


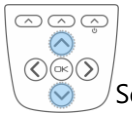

'ENTER PASSWORD' (if set default is "9325")


Scrolls through available characters

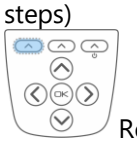

Moves between digits

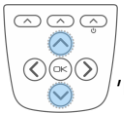

'LIVE CALIBRATION'


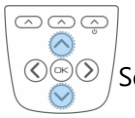
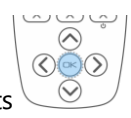

'SENSITIVITY'



Select required input sensitivity

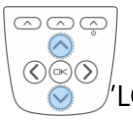
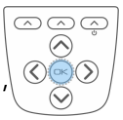
(Note, this **MUST** be selected before the following steps)


Return to previous menu


'UNITS'



Select required calibration units



Return to previous menu



'LOW/HIGH CALIBRATION'



'SET OUTPUT LOW'

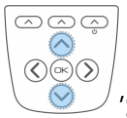
Manually enter the low output required using  to select digits and  to change the value


changes the sign of the entered number


moves the decimal place to the left

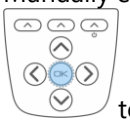

moves the decimal to the right

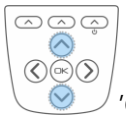

to save changes (long press cancels changes and returns to previous view)



'SET OUTPUT HIGH'

Manually enter the high output required (as above)

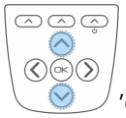
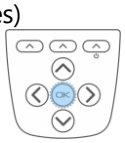

to save changes (long press cancels changes)


'CAPTURE mV/V LOW' Apply low load, let load settle then: 

Confirm or edit low mV/V input

(You can manually edit the mV/V to a value from a calibration certificate here)


to save changes (long press cancels manual changes)


'CAPTURE mV/V HIGH' Apply high load, let load settle then: 

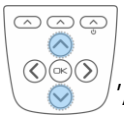
Confirm or edit high mV/V input

(You can manually edit the mV/V value to a value from a calibration certificate here)


to save changes (long press cancels manual changes)

If everything is as planned


Return to previous menu


'APPLY'



Return to previous selected display mode.

Change units

In all standard display modes,  scrolls through the available units for the selected calibration.

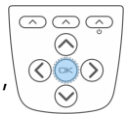
Change decimal places

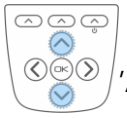
A 2 second press  shifts the decimal place position for the selected units.

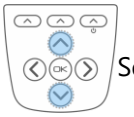
Overload/underload alarm

Please note, the values saved for the thresholds are applied in the calibrated units of the currently selected range. This means that different ranges will trigger at different loads if the calibrated unit is different.



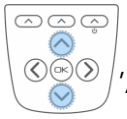
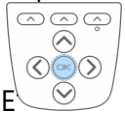
'ALARM'



'ALARM SOURCE'



Select 'GROSS' or 'NET'

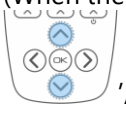


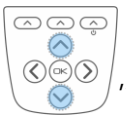
Return to previous menu


'ALARM MODE'



Select 'NORMAL' or 'LATCHED'


(When the alarm is latched but no longer being triggered, cancel the alarm by:


'ALARM'


 '**ALARM CANCEL**' )

 'ALARM THRESHOLDS' 

 'ALARM LOW' 

Manually enter the low threshold required using  to select digits and

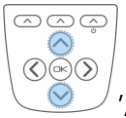
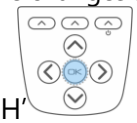
 to change the value

 changes the sign of the entered number

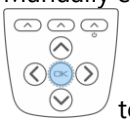
 moves the decimal place to the left

 moves the decimal to the right

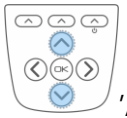
 to save changes (long press cancels changes and returns to display mode)

 'ALARM HIGH' 

Manually enter the high threshold required as above.

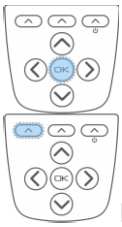
 to save changes (long press cancels changes and returns to display mode)

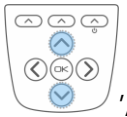
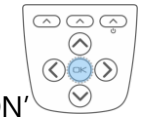
 Return to previous menu

 'ALARM TRIGGER' 

 Select from:

Disabled
Outside limits (<low, >high)
Inside limits (>low, <high)
Above high (>high)
Below high (<high)
Above low (>low)
Below low (<low)


Return to previous menu



'ALARM ACTION'



Select 'NONE', 'BEEP', 'FLASH' or 'BOTH'

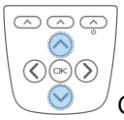

Return to previous menu


Return to previous selected display mode.

Using TEDS

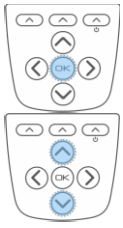
Plug in a TEDS enabled load cell.

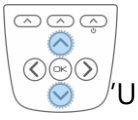

Message: 'NEW TEDS DEVICE USE SESSION DEFAULTS'
TEDS table(s) will be automatically loaded.

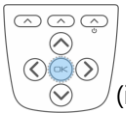

Change selected TEDS calibration

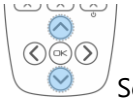

Change displayed units

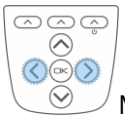
To disable TEDS and use the 9325-NU internal calibration:


'CALIBRATION'


'USER CALIBRATION'

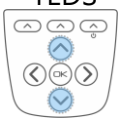


'ENTER PASSWORD' (if set default is "9325")


Scrolls through available characters

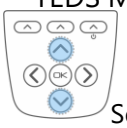


Moves between digits


'TEDS'



'TEDS MODE'

Select from:
'ENABLED (TEDS)'
'DISABLED (9325)'


Return to previous menu

Return to previous selected display mode. The next time that you connect that TEDS device you will get the message:

'KNOWN TEDS DEVICE SESSION RESTORED'

Enclosure

The enclosure is made from ABS with a soft polymer over mold for grip and shock absorption.
The enclosure, window and keypad should be wiped down with a damp cloth and a mild detergent (such as dishwashing liquid) or isopropyl alcohol.
It is weatherproof and can be washed with a damp cloth. Ensure that the battery compartment is tightly closed.

> *Avoid using abrasive cleaners. Avoid using anything containing acetone or cellulose.*

Dimensions

The mating connector will add another 45mm to the height not including any cable.
Weight with no mating connector is 350 g.

Battery Compartment

Before re-attaching the battery compartment cover check the rubber seals and grooves for any debris that may compromise the enclosure's water resistance.

The battery compartment cover should remain with the handheld case it was shipped with.

Accessories

A ¼" deep threaded socket on the rear of the enclosure allows a range of standard camera fittings to be used to mount the handheld.

Sometimes the handhelds are used fixed in place and the following two accessories offer a choice in mounting.

Magnetic Pad

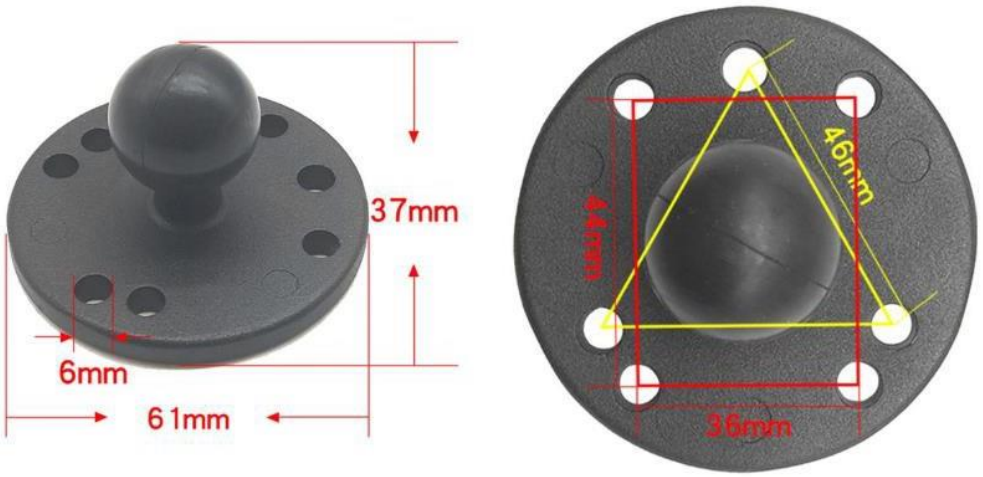
A 66mm diameter rubber coated magnetic pad that can be screwed onto the back of the enclosure provides for a very strong semi-permanent attachment to metallic surfaces and works equally well on a vertical surface. This is ideal for placing next to machinery in fixed installations.

An optional included ball-joint connection can be used for more positioning options.

Order Code: **9325-MP**

Fixed Mount

This mount is for more permanent fixing for dashboards, desktops and walls. Multiple fixing hole positions secure the base to the surface and a dual ball-jointed arm connects to the handheld enclosure threaded socket.
This allows a wide range of positions to be achieved before tightening the arm to fix in place.



Order Code: **9325-FM-B**

Carry Case

The carry case allows full access to the handheld display, keypad and connectors while offering a shoulder strap for easy carry and protection from mud and dust.

Order Code: **9325-CASE**

Connector Conversion Cable

This cable allows the original 9325-NU connector to be plugged in to the new 9325-NU using a conversion cable. The cable length is 300mm.

Order Code: **CT-811-1**

Specification

Strain Gage Measurement

Parameter	Min	Typ	Max	Units	Note
Measurement Method		6 Wire			Can accept a 4 wire input.
Excitation Voltage	3.2	3.3	3.4	VDC	
Drive Capability	85	-	10,000	Ohm	
Sensitivity FSR Ranges [1]	±7.5	-	±480	mV/V	
Linearity [2]		±2		ppm/FSR	In high quality operating mode
Offset Temperature Stability		12		nV/°C	at 2.5mV/V
Gain Temperature Stability		1	2	ppm/°C	
Internal Resolution		24		bit	
Resolution at 1 SPS		1,100,000 (20)		Counts (bit)	Noise free at ±7.5mV/V range
Resolution at 10 SPS		550,000 (19)		Counts (bit)	
Resolution at 2400 SPS		6,500 (14.3)		Counts (bit)	
Filters					

1 - Effective sensitivity from ±0.5mV/V with reduced resolution
2 - Linearity error can be further reduced by device linearization calibration
3 - Using Energizer L91 3000mAh cells

Electrical, Mechanical & Environmental

Parameter	Min	Typ	Max	Units	Note
Display Resolution		128 x 64		pixels	
Buzzer Acoustic Output		45		dB	
Power Supply [3]		2x AA (LRx) or USB powered			
Power Consumption		35		mA	Measurement operation
Standby Current		75		uA	
Battery Life Low Quality 1Hz		220		Hrs	
Battery Life High Quality 1200Hz		60		Hrs	
Operating Temperature Range	-10		50	°C	
Storage Temperature Range	-20		80	°C	
Operating Humidity Range	0		95	%RH	
Environmental Protection		IP64 (With connector mated or unmated)			
External Dimensions		L: 170mm, W: 94mm, H: 42mm			Excluding mated connector
Weight		365		g	Including batteries

Units of Measure

The 9325-NU has a large internal table of engineering units allowing conversion from the calibrated units into various other units, within the same measurement category, as required.
In addition to these automatic conversions there are also user defined units which allow the defining of units not contained in this table.

Category	Unit	Symbol
Voltage Ratio		
	mV/V	mV/V
	V/V	V/V
	µV/V	µV/V
Angle		
	radians	rad
	degrees	°
	circumference	c
	grade	grade
	minutes	'
	seconds	"
	revolutions	rev
Length		
	meters	m
	angstrom	Å
	astronomical unit	AU
	centimeters	cm
	chains gunters	ch
	ell	ell
	em	em
	fathoms	fm
	feet	ft
	furlongs	fur
	inches	in
	kilometers	km
	league	lea
	leagues	league
	light years	ly
	lines	ln
	microns	µ
	miles nautical	mi n
	miles	mi
	millimeters	mm
	mils	mil
	nanometers	nm
	parsec	pc

	yards	yd
Mass		
	kilograms	kg
	drams	dram
	grains	grains
	grams	g
	milligrams	mg
	ounces	oz
	pennyweights	pwt
	pounds	lb
	kilopounds	klb
	scruples	scruple
	slug	slug
	tons long	ton
	tons metric	T
	tonnes	tonne
	tons short	sh tn
	newtons	N
	kilonewtons	kN
Force		
	newtons	N
	kilonewtons	kN
	millinewtons	mN
	meganewtons	MN
	crinals	crinal
	dynes	dyne
	grams force	gf
	joules per cm	J/cm
	kilograms force	kgf
	kilograms force kp	kp
	kilograms meter/second^2	Kg ms^2
	ounces force	ozf
	pounds force	lbf
	poundals	pdl
	tons force long	tonfl
	tons force short	tonfs
	tons force metric	tonfm
	kilo pounds force	klbf
Pressure		
	bar	bar
	atmosphere techn	at
	atmosphere phys	atm
	dyne/cm^2	dyncm^2

	foot of water (39°F)	ftH20
	inch of water (39°F)	inH2O
	gigapascal	GP
	hectopascal	hP
	kg force / cm^2	$kgfcm^2$
	kg force / m^2	kgf/m^2
	microbar	µbar
	pascal	P
	newton/m^2	N/m^2
	ounce(avdp)/square inch	oz/in^2
	pounds per square foot	lb/ft^2
	pounds per square inch	psi
	tonne per square cm	T/cm^2
	meters of water	mH2O
	millibar	mbar
Speed		
	meter/sec	m/s
	centimeters/sec	cm/s
	feet/min	ft/min
	feet/sec	ft/s
	kilometers/hr	km/h
	kilometers/min	km/m
	kilometers/sec	km/s
	knots	kn
	meters/hr	m/h
	meters/min	m/min
	miles/hr	mph
	miles/min	mpm
	miles/sec	mps
	nautical miles/hr	n mph
	nautical miles/min	n mpm
	nautical miles/sec	n mps
Angular Velocity		
	radians/sec	rad/s
	degrees/sec	°/s
	rpm	rpm
Torsional Stiffness		
	newton meter per radian	Nm/rad
Torque		
	meter kilogram	m kg
	foot pound	ft lb
	foot poundal	ft pd
	inch pound	in lb

	ounce inch	oz-in
	milli newton meter	mNm
	gram centimeter	g cm
RMS Voltages		
	volts rms	V rms
	millivolts rms	mV rms
	microvolts rms	µV rms
	nanovolts rms	nV rms
	kilovolts rms	kV rms
Voltages		
	volts	V
	millivolts	mV
	microvolts	µV
	nanovolts	nV
	kilovolts	kV
RMS Current		
	amps rms	A rms
	milliamps rms	mA rms
	microamps rms	µA rms
	nanoamps rms	nA rms
	kiloamps rms	kA rms
Current		
	amps	A
	milliamps	mA
	microamps	µA
	nanoamps	nA
	kiloamps	kA
RMS Power		
	watts rms	W rms
	milliwatts rms	mW rms
	microwatts rms	µW rms
	kilowatts rms	kW rms
Power		
	watts	W
	milliwatts	mW
	microwatts	µW
	kilowatts	kW
	horsepower	hp
Temperature		
	celcius	°C
	farenheight	°F
	kelvin	K

Counts		
	counts	counts
Strain		
	strain	ε
	microstrain	με
Percent		
	percent	%
Humidity		
	humidity	%RH
Frequency		
	hertz	Hz
	kilohertz	kHz
	megahertz	MHz
	rpm	rpm
Resistance		
	ohms	Ω
	kiloohms	kΩ
	megaohms	MΩ
Density		
	kilograms per cubic meter	kg/m^3
	grams per litre	g/L
	pounds per cubic foot	lb/ft^3
Flow Volume		
	litres per second	L/s
	cubic meters per second	m^3/s
	cubic meters per hour	m^3/h
	gallons per minute	g/m
	cubic feet per minute	cft/m
	litres per minute	L/m
Flow		
	kg per second	kg/s
	lbs per second	lbs/s
Concentration		
	cubic meters per cubic meter	m^3/m^3
	litres per litre	L/L
	cubic foot per cubic foot	ftm^3/ftm^3
Concentration Mole		
	mole per cubic meter	mol/m^3
	mole per litre	mol/L
Acceleration		
	meters per $second^2$	m/sec^2
	g-force	g
	foot per $second^2$	ft/sec^2

Custom		
	custom unit 1	custom1
	custom unit 2	custom2
	custom unit 3	custom3
	custom unit 4	custom4
	Undefined	

EU Declaration of Conformity CE

Interface, Inc. declares under our sole responsibility that Model 9325 product range is in conformity with the following relevant Union harmonization legislation:

EMC directive 2014/30/EU
RoHS Directive 2011/65/EU
LVD directive 2014/35/EU

Based on the following harmonized standards:

Standards:
BS EN IEC 61326-1:2021
BS EN IEC 61326-2 3:2021
BS EN 61010-1:2010+A1:2019 / IEC 61010-1:2010

Name and position of authorized representative:

Ken Bishop

Date March 18, 2022

Ken Bishop
Senior Director – Custom Solutions
Interface, Inc.
Scottsdale, AZ 85260

Warranty

ONE YEAR WARRANTY

Interface, Inc. hereby warrants all products of its manufacture as follows: Commencing with the date of shipment of each load cell to the original purchaser, and for a period expiring one year from said date, Interface, Inc. warrants that each unit shall remain free from defects in parts, materials, and workmanship.
The warranties herein shall not obligate Interface, Inc. in any manner whatsoever with respect to, and shall not be applicable to, any defects which after inspection by Interface, Inc. are not Interface, Inc.'s reasonable satisfaction demonstrably the result of defective parts, materials, or workmanship. Interface, Inc. is not liable for consequential or contingent damages and its liability is strictly limited to the original purchase price of the product or its repair or replacement at Interface's option. The factory should be immediately notified of suspected warranty claims. All transportation, handling, customs clearance, and insurance charges for returned merchandise are to be prepaid and born by the customer.
The foregoing warranty is in lieu of any and all other warranties of guaranties expressed or implied and of all other obligations on the part of Interface, Inc. whether in contract or in tort. This warranty shall be void on any Interface product which has been subject to misuse, negligence, or accident, or has been installed, adjusted, or otherwise, then in accordance with the instructions furnished by Interface, Inc.