Selection of a vessel calibration stored in the HDI

Introduction

The HDI calibration (K) option allows for the access to the calibrations of a number of helium storage or research vessels. These are stored in the internal EPROM memory of the unit, but it requires a specific internal configuration.

In normal operation, the unit measures the normal state resistance of the helium probe, and from that, calculates the depth of helium in the vessel being measured. This is indicated on the display, shown in units of millimeters. With the C option, this number is compared to the set-points entered into the unit, and changes in the status of the relays and alarm made as appropriate.

When a calibration is selected, the unit performs an additional conversion using the selected (internal) calibration table, and gives the resulting number on the display, with the appropriate units for that particular calibration table. With the C option, this number is compared to the set-points entered into the unit as before.

It must be stressed that if control and alarm setpoints are entered into the unit before a calibration table is selected, the setpoints will not be converted with the selected calibration table. They may be reformatted to suit the style of the particular calibration table, but they are the same numerals in the same order. In any case, this circumstance is not expected to occur frequently.

The selection of a calibration table affects the way that the HDI is configured for use. References in this section to the C option and section C of the manual are only applicable to units with the Control and Alarm (C) option.

Vessel calibration, helium probes and other HDI options

It is clear that the selection of the wrong calibration table will result in wrong readings. In some cases, only the helium probe supplied with the system is suitable to be used when the table is selected, usually due to its dimensions.

In some cases, a number of possible helium probes could be used, so long as they reaches the bottom of the vessel, their active length has been correctly entered into the HDI, and the active length is greater than the depth of helium in the vessel. Please check with the staff at Twickenham for further details.

The calibration (K) option is not currently available for HDI units with the 2 or L options.

Selection of the calibration table

The selection of the calibration table can be done when the HDI unit in normal, front panel, operation. This is done by pressing the *Mode* button, and holding it in until the display has changed for a second time. It will then change into the currently selected calibration table entry. If the display does *not* change to that as shown below, the unit does not have the internal configuration needed for this option.

Pressing Mode





Normal operation, with a selected calibration

The format of the display when a calibration table has been selected will vary depending upon the selected calibration. The format of the numerals will depend upon the maximum number in the calibration table, and the largest change of volume per millimeter change in level within that table.

For a typical calibration table, where the maximum number is less than 100 (either litres or in percent), then one decimal place is shown. This is referred to here as 1 decimal format. A typical display (in this case percent mode) would be

For calibration tables where the maximum number is greater than 1000, then no decimal places are shown. This is referred to here as no decimal format. A typical example in this case would be

Apart from the fact that the unit is displaying a number calculated from a calibration table, all other aspects of the operation of the HDI remain the same as before. In particular, the analogue output still operates from the millimetre reading, and will not reflect any non-linear aspects of a vessel calibration.

Error messages

If an error message C *CAL 4, where C is the probe channel, appears on the display, or via the interface, it means that the helium depth calculated from the measurement is greater than that of the calibration table selected. In all probability, the wrong calibration table has been selected.

Vessel calibration and the control and alarm (C) option

Set points and calibration table

As mentioned above, if control and alarm set points are already stored in the HDI, the numerals stored in memory are simply reformatted to that appropriate to the newly selected calibration table. Therefore, if a new calibration table is selected (or none), then the six set points should be re-entered into the unit.

Other than this re-entering, the procedure is identical to that in section C, and there are no other effects in the operation of the unit.

Position	Character	Meaning	
	A , B	Probe A / Probe B being displayed.	
1	•, •	Probe A / Probe B displayed: Alarm active ^{\dagger} .	
		Fast mode, between readings	
2	*	Fast, slow or continuous mode, reading being taken	
	•	Slow mode, between readings	
	:	Slow mode, reading only when <i>Enter</i> is pressed	
3 - 7		up to five numerical digits of the reading (leading zeros suppressed); may include decimal point.	
	% or 1	Units character	
	x	Relay X active ^{$\dagger *$}	
8	У	Relay Y active ^{$\dagger *$}	
	¥	Both relays X and Y active ^{$\dagger *$}	
		* units character alternates with x,y or x	

Summary of the characters displayed with a calibration selected.

Table K.1 Description of characters on the HDI († C option only) display. Each position has a particular type of function assigned to it. This table excludes error messages.

Vessel calibration and Remote operation

Introduction

The remote operation of the HDI when a calibration is selected is for the most part unaffected by the selection. The response to the **G** command will still show the reading on the display, but it will return the percent character or the l character as appropriate to the calibration.

There are two new remote control commands which are used to set a calibration table, and confirm which calibration table has been set. The eight character string returned after the /C command is the same as that shown on the display when the calibration table is selected via the front panel. The currently available calibrations and return strings are shown in table K.5

It is not currently possible to download a calibration and store it in the HDI. All calibrations are stored in the EPROM itself.

Control and alarm option - additions

It is possible that some calibration tables result in numerals with five characters, which is greater than that allowed for in the existing read-back strings. As a result, three new commands have been introduced, which are only relevant when a calibration table has been selected.

Table K.3 shows these commands, table K.4 responses of these commands, and the responses of the commands that they replace.

Command List

Commands to select and confirm a selected calibration

Mnemonic	Action
# nn	Sets the calibration to entry nn. See table K.5 for the available selection.
$/\mathrm{C}$	Returns an eight character string identifying the currently selected calibration table - see table K.5

Table K.2 The remote interface commands to set and confirm the calibration table.

Commands that generate no response from the HDI (C option) with a calibration selected

Mnemonic	Action	
	Action for 1 decimal format calibrations	
Unnn.n	Sets the Alarm on point to nnn.n	
Vnnn.n	Sets the Alarm off point to nnn.n	
WXnnn.n	Sets the Relay x on point to nnn.n	
XXnnn.n	Sets the Relay x off point to nnn.n	
WYnnn.n	Sets the Relay y on point to nnn.n	
XYnnn.n	Sets the Relay y off point to nnn.n	
	Action for no decimal format calibrations	
Unnnnn	Sets the Alarm on point to nnnnn	
Vnnnnn	Sets the Alarm off point to nnnnn	
WXnnnnn	Sets the Relay x on point to nnnnn	
XXnnnnn	Sets the Relay x off point to nnnnn	
WYnnnnn	Sets the Relay y on point to nnnnn	
XYnnnnn	Sets the Relay y off point to nnnnn	

Table K.3 The remote interface commands to set the calibration table, and the control and alarm setpoints of the HDI with C option. There is no response from the unit to these commands.

Commands that generate a response from the HDI with C option.

Mnemonic	Response
В	Returns string U V Kn (no information)
С	Returns string WXXXWYXYQn (no information)
BB	Returns alarm set points as Unnn.nVnnn.nKn (1 decimal format) or UnnnnnVnnnnKn (no decimal format)
CX	Returns relay x set points and channel as WXnnn.nXXnnn.nQn (1 decimal format) or WXnnnnnXXnnnnQn (no decimal format)
CY	Returns relay y set points and channel as WXnnn.nXXnnn.nQn (1 decimal format) or WXnnnnnXXnnnnQn (no decimal format)

Table K.4 The remote interface commands than generate a response from the HDI. The n characters are single digits, and their combination is used in the same way as in the commands that the prefixed character code interprets them.

Note that if the HDI is in normal operating mode, with no calibration selected, then the commands BB, CX and CY will still return the strings as shown above in the no decimal format, with the same values as would be obtained from the B and C commands.

When a calibration table has been selected, then the commands B and C will return ---- where numerals would otherwise be for the W and X sections of the return string.

Calibration table selection.

Entry	Vessel	display format	/C response
00	Normal (mm) mode of operation		_CAL_OFF
01	Percent. Scales over the active length.	1 decimal	_PERCENT
02	Messer Cryotherm HELIOS 10k	no decimal	HELIO10K
03	Messer Cryotherm HELIOS 5k	no decimal	HELIO_5K
20	Cambridge Magnetic Refrigeration mF vessel, 900mm AL	1 decimal	mF/AL900
21	Cambridge Magnetic Refrigeration mF vessel, 700mm AL	1 decimal	mF/AL700
31	Air Liquide RH100 vessel	1 decimal	AL/RH100
32	Air Liquide RH65 vessel	1 decimal	AL/RH_65
33	Air Liquide RH38 vessel	1 decimal	AL/RH_38

Table K.5 The currently stored calibration tables in the HDI's EPROM. A calibration table is selected by the command **# nn**. The command /c produces the response as shown here to confirm the currently selected calibration table.