Installation guide
H-6527-8501-01-A

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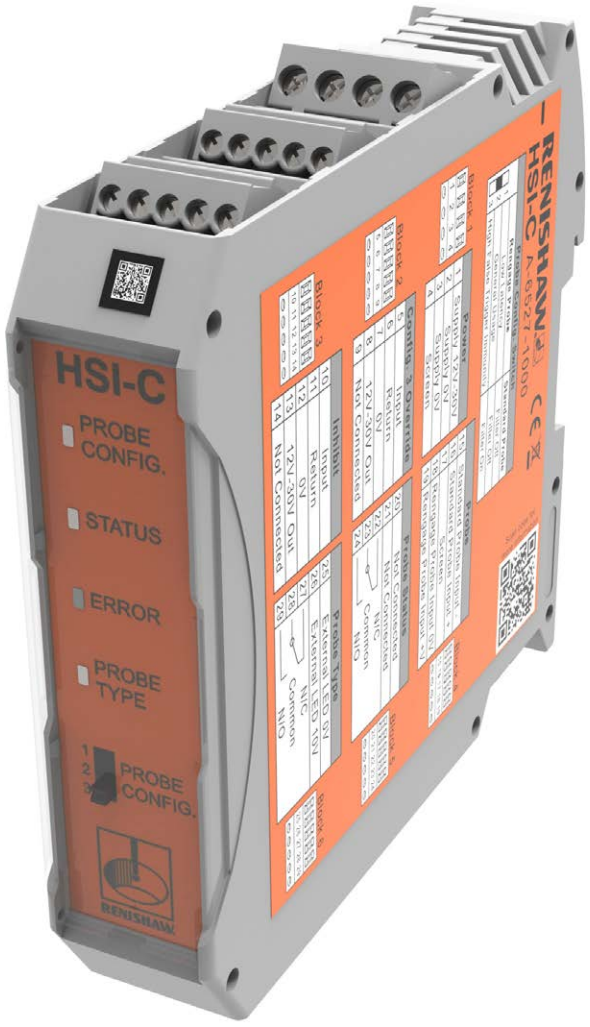
HSI-C hard-wired system interface – configurable



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Before you begin

Before you begin

Disclaimer

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All other brand names and product names used in this document are trade names, trade marks, or registered trade marks of their respective owners.

Warranty

Equipment requiring attention under warranty must be returned to your equipment supplier.

Unless otherwise specifically agreed in writing between you and Renishaw, if you purchased the equipment from a Renishaw company, the warranty provisions contained in Renishaw's CONDITIONS OF SALE apply. You should consult these conditions in order to find out the details of your warranty but, in summary, the main exclusions from the warranty are if the equipment has been:

- neglected, mishandled or inappropriately used; or
- modified or altered in any way except with the prior written agreement of Renishaw.

If you purchased the equipment from any other supplier, you should contact them to find out what repairs are covered by their warranty.

Changes to equipment

Renishaw reserves the right to change equipment specifications without notice.

CNC machines

CNC machine tools must always be operated by fully trained personnel in accordance with the manufacturer's instructions.

Care of the interface

Keep system components clean.

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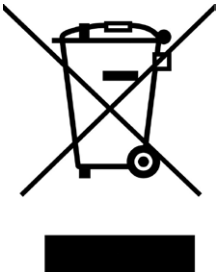
EU declaration of conformity

CE

Renishaw plc declares that the HSI-C complies with the applicable standards and regulations.

Contact Renishaw plc or visit **www.renishaw.com/hsi-c** for the full EU declaration of conformity.

WEEE directive



The use of this symbol on Renishaw products and/or accompanying documentation indicates that the product should not be mixed with general household waste upon disposal. It is the responsibility of the end user to dispose of this product at a designated collection point for waste electrical and electronic equipment (WEEE) to enable reuse or recycling. Correct disposal of this product will help to save valuable resources and prevent potential negative effects on the environment. For more information, please contact your local waste disposal service or Renishaw distributor.

FCC Information to user (USA only)

47 CFR Section 15.19

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

47 CFR Section 15.21

The user is cautioned that any changes or modifications not expressly approved by Renishaw plc or authorised representative could void the user's authority to operate the equipment.

47 CFR Section 15.105

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Safety

In all applications involving the use of machine tools or CMMs, eye protection is recommended.

Information to the machine supplier/ installer

It is the machine supplier's responsibility to ensure that the user is made aware of any hazards involved in operation, including those mentioned in Renishaw product literature, and to ensure that adequate guards and safety interlocks are provided.

Under certain circumstances, the probe signal may falsely indicate a probe seated condition. Do not rely on probe signals to halt the movement of the machine.

Information to the equipment installer

All Renishaw equipment is designed to comply with the relevant EU and FCC regulatory requirements. It is the responsibility of the equipment installer to ensure that the following guidelines are adhered to, in order for the product to function in accordance with these regulations:

- any interface MUST be installed in a position away from any potential sources of electrical noise, i.e. power transformers, servo drives etc.;
- all 0 Vdc/ground connections should be connected to the machine "star point" (the "star point" is a single point return for all equipment ground and screen cables). This is very important and failure to adhere to this can cause a potential difference between grounds;
- all screens must be connected as outlined in the user instructions;
- cables must not be routed alongside high current sources, i.e. motor power supply cables etc., or be near high-speed data lines;
- cable lengths should always be kept to a minimum.

Equipment operation

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

HSI-C basics

Introduction

HSI-C is an interface unit that is intended for application with the RENGAGE™ MP250 and standard probes used on CNC machine tools and cutter grinding machines. The interface unit is required to convert the signals from the probe into voltage-free solid-state relay (SSR) outputs for transmission to the CNC machine controller. The maximum SSR output operating current is 50 mA.

Typically installed within the CNC machine controller cabinet, and located away from sources of interference such as transformers and motor controls, the HSI-C can draw its power from the machine's nominal +12 Vdc to +30 Vdc supply. Where such a supply is not available, the HSI-C can be powered using any +12 Vdc to +30 Vdc (minimum 0.5 A) power supply. The machine's supply should be appropriately current limited to 10 A maximum.

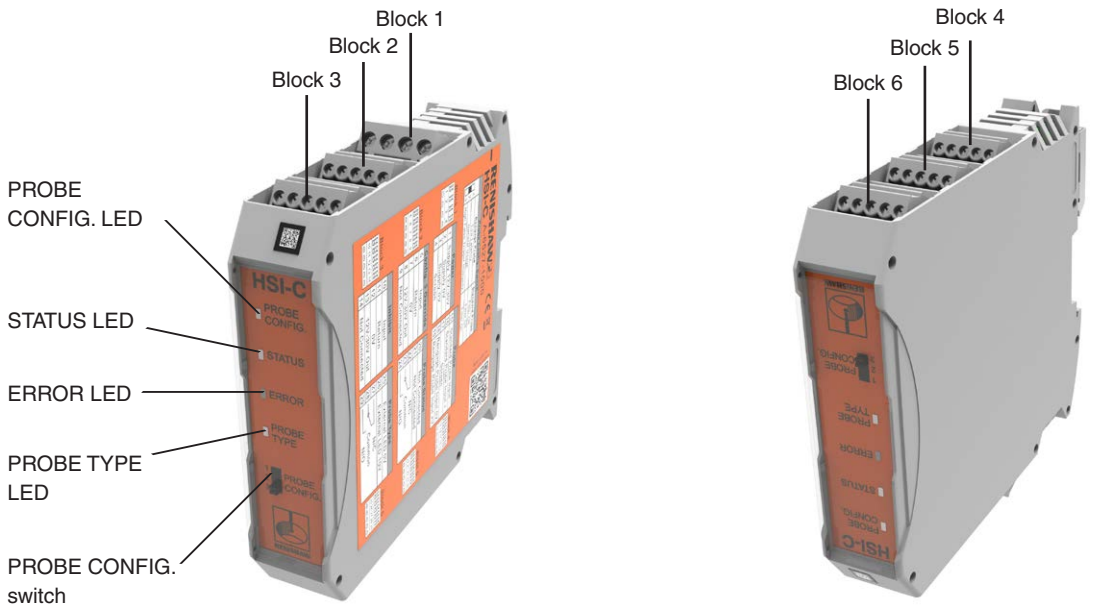
The supply is protected by a 140 mA self-resetting fuse (its nominal current, when connected to an inspection probe, is either 40 mA@12 Vdc or 23 mA@24 Vdc). To reset the fuse, remove the power then identify and rectify the cause of the fault.

The HSI-C enables the user to select a suitable level of immunity to false triggering for the connected probe, caused by machine vibrations or accelerations. The HSI-C can also respond to a config override input that switches the probe to the highest level of immunity to false triggering when either manoeuvring to a measure position at high speed, or when measuring with 'heavy' styli at high speed.

HSI-C components

The following components are located on the front, top and bottom faces of the HSI-C (as shown in the figure below):

- PROBE CONFIG. LED
- STATUS LED
- ERROR LED
- PROBE TYPE LED
- PROBE CONFIG. switch
- POWER CONNECTOR (Block 1, 4-way)
- CONFIG. 3 OVERRIDE CONNECTOR (Block 2, 5-way)
- INHIBIT CONNECTOR (Block 3, 5-way)
- PROBE CONNECTOR (Block 4, 5-way)
- SSR PROBE STATUS CONNECTOR (Block 5, 5-way)
- SSR PROBE TYPE AND EXTERNAL LED CONNECTOR (Block 6, 5-way)



NOTE: All connector blocks are pluggable and can be detached from the HSI-C enabling easy wire connection.

PROBE CONFIG. LED

The PROBE CONFIG. LED displays:

- A constant red when PROBE CONFIG. 1 is selected.
- A constant amber when PROBE CONFIG. 2 is selected.
- A constant green when PROBE CONFIG. 3 is selected.

If the LED is unlit then the PROBE CONFIG. switch is not correctly seated (i.e. in between indicated switch positions).

STATUS LED

The STATUS LED displays:

- A constant green when the probe is seated.
- A constant red when the probe is triggered or no probes are connected.

If the LED is unlit then there is no power supply to the HSI-C.

ERROR LED

The ERROR LED displays:

- A flashing red to indicate that an error condition has occurred. This happens when an overcurrent condition exists for either the RENGAGE output or an SSR output.
- A flashing amber to indicate a RENGAGE probe wiring fault between the probe and the interface (latched until power cycle).

PROBE TYPE LED

The PROBE TYPE LED displays:

- A constant green when the interface is connected to a RENGAGE probe.
- A constant amber when the interface is connected to a standard probe or when no probe is connected.
- Flashes red when the probe inhibit function is active.

If the LED is unlit then there is no power supply to the HSI-C.

PROBE CONFIG switch

The PROBE CONFIG. switch is a three-position slide switch that enables the user to change the operating configuration of the connected probe.

A change in the operating configuration is guaranteed after 70 ms.

PROBE CONFIG.	First generation MP250	Second generation MP250 (with C marking)	LP2
1	Enhanced trigger filter off	Level 1	Filter off
2	Enhanced trigger filter on	Level 2 (recommended)	Filter off
3	Enhanced trigger filter on	Level 3	Filter on

For first generation MP250 only;

When changing the operating configuration of a first generation MP250 it is necessary to either reset the power to the HSI-C, or activate the probe inhibit function. For instructions about the probe inhibit function, see “Probe inhibit function” on page 2.6. (This is not applicable to a second generation MP250).

For second generation MP250;

- Level 1 provides a low latency configuration for measuring in the machine acceleration zone with small approach distances.
- Level 2 provides a default configuration for general usage.
- Level 3 provides a high false trigger immunity configuration for either manoeuvring to the measure position at high speed, or when measuring with ‘heavy’ styli at high speed.

POWER CONNECTOR (Block 1, 4-way)

Used to supply power to the interface. The supply is fused 140 mA.

- Terminal 1: +12 Vdc to +30 Vdc supply unit.
- Terminal 2: 0 Vdc supply.
- Terminal 3: 0 Vdc supply.
- Terminal 4: screen.

CONFIG. 3 OVERRIDE CONNECTOR (Block 2, 5-way)

Used to connect the Config. 3 override function.

- Terminal 5: Config. 3 override input.
- Terminal 6: Config. 3 override return.
- Terminal 7: 0 Vdc.
- Terminal 8: +12 Vdc to +30 Vdc out (fused at 100 mA).
- Terminal 9: Not connected.

For more information about the Config. 3 override function, see page 2.8, “Config. 3 override function”.

INHIBIT CONNECTOR (Block 3, 5-way)

Used to connect the Inhibit function.

- Terminal 10: Inhibit input.
- Terminal 11: Inhibit return.
- Terminal 12: 0 Vdc.
- Terminal 13: +12 Vdc to +30 Vdc out (fused at 100 mA).
- Terminal 14: Not connected.

For more information about the inhibit function, see page 2.6, “Probe inhibit function”.

PROBE CONNECTOR (Block 4, 5-way)

Provides the connectivity for either a RENGAGE or standard probe.

- Terminal 15: Standard probe input –.
- Terminal 16: Standard probe input +.
- Terminal 17: Screen.
- Terminal 18: RENGAGE probe input 0 Vdc.
- Terminal 19: RENGAGE probe input + Vdc.

SSR PROBE STATUS CONNECTOR (Block 5, 5-way)

This connector is used for SSR probe status outputs.

- Terminal 20: Not connected.
- Terminal 21: Not connected.
- Terminal 22: Normally closed (N/C) (closed = probe seated).
- Terminal 23: Common connection.
- Terminal 24: Normally open (N/O) (closed = probe triggered).

SSR PROBE TYPE AND EXTERNAL LED CONNECTOR (Block 6, 5-way)

This connector is used for SSR probe type outputs and external LED (LED or buzzer).

- Terminal 25: External LED 0 Vdc.
- Terminal 26: External LED 10 Vdc.
- Terminal 27: Normally closed (N/C) (closed = RENGAGE probe selected).
- Terminal 28: Common connection.
- Terminal 29: Normally open (N/O) (closed = standard probe selected).

SSR

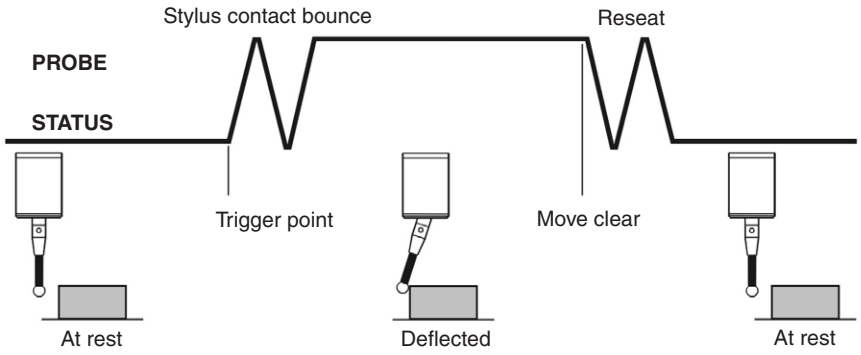
The SSR is configured as follows:

Normally closed (N/C)
or
Normally open (N/O).

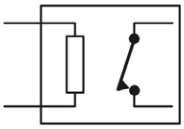
Maximum current is ±50 mA.
Maximum voltage is +30 Vdc.

NOTE: Change of state debounce time is 25 ms ±5 ms. Debounce time is the time delay between the HSI-C responding to a probe trigger and the point at which the probe can be used again.

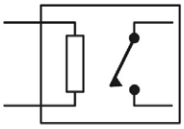
SSR OUTPUT OPTIONS



Status N/C



Status N/O



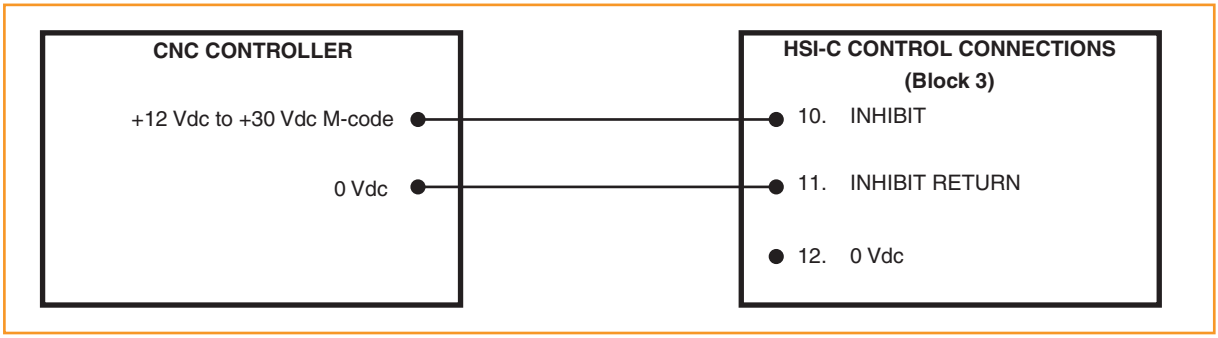
Probe inhibit function

The probe inhibit function is used to switch off the RENGAGE probe and is activated by an M-code. It is recommended that the RENGAGE probe is switched off using the probe inhibit function whenever it is not in use, and only switched on immediately before it is required. This will ensure that the RENGAGE probe is initialised just before measurement commences to ensure optimum performance. When the RENGAGE probe is switched on, it will take a minimum of 0.4 seconds before it is ready to measure and must remain stationary during this period. The standard probe may also be inhibited using this function, if required. When the probe is inhibited, the status output is forced into the non-triggered (seated) state, irrespective of actual probe status. There are several alternative methods of selecting the inhibit function, each of which is listed below:

+12 Vdc to +30 Vdc M-code (machine electrical output) connected directly to the HSI-C

When using this method, it is recommended that the HSI-C is connected as shown in the following diagram. Alternatively, pin 11 (INHIBIT RETURN) on block 3 may be linked to pin 12 (0 Vdc) on block 3, rather than to the 0 Vdc circuit within the machine's CNC controller (common 0 Vdc only).

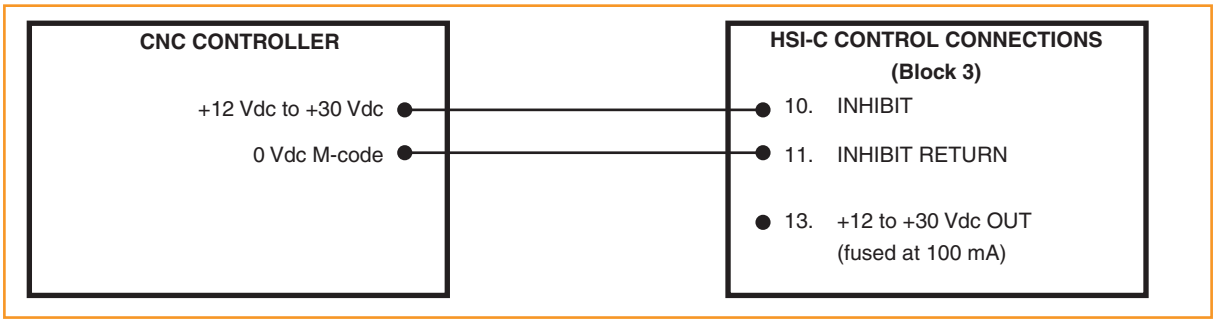
An M-code is used to activate the inhibit function. The M-code must supply a constant voltage of between +12 Vdc and +30 Vdc to pin 10 (INHIBIT) on block 3. To deactivate the inhibit function, the +12 Vdc to +30 Vdc supply must be removed from pin 10 (INHIBIT) on block 3



0 Vdc M-code (machine electrical output) connected directly to the HSI-C

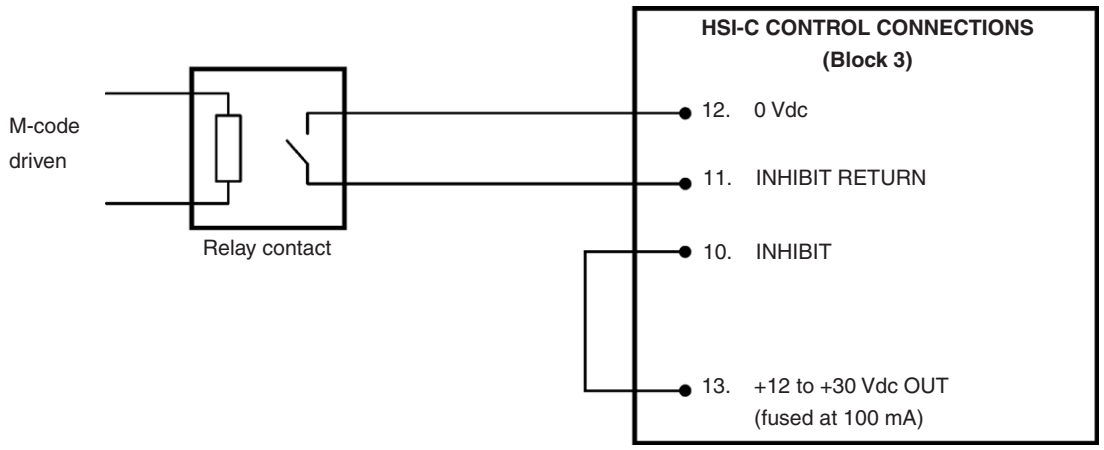
When using this method, it is recommended that the HSI-C is connected as shown in the following diagram. Alternatively, pin 10 (INHIBIT) may be linked to pin 13 (+12 Vdc to +30 Vdc OUT (fused at 100 mA)) on block 3, rather than to the +12 Vdc to +30 Vdc circuit within the machine's CNC controller (common 0 Vdc only).

An M-code is used to activate the inhibit function. The M-code must supply a constant 0 Vdc to pin 11 (INHIBIT RETURN) on block 3. To deactivate the inhibit function, a constant voltage of +12 Vdc to +30 Vdc must be applied to pin 11 (INHIBIT RETURN) on block 3.



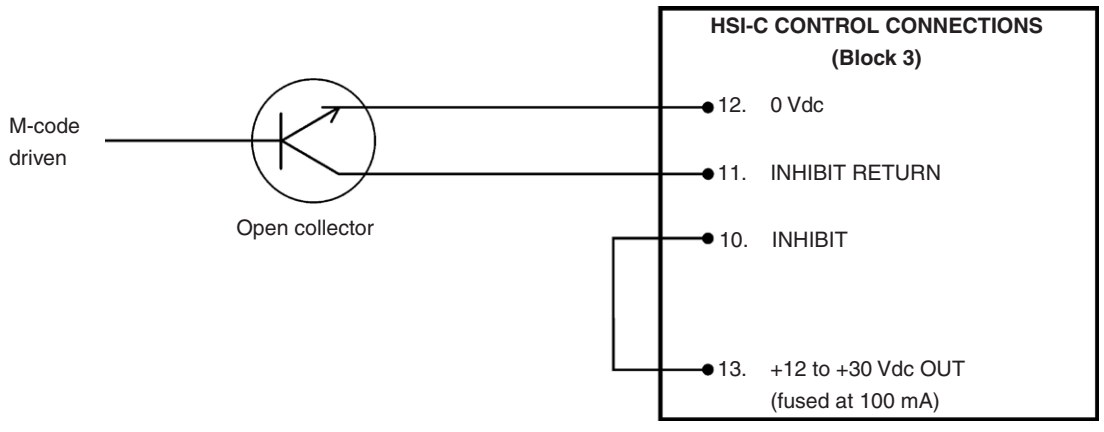
M-code (machine electrical output) driven relay contact

When using this method, it is recommended that the HSI-C is connected as shown in the following diagram. Shorting together pin 12 (0 Vdc) and pin 11 (INHIBIT RETURN) on block 3 (less than 100 Ω) will force the output into a seated state, irrespective of actual probe status, and remove power from the probe. Breaking contact between pin 11 and pin 12 (greater than 50 KΩ) will remove the inhibit function.



M-code (machine electrical output) driven open collector

When using this method, it is recommended that the HSI-C is connected as shown in the following diagram. An M-code is used to activate the inhibit function.



Config. 3 override function

The config. 3 override function provides the capability for the connected probe to switch to config. 3 during a probing cycle, regardless of the selected PROBE CONFIG switch position. The config. 3 override function is activated by an M-code.

- When LP2 is connected, the filter (8 ms nominal) will become enabled.
- When a second generation MP250 (with C marking, see figure below) is connected, level 3 (high false trigger immunity) will become enabled.

Second generation MP250 with C identification marking on probe body

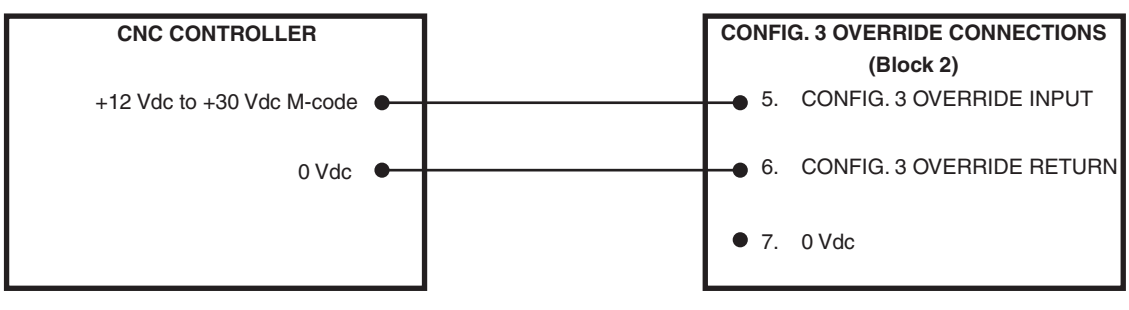
The config. 3 override function is not compatible for application with first generation MP250.

There are several methods to apply an M-code to select the config. 3 override function, each of which are described above:

+12 Vdc to +30 Vdc M-code (machine electrical output) connected directly to the HSI-C

When using this method, it is recommended that the HSI-C is connected as shown in the following diagram. Alternatively, pin 6 (CONFIG. 3 OVERRIDE RETURN) on block 2 may be linked to pin 7 (0 Vdc) on block 2, rather than to the 0 Vdc circuit within the machine's CNC controller (common 0 Vdc only).

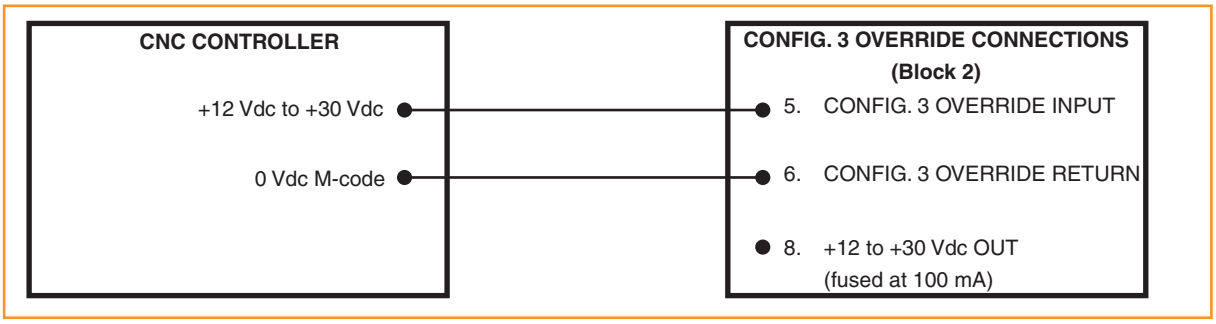
An M-code is used to activate the config. 3 override function. The M-code must supply a constant voltage of between +12 Vdc and +30 Vdc to pin 5 (CONFIG. 3 OVERRIDE INPUT) on block 2. To deactivate the config. 3 override function, the +12 Vdc to +30 Vdc supply must be removed from pin 5 (CONFIG. 3 OVERRIDE INPUT) on block 2.



0 Vdc M-code (machine electrical output) connected directly to the HSI-C

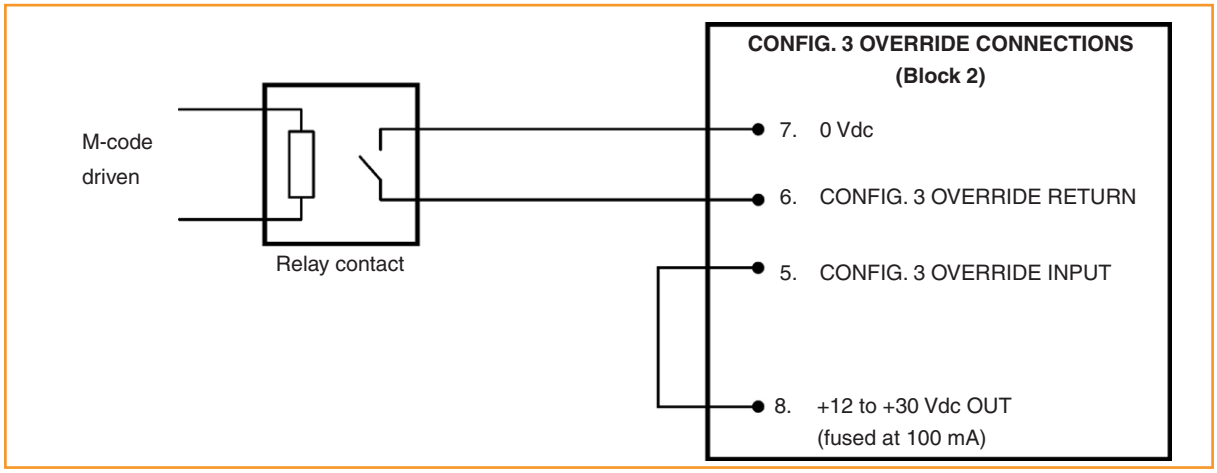
When using this method, it is recommended that the HSI-C is connected as shown in the following diagram. Alternatively, pin 5 (CONFIG. 3 OVERRIDE INPUT) may be linked to pin 8 (+12 Vdc to +30 Vdc OUT (fused at 100 mA)) on block 2, rather than to the +12 Vdc to +30 Vdc circuit within the machine's CNC controller (common 0 Vdc only).

An M-code is used to activate the config. 3 override function. The M-code must supply a constant 0 Vdc to pin 6 (CONFIG. 3 OVERRIDE RETURN) on block 2. To deactivate the config. 3 override function, a constant voltage of +12 Vdc to +30 Vdc must be applied to pin 6 (CONFIG. 3 OVERRIDE RETURN) on block 2.



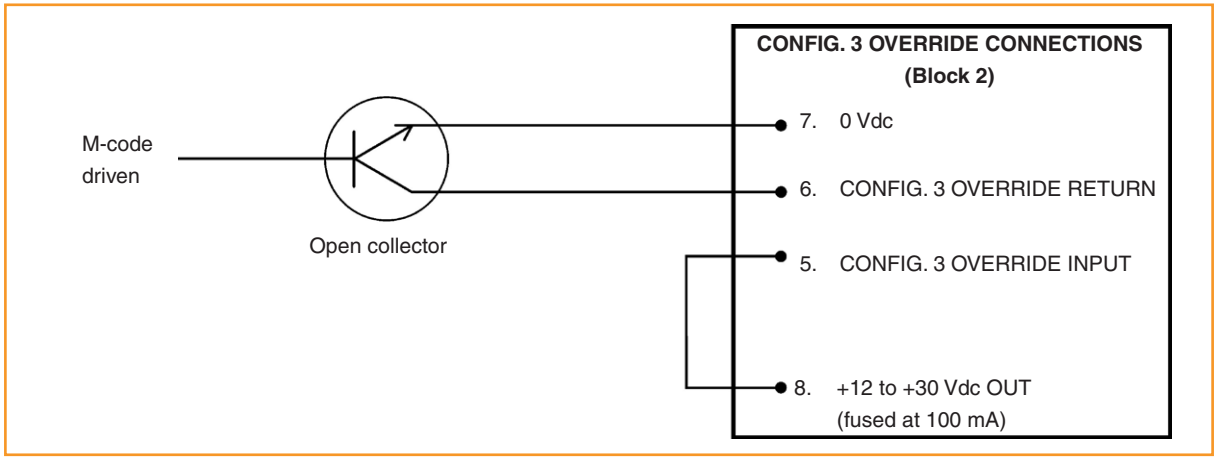
M-code (machine electrical output) driven relay contact

When using this method, it is recommended that the HSI-C is connected as shown in the following diagram. Shorting together pin 7 (0 Vdc) and pin 6 (CONFIG. 3 OVERRIDE RETURN) on block 2 (less than 100 Ω) will activate the config. 3 override function. Breaking contact between pin 7 and pin 6 (greater than 50 KΩ) will remove the config. 3 override function.

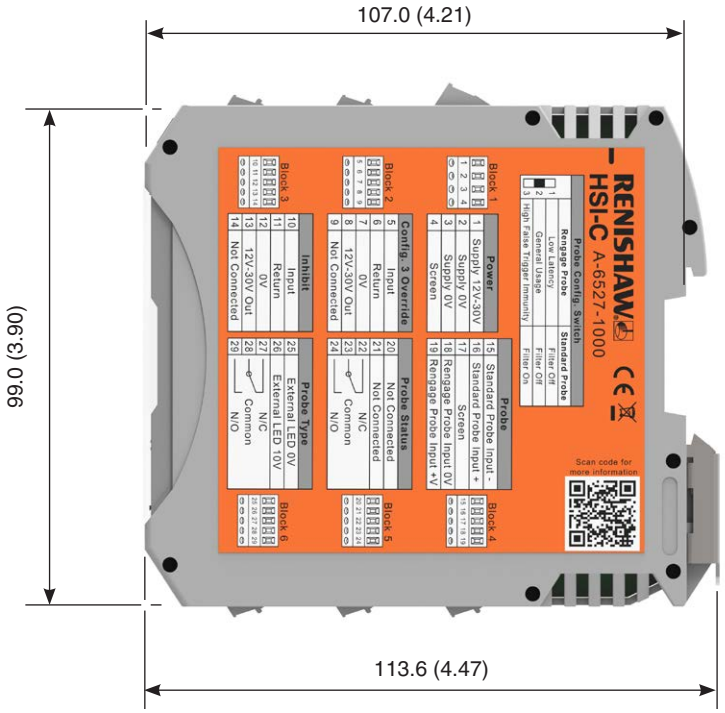


M-code (machine electrical output) driven open collector

When using this method, it is recommended that the HSI-C is connected as shown in the following diagram. An M-code is used to activate the config. 3 override function.



HSI-C dimensions



Dimensions given in mm (in)

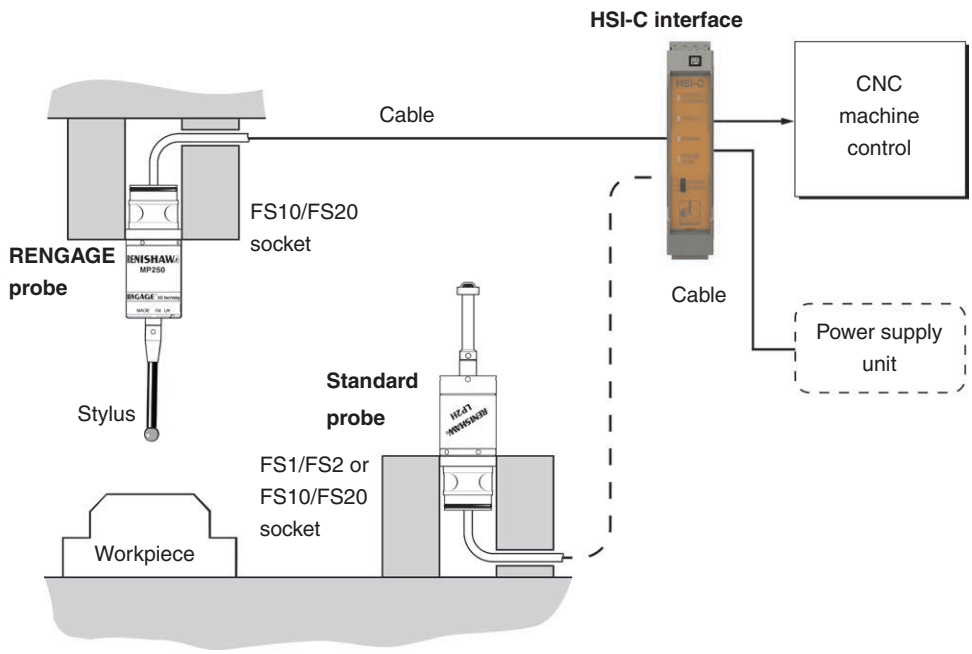
HSI-C specification

Principal application	The HSI-C processes signals from RENGAGE or standard hard-wired probes and converts them into voltage-free solid-state relay (SSR) outputs, which are then transmitted to the CNC machine controller.	
Dimensions	Width Height Depth	22.6 mm (0.89 in) 99.0 mm (3.90 in) 113.6 mm (4.47 in)
Transmission type	Hard-wired	
Probes per system	One	
Compatible probes	MP250 and LP2	
Supply voltage	12 Vdc to 30 Vdc	
Supply current	110 mA @ 12 Vdc, 80 mA @ 24 Vdc	
Outputs	Probe Status SSR, Probe Type SSR	
Inputs	Probe Inhibit, Config. 3 Override	
Output signal	Voltage-free SSR output, normally open or normally closed.	
Input/output protection	SSR output is protected by an electric circuit which limits the current to 60 mA. Power input is protected by a 140 mA resettable fuse.	
Diagnostic LEDs	ERROR, STATUS, PROBE TYPE and PROBE CONFIG. Connection provided for remote device (LED or buzzer).	
Probe operating configurations	For LP2 a trigger filter can be selected to reduce false triggers caused by machine vibration. For 2nd generation MP250, a low latency configuration, or a high false trigger resistant configuration may be selected.	
Mounting	DIN rail.	
Environment	Storage temperature	–25 °C to +70 °C (–13 °F to +158 °F)
	Operating temperature	+5 °C to +55 °C (+41 °F to +131 °F)

System installation

Installing the HSI-C

Typical HSI-C installation



RENGAGE probe compatible with the HSI-C	Standard probe compatible with the HSI-C
MP250	LP2

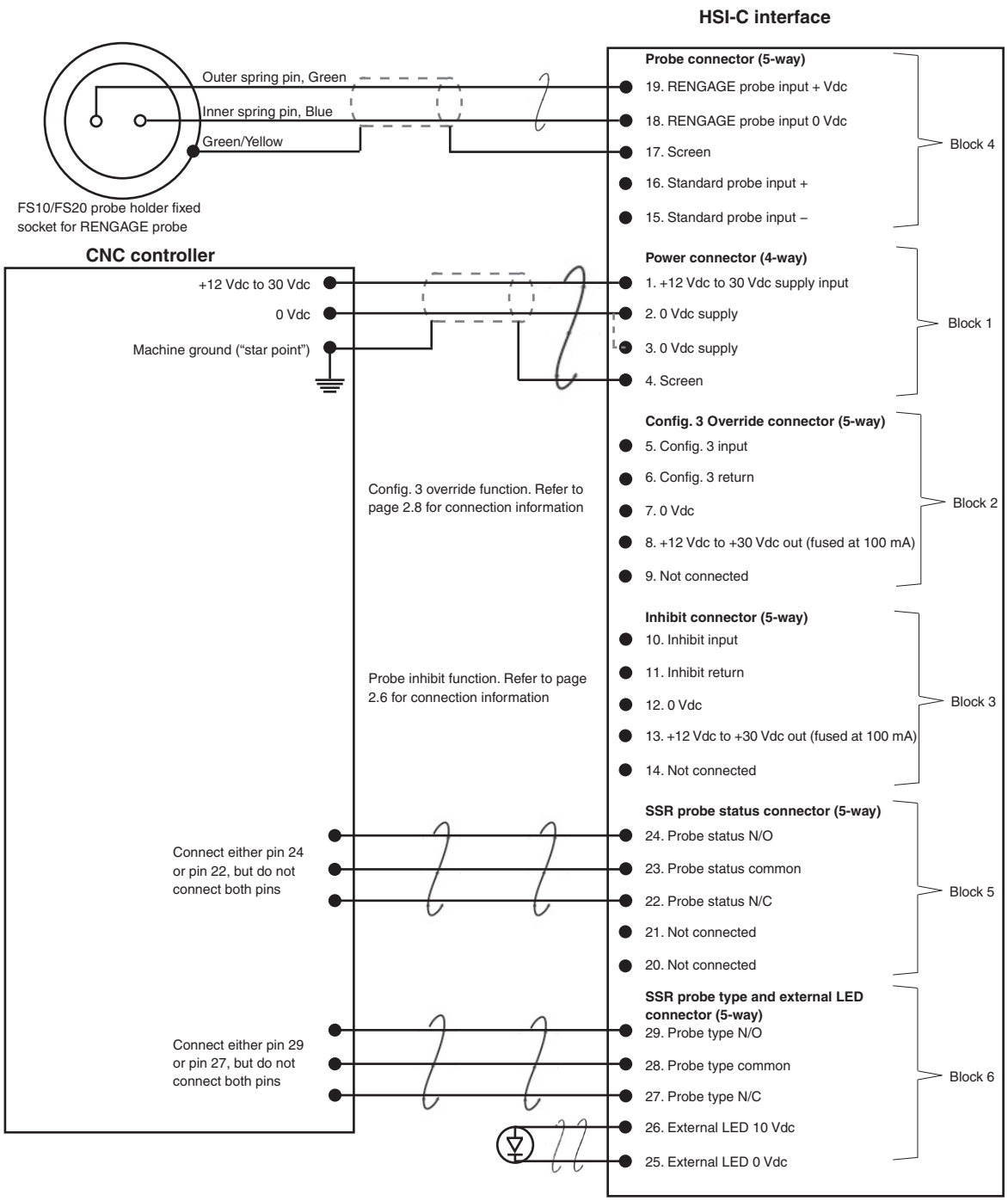
NOTE: Only one probe can be connected at a time.

NOTE: The connection between the probe socket and the HSI-C interface must be screened and connected to ground at the interface.

Mounting the HSI-C to a DIN rail

Standard DIN rail mounting

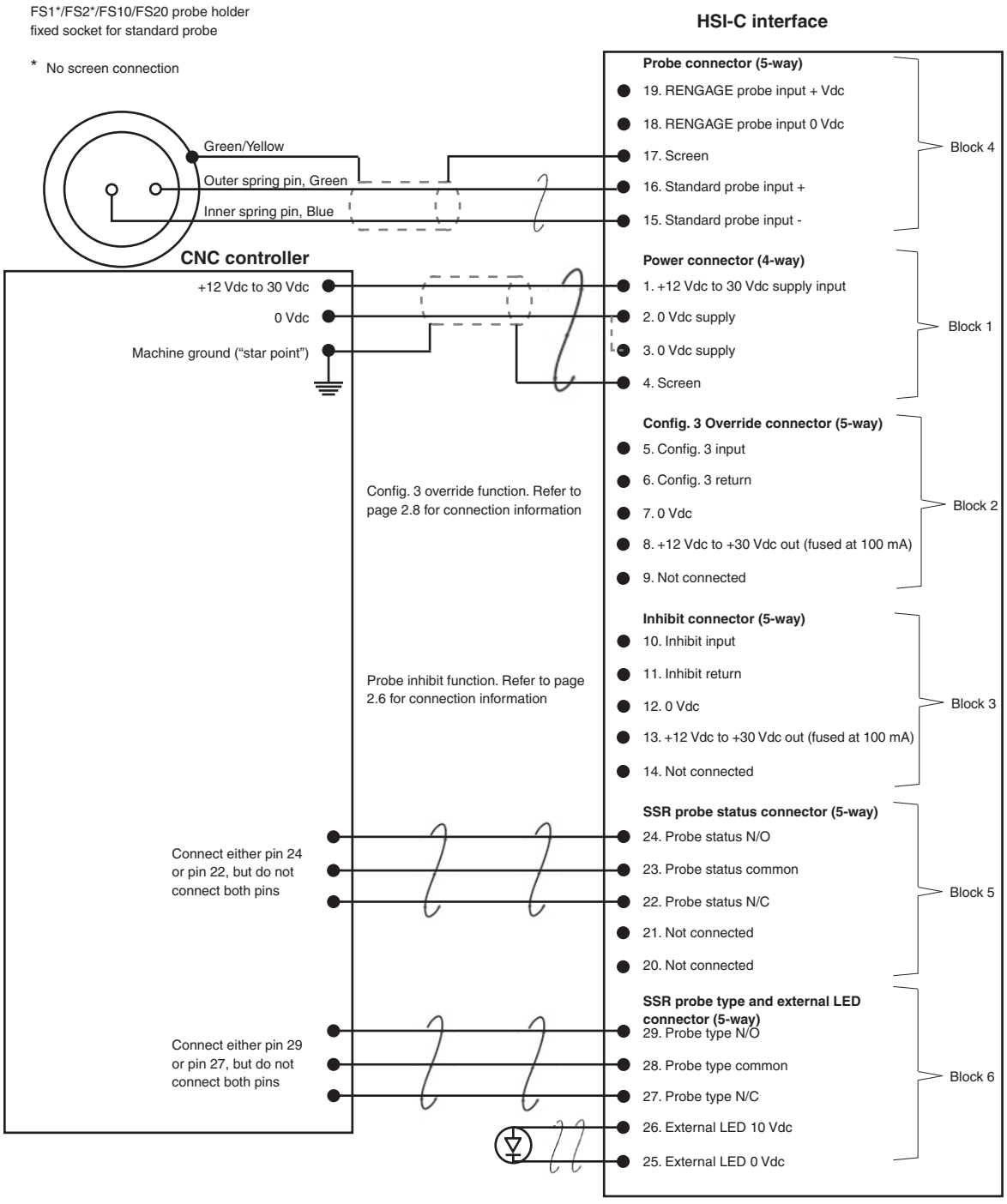
Connecting the HSI-C to a RENGAGE probe and the CNC controller



Probe status	Normally open (N/O)	Normally closed (N/C)
Probe triggered	Closed	Open
Probe seated	Open	Closed

Probe type	Normally open (N/O)	Normally closed (N/C)
Standard probe	Closed	Open
RENGAGE probe	Open	Closed

Connecting the HSI-C to a standard probe and the CNC controller



Probe status	Normally open (N/O)	Normally closed (N/C)
Probe triggered	Closed	Open
Probe seated	Open	Closed

Probe type	Normally open (N/O)	Normally closed (N/C)
Standard probe	Closed	Open
RENGAGE probe	Open	Closed

Parts list

Type	Part number	Description
Interface	A-6527-1000	HSI-C probe system interface, quick-start guide and packaging.
Terminal block	P-CN47-0082	4-way terminal block (1 off required).
Terminal block	P-CN47-0083	5-way terminal block (5 off required).
Publications. These can be downloaded from our web site at **www.renishaw.com**.		
MP250	H-5500-8500	Quick start guide: for rapid set-up of the MP250 probe.
HSI-C	H-6527-8500	Quick start guide: for rapid set-up of the HSI-C interface.
LP2	H-2000-5021	Installation and user's guide: LP2.
MP250	H-5500-8504	Installation guide for MP250.
HSI-C	H-6527-8501	Installation guide for HSI-C.

Renishaw plc
New Mills, Wotton-under-Edge
Gloucestershire, GL12 8JR
United Kingdom

T +44 (0)1453 524524
F +44 (0)1453 524901
E uk@renishaw.com

www.renishaw.com

RENISHAW
apply innovation™

For worldwide contact details, visit
www.renishaw.com/contact

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