RENISHAW
apply innovation ™

HSI hard-wired system interface

Compliance information for this product is available by scanning the QR code or visiting **www.renishaw.com/mtpdoc**

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Before you begin

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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.

Patents

None applicable.

Intended use

CNC machine tools or grinding machines using RENGAGE™ or standard probes for workpiece inspection require an interface unit. HSI is an interface unit to convert the signals from the probe into voltage-free solid state relay (SSR) outputs for transmission to the CNC machine controller.

Safety

Information to the user

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 EC 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 V/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 basics

2.1

Introduction

CNC machine tools or grinding machines using RENGAGE™ or standard probes for workpiece inspection require an interface unit 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 can draw its power from the machine's nominal 12 Vdc to 30 Vdc supply. Where such a supply is not available, the HSI can be powered using any 12 Vdc to 30 Vdc (minimum 0.5 A) power supply.

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 V or 23 mA @ 24 V). To reset the fuse, remove the power then identify and rectify the cause of the fault.

HSI components

The following components are housed within the front face of the HSI (as shown in the figure below):

- RENGAGE probe connector block (3-way);

- Standard probe connector block (3-way);

- Control connector block (12-way);

- ERROR LED;

- STATUS LED;

- PROBE TYPE LED.
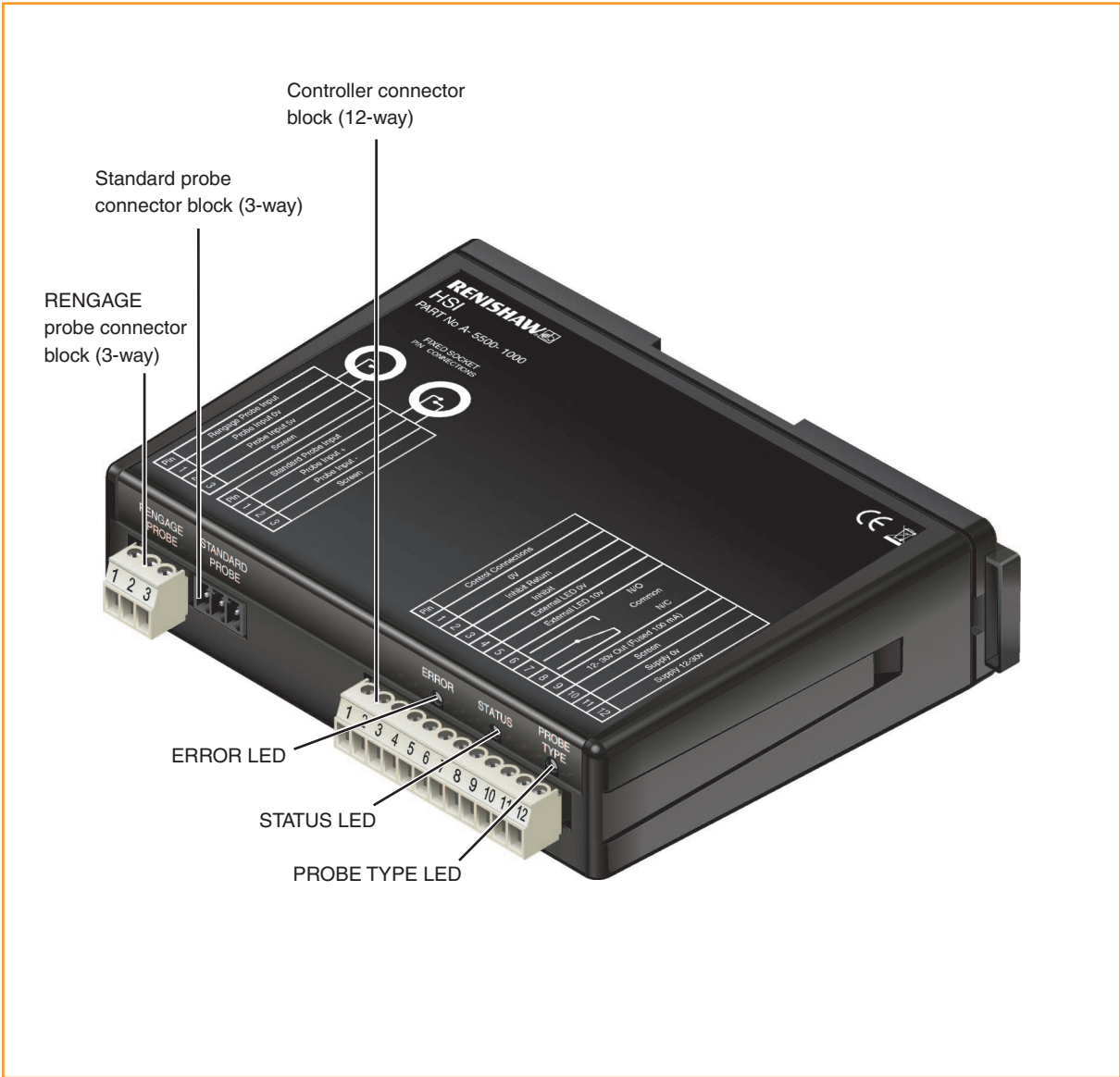
RENGAGE™ probe connector (3-way)

The RENGAGE probe connector is a three-pin connector and is designed to connect to a Renishaw RENGAGE probe.

Standard probe connector (3-way)

The standard probe connector is a three-pin connector and is designed to connect to Renishaw standard probes.

Controller connector (12-way)

The controller connector is a 12-pin connector and is designed to connect the HSI to the CNC machine controller and appropriate power supply as follows:

Terminals 1 to 3

These are used to connect the inhibit function. For more information about the inhibit function, please refer to page 2.6.

Terminals 4 and 5

If the HSI is installed where it cannot be easily seen, an output is provided so that a remote device (such as an LED or buzzer – not supplied) can be connected to the HSI and positioned near to the machine operator. This is an open drain pull-up output at a nominal 10 mA.

Terminals 6 to 8

These are the SSR probe trigger outputs:

- terminal 6 is normally open (NO);
- terminal 7 is the common connection;
- terminal 8 is normally closed (NC).

The current output from any of these terminals is limited to 60 mA.

Terminal 9

This is used to connect the inhibit functions to 12 V to 30 V. It is fused at 100 mA.

Terminals 10 to 12

These are used to supply power to the interface. The supply is fused at 140 mA.

ERROR LED

The ERROR LED flashes red to indicate that an error condition has occurred. This happens when too much current is supplied to the probe or to the SSR output.

STATUS LED

The STATUS LED displays:

- a constant green when the probe is seated;

- a constant red when the probe is triggered or no probe is connected.

If the LED is unlit, there is no power supply to the HSI.

PROBE TYPE LED

The PROBE TYPE LED displays:

- a constant green when the interface is connected to a RENGAGE probe;

- a constant orange when the interface is connected to a standard probe or when no probe is connected;

- a flashing red when a probe inhibit function is active.

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

Remote device

The remote device circuit provides:

- a closed output to indicate that the probe is seated (maximum current is 10 mA);

- an open output to indicate that the probe is triggered, that no probe is connected or that the power is off.

Solid-state relay (SSR)

The SSR relay is configured as follows:

Normally closed (NC)
or
Normally open (NO)

Maximum current is ±50 mA.
Maximum voltage is 30 V.

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

SSR OUTPUT OPTIONS	Stylus contact bounce / Reseat / PROBE STATUS / Trigger point / Move clear / At rest / Deflected / At rest
Status NC	Closed / Open
Status NO	Closed / Open
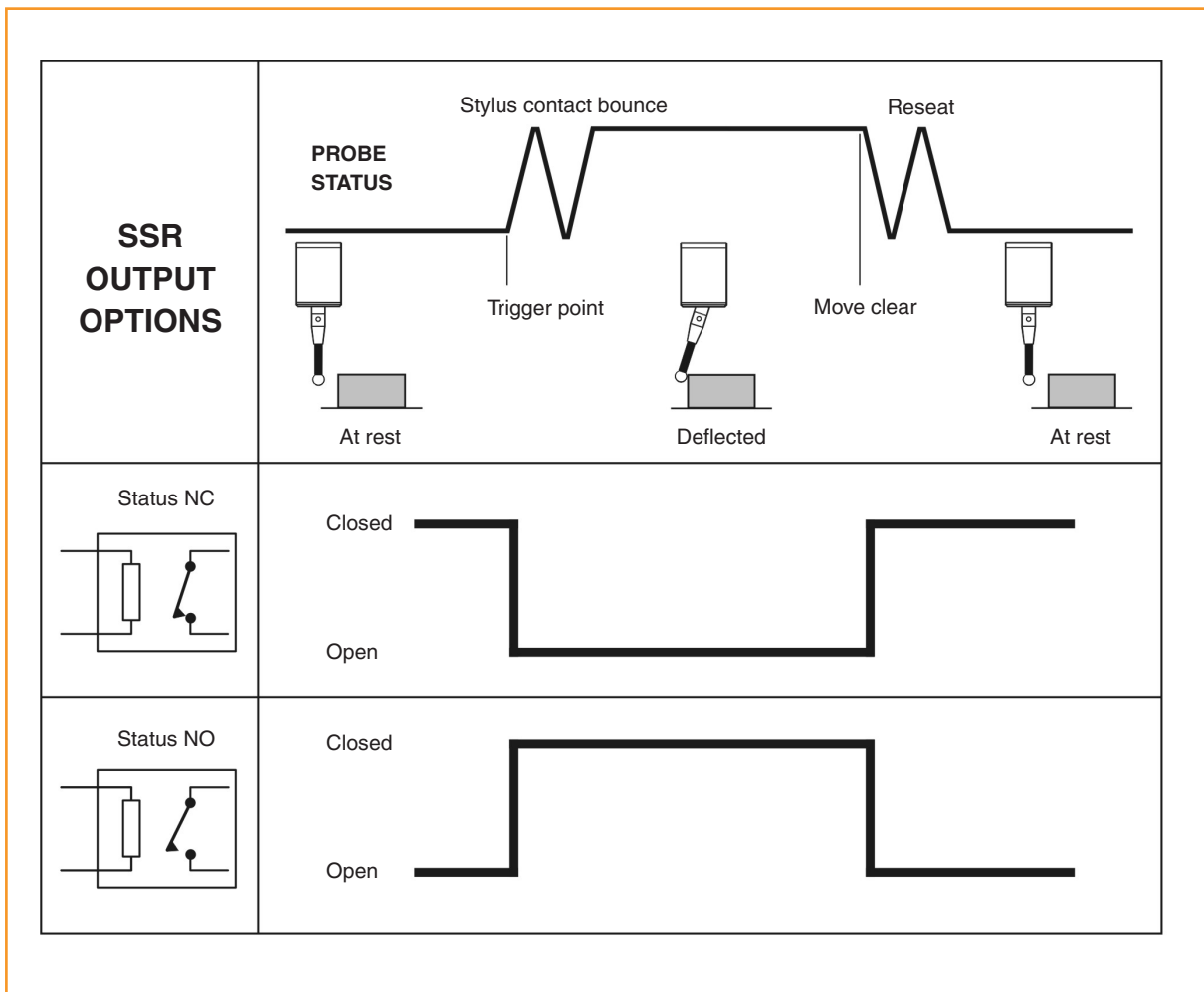
Probe inhibit function

The 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 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:
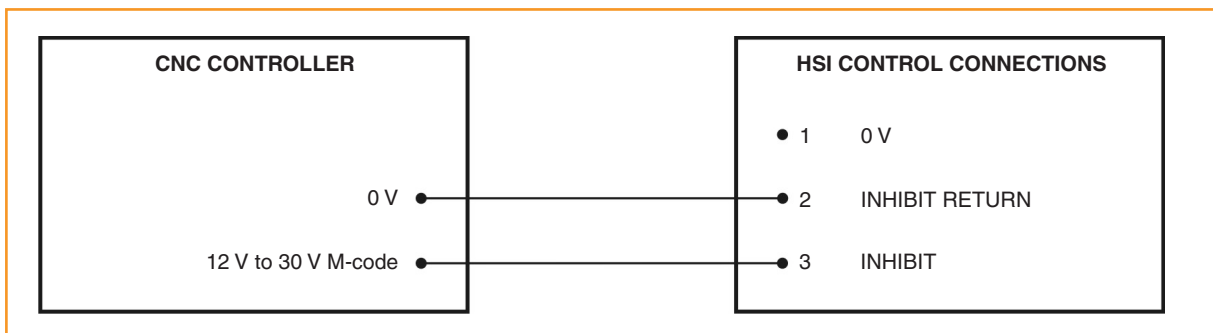
12 V to 30 V M-code connected directly to the HSI

When using this method, it is recommended that the HSI is connected as shown in the following diagram. Alternatively, pin 2 (INHIBIT RETURN) may be linked to pin 1 (0 V) on the HSI 12-way connector, rather than to the 0 V circuit within the machine's CNC controller.

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

0 V M-code connected directly to the HSI

When using this method, it is recommended that the HSI is connected as shown in the following diagram. Alternatively, pin 3 (INHIBIT) may be linked to pin 9 (12 V to 30 V OUT (FUSED 100mA)) on the 12-way connector, rather than to the 12 V to 30 V circuit within the machine's CNC controller.
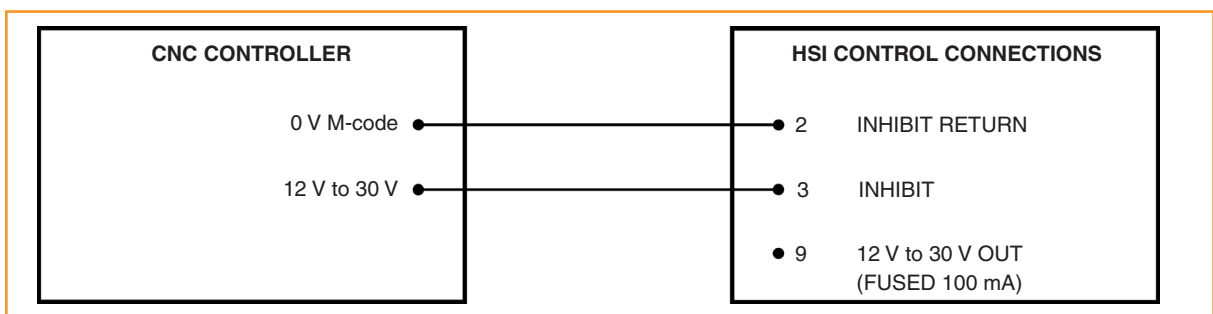
An M-code is used to activate the inhibit function. The M-code must supply a constant 0 V to pin 2 (INHIBIT RETURN) on the HSI 12-way connector. To deactivate the inhibit function, a constant voltage of 12 V to 30 V must be applied to pin 2 (INHIBIT RETURN) on the HSI 12-way connector.

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M-code driven relay contact

When using this method, it is recommended that the HSI is connected as shown in the following diagram. Shorting together pin 1 (0 V) and pin 2 (INHIBIT RETURN) of the HSI 12-way connector (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 1 and pin 2 (greater than 50 kΩ) will remove the inhibit function.

M-code driven

Relay contact

HSI CONTROL CONNECTIONS

1   0 V

2   INHIBIT RETURN

3   INHIBIT

9   12 V to 30 V (FUSED 100 mA)
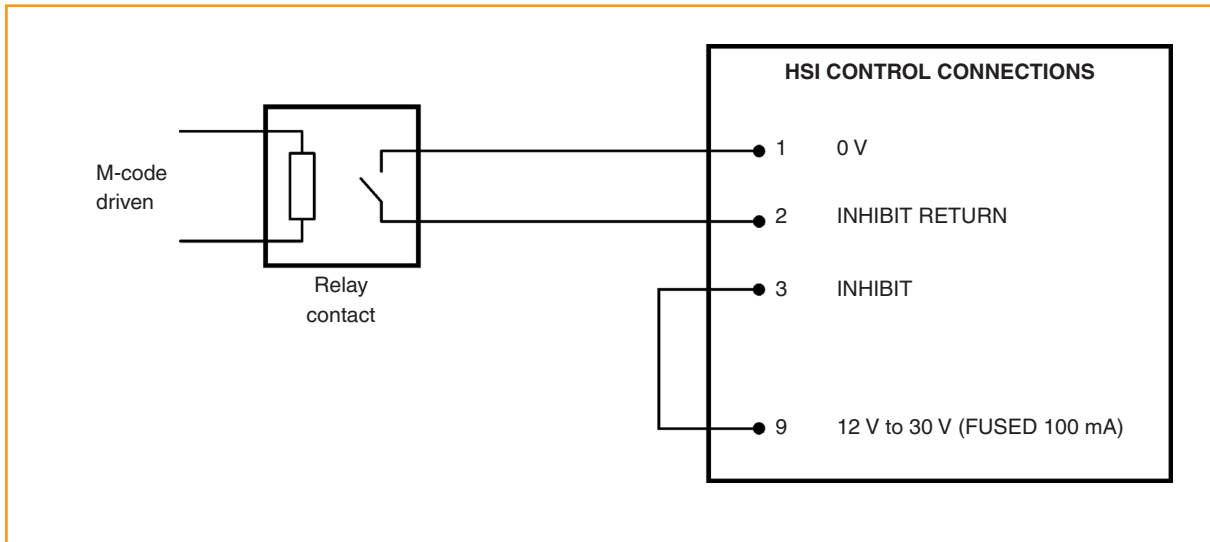
M-code driven open collector
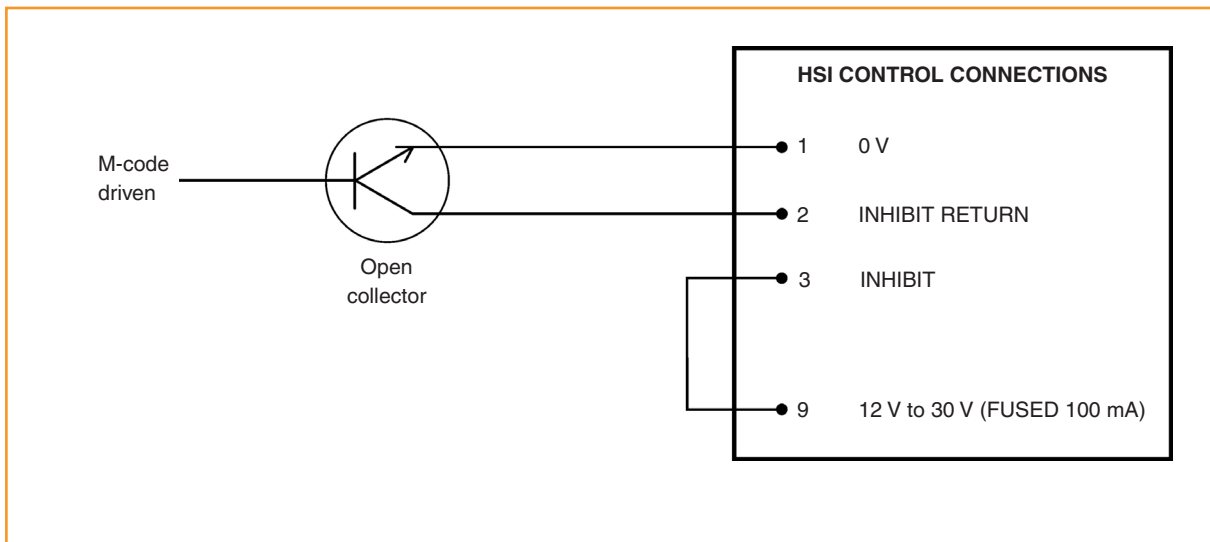
When using this method, it is recommended that the HSI is connected as shown in the following diagram. An M-code is used to activate the inhibit function.

M-code driven

Open collector

HSI CONTROL CONNECTIONS

1   0 V

2   INHIBIT RETURN

3   INHIBIT

9   12 V to 30 V (FUSED 100 mA)
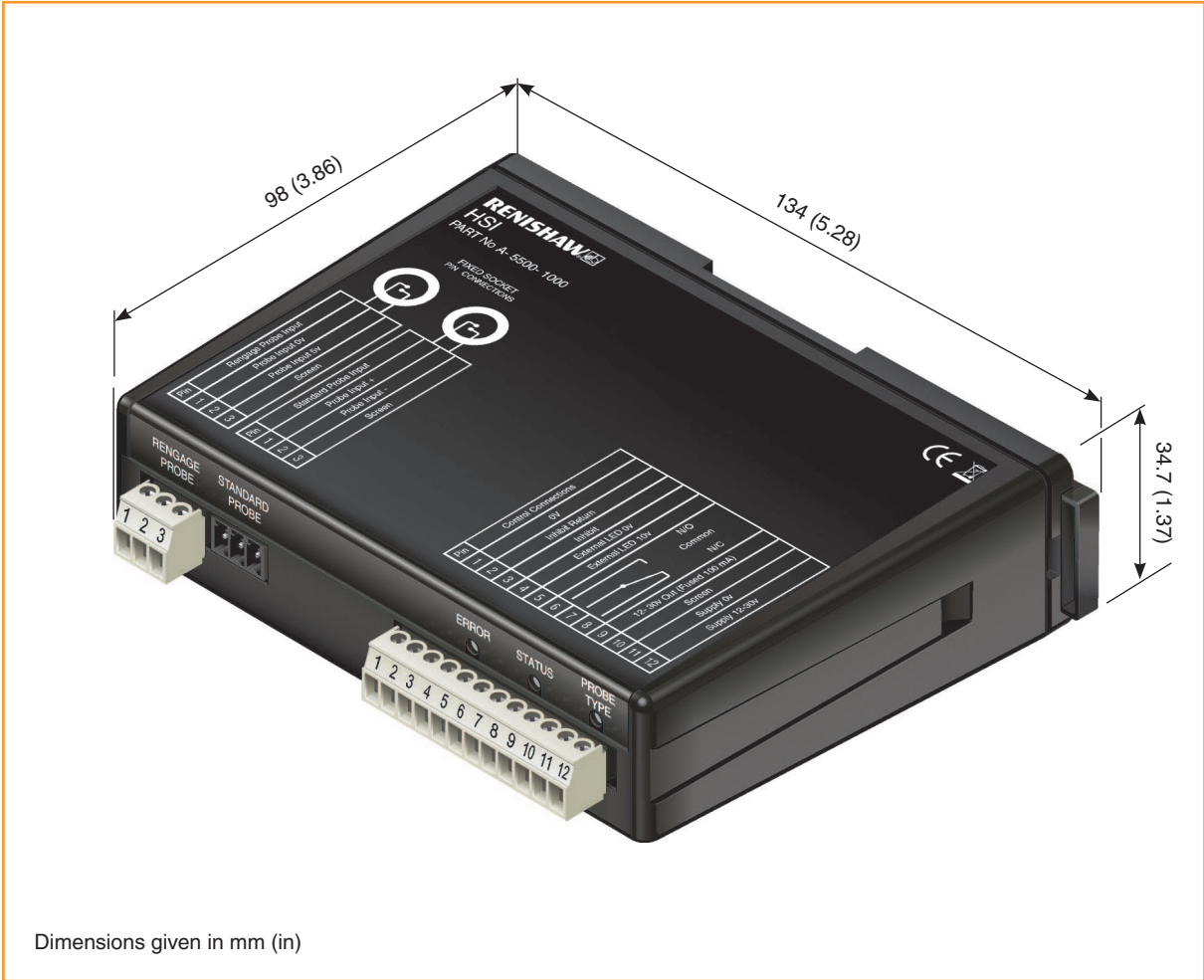
HSI dimensions

Dimensions given in mm (in)

HSI specification

Principal application	The HSI processes signals from RENGAGE probes or standard probes and converts them into voltage-free SSR output, which is then transmitted to the CNC machine controller.	
Dimensions	Width: Height: Depth:	134 mm (5.28 in) 34.7 mm (1.37 in) 98 mm (3.86 in)
Supply voltage	12 Vdc to 30 Vdc	
Supply current	40 mA @ 12 V, 23 mA @ 24 V	
Output signal	**Probe status** Voltage-free solid-state (SSR) output, configurable normally open or normally closed.	
Mounting	DIN rail. Alternative mounting using screws.	
Input/output protection	SSR output is protected by overcurrent circuitry, the output current should not exceed 50 mA. Power input is protected by a 140 mA resettable fuse.	
Diagnostic LEDs	Error, status and probe type. Connection provided for remote device (LED or buzzer).	
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)

HSI basics

2.10

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System installation

Installing the HSI

Typical HSI installation

HSI interface

Cable

CNC machine controller

RENISHAW MP250

RENGAGE probe

RENAGE 3D technology

MADE IN UK

Stylus

Cable

Standard probe

RENISHAW LP2

Optional power supply unit

Workpiece

RENGAGE probe compatible with the HSI
MP250

Standard probes compatible with the HSI
LP2
TS27R
TS34
TS20
RP3

NOTE: Only one probe can be connected at a time.
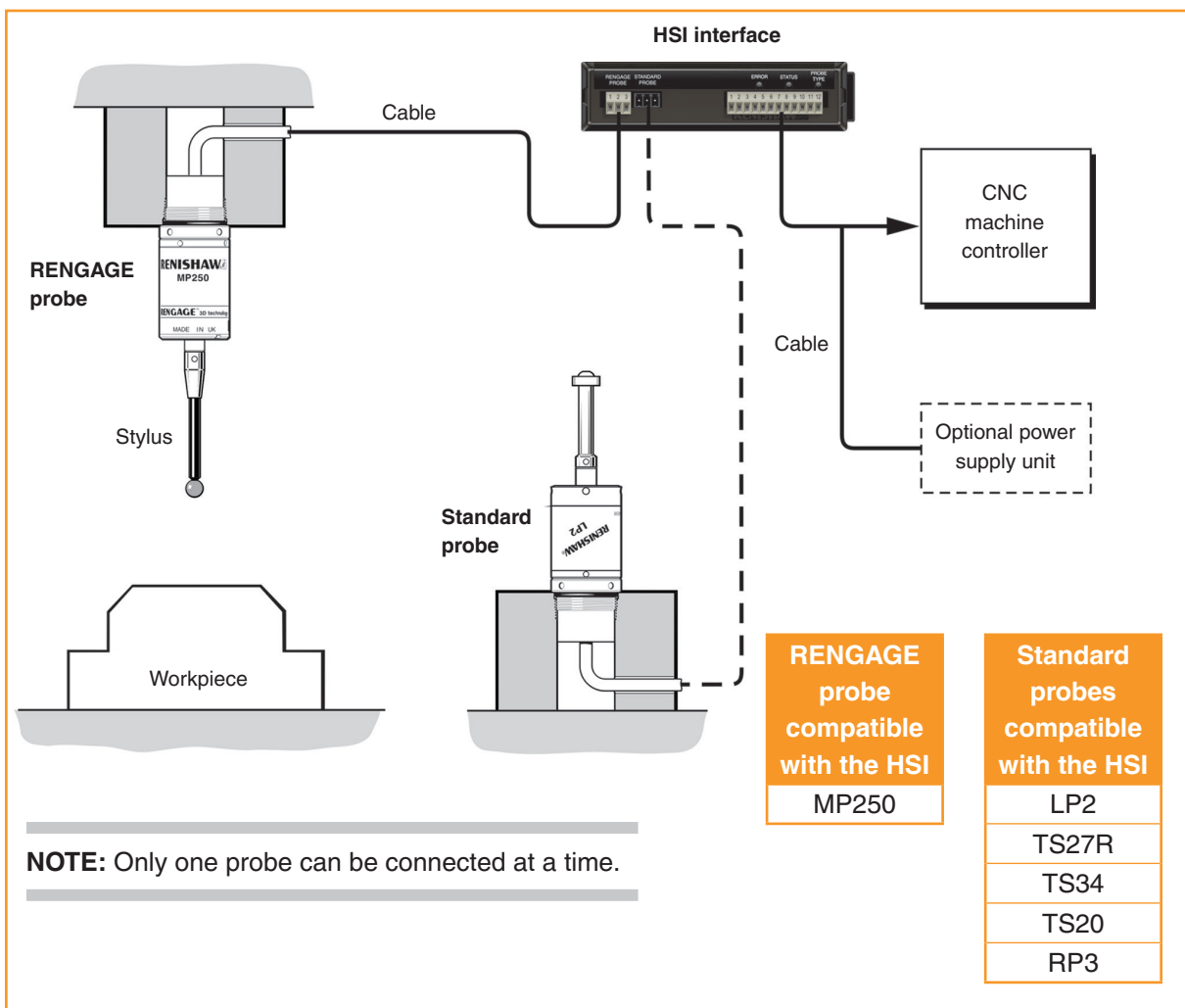
NOTE: The connection between the probe socket and the HSI interface must be screened and connected to ground at the interface.

Mounting the HSI to a DIN rail

34.7
(1.37)

134
(5.28)

98
(3.86)
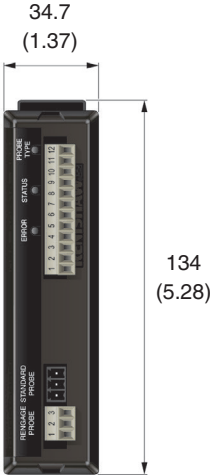
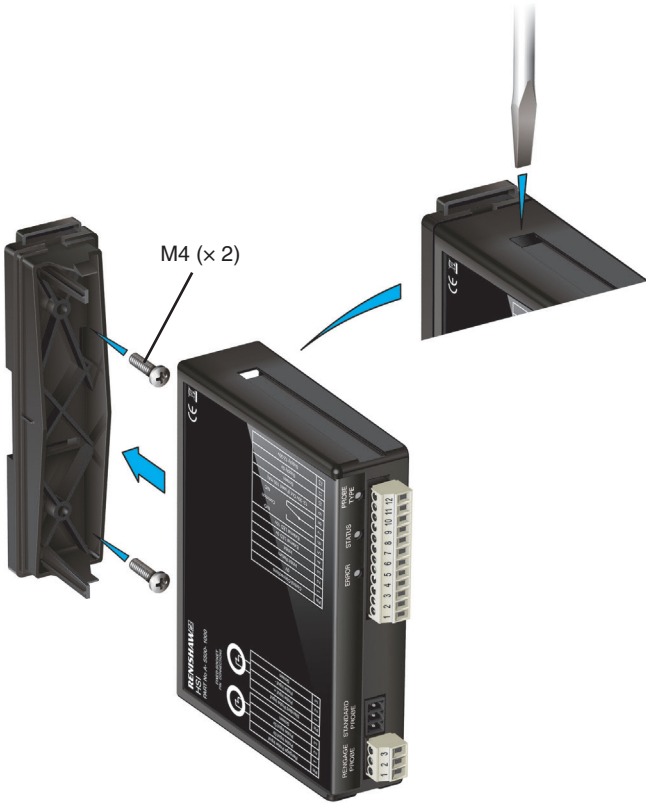**Standard DIN rail mounting**

M4 (× 2)

Alternative mounting

Dimensions given in mm (in)

Connecting the HSI to a RENGAGE™ probe and the CNC controller

For further information on RENGAGE™ probes compatible with HSI, refer to page 3.1.

HSI

RENGAGE probe connector (3-way)

- Inner spring pin, Blue → 1 Probe input 0 V
- Outer spring pin, Green → 2 Probe input 5 V
- Green/Yellow → 3 Screen

Probe holder fixed socket for RENGAGE probe

Controller connector (12-way)

CNC CONTROLLER

Probe inhibit function. Refer to page 2.6 for connection information.

- 1 0 V
- 2 Inhibit return
- 3 Inhibit
- 4 External LED 0 V
- 5 External LED 10 V
- 6 NO*
- 7 Common
- 8 NC**

Status output SSR

Connect either pin 6 or pin 8, but do not connect both wires

Probe input { I/O supply skip input }

Controller protective earth (also referred to as PE star point or earth plate)

- 9 12 V to 30 V out (fused 100 mA)
- 10 Screen
- 11 Supply 0 V
- 12 Supply 12 V to 30 V

Power input

Screen
0 Vdc
12 Vdc to 30 Vdc

Controller reference ground

Probe status	*Normally open (NO)	**Normally closed (NC)
Probe triggered	Closed	Open
Probe seated	Open	Closed

NOTE: When the SSR output is connected as normally open (NO), the RENGAGE probe will remain in the non-triggered (seated) state if the power supply is interrupted or if the probe is damaged.
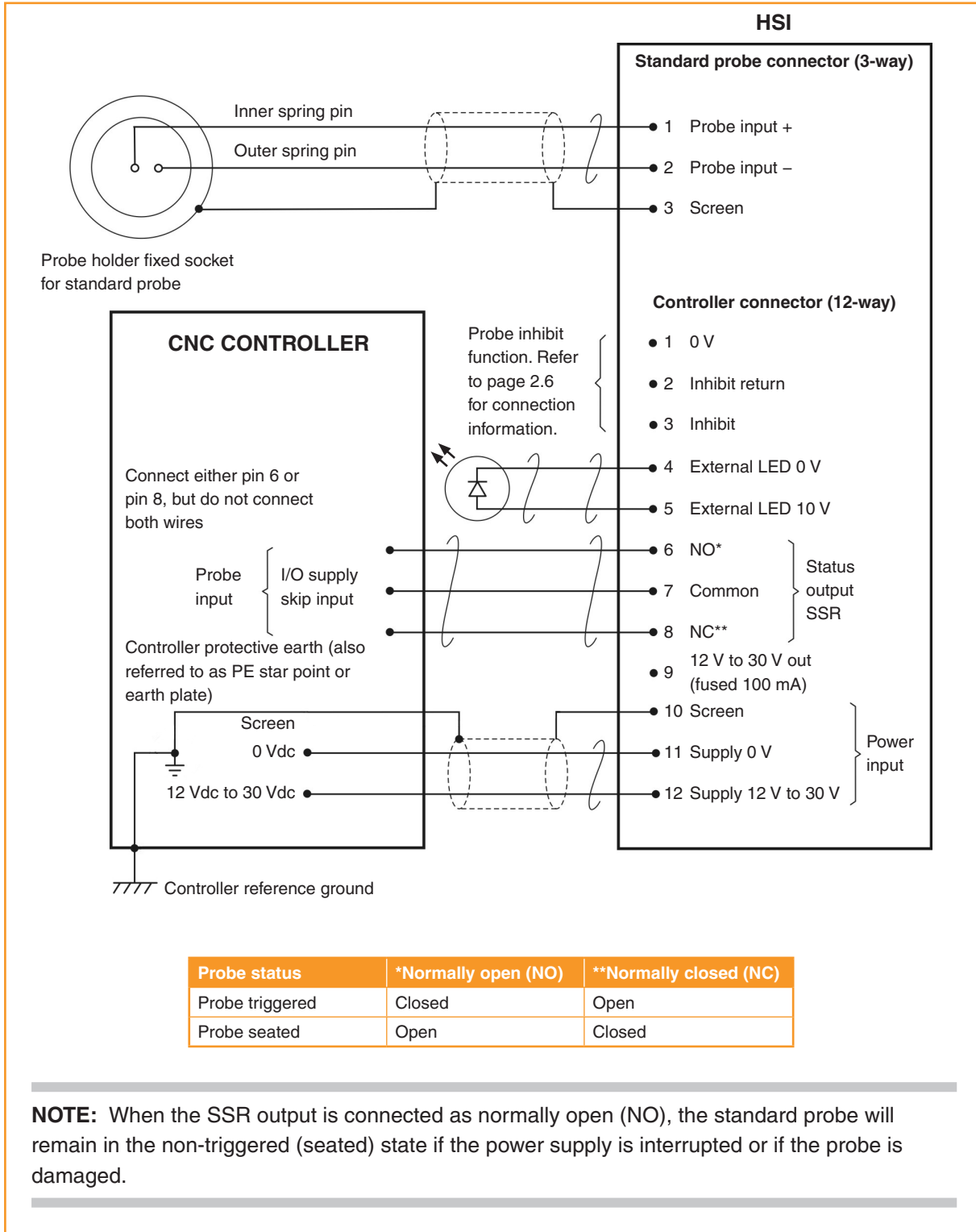
Connecting the HSI to a standard probe and the CNC controller

For further information on standard probes compatible with HSI, refer to page 3.1.

HSI

Standard probe connector (3-way)

Inner spring pin

Outer spring pin

- 1 Probe input +
- 2 Probe input –
- 3 Screen

Probe holder fixed socket
for standard probe

Controller connector (12-way)

CNC CONTROLLER

Probe inhibit function. Refer to page 2.6 for connection information.

- 1 0 V
- 2 Inhibit return
- 3 Inhibit
- 4 External LED 0 V
- 5 External LED 10 V

Connect either pin 6 or
pin 8, but do not connect
both wires

Probe
input

I/O supply
skip input

- 6 NO*   ⎫
- 7 Common   ⎬ Status output SSR
- 8 NC**   ⎭

Controller protective earth (also
referred to as PE star point or
earth plate)

- 9 12 V to 30 V out (fused 100 mA)

Screen

0 Vdc

12 Vdc to 30 Vdc

- 10 Screen   ⎫
- 11 Supply 0 V ⎬ Power input
- 12 Supply 12 V to 30 V ⎭

Controller reference ground

Probe status	*Normally open (NO)	**Normally closed (NC)
Probe triggered	Closed	Open
Probe seated	Open	Closed

NOTE: When the SSR output is connected as normally open (NO), the standard probe will remain in the non-triggered (seated) state if the power supply is interrupted or if the probe is damaged.

Parts list

4.1

Type	Part number	Description
Interface	A-5500-1000	HSI probe system interface with DIN rail mounting and three terminal blocks, support card and packaging.
Terminal block	P-CN25-0008	3-way terminal block.
Terminal block	P-CN47-0032	12-way terminal block.
Publications. These can be downloaded from our website at **www.renishaw.com**.		
MP250	H-5500-8504	Installation and user's guide: for the set-up of the MP250.
HSI	H-5500-8554	Installation and user's guide: for the set-up of the HSI.
TS20	H-2000-5010	Installation and user's guide: for the set-up of the TS20.
TS27R	H-2000-5018	Installation and user's guide: for the set-up of the TS27R.
LP2	H-2000-5021	Installation and user's guide: for the set-up of the LP2.
RP3	H-2000-5187	Installation and user's guide: for the set-up of the RP3.
TS34	H-2197-8500	Installation and user's guide: for the set-up of theTS34.

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