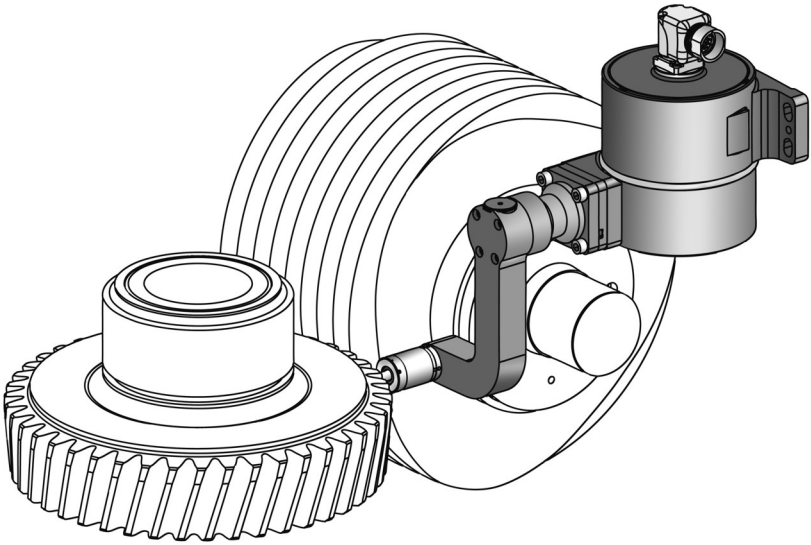
Installation and user guide
H-5616-8500-04-C

RENISHAW
apply innovation™

HPGA
high-precision generic arm



Original instructions – translations of these original instructions are available on request.

Renishaw plc. Registered in England and Wales. Company no: 1106260. Registered office: New Mills, Wotton-under-Edge, Gloucestershire, GL12 8JR, UK.

Renishaw part no: H-5616-8500-04-C

First issued: 10.2009

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Disclaimer

WHILE CONSIDERABLE EFFORT WAS MADE TO VERIFY THE ACCURACY OF THIS DOCUMENT AT PUBLICATION, ALL WARRANTIES, CONDITIONS, REPRESENTATIONS AND LIABILITY, HOWSOEVER ARISING, ARE EXCLUDED TO THE EXTENT PERMITTED BY LAW.

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Warranty

Unless you and Renishaw have agreed and signed a separate written agreement, the equipment and/or software are sold subject to the Renishaw Standard Terms and Conditions supplied with such equipment and/or software, or available on request from your local Renishaw office.

Renishaw warrants its equipment and software for a limited period (as set out in the Standard Terms and Conditions), provided that they are installed and used exactly as defined in associated Renishaw documentation. You should consult these Standard Terms and Conditions to find out the full details of your warranty.

Equipment and/or software purchased by you from a third-party supplier is subject to separate terms and conditions supplied with such equipment and/or software. You should contact your third-party supplier for details.

CNC machines

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

Care of the system

Keep system components clean and treat the system as a precision tool.

Patents

None applicable.

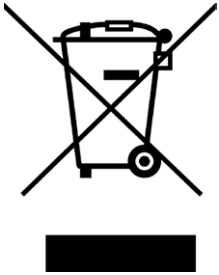
Compliance declaration

Renishaw plc hereby declares that the HPGA is in compliance with the essential requirements and other relevant provisions of:

- the applicable EU directives
- the relevant statutory instruments under UK law

Full declaration text is available at: **www.renishaw.com/mtpdoc**

Disposal of waste electrical and electronic equipment (WEEE)



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, contact your local waste disposal service or Renishaw distributor.

Intended use

The HPGA system is a motorised high-precision tool setting solution predominantly intended for use on 3-axis CNC grinding machines and CNC lathes for workpiece inspection, tool measurement and broken tool detection.

Safety

Information to the user

In all applications involving the use of machine tools, eye protection and safety footwear is recommended.

Remove power before performing any maintenance operations.

The expected method of providing an emergency stop for Renishaw products is to remove power.

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.

If the probe system fails, the probe signal may falsely indicate a probe seated condition. Do not rely on probe signals to halt the movement of the machine.

The high-precision generic arm (HPGA) system must be installed by a competent person, observing relevant safety precautions. Before starting work, ensure that the machine tool is in a safe condition with the power switched OFF and the power supply to the TSI 3, TSI 3-C or HSI disconnected.

CAUTION: HPGA and TSI 3 / TSI 3-C / HSI are intended for exclusive use as part of the HPGA system. Any attempts to integrate with other arms or interfaces could result in unexpected behaviour and/or product damage.

Information to the equipment installer

All Renishaw equipment is designed to comply with the relevant UK, 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 (for example, power transformers, servo drives).
- 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 (for example, motor power supply cables), 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.

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安全须知

用户须知

在所有涉及使用机床的应用中，建议采取保护眼睛的措施，并应穿着安全靴。

在执行任何维护操作之前，请先断开电源。

雷尼绍产品的建议急停方法是断开电源。

机床供应商/安装商须知

机床制造商有责任确保用户了解操作过程中存在的任何危险，包括雷尼绍产品说明书中所述的危险，并应确保提供充分的防护装置和安全联动装置。

如果测头系统发生故障，则可能误发测头已复位的信号。切勿单凭测头信号即停止机床运动。

高精度通用对刀臂 (HPGA) 系统必须由具备资质的人员在遵守相关安全措施的前提下进行安装。在开始工作之前，须确保机床的电源已关闭，处于安全状态，并且TSI 3、TSI 3-C或HSI的电源已断开。

小心：HPGA和TSI 3 / TSI 3-C / HSI仅可作为HPGA系统的一部分进行使用，如果试图将其与其他对刀臂或接口进行集成，将可能导致意外操作及/或产品损坏。

设备安装商须知

雷尼绍所有设备的设计均符合相关的UK、EU和FCC监管要求。为使产品按照这些法规正常运行，设备安装商有责任确保遵守以下指导原则：

- 任何接口的安装位置必须远离任何潜在的电噪声源（例如变压器、伺服系统驱动装置）。
- 所有0伏/接地连接都应当连接到机床接地终端上（“接地终端”是所有设备地线和屏蔽电缆的单点回路）。这一点非常重要，不遵守此规定会导致接地点之间存在电位差。
- 所有屏蔽装置都必须按照使用说明书中所述进行连接。
- 电缆线路不得与电机电源电缆等高电流源并行或靠近高速数据传输线。
- 电缆长度应始终保持最短。

设备操作

如果设备的使用方式与制造商要求的方式不符，则设备提供的保护功能可能会减弱。

REACH regulation

Information required by Article 33(1) of Regulation (EC) No 1907/2006 (“REACH”) relating to products containing substances of very high concern (SVHCs) is available at:
www.renishaw.com/REACH

China RoHS

For more information on China RoHS, visit:
www.renishaw.com/mtpchinarohs

FCC information to user (USA only)

Supplier’s declaration of conformity

47 CFR Section 2.1077 Compliance information

Unique identifier: HPGA high-precision generic arm
Responsible party – US contact information
Renishaw Inc.
1001 Wesemann Drive
West Dundee
Illinois
IL 60118
United States
Telephone number: +1 847 286 9953
Email: usa@renishaw.com

FCC compliance statement

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 their own expense.

ICES information to user (Canada only)

Class A Equipment Statement

This ISM device complies with Canadian ICES-001(A) / NMB-001(A).

Cet appareil ISM est conforme à la norme ICES-001(A) / NMB-001(A) du Canada.

TSI 3 / TSI 3-C software notices

This TSI 3 / TSI 3-C product includes embedded software (firmware) to which the following notices apply:

US government notice

NOTICE TO UNITED STATES GOVERNMENT CONTRACT AND PRIME CONTRACT CUSTOMERS

This software is commercial computer software that has been developed by Renishaw exclusively at private expense. Notwithstanding any other lease or licence agreement that may pertain to, or accompany the delivery of, this computer software, the rights of the United States Government and/or its prime contractors regarding its use, reproduction and disclosure are as set forth in the terms of the contract or subcontract between Renishaw and the United States Government, civilian federal agency or prime contractor respectively. Please consult the applicable contract or subcontract and the software licence incorporated therein, if applicable, to determine your exact rights regarding use, reproduction and/or disclosure.

Renishaw software EULA

Renishaw software is licensed in accordance with the Renishaw licence at: **www.renishaw.com/legal/softwareterms**

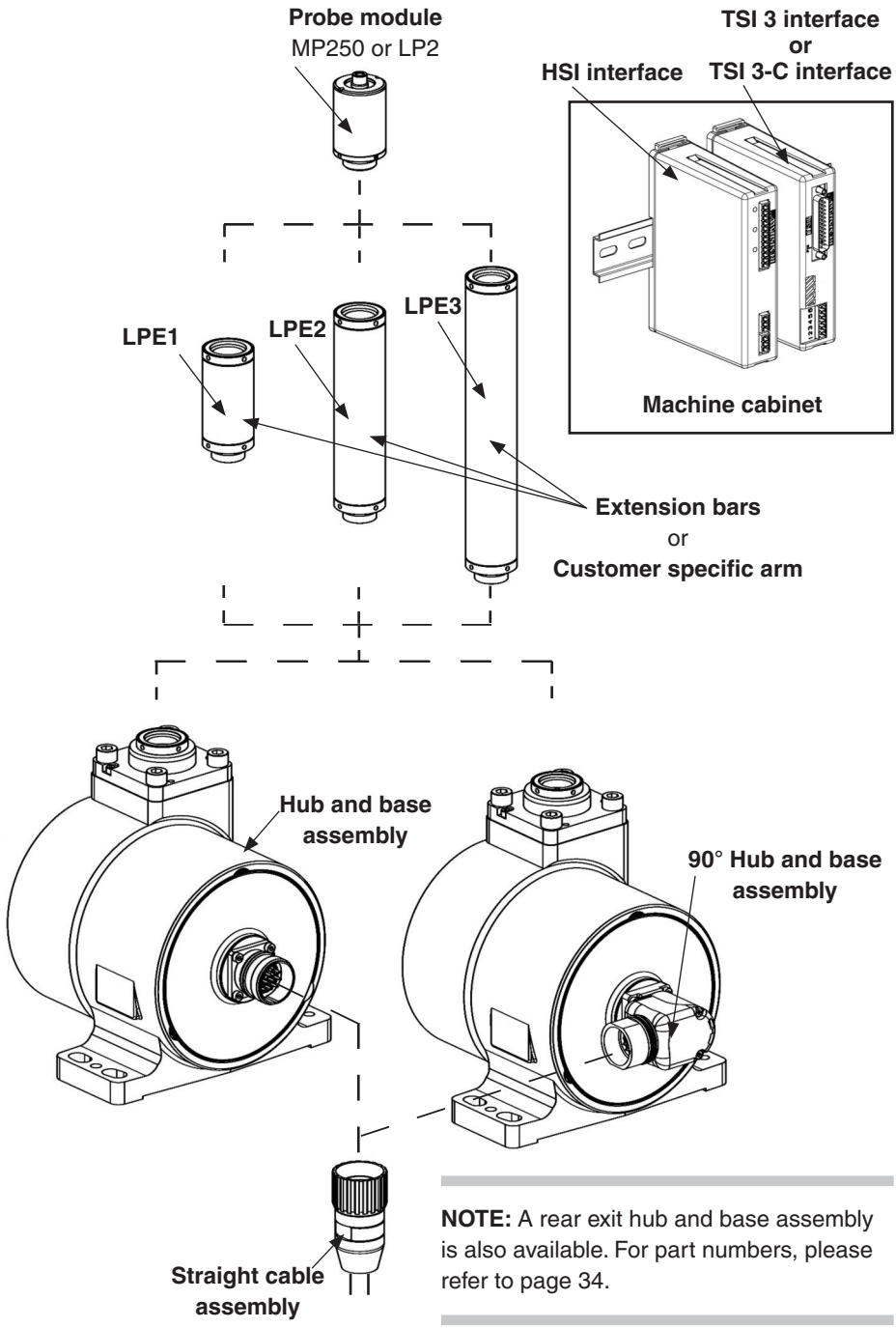
Primary application	Workpiece inspection and tool setting on cutter grinder machines and CNC lathes.
Sense directions	Probe ±X, ±Y, +Z
Arm sweep angle	90° (typical)
Weight	3.9 kg (137.57 oz), typical hub and base only.
Uni-directional repeatability	3.0 µm 2 sigma*
ARO to MRO**	2 seconds, typical
MRO to ARO**	2 seconds, typical
Power supply approvals	BS EN IEC 62368-1
Cable protection	The installer is responsible for ensuring adequate protection of the HPGA cable during normal use in the machining environment.
Probe §	LP2 or MP250
Interface	TSI 3 (or TSI 3-C) and HSI
Environment:	
IP rating	IPX8 (static)
Storage temperature	-25 °C to 70 °C (-13 °F to 158 °F)
Operating temperature	5 °C to 55 °C (41 °F to 131 °F)

* The system includes the hub/base, arm and probe.

Maximum 2 sigma value in any direction. Performance specification is for 10 points at 48 mm/min trigger speed using an LP2 probe with a 20 mm long stylus and a 15 mm square tip.

§ Please refer to Data Sheets H-2000-2100 (LP2) and H-5500-8200 (MP250) for more details.

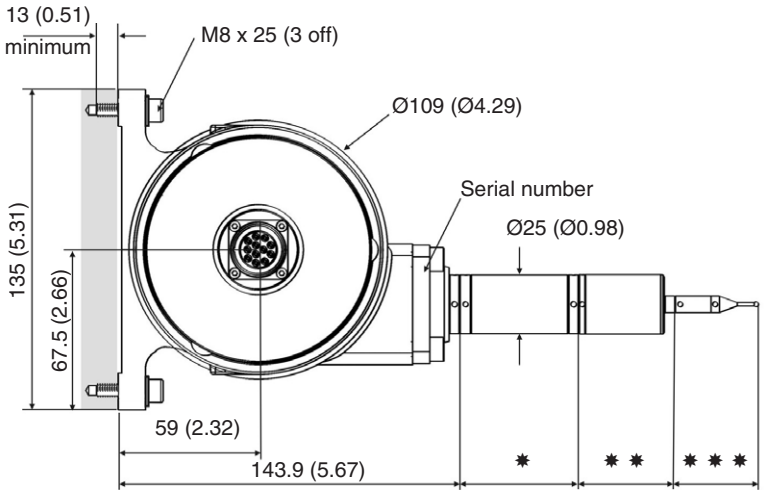
** MRO = Machine Ready Output
ARO = Arm Ready Output



NOTE: A rear exit hub and base assembly is also available. For part numbers, please refer to page 34.

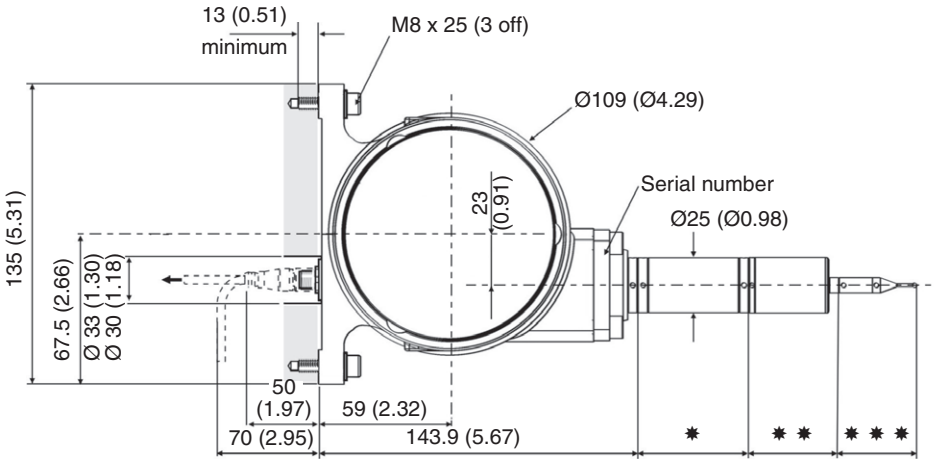
HPGA dimensions (side exit, side view)

dimensions mm (in)



HPGA dimensions (rear exit, side view)

dimensions mm (in)



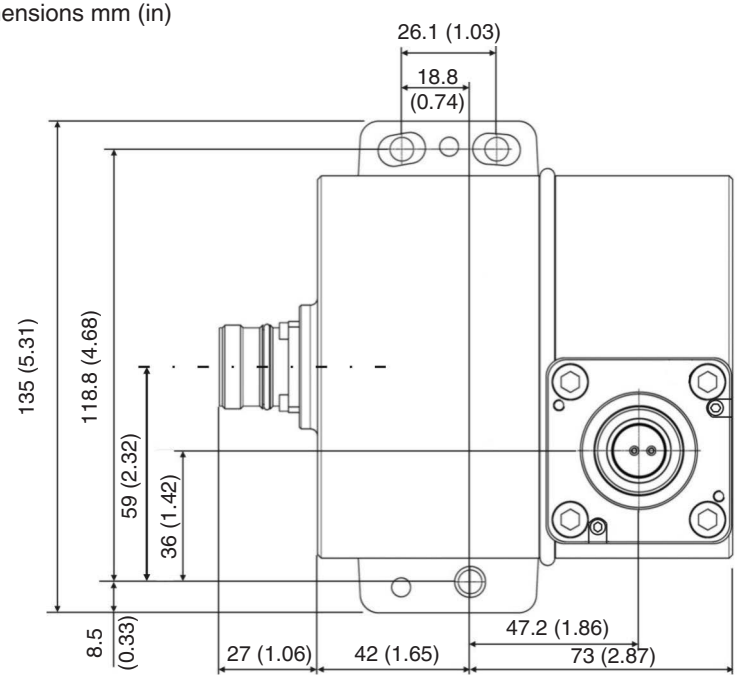
✱ LPE1 = 50 (1.97), LPE2 = 100 (3.94), LPE3 = 150 (5.91)

✱ ✱ LP2 probe = 40.8 (1.6), MP250 = 40.7 (1.6)

✱ ✱ ✱ For a full range of stylus please contact Renishaw plc

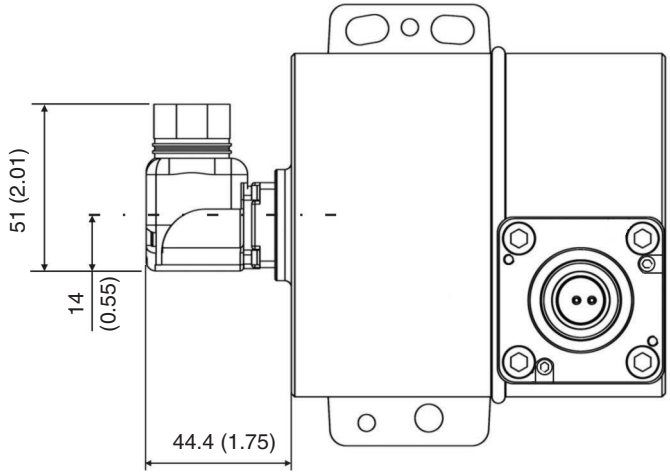
HPGA dimensions (top view) with straight connector

dimensions mm (in)

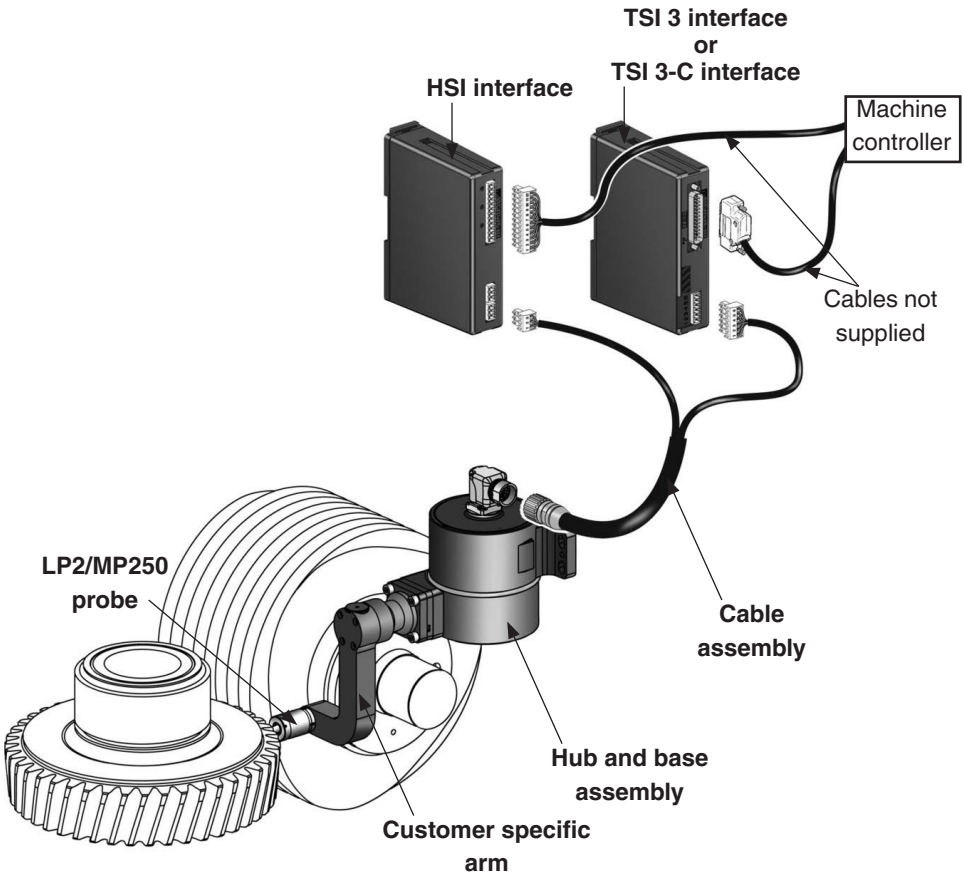


HPGA 90° connector dimensions

dimensions mm (in)

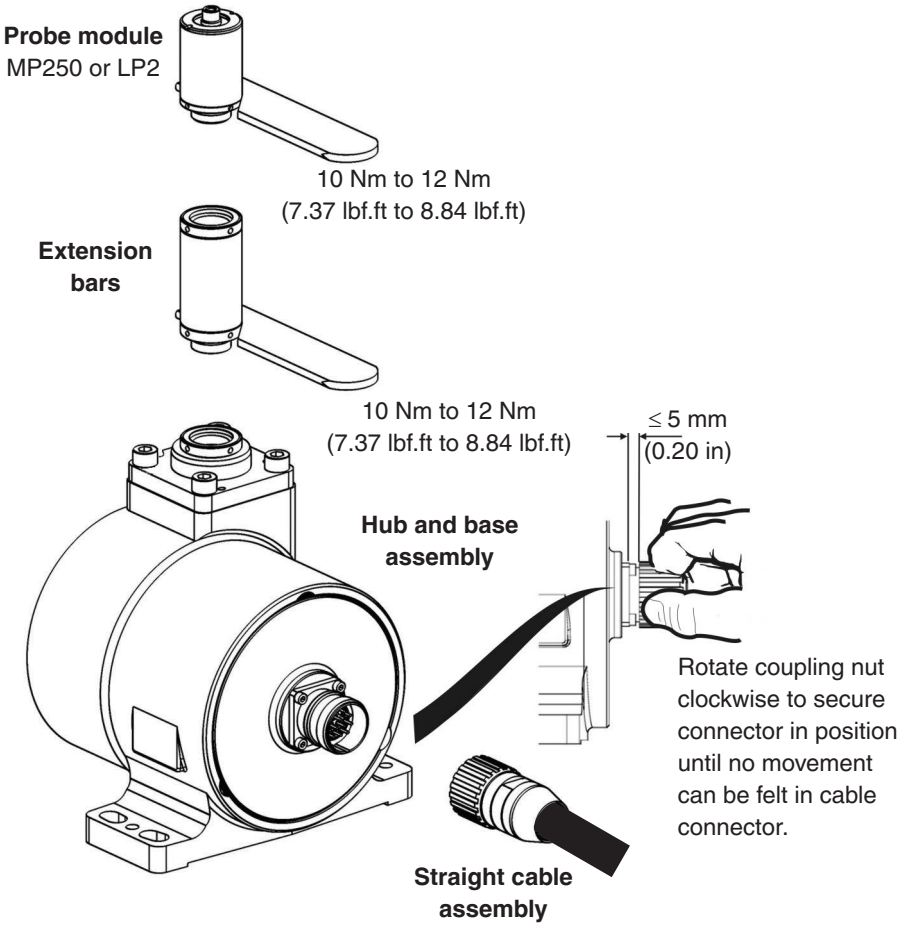


Installing the HPGA with TSI 3 (or TSI 3-C) and HSI interfaces

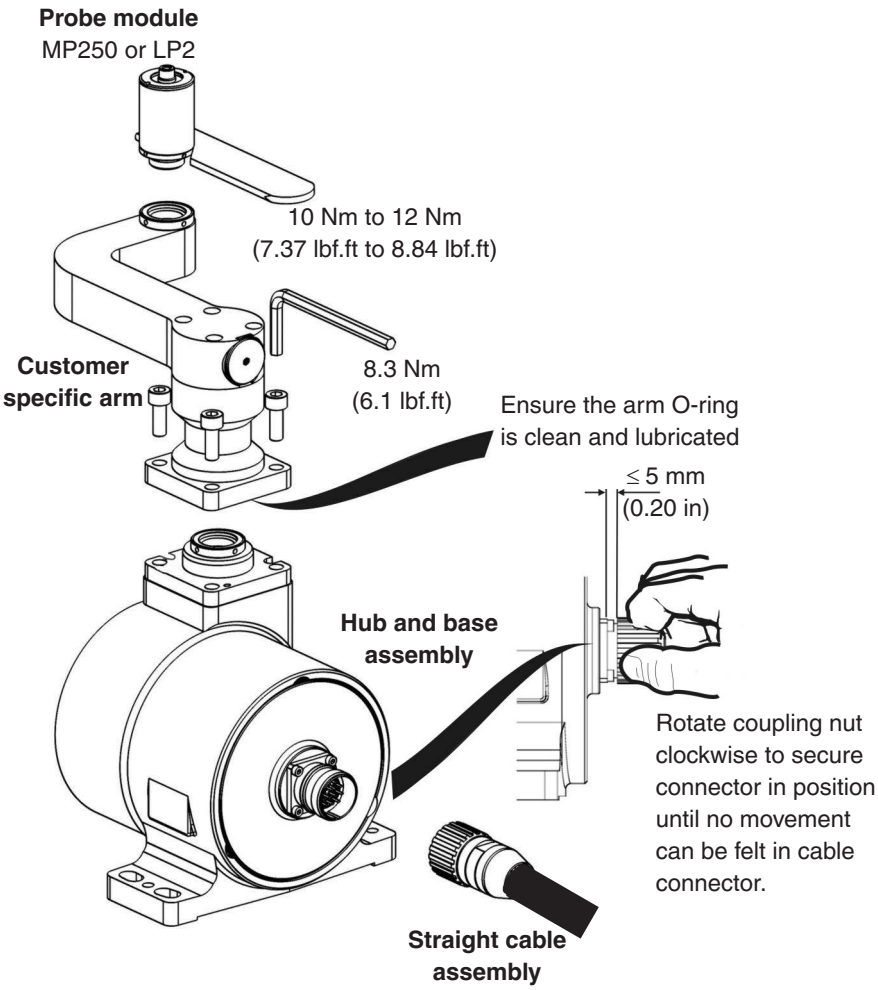


NOTE: For part numbers, please refer to page 34.

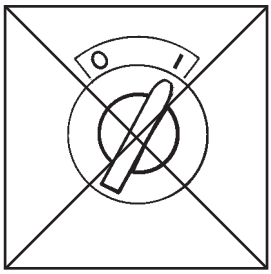
Installing a straight arm to the hub and base assembly

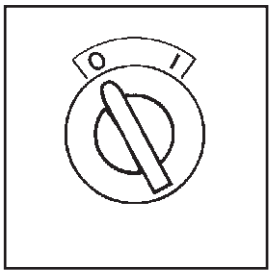


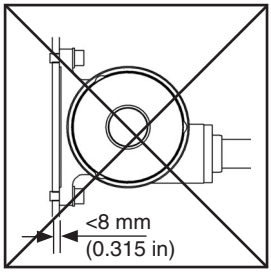
Installing a 90° arm to the hub and base assembly

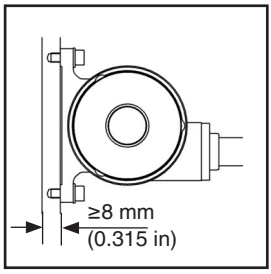


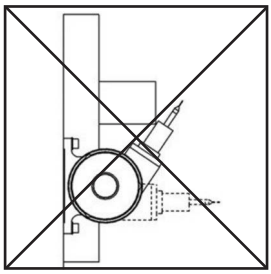
Installing the HPGA

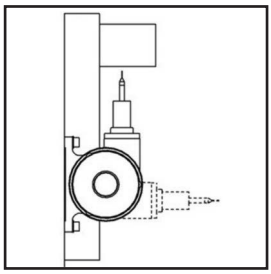


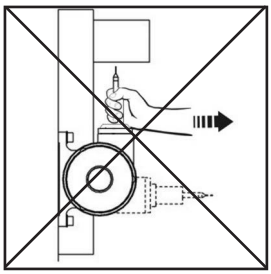


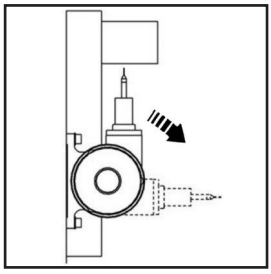




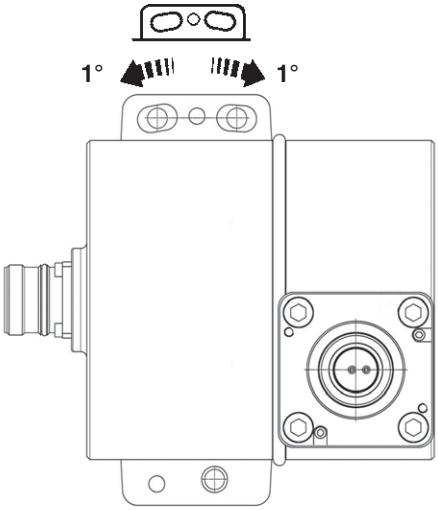




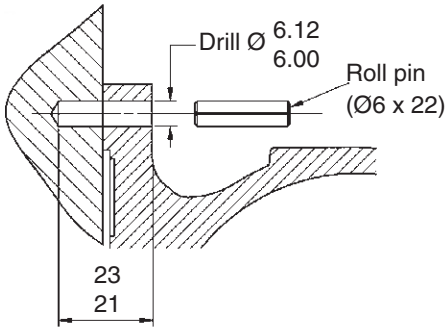




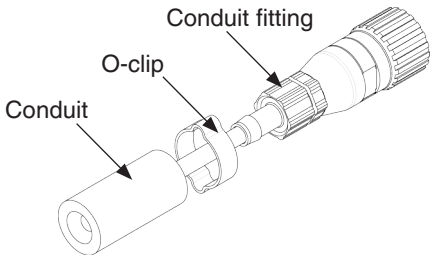
Hub and base adjustment



1. Rotate arm on bottom mounting screw to set stylus alignment.
2. Tighten all screws to 10 Nm.
3. Check that stylus alignment has not moved after tightening.
4. If required, dowel base in position. Drill through base into mounting using pilot holes as a guide. Fit roll pins supplied in base fixing kit. Apply corrosion inhibitor to pins after fitting.



Conduit installation



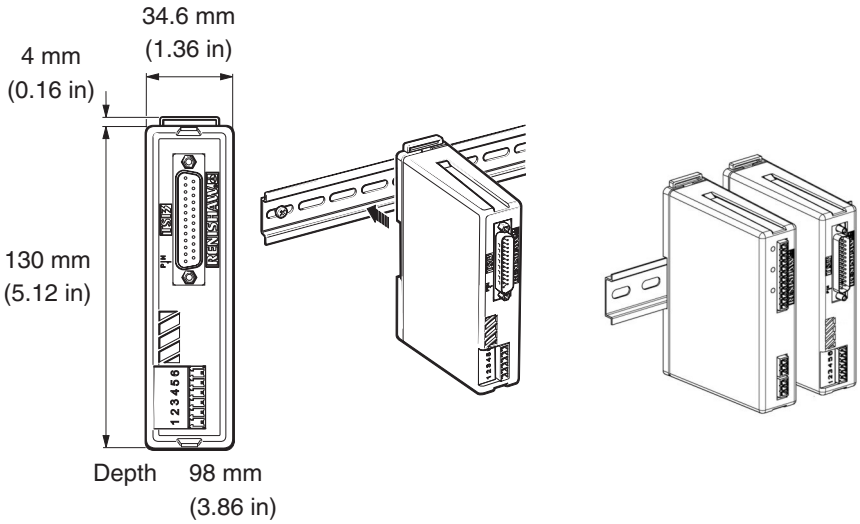
1. Loosely fit the O-clip over the conduit.
2. Push the conduit over the barbed conduit fitting and position the O-clip.
3. Pinch the O-clip onto the conduit using pincers.

NOTE: The procedure is similar for conduit installation on 90 degree connectors.

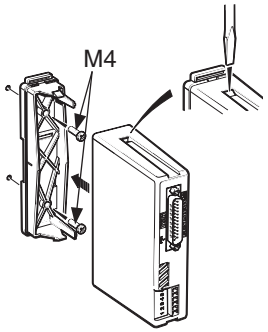
Installing the TSI 3 (or TSI 3-C) and HSI interface units

The TSI 3 (or TSI 3-C) and HSI interface units should be installed in the CNC control cabinet. Where possible, site the units away from potential sources of interference such as transformers and motor controllers.

dimensions mm (in)



Alternative mounting



CAUTION: The HPGA arm must only be used with the TSI 3 (or TSI 3-C) and HSI interfaces.

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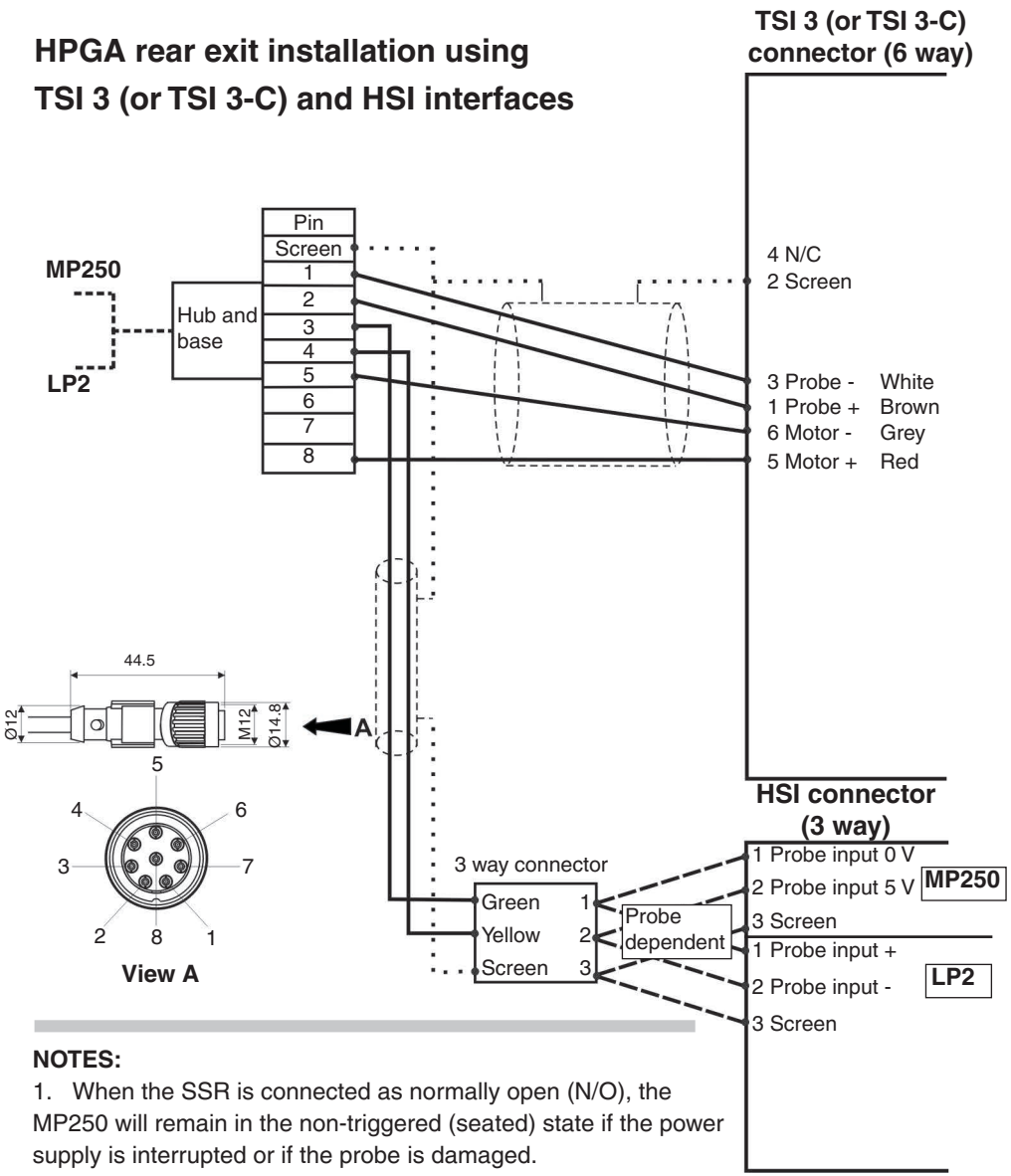
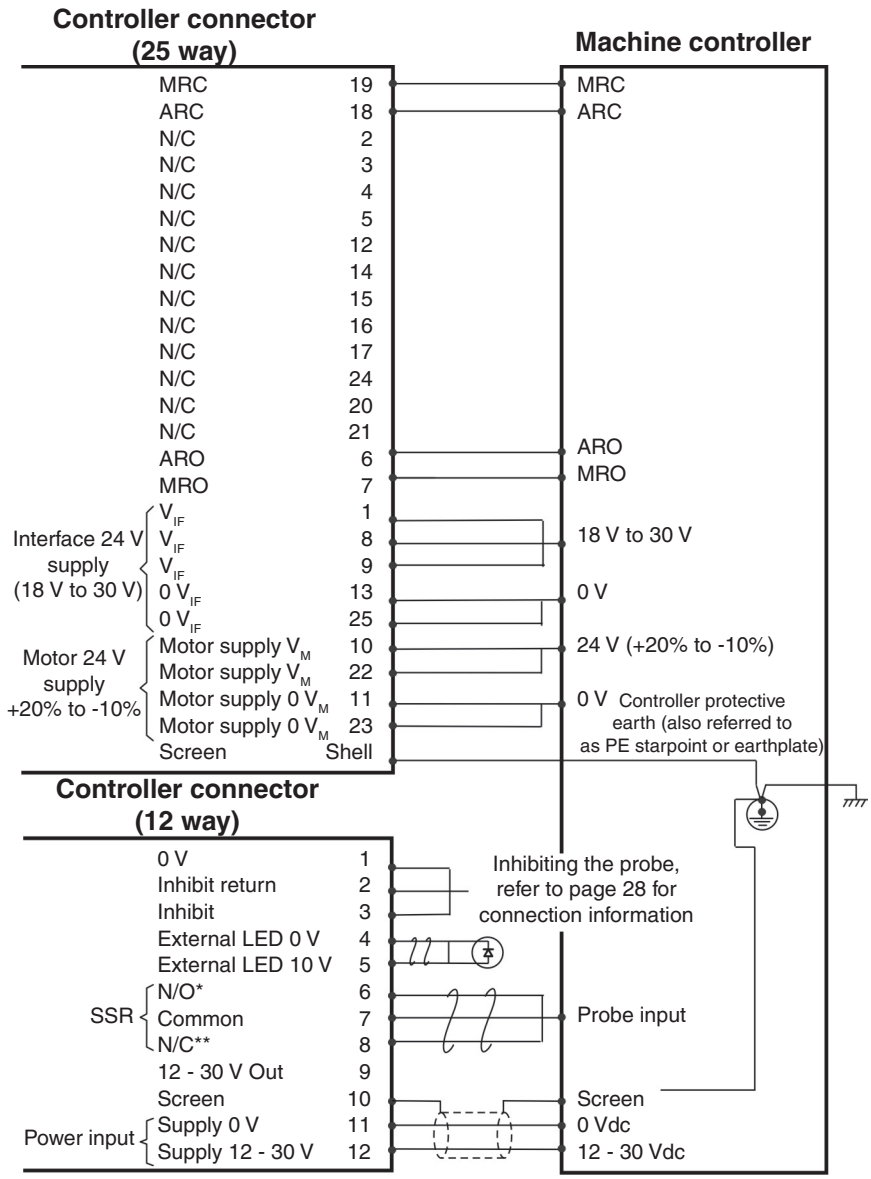
HPGA rear exit installation using TSI 3 (or TSI 3-C) and HSI interfaces



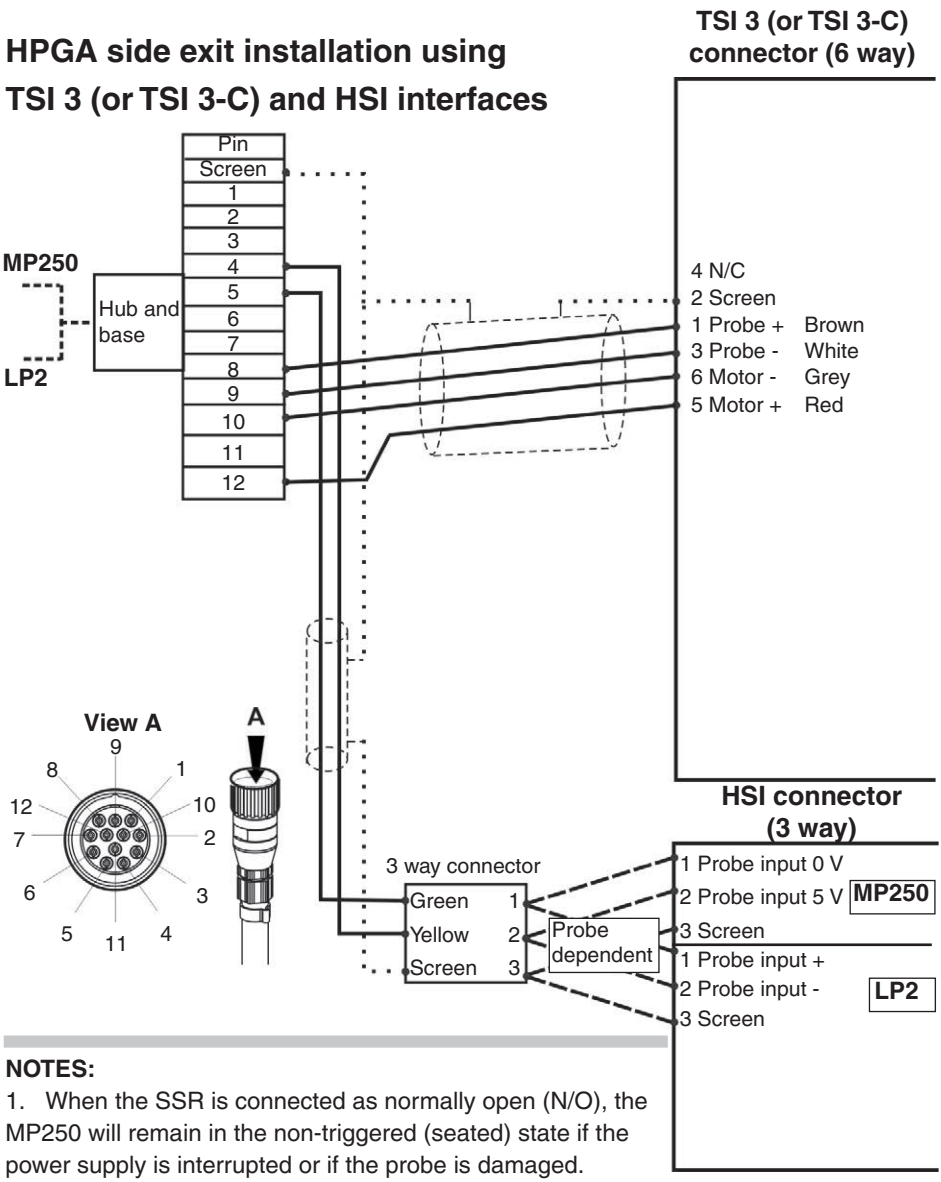
NOTES:

1. When the SSR is connected as normally open (N/O), the MP250 will remain in the non-triggered (seated) state if the power supply is interrupted or if the probe is damaged.
2. The TSI 3 (or TSI 3-C) interface will show a probe open condition whatever the status of the MP250 probe. For this reason the TSI 3 (or TSI 3-C) interface probe output must be ignored and the probe status from the HSI interface used.
3. The HSI probe output remains active in the machine ready position. To disable the probe output use the HSI inhibit function (refer to page 28).



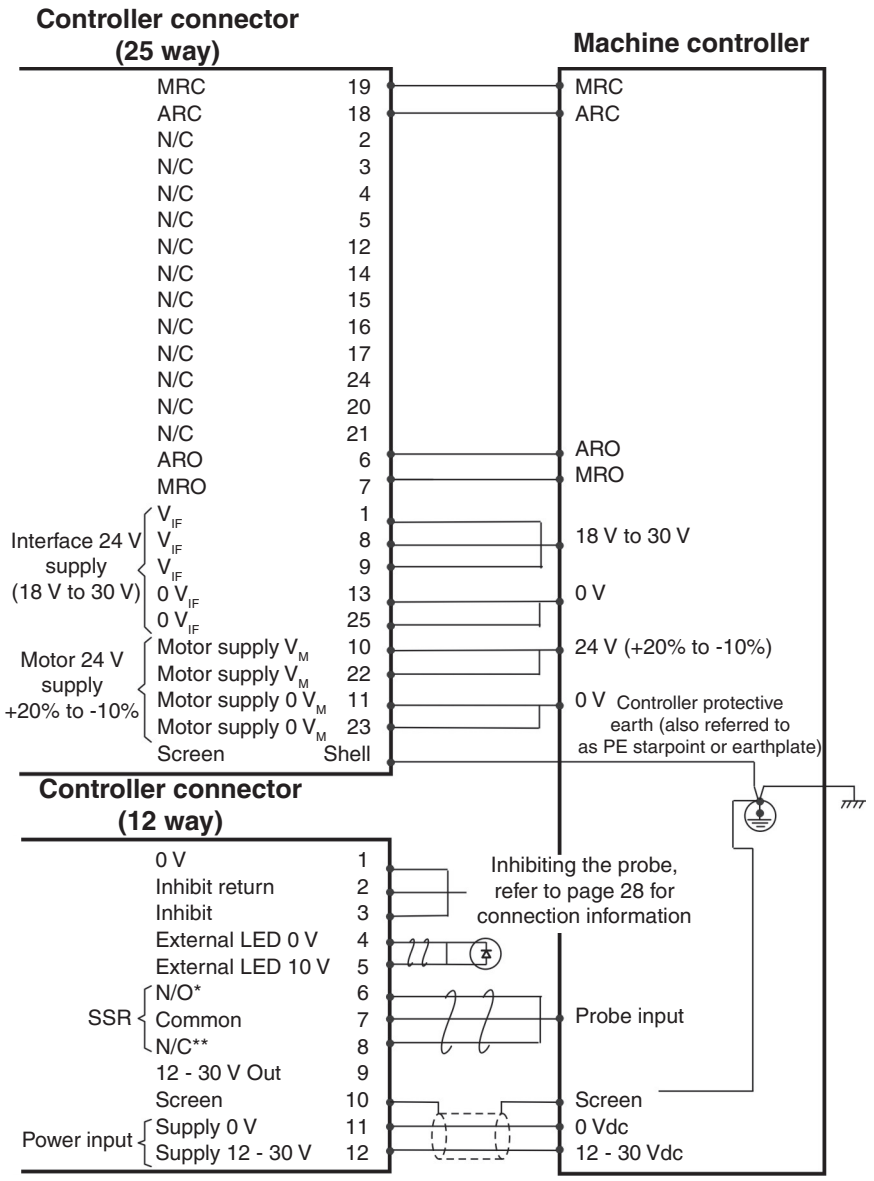
Status	*Normally open (N/O)	**Normally closed (N/C)
Probe triggered	Closed	Open
Probe seated	Open	Closed

HPGA side exit installation using TSI 3 (or TSI 3-C) and HSI interfaces



NOTES:

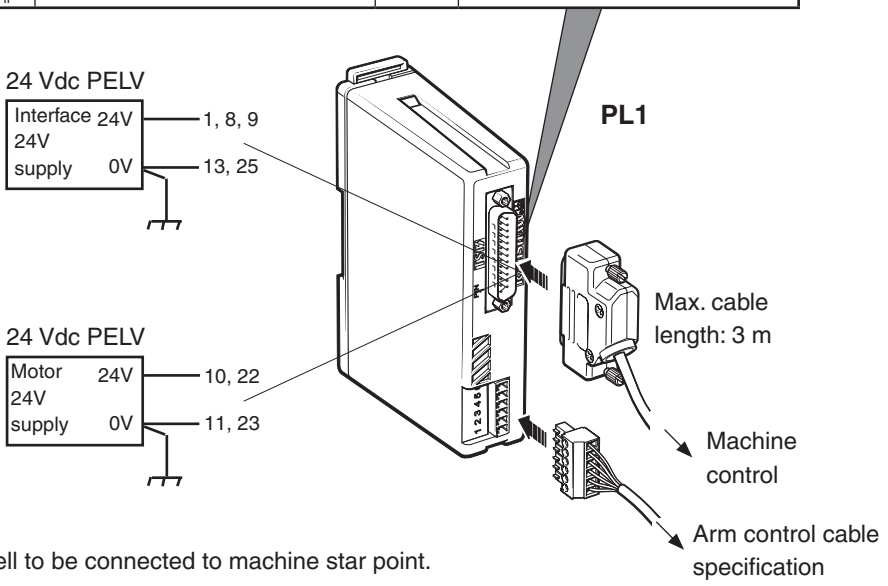
1. When the SSR is connected as normally open (N/O), the MP250 will remain in the non-triggered (seated) state if the power supply is interrupted or if the probe is damaged.
2. The TSI 3 (or TSI 3-C) interface will show a probe open condition whatever the status of the MP250 probe. For this reason the TSI 3 (or TSI 3-C) interface probe output must be ignored and the probe status from the HSI interface used.
3. The HSI probe output remains active in the machine ready position. To disable the probe output use the HSI inhibit function (refer to page 28).



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

Connecting the TSI 3 (or TSI 3-C) to the machine controller

1 V_{IF}	Interface 24V supply 18 V to 30 V	14 SelX-	No connection
2 X-O	No connection	15 SelX+	No connection
3 X+O	No connection	16 SelZ-	No connection
4 Z-O	No connection	17 SelZ+	No connection
5 Z+O	No connection	18 ARC	Arm ready command
6 ARO	Arm ready output	19 MRC	Machine ready command
7 MRO	Machine ready output	20 NC	No connection
8 V_{IF}	Interface 24V supply 18 V to 30 V	21 NC	No connection
9 V_{IF}	Interface 24V supply 18 V to 30 V	22 V_M	Motor 24 V supply +20% to -10%
10 V_M	Motor 24 V supply +20% to -10%	23 0 V_M	Motor 0 V
11 0 V_M	Motor 0 V	24 INH	No connection
12 NC	No connection	25 0 V_{IF}	Interface 0 V supply
13 0 V_{IF}	Interface 0 V supply	Shell SCR	Screen*



* Shell to be connected to machine star point.

V_{IF} = 24 Vdc 18 to 30 V
This supply powers the interface.
I_{MAX} = 100 mA (Not including output load currents)
V_M = 24 Vdc +20% to -10%
This supply powers the motor drive.
I_{MAX}= 2.5 A while motor is running (typical 2 seconds)
Circuit protection: Power supply protected against overcurrent and reverse connection.

Input specification

MRC
ARC

Internally pulled down (2K4) ACTIVE HIGH inputs

Output specification

ARO and MRO are current limited.

Arm ready (ARO) / Machine ready (MRO) outputs

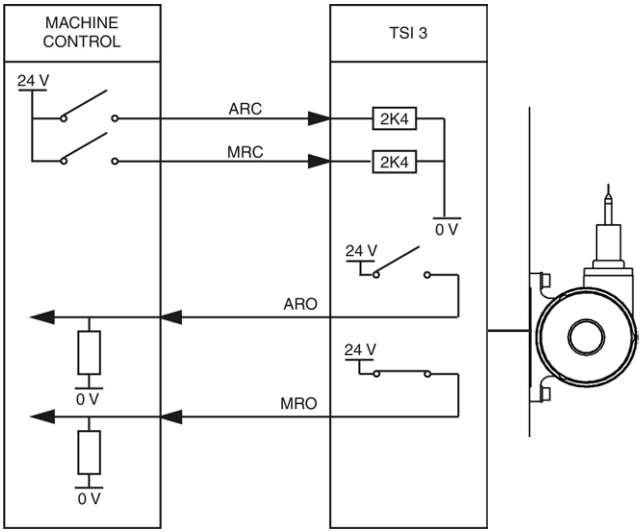
ARO (PL1-6)	**MRO (PL1-7)**
OCT ACTIVE HIGH outputs	V_{IF} - 2.4 V @ 20 mA

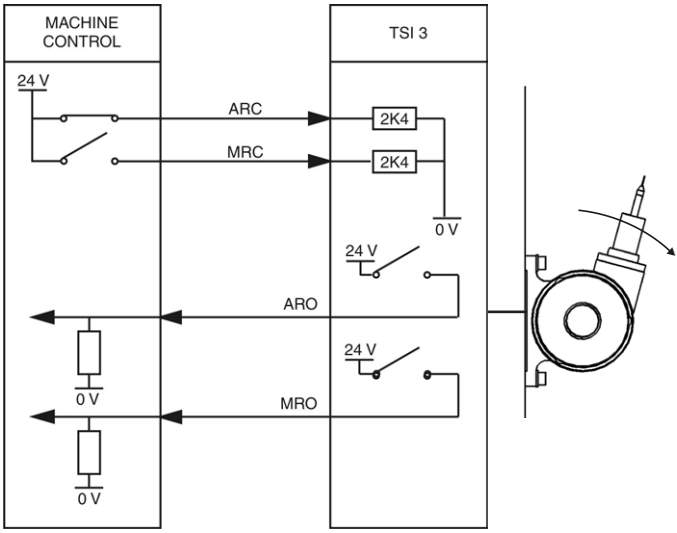
Arm control

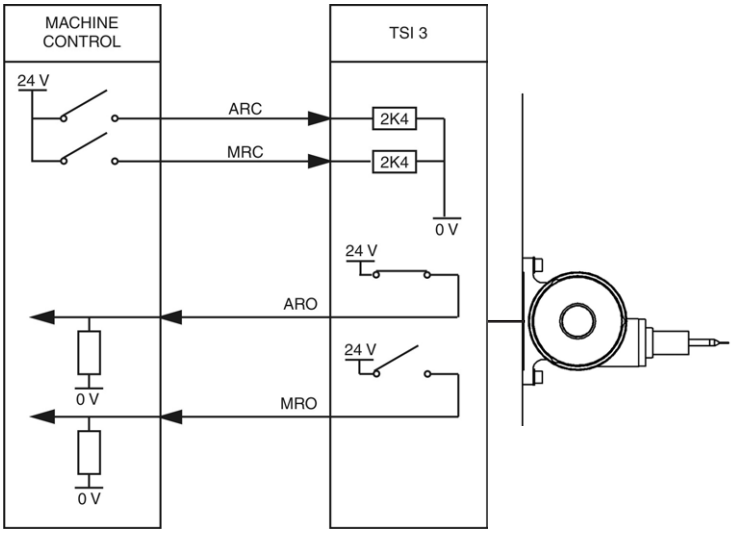
Two separate machine tool control outputs are required to command the arm to move to “machine ready position” (MRC) and “arm ready position” (ARC). The user must ensure that both outputs are never active at the same time. There must be a minimum time delay of 0.1 seconds (100 ms) between one command being de-activated and the other being activated. If both outputs are active at the same time then the arm is unable to determine what to do and will stop. This condition can only be overcome by de-activating both outputs.

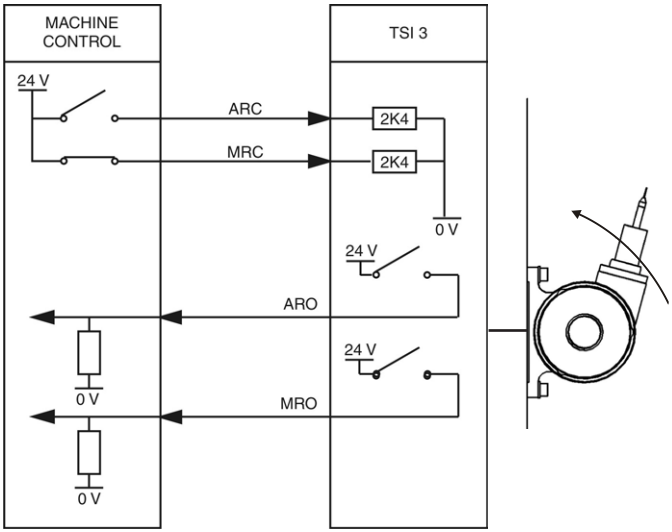
Two machine tool control inputs are required to receive arm position confirmation signals for “machine ready” (MRO) and “arm ready” (ARO).

All I/O are “ACTIVE HIGH” configuration.






MACHINE CONTROL
TSI 3
24 V
ARC
MRC
2K4
2K4
0 V
24 V
ARO
24 V
0 V
MRO
0 V


MACHINE CONTROL
TSI 3
24 V
ARC
MRC
2K4
2K4
0 V
24 V
ARO
24 V
0 V
MRO
0 V

HSI interface

The HSI is a hard-wired transmission interface which converts inspection probe signals 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's 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 HSI has a maximum input voltage range of 11 Vdc to 30 Vdc. The supply is protected by a 140 mA self-resetting fuse. To reset the fuse, remove the power then identify and rectify the cause of the fault.

An 'inhibit' function is included, and a facility to drive an external probe status LED.

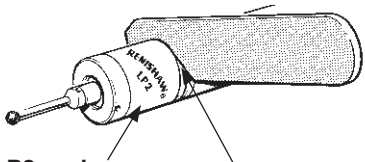
For information about probe inhibit function and probe status, please refer to the HSI Installation Guide (H-5500-8554).

You may undertake the maintenance routines described in these instructions.

Further dismantling and repair of Renishaw equipment is a highly specialised operation, which must be carried out at authorised Renishaw Service Centres.

Equipment requiring repair, overhaul or attention under warranty should be returned to your supplier.

Probe removal



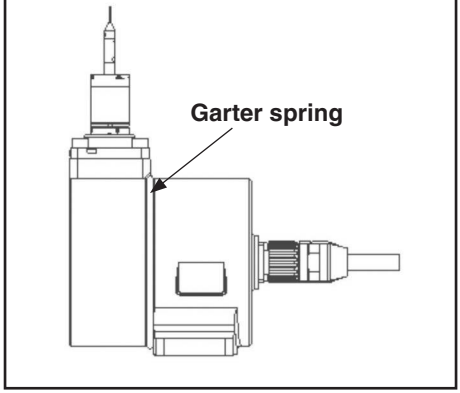
LP2 probe

M16 thread
normal
10 Nm to 12 Nm
(7.37 lbf.ft to 8.84 lb.ft)

Maximum
20 Nm (14.74 lbf.ft)

Cleaning the HPGA arm

Ensure garter spring and runner faces are kept clean and clear of swarf build up.



NOTE: For information on cleaning the LP2 probe, please refer to the LP2 probe system installation guide, H-2000-5021 and for the MP250 probe, please refer to the MP250 probe installation guide H-5500-8504.

Calibrating the probe

The exact procedure adopted is specific to each machine, control system and software package. However certain rules are common.

Before setting tools, it is necessary to calibrate the stylus position to establish its trigger points in relation to a datum on the machine. This can be achieved by the use of a known reference tool.

Recalibration is necessary periodically (at least every 6 months), and in special circumstances e.g. if the arm has been subjected to a crash or if the stylus has been replaced.

The recommended frequency of normal recalibration is dependent on the frequency of usage of the arm. This may vary greatly depending on the application of the tool setting arm, i.e. a typical jobbing shop may want to set tools twice per day and have 8 tools to set. This would therefore result in 2 arm operations per day. A large volume manufacturer however, may only wish to check for broken tools, but with a typical cycle time of 5 minutes and 24 hour working days, would operate the arm 288 times per day.

The following table should therefore be used when deciding on frequency of recalibration:

Recommended frequency of arm recalibration	
Arms operations per day	Recalibrate every...
<50	6 months
<100	3 months
>100	1 month

Symptom	Cause	Action
Poor system repeatability	Mounting screws not fully tightened.	Tighten screws to specified torque.
	Loose probe.	Verify tightness of probe in arm assembly.
	Loose stylus.	Ensure tip of stylus is tight. Ensure M4 grubscrew in stylus stem is tight. Ensure crash protection device is fully tightened into LP2 probe.
	Swarf on tool tip.	Remove swarf.
	Calibration and updating of offsets is not occurring.	Review software.
	Calibration and probing speeds are not the same.	Review software.
	Probing is being performed within the machine's acceleration/ deceleration zones.	Review software.
	Arm not mounted as recommended i.e. on sheet metal guards.	Mount on solid base.
	Probing feedrate is too high for the machine controller.	Perform repeatability trials at various feedrates.
	Temperature variation is causing excessive movement of the machine and the HPGA.	Minimise machine and HPGA temperature changes. Increase the frequency of calibration.
	Machine has poor repeatability due to loose encoders, backlash, tight slideways and/or accidental damage.	Perform health check on machine.

Symptom	Cause	Action
Poor system repeatability (continued)	Excess machine vibration.	Eliminate vibration.
	Minor collision.	Move arm to stow position and back to active position to reset arm to kinematic seating.
Symptom	**Cause**	**Action**
No probe output	Damaged or dirty probe contacts.	Check condition of probe contacts. If contacts are dirty, clean using compressed air and a clean lint-free cloth.
	Probe not connected.	Check wiring to machine. Check probe is fully screwed into holder.
	Probe has failed.	Remove probe and check probe for continuity across probe contacts (resistance should be less than 1 KΩ). **NOTE:** The action mentioned is only applicable to the LP2 probe.

Symptom	Cause	Action
Arm system not responding to commands	Power supply not connected.	Check electrical connections (ensure motor and I/O supplies are connected). Check power supply (supplies) for voltage and polarity.
	Command not received.	Check machine control electrical outputs. Check electrical connections.
	TSI 3 (or TSI 3-C) not responding.	Remove power from TSI 3 (or TSI 3-C) (power machine down or alternatively disconnect 25 way 'D' type connector for 5 seconds minimum and reconnect).
Symptom	**Cause**	**Action**
Arm system responds to commands but does not acknowledge completion of move (MRO, ARO)	Damaged or dirty probe contacts.	Check condition of probe contacts. If contacts are dirty, clean using compressed air and a clean lint-free cloth.
Symptom	**Cause**	**Action**
No probe output	Probe not connected.	Ensure probe is fully screwed into holder.
	Probe status (PS) not received by machine control.	Check machine control inputs / outputs. Check electrical connections.

Type	Part Number	Description
Medium HPGA S/E kit	A-5616-0401	Hub and base assembly, TSI 3 interface, HSI interface and installation and user guide.
Medium HPGA 90° S/E kit	A-5616-0451	90° hub and base assembly, TSI 3 interface, HSI interface and installation and user guide.
Medium HPGA S/E hub and base assembly	A-5616-0302	Hub and base assembly, installation and user guide and packaging.
Medium HPGA 90° S/E hub and base assembly	A-5616-0352	90° hub and base assembly, installation and user guide and packaging.
Medium HPGA R/E kit	A-5616-0430	Hub and base assembly, TSI 3 interface, HSI interface and installation and user guide.
Medium HPGA R/E hub and base assembly	A-5616-0332	Hub and base assembly, installation and user guide and packaging.
R/E cable	P-CN21-0043	HPGA R/E cable 1.5 m long.
R/E cable	P-CN21-0040	HPGA R/E cable 3 m long.
R/E cable	P-CN21-0041	HPGA R/E cable 5 m long.
R/E cable	P-CN21-0042	HPGA R/E cable 10 m long.
S/E cable	A-5616-0092	HPGA 90° S/E cable 2 m long.
S/E cable	A-5616-0091	HPGA 90° S/E cable 5 m long.
S/E cable	A-5616-0090	HPGA 90° S/E cable 10 m long.
S/E cable	A-5616-0082	HPGA straight S/E cable 2 m long.
S/E cable	A-5616-0081	HPGA straight S/E cable 5 m long.
S/E cable	A-5616-0080	HPGA straight S/E cable 10 m long.
HSI interface	A-5500-1000	HSI system interface with DIN rail mounting and three terminal blocks, support card and packaging.
TSI 3-C interface	A-2181-2239	TSI 3-C system interface with DIN rail mounting.
TSI 3 interface	A-2181-0465	TSI 3 system interface with DIN rail mounting.
MP250 probe	A-5500-1600	MP250 probe with tool kit (C spanner x 2 and stylus tool) and support card.
LP2 probe	A-2063-6098	LP2 probe complete with two C spanners and TK1 tool kit.
LPE1	A-2063-7001	LPE1 extension bar - 50 mm long.

Type	Part Number	Description
LPE2	A-2063-7002	LPE2 extension bar - 100 mm long.
LPE3	A-2063-7003	LPE3 extension bar - 150 mm long.
Cube stylus kit	A-5003-4715	Cube stylus kit 19 mm x 19 mm.
C spanner	A-2063-7587	C spanner.
Stylus tool	M-5000-3707	Tool for tightening/releasing styli.
Base fixing kit	A-2275-0113	HPGA base fixing kit.
Publications. These can be downloaded from our website at **www.renishaw.com**.		
Styli	H-1000-3200	Technical specifications guide: Styli and accessories – or visit our Online store at **www.renishaw.com/shop**.
Probe software	H-2000-2298	Data sheet: Probe software for machine tools – programs and features.
HSI	H-5500-8554	Installation guide: for set-up of the HSI hard-wired system interface.
MP250	H-5500-8504	Installation guide: for set-up of the MP250 machine tool probe system.
LP2	H-2000-5021	Installation guide: for set-up of the LP2 probe system.

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