Programmer's manual
H-1000-6005-03-A

RENISHAW
apply innovation™

PHS servo positioning head system

Renishaw part no: H-1000-6005-03-A

Issued: 03 2006

PHS1

Servo positioning head system

Programmer's manual

CE

FCC (USA)

Information to user (FCC 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 used in accordance with the installation 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 you will be required to correct the interference at your own expense.

Information to user (FCC 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.

Special accessories (FCC section 15.27)

The user is also cautioned that any peripheral device installed with this equipment such as a computer, must be connected with a high-quality shielded cable to insure compliance with FCC limits.

Care of probing system

Renishaw probing systems are precision tools used to obtain precise measurements and should therefore be treated with care.

Changes to equipment

Renishaw reserves the right to change specifications without notice.

Renishaw reserves the right to improve, change or modify its hardware or software without incurring any obligations to make changes to Renishaw equipment previously supplied.

Warranty

Renishaw plc warrants its equipment provided that it is installed exactly as defined in associated Renishaw documentation.

Consent must be obtained from Renishaw if non-Renishaw equipment (eg interfaces and/or cabling) is to be used or substituted. Failure to comply with this will invalidate the Renishaw warranty.

Claims made under warranty must be made from authorised service centres only, which may be advised by the supplier or distributor.

Patents

Features of Renishaw's PHS1 servo positioning head system, associated and similar equipment are the subjects of the patents and patent applications listed below:

EP 0142373 JP 2098080 US 4651405

EP 0293036 JP 12,662/1998

EP 0816014

EP 0836377

GB - Warnings

NOTE: The PHS1 servo positioning head contains pre-loaded spring elements which can be dangerous if any attempt is made to disassemble the head.

Pinch hazards exist between moving parts and between moving and static parts. Do not hold the probe head during movements, or when manually changing a probe.

Beware of unexpected movement. The user should remain outside the full working envelope of probe head / extension / probe combinations.

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

There are external air pipes on certain installations. Care should be taken to ensure that the pipes are securely fastened to the barbed air fittings.

There are normally no user-serviceable parts inside Renishaw mains-powered units. Return defective units to an authorised Renishaw Customer Service Centre.

For instructions regarding the safe cleaning of Renishaw products, refer to the maintenance information in the relevant product documentation.

Remove power before performing any maintenance operations.

Refer to the machine supplier's operating instructions.

NOTE: There are no mains powered units in the PHS1 system.

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 documentation, 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 stop machine movement.

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

International safety instructions

EN **WARNING:** Please turn to appendix 2 and read the safety instructions in your own language before unpacking and installing this product.

CZ **UPOZORNĚNÍ:** Před rozbalením a instalací tohoto výrobku čtěte bezpečnostní pokyny uvedené v Příloze 2.

DA **ADVARSLER:** Læs sikkerhedsinstrukserne i Appendix 2 FØR udpakning og installation af dette produkt!

DE **VORSICHT:** Lesen Sie die Sicherheitsanweisungen in Ihrer Sprache im Anhang 2 vor dem Auspacken und Installieren des Produktes.

EL **ΠΡΟΕΙΔΟΠΟΙΗΣΕΙΣ:** Πρέπει τώρα να γυρίσετε στο Κεφάλαιο 2 και να διαβάσετε τις οδηγίες ασφαλείας στη δική σας γλώσσα προτού ανοίξετε αυτό το προϊόν για να το εγκαταστήσετε.

ES **ADVERTANCIAS:** Debe volver al Apéndice 2 y leer las instrucciones de seguridad en su propio idioma antes de abrir e instalar este producto.

ET **HOIATUSED:** Nüüd peate vaatama 2. lisa ja enne selle toote lahtipakkimist ja paigaldamist lugema läbi ohutusjuhendi oma keeles.

FI **VAROITUKSET:** Ennen tämän tuotteen pakkauksen avaamista ja asentamista lue liitteessä 2 olevat omalla kielelläsi kirjoitetut turvaohjeet.

FR **AVERTISSEMENTS:** Vous devez à présent consulter l'annexe 2 et les instructions de sécurité dans votre propre langue avant de déballer et d'installer ce produit.

HU **FIGYELMEZTETÉSEK:** Lapozzon a 2. függelékhez és olvassa el a biztonsági előírásokat az Ön saját nyelvén mielőtt kicsomagolná és beüzemelné a terméket.

IT **AVVERTENZE:** Prima di aprire ed installare questo prodotto dovete leggere le istruzioni di sicurezza nella Vostra Lingua riportate nell'Appendice 2.

LT **ĮSPĖJIMAI:** Prieš išpakuojant ir įdiegiant produktą jums reikia grįžti prie 2 priedo ir perskaityti nurodymus dėl saugos savo kalba.

LV **BRĪDINĀJUMI:** Pirms šī izstrādājuma izsaiņošanas un uzstādīšanas jums jāiepazīstas ar 2. pielikuma drošības instrukcijām savā valodā.

MT **TWISSIJIET:** Issa għandek tmur f'appendiċi 2 sabiex taqra l-istruzzjonijiet tas-sigurtà fil-lingwa tiegħek qabel ma tispakkja u tinstalla dan il-prodott.

NL **WAARSCHUWING:** Ga nu naar Appendix 2 en lees de veiligheidsinstructies, in uw eigen taal, voordat u dit product uitpakt en installeert.

PL **OSTRZEŻENIA:** Przed rozpakowaniem i instalacja produktu nalezy przeczytac zalacznik nr 2 i zapoznac sie z zasadami bezpieczenstwa w jezyku uzytkownika.

PT **AVISOS:** Você deve retornar ao Apêndice 2 e ler as instruções de segurança em seu idioma antes de desembalar e instalar este produto.

SK **VÝSTRAHY:** Pred rozbalením a inštaláciou tohto produktu si musíte pozrieť prílohu 2 a prečítať bezpečnostné pokyny vo vašom jazyku.

SL **OPOZORILA:** Sedaj morate v prilogi 2 prebrati varnostne napotke v svojem jeziku, preden odpakirate in namestite produkt.

SV **VARNING:** Du måste nu gå till bilaga 2 och läsa säkerhetsinstruktionerna på ditt eget språk innan du packar upp och installerar denna produkt.

Environmental requirements

The following environmental conditions comply with (or exceed) BS EN 61010-1:1993.

Indoor use	IP30 (no protection against water)
Altitude	Up to 2000 m
Operating temperature	+10 °C to +40 °C
Storage temperature	-10 °C to +70 °C
Relative humidity	80% maximum for temperatures up to +31 °C Linear decrease to 50% at +40 °C
Transient overvoltages	Installation category II
Pollution degree	1

Spécifications relatives à l'environnement

Les conditions d'environnement sont en accord avec la norme BS EN 61010-1:1993 ou ultérieure.

Utilisation uniquement à l'intérieur	IP30 (aucune protection contre l'eau)
Altitude	Jusqu'à 2000 m
Température de fonctionnement	+10 °C à +40 °C
Température de stockage	-10 °C à +70 °C
Humidité relative	80% maximum pour des températures jusqu'à +31 °C avec diminution linéaire jusqu'à 50% à +40 °C
Surtensions transitoires	Installation classée en 2ème catégorie
Degré de pollution	1

Umgebungsbedingungen

Die Forderungen der Richtlinie BS EN 61010-1:1993 sind erfüllt.

Inneneinsatz	IP30 (kein Schutz gegen Wasser)
Höhe	bis zu 2000 m
Betriebstemperatur	+10 °C bis +40 °C
Lagertemperatur	-10 °C bis +70 °C
Relative Luftfeuchtigkeit	maximal 80% für Temperaturen bis +31 °C, linearer Anstieg bis 50% bei +40 °C
Kurzzeitige Überspannungen	Installationsklasse II
Verschmutzungsgrad	1

Specifiche ambientali operative

Le seguenti specifiche ambientali di lavoro sono conformi, o eccedono, la norma BS EN 61010-1:1993.

Uso interno	IP30 (senza protezione contro l'acqua)
Altitudine	Fino a 2000 m
Temperatura di lavoro	da +10 °C a +40 °C
Temperatura di immagazzinamento	da –10 °C a +70 °C
Umidità relativa	Massimo 80% per temperatura fina a +31 °C riduzione lineare al 50% a +40 °C
Sovraccarichi di tensione (transienti)	Categoria d'installazione II
Grado di inquinamento	1

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1 Introduction

This document presents the essential information for programmers writing software to control the PHS1 servo positioning head.

The PHS1 servo positioning head has two rotational axes, referred to throughout as D and E.

- The D axis is nearest the mounting for the head.
- The E axis carries a detachable lightweight arm and probe.

Each axis is functionally identical and consists of:

- A velocity control loop, which keeps the axis angular velocity constant at the commanded value regardless of load.
- A high accuracy, high resolution (0.2 arc seconds) position measuring sub-system, which can be latched by external events for synchronisation.
- A reference mark which allows the axis positions to be related to a known mechanical position on power up.

NOTE: The head only accepts velocity commands - closing the position loop must be done externally to the PHS1 system.

Communications within the system are by high speed serial links and are transparent to the user.

The head is controlled by a PC interface card. All functions are accessed by reading and writing to the appropriate register addresses as described in this document.

An address map can be found in appendix 1.

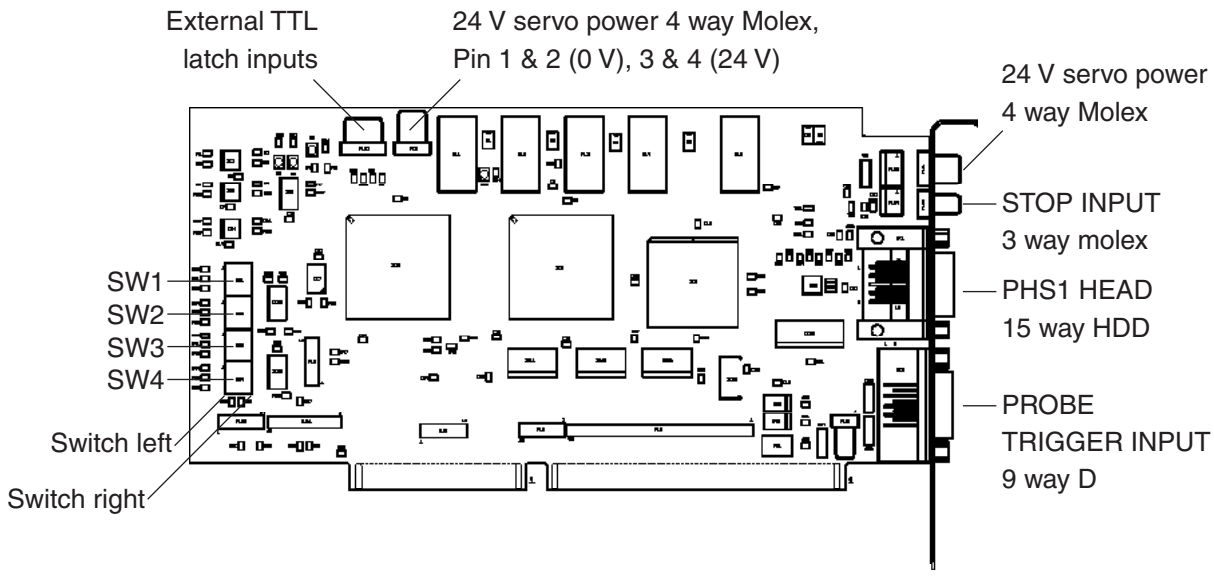

Figure 1 - PHS PC interface card

2 System description

This section contains brief descriptions and definitions of the PHS1 system and of the terminology used in this guide and the general construction of the address map of the PC card.

2.1 Communications link

Table 1 - Communications link definitions	
Uplink	From the head to the card
Downlink	From the card to the head

2.2 System modules

The PHS1 head contains three discrete electronic modules. Each module uses a block of addresses on the PC card.

Table 2 - PHS1 electronic modules		
Module	**Description**	**Uplink address block**
Comms module	This module acts as a communications interface between the head axes and the PC card. It assembles information from the D and E axis modules, combines it with its own information and then transmits it back to the PC card (UPLINK).	82 – 9A
D axis module	Controls motion of the D axis (nearest the CMM quill).	A0 – BA
E axis module	Controls motion of the E axis.	C0 – DA

2.3 Position registers

Each axis in the PHS1 system (D axis and E axis) has a set of three position registers. Each register is designed to be used for a different purpose:

Table 3 - Position registers	
Servo register	This register is intended to be used for servo update information and should be read by the servo system. It can be frozen by either internal IRQ (real or simulated) or an external TTL latch signal.
Measurement register	This register is designed for measurement purposes. It can be frozen by either internal IRQ (real or simulated), external TTL latch signal or external probe trigger input line.
Spare register	The third position register is spare for future expansion. It can be frozen by either internal IRQ (real or simulated) or an external TTL latch signal.

2.4 Control bits

All control bits in registers must be reset before they are set again. Each reset/set operation is a single instruction to the system logic.

Table 4 - Bit definitions	
Set	1
Reset	0

2.5 Comms message timing

The uplink (head to card) sends a message every 35 µs (microseconds).

The downlink (card to head) message transmission time is 20 µs.

2.5.1 Command response latency

From writing a command to the card for the head a typical reply time to the command from the head to the card will be 200 µs, max 500 µs.

2.6 Watchdog timers

Each axis of the head has a watchdog timer to monitor receipt of servo control commands from the control program. The timer measures the interval between receipt of velocity demands and will shut down the head if commands are not received for a certain period of time, set to 2.048 ms (milliseconds) default and selectable between 1 µs and 16.384 ms (see section 7.3.1).

Each timer starts when the enable servo command is sent to its axis (see sections 6.2 and 7.3) and is reset when a servo velocity demand is received by that axis.

2.7 Axis direction deflection

2.7.1 D axis direction deflection

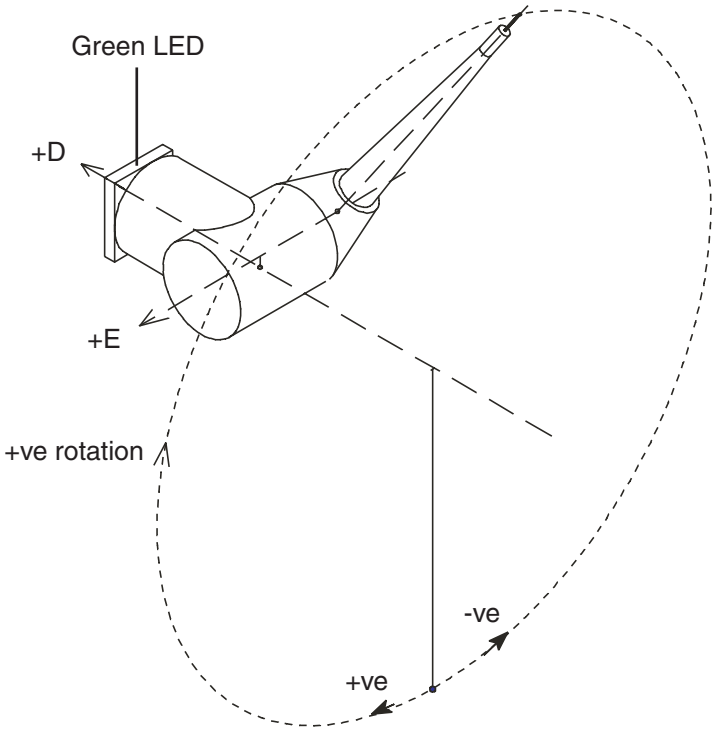

Figure 2 - PHS PC interface card

2.7.2 E axis direction deflection

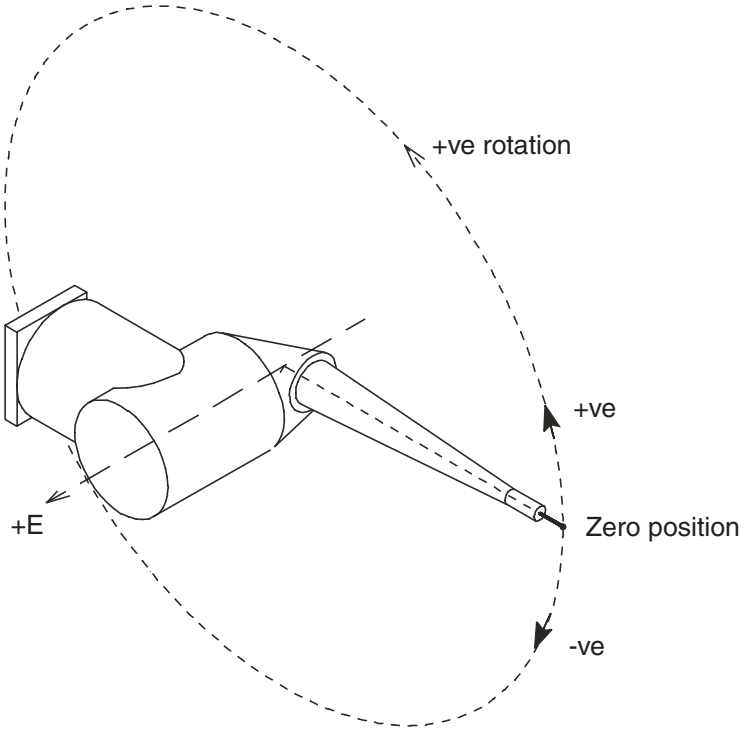

Figure 3 - E axis direction deflection

3 Card set-up

The card can be used in I/O mapped mode.

3.1 I/O map mode

- Permanent 16 bit transfer mode is enabled when the card is set in I/O map mode

In I/O map mode the card address is decoded to a 256 I/O block using switches SW1-1 to SW3-2.

Table 5 - Card address

Address	SW1-1	SW1-2	SW1-3	SW2-1
0XXX	LEFT	LEFT	LEFT	LEFT
1XXX	LEFT	LEFT	LEFT	RIGHT
2XXX	LEFT	LEFT	RIGHT	LEFT
3XXX	LEFT	LEFT	RIGHT	RIGHT
4XXX	LEFT	RIGHT	LEFT	LEFT
5XXX	LEFT	RIGHT	LEFT	RIGHT
6XXX	LEFT	RIGHT	RIGHT	LEFT
7XXX	LEFT	RIGHT	RIGHT	RIGHT
8XXX	RIGHT	LEFT	LEFT	LEFT
9XXX	RIGHT	LEFT	LEFT	RIGHT
AXXX	RIGHT	LEFT	RIGHT	LEFT
BXXX	RIGHT	LEFT	RIGHT	RIGHT
CXXX	RIGHT	RIGHT	LEFT	LEFT
DXXX	RIGHT	RIGHT	LEFT	RIGHT
EXXX	RIGHT	RIGHT	RIGHT	LEFT
FXXX	RIGHT	RIGHT	RIGHT	RIGHT

Table 6 - Card address				
Address	**SW2-2**	**SW2-3**	**SW3-1**	**SW3-2**
X0XX	LEFT	LEFT	LEFT	LEFT
X1XX	LEFT	LEFT	LEFT	RIGHT
X2XX	LEFT	LEFT	RIGHT	LEFT
X3XX	LEFT	LEFT	RIGHT	RIGHT
X4XX	LEFT	RIGHT	LEFT	LEFT
X5XX	LEFT	RIGHT	LEFT	RIGHT
X6XX	LEFT	RIGHT	RIGHT	LEFT
X7XX	LEFT	RIGHT	RIGHT	RIGHT
X8XX	RIGHT	LEFT	LEFT	LEFT
X9XX	RIGHT	LEFT	LEFT	RIGHT
XAXX	RIGHT	LEFT	RIGHT	LEFT
XBXX	RIGHT	LEFT	RIGHT	RIGHT
XCXX	RIGHT	RIGHT	LEFT	LEFT
XDXX	RIGHT	RIGHT	LEFT	RIGHT
XEXX	RIGHT	RIGHT	RIGHT	LEFT
XFXX	RIGHT	RIGHT	RIGHT	RIGHT

3.2 Switch summary

Table 7 - PHS1 PC card switch summary					
Switch		**Description**			**Reference**
SW1	**1**	Card address selection			3.1 (I/O map mode)
	2				
	3				
SW2	**1**				
	2				
	3				
SW3	**1**				
	2				
	3				
SW4	**1**	Sync edge select	**LEFT**	**RIGHT**	
			Rising edge	Falling edge	
	2	Controller select *	IBM-PC	DELTA-TAU	
	3				

See figure 1 for switch positions.

* Ensure switch is correct before powering the controller. Incorrect setting may cause damage to the controller and erratic behaviour.

4 Identifying the card

The card can be identified by reading the PC card recognition registers:

- 7A contains the ASCII code for “PH”
- 78 contains the ASCII code for “S1”

Identification mode (see section 5) can be used to read the serial number of the head and the identification versions of the axis modules.

5 System modes

The PHS1 system has four modes of operation.

5.1 System mode descriptions

Table 8 - System modes

Mode	Description	Registers		Update information
		Names	Address	
Normal	This is the normal mode of operation for the PHS1 system. All three position registers (servo, measurement and spare) in each axis are updated every 35 µs. The data is stored in the first two addresses in each register.	D axis servo register	A0, A2	Registers updated every 35 µs.
		D axis measurement register	A8, AA	
		D axis spare register	B0, B2	
		E axis servo register	C0, C2	
		E axis measurement register	C8, CA	
		E axis spare register	D0, D2	
Diagnostic	Reserved for Renishaw use only			
Identification	In identification mode the head returns its serial number and a module identification code for each axis module (D and E)	Head serial number	82, 84, 86	Registers updated once only when mode entered. It is then assumed that normal or diagnostic mode will be entered to continue normal transmission of information.
		D axis module identification	B8	
		E axis module identification	D8	
Auxiliary register	In this mode the auxiliary registers in each head module (comms, D axis and E axis) are read back and stored. This saves the control program from keeping an image of these registers.	D axis module auxiliary register	BA	Registers updated once only when mode entered. It is then assumed that normal or diagnostic mode will be entered to continue normal transmission of information.
		E axis module auxiliary register	DA	

5.2 System mode change request

System modes changes are requested by setting 2 command bits in address 40 (the comms module downlink address). See section 7.2.1 for details of the system mode change request command.

NOTE: Identification and auxiliary register modes can only be entered if the system is in either normal or diagnostic mode. It is not possible to enter auxiliary register mode directly from identification mode or vice versa.

Table 9 - Example of changing from identification mode to auxilliary register mode		
Current mode	**Command**	**Notes**
Identification		
	Request change to normal mode	Normal mode is an interim step in changing from identification mode to auxiliary register mode.
Normal		
	Request change to auxiliary register mode	Auxiliary register mode can only be entered from normal or diagnostic mode.
Auxiliary register		

5.3 System mode change verification

Once a mode change has been requested, bit 7 of address 60 changes to 1 to indicate that the system is awaiting a mode change. This bit can be monitored until it resets to 0 to confirm that the mode requested has been selected.

NOTE: The control program may not see the change of state of this bit as the transmission time for mode change requests to take effect is typically 200 µs, max 500 µs.

Table 10 - System mode change verification	
Bit 7 of address 60	**Description**
1	Awaiting mode change.
0	Last mode change requested has been selected.

5.4 Current system mode identification

Bits 5 and 6 of address 64 give the current mode the system is in.

Table 11 - Current mode identification		
Mode	**Bit 6 of address 64**	**Bit 5 of address 64**
Normal	0	0
Diagnostic	0	1
Identification	1	0
Auxiliary register	1	1

6 Starting the head

There are two levels of control of transmission of servo power to the head:

- Overall servo power (see section 6.1)
- Motor power for each individual axis (see section 6.2)

6.1 Head servo power control

Address 02 is the head control register (see appendix A1).

Bit 0 controls servo power transmission to the head.

NOTE: This power supply is for the head servo motors only, power for the head electronics is available at all times. Position and reference information will be retained at all times whatever the status of the 24 V servo power supply unless the head is completely disconnected.

Setting bit 0 to 1 connects 24 V servo power to the head provided:

- There is no STOP condition (bit 5)
- Air supply pressure is correct (bit 7)
- There are no comms link errors

Bit 3 will then be set by the card to indicate that the servo power relay on the card has been activated.

Bit 6 will then be set by the card to indicate that servo power has been supplied to the head (under normal operation this bit will mirror bit 3).

If STOP is raised then bit 6 will be set to 0 and 24 V servo power will be removed from the head, effectively shutting the head down. Bit 0 must then be set back to 0 and all STOP conditions must be removed before restart (and by implication bit 5 will return to 0) before bit 0 can be set back to 1 to power the head again.

6.2 Axis servo power control

After servo power has been transmitted to the head (see section 6.1) servo power to each axis must be enabled separately by loading a servo enable command to the local command register for that axis (see section 7.3). This allows each axis to be powered and controlled independently, for example during the procedure for setting axis zero positions. If an axis shuts down for any reason, the error must be reset in the head and the axis disabled before the axis will re-enable.

- Individual axis velocity demand is set to zero automatically on power up and when the servo motor is disabled
- When the bit is clear the motor terminals for that axis are shorted, effectively braking it

NOTE: The axis watchdog timer begins immediately servo power is enabled to the axis. Regular transmission of velocity demands to control position must therefore begin when servo power has been enabled to the axis.

7 Downlink (card to head) commands

7.1 Downlink command addresses

Five 16 bit locations are available for sending information to the PHS1 head itself (downlink).

Table 12 - Command addresses		
Module	**Address**	**Description**
COMMS module	40	Global command
D axis module	44	Local command to D axis only
	46	Velocity demand
E axis module	48	Local command to E axis only
	4A	Velocity demand

Information is automatically transmitted to the head by the PC card (downlink) on writing to an address.

Transmissions occur in the order in which the addresses were loaded.

Commands can be cleared by setting bit 5 in address 7C (reset register).

7.2 Global commands

Commands sent to address 40 are global and affect the whole system, i.e. axis modules as well as the comms modules.

Table 13 - Global commands			
Address 40	**Bit**	**Type**	**Description**
	0	rw	1 = LEDOff. Turns all probe (red) LEDs off. Green power LED will be unaffected.
	1-10	rw	Reserved for future use. Must be kept at 0.
	11	rw	1 = Reset all error flags. Clears on rising edge. If any error flags persist then those errors are still present.
	12, 13	rw	System mode change request. See section 7.2.1.
	14, 15	rw	Timebase operation control (please refer to ‘Up link time base control’ on page 23).

7.2.1 System mode change request

System mode changes are requested by setting 2 command bits in address 40. See section 5 for further information on system modes.

Table 14 - System mode change request			
Address 40	**Mode**	**Bit 13**	**Bit 12**
	Normal	0	0
	Diagnostic	0	1
	Identification	1	0
	Auxiliary register	1	1

NOTE: Identification and auxiliary register modes can only be entered if the system is in either normal or diagnostic mode. It is not possible to enter auxiliary register mode directly from identification mode and vice versa.

7.2.2 Data link error reset operations

Reset the ISA card

The register at address 7C HEX contains bits that, when set, can be used to reset the ISA card FPGA logic. It has no effect in the head logic.

Bit 0 is used to reset the up link decoder logic on the card. Whilst set, the card up link decoder is stopped.

But 5 is used to reset all down link requests that may be pending. All down link channels will be cleared of data and set to ‘not busy’. If this is done while a down link is transmitting, then the data word will be shortened and the next up link message will report it as a down link error.

Reset the PHS head

To reset the head logic a message needs to be sent via the down link to the head global register located at address 40 HEX in the card map.

Sending a global command with bit 11 set will clear all errors in the head including any up link error states that have been temporarily latched in the head. If the head has a permanent error this will override the ‘clear’ function. Errors that persist will require the head to be serviced.

Up link time base control

A command to the global head register at address 40 HEX can set the timing between up link messages. This value is held by the card decoder logic and is then sent and stored in the head. This maintains card and head synchronisation and avoids false timeouts. When bit 14 is set it defines bits 11 down to 0 as a time base value. Resolution of the time base value is 100 nsec (nanoseconds). The power-on default value provides a time base of 35 µs.

Note that when a time base change is commanded to the head, it can take two to three times the current time base value before the head will be guaranteed to have changed to the new time base value. For example, changinng from 35 µs to 400 µs can take up to 105 µs. Similarly, changing from 400 µs to 35 µs can take 1.2 msec.

Care is needed to ensure that a time base value that is shorter than the message length and decode time should never be sent. Generally, the only commands that need to be sent are:

415E HEX	25 µs	Normal time for a 2 axis system.
41F4 HEX	50 µs	Three axis system or two axis system with scanning probe.
4FA0 HEX	400 µs	Maximum value. Used when re-synchronising the up link. refer to up link error recovery work-around.

7.3 Local commands

Local commands are sent to each axis module individually and affect only that axis module.

Table 15 - Local commands
Addresses 44 (D axis) and 48 (E axis)

	Bit	Type	Description
Address 44 (D axis) Address 48 (E axis)	0	rw	1 = Inhibit axis error count. **IMPORTANT NOTE:** This function is for development purposes only. This bit must be set to 0 during normal use.
	1	rw	1 = Inhibit axis watchdog timer. **IMPORTANT NOTE:** This function is for development purposes only. This bit must be set to 0 during normal use.
	2-11	rw	Reserved for future use. Must be kept at 0.
	12	rw	1 = Enable reference mark zeroing (see section 9).
	13	rw	1 = Enable axis servo power (see section 6.2). Setting this bit connects power to the individual axis velocity servo. The axis velocity demand is set to zero automatically when the servo enable bit is raised. When clear, the motor is shunted, effectively braking it. **NOTE:** If the head is disabled by shutting down or through an error or through an overtorque then axis servo power must be disabled before it can be re-enabled using these bits. If an error occurs, including an overtorque this must be cleared before restart.
	14, 15	rw	Timebase operation control (please refer to ‘Up link time base control’ on page 23).

7.3.1 Watchdog timer timeout selection

The axis module command registers can also be used to select timeouts for the watchdog timers for each axis. When bit 14 is set to 1, these registers can be loaded with a timeout value for the individual axis watchdog timer (when bit 14 is reset to 0, local commands can again be loaded).

Table 16 - Watchdog timer timeout selection
Addresses 44 (D axis) and 48 (E axis)

	Bit	Type	Description
Address 44 (D axis) Address 48 (E axis)	0-13	rw	Axis watchdog timer timeout value, set in 1 µs steps. Default value is 2.048 ms. Maximum value is 16.384 ms.
	14	rw	Must be set to 1.
	15	rw	Must be set to 0.

7.4 Velocity demand

Velocity demand is sent as a 16 bit, two's complement integer.

Numbers in the range 1 to 7FFF (1 to 32767 decimal) result in positive rotation.

Table 17 - Velocity demand data

Item	Value
Tacho output	312 mV / rad / sec
Full speed	1.53 revs / sec
1 DAC bit	16.8 millidegrees / sec
	1.01 minutes / sec
	0.293 milliradians / sec
	303 grating counts / sec

NOTE: It is recommended that speed should be 120 degrees / sec but should not exceed 150 degrees / sec.

7.5 Downlink busy register

Address 62 is the downlink busy register and should be monitored to confirm downlink command transmission.

5 bits in address 62 represent the state of each downlink command address. When the bit for an address is set to 1 then that command address cannot be reloaded until the message it contains has been sent and that address is no longer busy.

8 Reading axis positions

8.1 Position register latches

Each axis has three position registers (servo, measurement and spare), each holding the same position information.

Each position register (servo, measurement and spare) can be latched in one of a number of ways:

8.1.1 IRQ

Addresses 04, 06 and 08 are the IRQ latch masks for the servo, measurement and spare registers respectively.

8.1.2 Simulated IRQ

When bit 7 of address 0A is set, address 0A can be used as a latch simulator. This address can be loaded to simulate IRQs.

When using this function, a true IRQ pulse must be simulated by raising the simulated signal for a minimum of 1 µs before lowering it. The position register latches on the rising edge of this pulse.

8.1.3 External TTL latch signal via connector PL4 on the PC card

Mounted at the top left of the PC card (when viewed from the component side) is a connector designated PL4 which carries signals that can be used to freeze the head position values in the PC card registers instead of using the IRQ signals. The probe trigger input on the rear panel connector remains active.

Connector pin details

The input signals are TTL compatible and are all fitted with a 10KΩ pullup resistor to the PC +5V DC supply. The resistors provide a termination which, when no connections are made to this connector, will result in a default disabled state. Recommended drive circuit is an open collector driver to 0 V capable of sinking 1 mA.

Pin 1 LATCH 1 signal (latches the servo register).

Pin 2 LATCH 2 signal (latches the measurement register).

Pin 3 LATCH 3 signal (latches the spare register).

Pin 4 EXTLATCH signal (set to 0 V to enable latch signals).

Pin 5 is the PC 0 V.

NOTE: Pin 1 is on the right when viewed from the component side.

External connector signals operation

Latching of the head positions using the external latch signals can be enabled by setting a logic 1 in bit 6 of address 0A or by connecting the EXTLATCH signal on pin 4 to the PC 0 V at pin 5 (this will also be indicated by bit 6).

When the external latch signals are enabled, a rising edge on any of the signals will freeze the corresponding registers.

Frozen data is released by pulsing the appropriate reset bit at address 7C as described in section 8.4.

8.1.4 Probe trigger input signal - measurement register only

When bit 1 of address 02 (head control register) is set, the latch source for the measurement register only is connected to the probe trigger from the trigger input connection. The D and E axis measurement registers are thus frozen when the probe is triggered, enabling the measurement registers to be used to synchronise PHS1 head position with CMM position at the instant a probing point is taken.

The probe trigger input is similar to the Renishaw PICS (product interconnection system) standard. It differs in that the PHS1 interface card registers a trigger on the rising edge of the signal, as opposed to the PICS system which registers a trigger on the falling edge.

A standard Renishaw probe interface with PICS output (PI 4-2 or PI200) and PICS cabling can be used if the trigger output is inverted to give a rising edge when the probe is triggered. Please refer to the integration documentation supplied with the specific interface for details of PICS signal inversion.

NOTE: The PC card does not generate IRQs, it only uses them.

8.2 Position data

Position data is read in as 32 bits in two's complement - only 24 bits are used. Bit 23 is copied to bits 24 - 31 to preserve the correct two's complement format.

ie 0 to 7FFFFF is 0 to 8388607, 800000 to FFFFFF is -8388608 to -1

One data count is approximately 0.2 arc seconds. There are 6,479,872 counts per revolution.

8.3 Position data registers

Table 18 - Position data registers			
Module	**Address**	**Position register**	**Description**
D axis	A0	Servo register	Lower 16 bits of D axis position count.
	A2		Upper 16 bits of D axis position count.
	A8	Measurement register	Lower 16 bits of D axis position count.
	AA		Upper 16 bits of D axis position count.
	B0	Spare register	Lower 16 bits of D axis position count.
	B2		Upper 16 bits of D axis position count.
E axis	C0	Servo register	Lower 16 bits of E axis position count.
	C2		Upper 16 bits of E axis position count.
	C8	Measurement register	Lower 16 bits of E axis position count.
	CA		Upper 16 bits of E axis position count.
	D0	Spare register	Lower 16 bits of E axis position count.
	D2		Upper 16 bits of E axis position count.

8.4 Freezing and reading axis positions

The following sequence should be used to freeze and read axis positions:

1. Ensure the position register latch masks have been set correctly.

2. Ensure address 7C = 00. 7C is the reset register and must be cleared before axis positions can be read.

3. Poll address 76 (position status register) until the appropriate bit indicates that a position register has been latched and frozen (see section 8.1 for details on how the registers may be frozen).

Table 19 - Position status register		
Address 76	**Bit**	**Description**
	2	1 when servo registers frozen.
	3	1 when measurement registers frozen.
	4	1 when spare registers frozen.
	5	1 while position registers are updating.

4. The appropriate data can now be read.

NOTE: If the position register was frozen by a simulated IRQ, ensure that the IRQ simulation bit has now been cleared.

5. The appropriate reset bit should be pulsed (for a minimum of 1 µs) to unfreeze the position register. The register unfreezes on the rising edge of this pulse.

Table 20 - Reset register		
Address 7C	**Bit**	**Description**
	2	Pulse to unfreeze servo registers.
	3	Pulse to unfreeze measurement registers.
	4	Pulse to unfreeze spare register.
	5	Pulse to reset downlink to head and clear all busy flags. **NOTE:** This clears all pending flags.

9 Setting axis zero positions

Each axis has a reference mark to enable its zero position to be set. This zero position is nominally at the mid-travel point of the axis (figures 2 and 3 show axis zero points).

If the PC card is powered down or if the head itself is unplugged, then counter position data will be lost and each axis must have its zero position reset before the head is next used.

To set the zero point of each axis (each axis must be set individually), the axis must be driven past its reference mark in a negative direction (see figures 2 and 3 for definitions of axis directions).

NOTE: It is recommended that while setting the axis zero positions under open loop velocity control, the position should be continually read and differentiated so that the actual axis speed can be checked for an unexpected stop (e.g. if the axis reaches the end stop).

9.1 Reference mark direction indicators

Bits 6 and 10 of head status register 2 (address 6A) indicate which side of the reference mark the axes are for D and E respectively.

Table 21 - Reference mark direction indicators (address 6A)

Address 6A	Bit	Type	Description
	6	ro	D axis reference mark direction. 1 = D axis position is more negative than reference mark position. D axis must be moved in the positive direction until this bit clears.
	10	ro	E axis reference mark direction. 1 = E axis position is more negative than reference mark position. E axis must be moved in the positive direction until this bit clears.

9.2 Setting axis zero positions

1. Read the reference mark direction indicator to see which side of the reference mark the axis is (see table 21 above).

   1a If the direction bit is 1 then the axis must be driven under open loop velocity control in the positive direction until the bit clears.

   1b If the direction bit is 0 then the axis is the correct side of the reference mark and the procedure can continue.

2. Set bit 13 of the axis's local command register to 1. The system will now set the axis position registers to zero when the reference mark is passed in the negative direction.

NOTE: This bit must be set back to 0 when the axis position has been set or the axis position registers will continue to be set to zero every time the reference mark is passed. This bit should not be set when operating the axis in a closed position control loop.

3. Drive the axis under open loop velocity control at a constant speed of 5 degrees per second in the negative direction until it passes the reference mark. Bits 5 and 9 of head status register 2 (address 6A) indicate that the zero position has been set for axes D and E respectively.

4. Stop axis motion.

5. Set bit 13 of the axis's local command register to 0. The axis will now ignore the reference mark each time it passes it.

10 Temperature measurement

The value indicating temperature can be found at address E0 on the PC card. The following algorithms can be used to determine the head core temperature from the 9 bit sign extended to sixteen bit word in E0.

$$\text{Temperature (°C)} = 235 - \left[\frac{200}{1 + (E0) / 1024}\right]$$

$$\text{Temperature (°F)} = 455 - \left[\frac{360}{1 + (E0) / 1024}\right]$$

Table 22 - Temperature measurement specification for PHS

Parameter range	Conditions	Value	Units
Resolution	At 75	0.16	°C
	At 35	0.2	°C
	At -31	0.35	°C
Quantisation error	At 70	0.20 max.	°C
	At -10	0.39 max.	°C
Offset	-31 to +75	4 max	°C
Linearity	At -31 to +75	0.5	°C

NOTE: The offset can be removed by allowing the PHS to stabilise unpowered at an ambient temperature, recording the ambient externally and then powering the PHS and measuring its internal temperature before it warms up. Offsets should be subtracted from the 235 or 455 values in the algorithm.

11 Probe arm signals

CAUTION: Certain probe arm signals do not automatically shut down servo power to the head. Control software intervention will therefore be required to make a decision on further operation of the head. These instances are outlined in this section.

Table 22 - Probe arm signals

Address	Bit	Description	Notes
60	**System status summary register** This register provides a simple summary of system status and is derived from the contents of the other status registers.		
	5	1 = Arm change state	Set whenever bits 0 or 1 in head status register 2 change (see below).
	6	1 = Axis enable error	Set whenever D or E axis axis enable error bits are set in head status register 2 (see below).
6A	**Head status register 2**		
	0	1 = Arm present	If arm present is ever set without arm locked also set, this indicates that the arm is not firmly attached to the head. The control software must decide whether further operation of the head is safe.
	1	1 = Arm locked	
	2	1 = Arm fail	Set to 1 if one of the arm safety sensors fails. A permanent arm failure is extremely unlikely, however this bit will be set during an arm change as a result of transient conditions which trigger the fault detection. It should therefore be ignored during (but only during) arm changes.
	7	1 = D axis unexpected axis disable	Unexpected axis disable represents a possible unsafe condition (eg a probe arm has collided with an obstacle or an axis fault). Normally overtorque but can be a read head or other fault. A decision must be made by the control software on further operation of the head. Overtorque will not shut down the head but will disable the relevant drive. **NOTE:** Head overtorque will not necessarily identify a probe arm collision condition. The axis clutches may slip before an overtorque error occurs. Therefore a timeout should be included in the control program to detect if the head fails to find position correctly, indicating that a collision has occurred.
	11	1 = E axis unexpected axis disable	

12 Monitoring system status

12.1 System status summary register

Address 60 contains a read only summary of system status to enable simple checking of the general condition of the head and the uplink (head to card) and downlink (card to head) transmission links. Its contents are derived from the other status registers, for example the axis error bit will be set if either the D axis or E axis axis error bits are set in head status register 2.

Control software should monitor this register during normal operation. If a bit is set in this address then the relevant address reference given in the table below should be checked for more details.

All 0s in this register mean that there are no head or comms link faults and that there are no messages queuing for the downlink.

Table 23 - System status summary register

Address 60	**Address ref**	**Bit**	**Description**	**Notes**	**Ref**
	62	0	1 = Downlink busy	Summarises the status of the downlink busy register (62).	7.5
		1	1 = Downlink failure	Indicates head has received a corrupt transmission. Mirrors bit 3 in head status register 2. This is not necessarily a fatal error. The control software should decide whether to attempt to repeat message transmission or not.	
	64	2	1 = Uplink failure	Summarises the status of the uplink status register (64). Head will shut down if the uplink fails.	
		3	1 = Head error	Fatal head error. Head will shut down.	
		4	1 = Internal head comms error	This is not necessarily a fatal error. The control software should decide whether to attempt to repeat message transmission or not.	
	6A	5	1 = Arm change of state	Summarises probe arm information from head status register 2 (6A).	10
	6A	6	1 = Axis enable error	Summarises D and E axis axis error bits in head status register (6A). Drive will be disabled..	
	64	7	1 = Awaiting system mode change 0 = Last system mode change requested has been selected	Indicates status of system mode change requests. Uplink status register carries an identification code of the current mode the system is in.	5
		8 - 15	Not used		

12.2 Additional status information

More detailed status information for diagnostic purposes is available in several other addresses. These addresses should not need to be read during normal operation of the head, however they should be able to be read to assist in fault diagnosis during development and operation of the system.

Table 24 - Additional status information

Address	Description	Notes
62	Downlink busy register	Details on which specific downlink (card to head) command addresses are busy.
64	Uplink status register	Detailed information on uplink (head to card) errors. Also contains system mode identification bits.
66	Uplink error count	Indicates how frequent uplink error messages are. An overflow on this error count will lead to a head shutdown and the transmission loss bit being set in the uplink status register.
68	Head status register 1	Comms and axis module errors.
6A	Head status register 2	Probe arm condition and axis status information.
76	Position status register	Probe trigger input signal status and position register update status.

12.3 Auxiliary registers

Each axis module has an auxiliary register which contains an image of the watchdog timer timeout setting for that axis. This saves the control program from having to keep an image of these settings itself.

The auxiliary registers can only be accessed in auxiliary register mode (see section 5). The PC card registers are updated once only when auxiliary register mode is entered with the head axis register data.

Table 25 - Auxiliary registers

Address	Bit	Type	Description
BA	0 - 13	ro	D axis watchdog timer timeout setting
	14	ro	Always 1
	15	ro	Always 0
DA	0 - 13	ro	E axis watchdog timer timeout setting
	14	ro	Always 1
	15	ro	Always 0

NOTE: Unless the watchdog timer is set by the control program itself (see section 7.3.1) the system will use the default value of 2.048 ms for both axes and the auxiliary registers will contain zero.

These auxiliary registers are expandable for use on future PHS systems.

13 Appendix 1 - PHS1 PC card address map

Bit types

- rw indicates that a bit is read / write
- ro indicates that a bit is read only

Not used

- Where a bit is labelled not used it is undefined and may be either 1 or 0

13.1 Head control register

Table 26 - Head control register

Address	Bit	Type	Description	Ref
02	0	rw	Set to 1 to start head (supply 24 V servo power). Set to 0 to stop head (remove servo power).	6.1
	1	rw	Measurement register latch source selection. Set to 1 for probe trigger input line (probe). Set to 0 for IRQ.	8.1.4
	2		Not used.	
	3	ro	1 = 24V head power relay on card powered.	6.1
	4	ro	1 = 24V power present at PC card.	
	5	ro	1 = STOP is set. Head will shut down.	
	6	ro	1 = 24V power supplied to head (mirrors bit 3 under normal operation).	6.1
	7	ro	1 = air pressure correct. 0 = low air pressure. Head will shut down.	
	8 - 15		Not used.	

13.2 Position register latches

Table 27 - Servo register latch mask				
Address	**Bit**	**Type**	**Description**	**Ref**
04	Set the appropriate bit to 1 to use that IRQ as the servo register latch.			8.1
	0	rw	IRQ5	
	1	rw	IRQ7	
	2	rw	IRQ10	
	3	rw	IRQ11	
	4	rw	IRQ12	
	5	rw	IRQ15	
	6 - 15		Not used	

Table 28 - Measurement register latch mask				
Address	**Bit**	**Type**	**Description**	**Ref**
06	Set the appropriate bit to 1 to use that IRQ as the measurement register latch. This register is only active if bit 1 of the head control register (02) has been set to 0.			8.1
	0	rw	IRQ5	
	1	rw	IRQ7	
	2	rw	IRQ10	
	3	rw	IRQ11	
	4	rw	IRQ12	
	5	rw	IRQ15	
	6 - 15		Not used	

Table 29 - Spare register latch mask				
Address	**Bit**	**Type**	**Description**	**Ref**
08	Set the appropriate bit to 1 to use that IRQ as the spare register latch.			8.1
	0	rw	IRQ5	
	1	rw	IRQ7	
	2	rw	IRQ10	
	3	rw	IRQ11	
	4	rw	IRQ12	
	5	rw	IRQ15	
	6 - 15		Not used	

Table 30 - Latch simulator				
Address	**Bit**	**Type**	**Description**	**Ref**
0A	0	rw	IRQ5. Set to 1 to simulate IRQ5. Pulse for minimum 1 µs. Latches on rising edge.	8.1.2
	1	rw	IRQ7	
	2	rw	IRQ10	
	3	rw	IRQ11	
	4	rw	IRQ12	
	5	rw	IRQ15	
	6	rw	Set to 1 to use external TTL level latch signals via PL4 connector on PC card.	
	7	rw	Set to 1 to use simulated latches from this address. Set to 0 to use true internal IRQ latches.	
	8 - 15		Not used	

13.3 Downlink command addresses

Table 31 - Downlink command addresses				
Address	**Bit**	**Type**	**Description**	**Ref**
Comms module downlink				
40		rw	Global command.	7.2
D axis module downlink				
44		rw	Local command to D axis only.	7.3
46		rw	Velocity data.	7.4
E axis module downlink				
48		rw	Local command to E axis only.	7.3
4A		rw	Velocity data.	7.4

13.4 System status registers

Table 32 - System status summary register				
Address	**Bit**	**Type**	**Description**	**Ref**
60	0	ro	1 = Downlink busy	11
	1	ro	1 = Downlink failure.	
	2	ro	1 = Uplink failure. Head shuts down.	
	3	ro	1 = Head error. Head shuts down.	
	4	ro	1 = Internal head comms error.	
	5	ro	1 = Arm change of state. This bit latches when set.	
	6	ro	1 = Axis enable error.	
	7	ro	1 = Awaiting system mode change. 0 = Last system mode change request has been selected.	
	8 - 15		Not used.	

Table 33 - Downlink busy register				
Address	**Bit**	**Type**	**Description**	**Ref**
62	0	ro	Comms module command downlink busy.	7.5
	1	ro	Not used.	
	2	ro	D axis module command downlink busy.	
	3	ro	D axis module velocity demand downlink busy.	
	4	ro	E axis module command downlink busy.	
	5	ro	E axis module velocity demand downlink busy.	
	6 - 15		Not used.	

Table 34 - Uplink status register				
Address	**Bit**	**Type**	**Description**	**Ref**
64	0	ro	1 = Uplink CRC error.	11
	1	ro	1 = Uplink sync error.	
	2	ro	1 = Uplink word count error.	
	3	ro	1 = Uplink timebase error.	
	4	ro	1 = Uplink transmission loss. Head shuts down.	
	5, 6	ro	System mode identification.	
	7 - 15		Not used.	

Table 35 - Uplink error count				
Address	**Bit**	**Type**	**Description**	**Ref**
66	0 - 4	ro	Uplink error count.	11
	5 - 15		Not used.	

Table 36 - Head status register 1				
Address	**Bit**	**Type**	**Description**	**Ref**
68	0	ro	1 = Comms module error. Head shuts down.	7.5
	1	ro	1 = D axis module error. Head shuts down.	
	2	ro	1 = E axis module error. Head shuts down.	
	3 - 7		Not used.	
	8	ro	1 = Comms module internal comms error – IGNORE, RENISHAW USE ONLY.	
	9	ro	1 = D axis module internal comms error – IGNORE, RENISHAW USE ONLY.	
	10	ro	1 = E axis module internal comms error – IGNORE, RENISHAW USE ONLY.	
	11 - 15		Not used.	

Table 37 - Head status register 2				
Address	**Bit**	**Type**	**Description**	**Ref**
6A	0	ro	1 = Arm present. Probe arm is engaged with drive mechanism.	11
	1	ro	1 = Arm locked. Probe arm is locked correctly and is safe to drive.	
	2	ro	1 = Arm fail. Probe arm location sensor failure	
	3	ro	1 = Downlink fail.	
	4	ro	1 = D axis drive enabled.	6.2
	5	ro	1 = D axis position zero. Position counter has been reset by reference mark.	9
	6	ro	1 = D axis reference mark direction indicator.	9.1
	7	ro	1 = D axis enable error. Motor current limit has been exceeded on or after startup. Drive will be disabled.	
	8	ro	1 = E axis drive enabled.	6.2
	9	ro	1 = E axis position zero. Position counter has been reset by reference mark.	9
	10	ro	1 = E axis reference mark direction indicator.	9.1
	11	ro	1 = E axis enable error. Motor current limit has been exceeded on or after startup. Drive will be disabled.	
	12 - 15		Not used.	

Table 38 - Position status register				
Address	**Bit**	**Type**	**Description**	**Ref**
76	0	ro	0 = Probe trigger input low.	
	1	ro	0 = Probe trigger LEDOFF input low.	
	2	ro	1 = Servo registers frozen.	8.4
	3	ro	1 = Measurement registers frozen.	
	4	ro	1 = Spare registers frozen.	
	5	ro	1 = Position registers are updating.	
	6 - 15		Not used.	

13.5 PC card recognition registers

Table 39 - PC card recognition registers				
Address	**Bit**	**Type**	**Description**	**Ref**
78	0 - 7	ro	ASCII “1”	4
	8 - 15	ro	ASCII “S”	
7A	0 - 7	ro	ASCII “H”	
	8 - 15	ro	ASCII “P”	

13.6 Reset register

Table 40 - Rester register				
Address	**Bit**	**Type**	**Description**	**Ref**
7C	0	rw	Set to 1 to reset comms uplink and busy bits. Setting this bit clears the comms link when an error has occurred. It should be clear during normal operation. Pulse for minimum 1 µs. Clears on rising edge.	
	1	rw	Set to 1 to reset arm change of state bit in system status register (bit 5, address 60). Pulse for minimum 1 µs. Clears on rising edge.	
	2	rw	Set to 1 to unfreeze servo registers. Pulse for minimum 1 µs. Clears on rising edge.	8.4
	3	rw	Set to 1 to unfreeze measurement registers. Pulse for minimum 1 µs. Clears on rising edge.	
	4	rw	Set to 1 to unfreeze spare registers. Pulse for minimum 1 µs. Clears on rising edge.	
	5	rw	Set to 1 to reset downlink and clear all busy flags (including pending flags). Set to 0 to allow downlink transmission.	
	6 - 15		Not used.	

NOTE: The reset register should be reset to 0 after use.

13.7 PC card transfer mode identification

Table 41 - PC card transfer mode identification				
Address	**Bit**	**Type**	**Description**	**Ref**
7E	0	ro	1 = 16 bit mode. This bit is always 1 when I/O map mode is selected.	2
	1 - 15		Not used.	

13.8 Comms module address block

Table 42 - Head serial number (identification mode only)				
Address	**Bit**	**Type**	**Description**	**Ref**
82		ro	Lowest 2 characters (ASCII).	5
84		ro	Middle 2 characters (ASCII).	
86		ro	Highest 2 characters (ASCII).	

13.9 D axis module address block

13.9.1 D axis module servo register

Table 43 - D axis module servo register (normal mode only)				
Address	**Bit**	**Type**	**Description**	**Ref**
A0		ro	Lower 16 bits of D axis position count.	8.2
A2		ro	Upper 16 bits of D axis position count.	

13.9.2 D axis module measurement register

Table 44 - D axis module measurement register (normal mode only)				
Address	**Bit**	**Type**	**Description**	**Ref**
A8		ro	Lower 16 bits of D axis position count.	8.2
AA		ro	Upper 16 bits of D axis position count.	

13.9.3 D axis module spare register

Table 45 - D axis module spare register (normal mode only)				
Address	**Bit**	**Type**	**Description**	**Ref**
B0		ro	Lower 16 bits of D axis position count.	8.2
B2		ro	Upper 16 bits of D axis position count.	

13.9.4 D axis module auxiliary register

Table 46 - D axis module auxiliary register				
Address	**Bit**	**Type**	**Description**	**Ref**
D axis electronics module identifier (identification mode only)				
B8	0 - 7		D axis electronics module identifier.	4, 5
	8 - 10		D axis electronics module qualifier.	
	11 - 15		Not used.	
D axis module auxiliary register (Auxiliary register mode only)				
BA	0 - 13		D axis watchdog timer timeout setting.	11
	14		Always 1.	
	15		Always 0.	

13.10 D axis module address block

13.10.1 E axis module servo register

Table 47 - E axis module servo register (normal mode only)				
Address	**Bit**	**Type**	**Description**	**Ref**
C0		ro	Lower 16 bits of E axis position count.	8.2
C2		ro	Upper 16 bits of E axis position count.	

13.10.2 E axis module measurement register

Table 48 - E axis module measurement register (normal mode only)				
Address	**Bit**	**Type**	**Description**	**Ref**
C8		ro	Lower 16 bits of D axis position count.	8.2
CA		ro	Upper 16 bits of D axis position count.	

13.10.3 E axis module spare register

Table 49 - E axis module spare register (normal mode only)				
Address	**Bit**	**Type**	**Description**	**Ref**
D0		ro	Lower 16 bits of D axis position count.	8.2
D2		ro	Upper 16 bits of D axis position count.	

13.10.4 E axis module auxiliary register

Table 50 - E axis module auxiliary register				
Address	**Bit**	**Type**	**Description**	**Ref**
E axis electronics module identifier (identification mode only)				
D8	0 - 7		E axis electronics module identifier.	4, 5
	8 - 10		E axis electronics module qualifier.	
	11 - 15		Not used.	
E axis module auxiliary register (Auxiliary register mode only)				
DA	0 - 13		E axis watchdog timer timeout setting.	11
	14		Always 1.	
	15		Always 0.	

Appendix 2 - International safety statements

CZ - UPOZORNĚNÍ

POZNÁMKA: Servo polohovací hlava PHS obsahuje předpjaté pružinové prvky, které mohou být nebezpečné, pokud bude učiněn pokus hlavu rozmontovat.

Mezi pohyblivými součástmi a mezi pohyblivými a statickými součástmi hrozí nebezpečí přiskřípnutí. Při přesunování nebo ručním nastavování sondy nedržte snímací hlavici.

Dejte pozor na nečekaný pohyb stroje. Uživatel by měl setrvávat mimo pracovní rozsah stroje, zejména mimo místa pohybu snímací hlavice, prodloužení a sondy.

Při jakékoli práci s obráběcími stroji nebo souřadnicovými měřicími stroji (CMM) je doporučeno používat ochranu očí.

Jisté instalace obsahují externí vzduchové potrubí. Je třeba věnovat pozornost bezpečnému uchycení potrubí k vzduchovým fitinkům.

Síťově napájené produkty Renishaw obvykle neobsahují žádné části opravitelné uživatelem. Vadné jednotky zašlete do centra autorizovaného servisu společnosti Renishaw.

Pokyny týkající se bezpečného čištění produktů společnosti Renishaw naleznete v části věnované informacím o údržbě v příslušné dokumentaci k produktu.

Před započetím jakékoliv údržby zařízení odpojte napájení.

Přečtěte si provozní pokyny dodavatele příslušného stroje.

POZNÁMKA: Systém PHS1 neobsahuje elektřinou napájené jednotky.

Povinností dodavatele stroje je informovat uživatele o nebezpečích spojených s provozem i o nebezpečích zmiňovaných v dokumentaci k produktům společnosti Renishaw a zajistit dostatečné ochranné a bezpečnostní systémy.

Za určitých okolností může signál sondy nesprávně označovat klidový stav sondy. Nevyužívejte signály sondy jako hlavní impuls pro zastavování stroje.

Předpokládaným způsobem nouzového zastavení produktů společnosti Renishaw je odpojení napájení.

DA - ADVARSLER

SIKKERHEDSBEMÆRKNING: PHS1-servopositioneringshovedet indeholder forbelastede fjederelementer, som kan være farlige, hvis man forsøget at skille hovedet ad.

Der er risiko for at blive klemt mellem bevægelige dele og mellem bevægelige og statiske dele. Hold ikke i probehovedet under bevægelse eller under manuelle probeskift.

Pas på uventede bevægelser. Brugeren bør holde sig uden for hele probehovedets/forlængerens/probens arbejdsområde.

I alle tilfælde, hvor der anvendes værktøjs- og koordinatmålemaskiner, anbefales det at bære øjenbeskyttelse.

Visse installationer omfatter udvendige rør. Man skal være omhyggelig med at sikre, at rørene fastgøres forsvarligt til alle luftfittings med modhager.

Der er ingen dele inde i Renishaw-enhederne, som sluttes til lysnettet, der kan efterses eller repareres af brugeren. Send alle defekte enheder til Renishaws kundeservicecenter.

Se afsnittet VEDLIGEHOLDELSE (MAINTENANCE) i produktdokumentationen for at få instruktioner til sikker rengøring af Renishaw-produkter.

Afbryd strømforsyningen, før der foretages vedligeholdelse.

Se maskinleverandørens brugervejledning.

BEMÆRKNING: PHS1-systemet indeholder ingen netstrømsdrevne enheder.

Det er maskinleverandørens ansvar at sikre, at brugeren er bekendt med eventuelle risici i forbindelse med driften, herunder de risici, som er nævnt i Renishaws produktdokumentation, og at sikre, at der er tilstrækkelig afskærmning af sikkerhedsblokeringer.

Under visse omstændigheder kan sondesignalet ved en fejl angive, at sonden står stille Stol ikke på, at sondesignaler stopper maskinens bevægelse.

Den forventede metode til nødstop af Renishaw-produkter er afbrydelse strømforsyningen

DE - VORSICHT

SICHERHEITSHINWEIS: Der Servopositionierkopf PHS1 enthält vorgespannte Federelemente, die gefährlich sein können, wenn versucht wird, den Kopf auseinanderzunehmen.

Zwischen beweglichen und zwischen beweglichen und statischen Teilen besteht Einklemmgefahr. Den Messtasterkopf nicht anfassen, wenn er sich bewegt oder wenn ein manueller Messtasterwechsel durchgeführt wird.

Auf unerwartete Bewegungen achten Der Anwender sollte sich möglichst nur außerhalb des Messtaster-Arbeitsbereiches aufhalten.

Bei Arbeiten an Werkzeugmaschinen oder Koordinatenmessgeräten wird Augenschutz empfohlen.

Bestimmte Installationen haben externe Luftleitungen. Es sollte Vorsicht walten gelassen werden, um sicherzustellen, daß die Leitungen sicher an allen Druckluftfittings mit Widerhaken befestigt sind.

Die betriebenen Renishaw-Einheiten enthalten keine Teile, die vom Anwender gewartet werden können. Senden Sie mangelhafte Geräte an Ihren Renishaw Kundendienst zurück.

Anleitungen über die sichere Reinigung von Renishaw-Produkten finden Sie im Kapitel WARTUNG in der Produktdokumentation.

Vor Wartungsarbeiten muss die Stromversorgung getrennt werden.

Beziehen Sie sich auf die Wartungsanleitungen des Lieferanten.

HINWEIS: Das PHS1-System hat keine netzbetriebenen Einheiten.

Es obliegt dem Maschinenlieferanten, den Anwender über alle Gefahren, die sich aus dem Betrieb der Ausrüstung, einschließlich der, die in der Renishaw Produktdokumentation erwähnt sind, zu unterrichten und zu versichern, dass ausreichende Sicherheitsvorrichtungen und Verriegelungen eingebaut sind.

Unter gewissen Umständen könnte das Messtaster Fehlsignale melden (Ausgelenkt). Verlassen sie sich nicht auf das Messtastersignal um die Maschine zu stoppen.

Renishaw-Produkte sollen im Notfall durch Trennen der Stromversorgung gestoppt werden.

EL - ΠΡΟΕΙΔΟΠΟΙΗΣΕΙΣ

ΣΗΜΕΙΩΣΗ ΑΣΦΑΛΕΙΑΣ: Η κεφαλή PHS1 με σύστημα υποβοήθησης περιέχει προ-τανυσμένα ελατήρια που είναι δυνατό να αποβούν επικίνδυνα αν επιχειρηθεί η αποσυναρμολόγηση της κεφαλής.

Υπάρχει κίνδυνος πιασίματος μεταξύ των κινούμενων μερών όπως και μεταξύ των κινούμενων και στατικών μερών Δεν πρέπει να κρατάτε την κεφαλή του ανιχνευτή κατά την κίνηση ούτε κατά τη διάρκεια χειροκίνητων αλλαγών του ανιχνευτή

Προσοχή - κίνδυνος απροσδόκητων κινήσεων. Ο χρήστης πρέπει να παραμένει εκτός του χώρου που επηρεάζεται από όλους τους συνδυασμούς λειτουργίας της κεφαλής του αισθητήρα, της προέκτασης και του αισθητήρα.

Σε όλες τις εφαρμογές που συνεπάγονται τη χρήση εργαλειομηχανών και μηχανών προσδιορισμού συντεταγμένων, συνιστάται να χρησιμοποιείται προστασία ματιών.

Σε ορισμένες εγκαταστάσεις, υπάρχουν εξωτερικοί σωλήνες αέρα. Πρέπει να δοθεί η απαραίτητη προσοχή για να διασφαλιστεί ότι οι σωλήνες είναι γερά στερεωμένοι σε όλα τα ακιδωτά εξαρτήματα σύνδεσης αέρα.

Στο εσωτερικό μονάδων της Renishaw που συνδέονται με το κεντρικό ηλεκτρικό ρεύμα δεν υπάρχουν εξαρτήματα που μπορούν να επισκευαστούν από το χρήστη. Επιστρέψτε τις ελαττωματικές μονάδες σε εξουσιοδοτημένο κέντρο εξυπηρέτησης πελατών της Renishaw.

Για οδηγίες σχετικά με τον ασφαλή καθαρισμό των προϊόντων Renishaw, ανατρέξτε στην ενότητα ΣΥΝΤΗΡΗΣΗ του έντυπου συνοδευτικού υλικού του αντίστοιχου προϊόντος.

Αποσυνδέστε το μηχάνημα από το ηλεκτρικό ρεύμα προτού επιχειρήσετε τυχόν εργασίες συντήρησης.

Ανατρέξτε στις οδηγίες λειτουργίας του προμηθευτή του μηχανήματος.

ΣΗΜΕΙΩΣΗ: Στο σύστημα PHS1 δεν περιλαμβάνονται μονάδες που τροφοδοτούνται με ρεύμα δικτύου.

Αποτελεί ευθύνη του προμηθευτή του μηχανήματος να εξασφαλίσει ότι ο χρήστης είναι ενήμερος τυχόν κινδύνων που συνεπάγεται η λειτουργία, συμπεριλαμβανομένων όσων αναφέρονται στο έντυπο συνοδευτικό υλικό των προϊόντων της Renishaw. Είναι επίσης ευθύνη του να εξασφαλίσει ότι υπάρχουν τα απαιτούμενα προστατευτικά καλύμματα και μανδαλώσεις ασφάλειας.

Σε ορισμένες περιπτώσεις το σήμα ανιχνευτή μπορεί να δείξει λανθασμένα ότι ο ανιχνευτής έχει τοποθετηθεί. Μη βασίζεστε στα σήματα ανιχνευτή για θέση της κίνησης του μηχανήματος εκτός λειτουργίας.

Η αναμενόμενη μέθοδος διακοπής έκτακτης ανάγκης για τα προϊόντα Renishaw είναι η αποσύνδεσή τους από το ηλεκτρικό ρεύμα.

ES - ADVERTANCIAS

OBSERVACIÓN DE SEGURIDAD: El cabezal de servo colocación PHS1 contiene elementos de resorte pre-cargados que pueden ser peligrosos si se hace algún intento de desmontar el cabezal.

Existe el peligro de atraparse los dedos entre las distintas partes móviles y entre partes móviles e inmoviles. No sujetar la cabeza de la sonda mientras se mueve, ni durante los cambios manuales de la sonda.

Tener cuidado con los movimientos inesperados. El usuario debe quedarse fuera del grupo operativo completo compuesto por la cabeza de sonda/extensión/sonda o cualquier combinación de las mismas.

Se recomienda usar protección para los ojos en todas las aplicaciones que implican el uso de máquinas herramientas y máquinas de medición de coordenadas.

Existen tuberías exteriores de aire en ciertas instalaciones. Debe tenerse cuidado en asegurarse de que las tuberías están sujetas de forma segura a todas las piezas de aire con salientes.

Dentro de las unidades Renishaw que se enchufan a la red, no existen piezas que puedan ser mantenidas por el usuario. Las unidades defectuosas deben ser devueltas a un Centro de Servicio al Cliente Renishaw.

Para instrucciones sobre seguridad a la hora de limpiar los productos Renishaw, remitirse a la sección titulada MANTENIMIENTO (MAINTENANCE) en la documentación sobre el producto.

Quitar la corriente antes de emprender cualquier operación de mantenimiento.

Remitirse a las instrucciones de manejo del proveedor de la máquina.

OBSERVACIÓN: No hay unidades con alimentación de la red en el sistema PHS1.

Es responsabilidad del proveedor de la máquina asegurar que el usuario sea informado sobre los peligros relacionados con el funcionamiento, incluidos los peligros mencionados en la documentación de los productos Renishaw, y asegurar que se suministran los dispositivos de protección y seguridad adecuados.

Bajo determinadas circunstancias la señal de la sonda puede indicar erróneamente que la sonda está asentada. No fiarse de las señales de la sonda para parar el movimiento de la máquina.

El método previsto para efectuar una parada de emergencia de los productos Renishaw es el de quitar la corriente.

ET - HOIATUSED

MÄRKUS: PHS-servopaigutuspea sisaldab eelpingestatud vedrusid, mis võivad pea lahtivõtmisel olla ohtlikud

Masina liikuvad osad võivad põhjustada muljumisohtu. Ärge hoidke masina liikumise ajal või sondi vahetamise ajal kinni sondipeast.

Arvestage masina ootamatu liikumisega. Kasutaja peab jääma väljapoole sondipea ja sondipikendi tööulatust.

Masina ja materjalidega töötamisel on alati soovitav kanda silmade kaitset.

Teatavatel paigaldistel on välised õhutorud. Hoolitsege selle eest, et torud oleksid õhusüsteemi seadiste küljes kindlalt kinni.

Vooluvõrgus töötavates Renishaw masinates ei ole reeglina selliseid detaile, mida kasutaja peaks ise hooldama. Tagastage vigased seadmed volitatud Renishaw klienditeeninduskeskusse.

Täpsemad juhised Renishaw toodete ohutuks puhastamiseks leiate vastava toote dokumentide hooldusjuhiste alaosast.

Enne hooldustoimingute teostamist ühendage seade alati vooluvõrgust lahti.

Täpsemad juhised leiate masina tarnija poolt antud kasutusjuhendist.

MÄRKUS: PHS1-süsteemis puuduvad võrgutoitega üksused.

Masina tarnija vastutuseks on tagada, et kasutajat teavitatakse masina tööga kaasnevatest ohtudest, kaasa arvatud need ohud, mida on mainitud Renishaw toote dokumentides, ning samuti tagada, et masinaga oleks kaasas korrektsed kaitsepiirded ja turvalukud.

Teatud tingimustel võib sondi signaal ekslikult näidata, nagu oleks sond paigale asetunud. Ärge lähtuge masina liikumise peatamisel sondi signaalidest.

Esmaseks masina hädaseiskamise meetodiks Renishaw toodete puhul on elektritoite katkestamine.

FI - VAROITUKSET

TURVALLISUUSTTA KOSKEVA HUOMAUTUS: PHS1-servo-asetuspää sisältää ennalta kuormitettuja jousielementtejä, jotka voivat osoittautua vaarallisiksi, jos päätä yritetään purkaa.

Liikkuvien osien sekä liikkuvien ja staattisten osien välillä on olemassa puristusvaara. Älä pidä kiinni mittapäästä koneen liikkeiden aikana tai manuaalisen mitta-anturinvaihdon aikana.

Varo odottamatonta liikettä. Käyttäjän tulee pysytellä mittapää/jatke/anturi yhdistelmän toiminta-alueen ulkopuolella.

Kaikkia työstökoneita ja koordinaattimittakoneita (CMM) käytettäessä suositamme silmäsuojuksia.

Tietyillä asennuksilla on ulkopuolisia ilmaputkia. On noudatettava varovaisuutta sen varmistamiseksi, että putket on kiinitetty kunnolla kaikkiin väkäilmavarustuksiin.

Sähköverkkoon kytkettävät Renishaw-tuotteet eivät sisällä käyttäjän huollettavia osia. Vialliset osat tulee palauttaa valtuutetulle Renishaw-asiakaspalvelukeskukselle.

Renishaw-tuotteiden turvalliset puhdistusohjeet löytyvät tuoteselosteen HUOLTOA (MAINTENANCE) koskevasta osasta.

Kytke syöttöjännite pois ennen huoltotoimenpiteitä.

Katso koneen toimittajan käyttöohjeita.

HUOMAUTUS: PHS1-järjestelmässä ei ole virtaverkkokytkenteisiä yksikköjä.

Koneen toimittajan vastuulla on että käyttäjä on saanut tiedon mahdollisista käyttöön liittyvistä vaaroista, mukaan lukien Renishaw'n tuoteselosteessa mainitut vaarat. Konetoimittajan tulee myös varmistaa, että suojukset ja turvalukitukset ovat riittävät.

Tietyissä olosuhteissa anturilta tuleva signaali saattaa virheellisesti osoittaa että mitta-anturi on lepotilassa (=ei-kosketuksessa). Älä pysäytä koneen liikettä mittapään signaalien perusteella.

Renishaw-tuotteiden hätäpysäytys tehdään tavallisesti kytkemällä virta pois päältä.

FR - AVERTISSEMENTS

NOTE DE SECURITE: La tête de servopositionnement PHS1 contient des éléments à ressort accumulateur qui peuvent être dangereux si l'on essaie de la démonter.

L'effet de pincement dû au mouvement des pièces mobiles entre elles ou avec des pièces fixes présente des dangers. Ne pas tenir la tête lorsqu'elle se déplace ou que le palpeur est changé à la main.

Attention aux mouvements brusques. L'utilisateur doit toujours rester en dehors de la zone de sécurité des installations multiples tête/rallonge/palpeur.

Le port de lunettes de protection est recommandé pour toute application sur machine-outil et MMT.

Des tuyaux d'air externes sont présents sur certaines installations. Veiller à ce que les tuyaux soient bien fixés à tous les raccords cannelés.

Aucune pièce des produits Renishaw alimentées sur secteur ne peut être réparée par l'utilisateur. Renvoyer toute matériel défectueux à un Centre Après Vente Renishaw agréé.

Les conseils de nettoyage en toute sécurité des produits Renishaw figurent dans la section MAINTENANCE de votre documentation.

Mettre la machine hors tension avant d'entreprendre toute opération de maintenance.

Consulter le mode d'emploi du fournisseur de la machine.

NOTE: Le système PHS1 ne possède aucun dispositif alimenté par le secteur.

Il incombe au fournisseur de la machine d'assurer que l'utilisateur prenne connaissance des dangers d'exploitation, y compris ceux décrits dans la documentation du produit Renishaw, et d'assurer que des protections et verrouillages de sûreté adéquats soient prévus.

Dans certains cas, il est possible que le signal issu du capteur indique à tort que celui-ci est hors matière. Ne pas se fier aux signaux du capteur qui ne garantissent pas toujours l'arrêt de la machine.

La procédure habituelle d'arrêt d'urgence des produits Renishaw est la mise hors tension.

HU - FIGYELMEZTETÉSEK

MEGJEGYZÉS: A PHS szervóhelyzet-állító fej előterhelt rugóelemeket tartalmaz, amelyek veszélyt jelenthetnek, ha megkísérlik szétszerelni a fejet.

Fennáll a veszélye, hogy a keze beszorulhat mozgó alkatrészek valamint mozgó és álló alkatrészek közé. Mozgás közben, vagy a mérőtapintó kézi cserélésekor ne fogja meg a tapintófejet.

Vigyázat! A gép váratlanul elindulhat! Tartózkodjon a tapintófej/hosszabbító/mérőtapintó együttes mozgáskörzetén kívül!

Szerszámgépek és KMG-ek használata során ajánlatos szemvédőt viselni.

Egyes berendezések külsején levegőcsövek vannak. Gondoskodni kell róla, hogy a csövek biztonságosan rá legyenek erősítve a levegőszerelvényekre.

A Renishaw hálózati egységeiben általában nincsenek a felhasználó által javítható alkatrészek. A meghibásodott egységeket juttassa el valamelyik hivatalos Renishaw Vevőszolgálati Központhoz.

A Renishaw termékek bizonságos tisztításával kapcsolatos útmutatások az illető termék dokumentációjában szereplő karbantartási tudnivalóknál olvashatók.

Mielőtt bármilyen karbantartási művelet végezne, kapcsolja ki a berendezést.

Olvassa el a gép szállítója által adott használati utasítás ide vonatkozó részét.

MEGJEGYZÉS: A PHS1 rendszerben nicsenek hálózatról működő egységek.

A gép szállítója felelős azért, hogy felhívja a felhasználó figyelmét az üzemeltetéssel kapcsolatos veszélyforrásokra, ideértve az illető Renishaw termék dokumentációjában ismertetetteket is, és hogy gondoskodjon a megfelelő védőburkolatok és biztonsági reteszelések meglétéről.

Bizonyos körülmények között a mérőtapintó azt jelezheti, hogy a mérőtapintó felfeküdt a mérendő objektumon, noha ez nincs így. Ezért a gép mozgásának leállításakor nem szabad a mérőtapintó jeleire hagyatkozni.

A Renishaw termékek vészleállításának elvárt módszere a berendezés kikapcsolása.

IT - AVVERTENZE

AVVERTENZE DI SICUREZZA: Nella testina a posizionamento servo-assistito del sistema PHS1 sono montati componenti precaricati a molla che in caso di un tentativo di smontaggio non autorizzato della testina potrebbero scattare ed essere molto pericolosi.

Esiste pericolo di danno da schiacciamento tra le parti in moto o tra le parti in moto e quelle ferme. Non afferrare alcun componente del sistema quando è in moto o durante il cambio sonda manuale.

Fare attenzione ai movimenti improvvisi e tenersi fuori dal campo operativo delle combinazioni testa/prolunga e barra/sonda. Si raccomanda all'utente di tenersi al di fuori dal campo di lavoro della testa, includendo le varie possibili combinazioni di sonde e prolunghe.

Si raccomanda di indossare occhiali di protezione in qualsiasi applicazione che comporti l'uso di macchine utensili e macchine di misura a coordinate.

Alcuni modelli richiedono l'alimentazione d'aria compressa e sono dotati di flessibili montati esternamente. É essenziale controllare che il collegamento ai raccordi sia effettuato correttamente.

Gli apparecchi Renishaw alimentati da rete elettrica non contengono componenti su cui si possano eseguire interventi di manutenzione da parte dell'utente. In caso di guasto, rendere l'apparecchio a uno dei Centri di Assistenza Renishaw

Per le istruzioni relative alla pulizia dei prodotti Renishaw, fare riferimento alla sezione MANUTENZIONE (MAINTENANCE) della documentazione dello specifico prodotto. (questa sezione deve essere stampata solo nella prima sezione del manuale/guida dell'utente).

Prima di effettuare qualsiasi intervento di manutenzione, isolare dall'alimentazione di rete.

Consultare le istruzioni d'uso fornite dal fabbricante della macchina.

NOTA: Il sistema PHS1 non contiene componenti azionati dall'alimentazione di rete.

Il fornitore della macchina ha la responsabilità di avvertire l'utente dei pericoli inerenti al funzionamento della stessa, compresi quelli riportati nelle istruzioni della Renishaw, e di mettere a disposizione i ripari di sicurezza e gli interruttori di esclusione.

È possibile, in certe situazioni, che la sonda emetta erroneamente un segnale di sonda a riposo. Non fare affidamento sugli impulsi trasmessi dalla sonda per arrestare la macchina.

Il metodo corretto di eseguire un'arresto di emergenza per i prodotti Renishaw è l'interruzione dell'alimentazione elettrica.

LT - ĮSPĖJIMAI

PASTABA: PHS pagalbinėje nustatymo galvutėje yra įtempti spyruokliniai elementai, kurie gali būti pavojingi, jei bandysite išmontuoti galvutę.

Tarp judančių detalių bei tarp judančių ir statiškų detalių pakliuvę daiktai gali būti suspausti. Nelaikykite zondo galvutės veikiant įrenginiui ar keisdami zondą rankiniu būdu.

Saugokitės netikėtų judesių. Naudotojui nerekomenduojama atidaryti veikiančios zondo galvutės / ilgintuvo / zondų junginio gaubto.

Dirbant visus darbus, naudojant įrenginio įrankius ar valant ir prižiūrint įrenginį, rekomenduojama užsidėti apsauginius akinius.

Atskiruose modeliuose yra išoriniai oro vamzdžiai. Pasirūpinkite, kad vamzdžiai būtų tinkamai pritvirtinti prie oro jungčių.

Paprastai Renishaw prietaisuose, maitinamuose iš elektros tinklo, nėra detalių, kurias galėtų remontuoti pats naudotojas. Grąžinkite sugedusius prietaisus Renishaw klientų aptarnavimo centrui.

Nurodymų dėl saugaus Renishaw prietaisų valymo ieškokite atitinkamo prietaiso techninėje dokumentacijoje apie priežiūrą.

Prieš atlikdami techninę priežiūrą, išjunkite elektros srovės tiekimą.

Laikykitės įrenginio tiekėjo naudojimo nurodymų.

PASTABA: PHS1 sistemoje nėra mazgų, maitinamų iš maitinimo tinklo.

Įrenginio tiekėjas atsako už tai, kad naudotojas būtų įspėtas apie pavojus, susijusius su įrenginio naudojimu, taip pat pavojus, minimus Renishaw prietaiso techninėje dokumentacijoje, ir kad būtų sumontuoti atitinkami apsauginiai įrenginiai bei blokatoriai.

Susiklosčius tam tikroms aplinkybėms, zondo signalas gali neteisingai informuoti, kad jo reikšmės nustatytos į pradinę būseną. Nepasikliaukite zondo signalais ir iš karto nestabdykite įrenginio.

Tinkamiausias būdas sustabdyti Renishaw prietaisą yra nutraukti elektros srovės tiekimą.

LV - BRĪDINĀJUMI

PIEZĪME: PHS servo pozicionēšanas galviņa ietver iepriekš nospriegotas atsperes elementus, kas varētu būt bīstami, ja mēģina izjaukt galviņu

Starp kustīgajām daļām, kā arī kustīgajām un nekustīgajām daļām iespējams saspiešanas risks. Nepieskarieties ar rokām tausta uzgalim kustības laikā vai mainot taustu.

Uzmanieties no negaidītas kustības.Lietotājam jāpaliek ārpus tausta/uzgaļa/kontaktmērgalviņas pilna darbības rādiusa.

Pie visiem darbiem, kuros tiek izmantotas darba iekārtas vai koordinātu mērīšanas ierīces, ieteicams aizsargāt acis.

Dažās iekārtās ir uzstādītas ārējas gaisa caurules. Jāpārliecinās, ka caurules ir droši piestiprinātas pie gaisa stiprinājumiem.

Parasti Renishaw strāvai pievienotajās ierīcēs nav daļu, kuras apkalpo lietotājs.Nosūtiet bojātās ierīces atpakaļ uz pilnvarotu Renishaw klientu apkalpošanas centru.

Instrukcijas drošai Renishaw izstrādājumu tīrīšanai ir iekļautas apkalpošanas informācijā atbilstošā izstrādājuma dokumentācijā.

Atvienojiet no strāvas pirms jebkuru apkalpošanas darbu veikšanas.

Skatiet iekārtas piegādātāja ekspluatācijas instrukcijas.

PIEZĪME: PHS1 sistēmā nav elektroierīču.

Iekārtas piegādātājs atbild par to, lai lietotājs būtu iepazīstināts ar jebkuriem draudiem, kas saistīti ar tās darbību (ieskaitot tos, kas minēti Renishaw izstrādājuma dokumentācijā), un lai būtu nodrošinātas atbilstošas aizsargierīces un aizsargbloķētāji.

Noteiktos apstākļos tausta signāls var nepareizi norādīt tausta stāvokli.Nepaļaujieties uz tausta signālu, lai apturētu iekārtas kustību.

Tiek pieņemts, ka Renishaw izstrādājumu avārijas apturēšanai lietotājs to atvienos no strāvas.

MT - TWISSIJIET

NOTA: Ir-ras tal-pożizzjonament tas-servo tal-PHS għandha elementi ta' molol mgħobbija minn qabel li jistgħu jkunu perikoluż jekk xi ħadd jipprova jżarma r-ras.

Hemm il-periklu li wieħed jinqaras bejn biċċiet li jiċċaqilqu u bejn biċċiet li jiċċaqilqu u biċċiet statiċi. Iżżommx ir-ras tas-sonda waqt movimenti, jew meta tkun qiegħed/qegħda tbiddel sonda.

Oqgħod attent(a) għal moviment mhux mistenni. L-utent għandu jibqa' barra l-envelopp ta' tħaddim sħiħ tal-kombinazzjonijiet tar-ras tas-sonda/estensjoni/sonda.

Fl-applikazzjonijiet kollha li jinvolvu l-użu ta' għodda tal-makni jew CMMs, il-protezzjoni ta' l-għajnejn hija rrakkommandata.

F'ċerti installazzjonijiet hemm pajpijiet ta' l-arja li jgħaddu minn barra. Għandha tingħata attenzjoni sabiex jiġi żgurat li l-pajpijiet huma mqabbdin sew ma' l-apparat ta' l-arja.

Normalment ma hemm ebda biċċiet li jistgħu jiġu mogħtija servis mill-utent ġewwa l-unitajiet mħaddma bl-elettriku ta' Renishaw. Irritorna unitajiet difettużi lil Ċentru Li Jaqdi l-Ħtiġijiet tal-Klijenti ta' Renishaw awtorizzat.

Għal struzzjonijiet dwar it-tindif bla periklu tal-prodotti ta' Renishaw, irreferi għall-informazzjoni tal-manutenzjoni fid-dokumentazzjoni tal-prodott relevanti.

Itfi d-dawl qabel tibda tagħmel xi xogħol ta' manutenzjoni.

Irreferi għall-istruzzjonijiet ta' tħaddim tal-fornitur tal-makna.

NOTA: M'hemmx tagħmir imħaddem bil-provvista ta' l-elettriku fis-sistema PHS1.

Hija r-responsabbiltà tal-fornitur tal-makna li jiżgura li l-utent ikun magħmul konxju ta' kwalunkwe perikli involuti fit-tħaddim, inklużi dawk imsemmija fid-dokumentazzjoni tal-prodott ta' Renishaw, u li jiżgura li hemm provdut l-ilqugħ u l-interlocks ta' sigurtà adegwati.

Taħt ċerti ċirkostanzi s-sinjal tas-sonda jista' b'mod falz jindika kundizzjoni ta' sonda mhux attiva. Tiddependix fuq sinjali tas-sonda sabiex twaqqaf il-moviment tal-makna.

Il-metodu mistenni ta' li jiġi provdut waqfien ta' emerġenza għal prodotti ta' Renishaw huwa li jintefa' d-dawl.

NL - WAARSCHUWING

VEILIGHEIDSMELDING: De PHS1 servo-positioneerkop bevat veerbelaste onderdelen die gevaarlijk kunnen zijn als men probeert de kop te demonteren.

Er is risico op inklemming tussen de bewegende onderdelen onderling en tussen bewegende en niet bewegende onderdelen. De tasterkop tijdens beweging of tijdens manuele sondeveranderingen niet vasthouden.

Oppassen voor onverwachte beweging. De gebruiker dient buiten het werkende signaalveld van de Tasterkop/Extensie/Taster combinaties te blijven.

Het dragen van oogbescherming wordt tijdens gebruik van Bewerkingsmachines en CMM's aanbevolen.

Bepaalde installaties zijn voorzien van externe luchtleidingen. Men moet ervoor zorgen dat de luchtleidingen stevig zijn aangesloten.

De onderdelen van Renishaw units die op het net worden aangesloten kunnen niet door de gebruiker onderhouden of gerepareerd worden. U kunt defecte units naar een erkend Renishaw Klantenservice Centrum brengen of toezenden.

Voor het veilig reinigen van Renishaw produkten wordt verwezen naar het hoofdstuk ONDERHOUD (MAINTENANCE) in de produktendocumentatie.

Voordat u enig onderhoud verricht dient u de stroom uit te schakelen.

Raadpleeg de bedieningsinstructies van de machineleverancier.

N.B.: Het PHS1 systeem bevat geen onderdelen die via het lichtnet zijn gevoed.

De leverancier van de machine is ervoor verantwoordelijk dat de gebruiker op de hoogte wordt gesteld van de risico's die verbonden zijn aan bediening, waaronder de risico's die vermeld worden in de produktendocumentatie van Renishaw. De leverancier dient er tevens voor te zorgen dat de machine is voorzien van voldoende beveiligingen en veiligheidsgrendelinrichtingen.

Onder bepaalde omstandigheden kan het tastersignaal een onjuiste tastertoestand aangeven. Vertrouw niet op de tastersignalen voor het stoppen van de machinebeweging.

In geval van nood wordt er verwacht dat het Renishaw product wordt stopgezet door de stroom uit te schakelen.

PL - OSTRZEŻENIA

UWAGA: Głowica PHS z napędem zawiera wstępnie obciążone elementy sprężyste, które mogą stanowić zagrożenie w przypadku jakiejkolwiek próby rozłożenia głowicy na części.

Występuje niebezpieczeństwo zakleszczenia pomiędzy częściami ruchomymi oraz częściami ruchomymi i nieruchomymi. Nie wolno trzymać głowicy sondy podczas wykonywania przemieszczeń ani podczas ręcznej zmiany sondy.

Należy wystrzegać się nieskoordynowanych ruchów. Użytkownik powinien pozostawać poza pełnym zasięgiem roboczym zespołu głowica sondy/łącznik przedłużający/sonda.

Podczas obsługi obrabiarek lub maszyn współrzędnościowych zaleca się używanie osłon na oczy.

W pewnych instalacjach występują zewnętrzne przewody rurowe powietrza. Należy zadbać, aby te przewody rurowe były pewnie zamocowane do króćców powietrza.

Zazwyczaj wewnątrz zespołów Renishaw zasilanych z sieci elektrycznej nie ma części podlegających obsłudze wykonywanej przez użytkownika. Niesprawne zespoły należy przekazywać do autoryzowanego centrum serwisowego firmy Renishaw.

Aby uzyskać instrukcje dotyczące bezpiecznego wykonywania czyszczenia produktów Renishaw, należy zapoznać się z informacjami dotyczącemi konserwacji w dokumentacji odpowiedniego produktu.

Przed przystąpieniem do jakichkolwiek czynności konserwacyjnych należy odłączyć zasilanie energią elektryczną.

Zapoznać się z instrukcjami obsługi dostarczonymi przez dostawcę urządzeń.

UWAGA: System PHS1 nie zawiera żadnych zespołów o zasilaniu sieciowym.

Na dostawcy obrabiarki spoczywa odpowiedzialność za uprzedzenie użytkownika o wszelkich zagrożeniach związanych z eksploatacją łącznie z tymi, o jakich wspomina się w dokumentacji produktu Renishaw oraz za zapewnienie stosownych osłon i blokad zabezpieczających.

W określonych warunkach sygnał sondy może fałszywie wskazywać stan gotowości sondy. Nie należy zatrzymywać pracy maszyny tylko z powodu fałszywego sygnału sondy.

Zalecaną metodą zapewnienia awaryjnego zatrzymania działania produktów firmy Renishaw jest odłączenie zasilania energią elektryczną.

PT - AVISOS

NOTA DE SEGURANÇA: A cabeça de posicionamento do servo da PHS1 contém elementos de mola pré-carregada que podem ser perigosos se for feita qualquer tentativa para desmontar a cabeça.

Existe perigo de esmagamento entre as peças móveis/estáticas do equipamento. Não segure o apalpador nem o cabeçote quando a máquina estiver em funcionamento.

Tome cuidado com movimentos inesperados O usuário deve permanecer fora da área de trabalho das combinações do cabeçote/extensão/apalpador.

Em todas as aplicações que envolvam a utilização de Máquinas Operatrizes e Tridimensionais, recomenda-se utilizar proteção para os olhos.

Em certas instalações existem tubos de ar exteriores. Deve ser tomado cuidado para assegurar que os tubos são bem apertados a todas as adaptações de ar de enroscar.

Não existem partes que possam ser reparadas pelo usuário dentro dos equipamentos Renishaw. Retorne as unidades com defeito a um Centro Autorizado de Atendimento a Clientes Renishaw.

Para instruções relativas à limpeza segura dos produtos Renishaw, consultar a seção MANUTENÇÃO (MAINTENANCE) na documentação do produto.

Desligar a alimentação de energia antes de efetuar qualquer operação de manutenção.

Consultar as instruções de funcionamento do fornecedor da máquina

NOTA: Não há nenhumas unidades accionadas do sector no sistema PHS1.

É da responsabilidade do fornecedor da máquina garantir que o operador esteja consciente dos perigos envolvidos na operação, incluindo os mencionados na documentação dos produtos da Renishaw, e garantir o fornecimento de bloqueios de segurança e proteções adequadas.

Em determinadas circunstâncias, o sinal do apalpador pode indicar incorretamente uma condição de toque. Não confie nos sinais do apalpador para parar o movimento da máquina.

O método sugerido para uma parada de emergência de produtos Renishaw é desligar a alimentação de energia.

SK - VÝSTRAHY

POZNÁMKA: Hlavica systému PHS s polohovacím servopohonom obsahuje predpäté pružinové prvky, ktoré môžu byť nebezpečné v prípade pokusu o demontáž hlavice.

Medzi pohyblivými časťami a medzi pohyblivými a statickými časťami vzniká riziko pomliaždenia. Snímaciu hlavicu počas pohybu alebo pri ručnej výmene sondy nechytajte.

Dávajte si pozor na neočakávaný pohyb. Používateľ by mal zostať mimo celej pracovnej dráhy zostavy snímacej hlavice, ramena a sondy.

Vo všetkých aplikáciách zahŕňajúcich používanie obrábacích strojov alebo súradnicových meracích prístrojov sa odporúča ochrana očí.

Niektoré inštalácie obsahujú externé vzduchové potrubia. Treba dávať pozor, aby sa zaručilo bezpečné pripevnenie potrubí k vzduchovým armatúram.

Vo vnútri zariadení Renishaw napájaných zo siete nie sú zvyčajne žiadne súčasti, ktoré by mohol opraviť používateľ. Vadné zariadenia vráťte do autorizovaného strediska služieb zákazníckom spoločnosti Renishaw.

Pokyny týkajúce sa bezpečného čistenia produktov spoločnosti Renishaw získate v informáciách o údržbe uvedených v dokumentácii k príslušnému produktu.

Pred každým vykonávaním údržby odpojte napájanie.

Pozrite si prevádzkové pokyny dodávateľa stroja.

POZNÁMKA: V systéme PHS1 sa nenachádzajú žiadne jednotky napájané zo siete.

Zodpovednosťou dodávateľa stroja je zaručiť oboznámenie používateľa so všetkými rizikami súvisiacimi s prevádzkou, vrátane tých, ktoré sú uvedené v dokumentácii k produktu spoločnosti Renishaw, a zaručiť poskytnutie adekvátnych zábran a bezpečnostných blokovaní.

Signál sondy môže za určitých okolností nesprávne indikovať parkovaciu polohu sondy. Pri zastavovaní pohybov stroja sa nespoliehajte na signály sondy.

Predpokladaný spôsob núdzového zastavenia zariadení spoločnosti Renishaw spočíva v odpojení napájania.

SL - OPOZORILA

OPOMBA: V servo merilni glavi PHS se nahajajo vnaprej napeti vzmetni elementi, ki so lahko pri kakršnemkoli poskusu odpiranja glave nevarni.

Pazite, da se ne uscipnete med gibajocimi deli ter med gibajocimi in staticnimi deli. Ne drzite glave sonde med premiki ali med rocno zamenjavo sonde.

Bodite pozorni na nepricakovane premike. Uporabnik naj se zadrzuje zunaj delovnega obmocja kombinacij glava sonde/podaljsek/sonda.

Pri vseh vrstah uporabe strojnih orodij ali KMM se priporoca uporaba zascite za oci.

Nekatere inštalacije imajo zunanje cevi. Paziti je potrebno, da so cevi varno nameščene na priključke za zrak.

Navadno v Renishaw-ovih enotah, napajanih iz omrezja, ni delov, ki bi jih lahko uporabnik servisiral sam. Okvarjene enote vrnite v pooblascen Renishaw-ov servisni center.

Za navodila glede varnega ciscenja Renishaw-ovih izdelkov glejte informacije o vzdrzevanju v ustrezni produktni dokumentaciji.

Pred kakrsnimkoli vzdrzevanjem odklopite napajanje.

Glejte navodila za upravljanje dobavitelja stroja.

OPOMBA: Nobeden izmed delov sistema PHS1 ni namenjen napajanju iz električnega omrežja.

Odgovornost dobavitelja stroja je, da uporabnika opozori na vse nevarnosti, ki nastopajo med delovanjem, vkljucno s tistimi, ki so omenjene v Renishaw-ovi produktni dokumentaciji, in da zagotovi, da so dobavljene vse potrebne zascite in varnostne zapore.

Pod dolocenimi pogoji lahko signal sonde napacno nakazuje, da je sonda v lezecem polozaju. Ne zanasajte se na signale sonde za ustavitev premikanja stroja.

Pricakovana metoda za zaustavitev v sili za Renishaw-ove izdelke je odvzem napajanja.

SV - VARNING

SÄKERHETSANVISNING: Servoinställningshuvud PHS1 innehåller förspända fjäderelement, som kan utgöra en fara vid försök att ta isär huvudet.

Risk för klämning existerar mellan rörliga delar och mellan rörliga och stillastående delar. Håll ej i sondens huvud under rörelse eller under manuella sondbyten.

Se upp för plötsliga rörelser. Användaren bör befinna sig utanför arbetsområdet för sondhuvudet/förlängningen/sond-kombinationerna.

Ögonskydd rekommenderas för alla tillämpningar som involverar bruket av maskinverktyg och CMM.

Vissa installationer har utanpåliggande luftrör. Var noga med att kontrollera att rören är ordentligt anslutna till samtliga hullingluftförbindningar.

Det finns inga delar som användaren kan utföra underhåll på inuti Renishaws nätströmsdrivna enheter. Returnera defekta delar till ett auktoriserat Renishaw kundcentra.

För instruktioner angående säker rengöring av Renishaws produkter, se avsnittet UNDERHÅLL (MAINTENANCE) i produktdokumentationen.

Koppla bort strömmen innan underhåll utförs.

Se maskintillverkarens bruksanvisning.

OBS: PHS1-systemet innefattar inga enheter som drivs med nätström.

Maskinleverantören ansvarar för att användaren informeras om de risker som drift innebär, inklusive de som nämns i Renishaws produktdokumentation, samt att tillräckligt goda skydd och säkerhetsförreglingar tillhandahålls.

Under vissa omständigheter kan sondens signal falskt ange att en sond är monterad. Lita ej på sondsignaler för att stoppa maskinens rörelse.

Metoden för nödstopp för Renishaws produkter förutsätter att strömmen kopplas bort.

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