

# Commissioning the Hardinge Lathe

## Table of Contents

Summary.....	1
Cost Summary.....	2
Maintenance Team.....	2
Electrical Supply and Emergency Stop Switches.....	2
Electrical Supply Cost.....	3
Emergency Stop Switches.....	3
Design Notes.....	3
Stop Switch Costs.....	4
G10 Layout.....	5
Taking the lathe off the Pallet.....	6
Remaining Issues with the Lathe.....	6
Lathe Tooling.....	6
Essential.....	7
Optional.....	7
Consumables.....	8
Induction.....	9
Charging for use.....	10

## Summary

The Hardinge runs and cuts metal but needs work, money, and management decisions to be made operational and safe:

- Agree Work to be done
- Authorise the budget
- Form an effective maintenance team to share the workload
- Install a mains supply
- Install emergency stop switches and related
- Re-arrange the G10 Layout
- Take the lathe off the pallet and level it
- Fix remaining issues with the lathe
- Agree and buy necessary tooling
- Agree and set up the consumable budget
- Prepare and agree the Induction process, user agreement, and usage charge.
- Run inductions

# Commissioning the Hardinge Lathe

## Cost Summary

Item	Notes	Estimate
Mains Supply	Guess	£700
Emergency Stop switches and contactors	Reasonably Good estimate	£420
Remove Lathe from Pallet	Contingency	200
Remaining issues	Incomplete	12
Necessary tooling	typical price for reasonable quality new items	200
Optional Tooling	Rough idea to manage expectations	470
Consumables	annual	119
Contingency		20% of agreed budget

## Maintenance Team

The lathe needs enough people on a maintenance team prepared to give their time on an unpaid voluntary basis. They need to be prepared to be on a rota to carry out work on a regular basis but not be on call to fix it.

They need to be able to run a lathe and have the mechanical skill to adjust it, keep it lubricated, and recognise developing faults.

To be fair to people on the maintenance team I feel that;

- the usage fee should include a time component so all users contribute to the effort required to run Hackspace.
- the Hackspace insurance should indemnify them for claims of negligence or faulty workmanship.

In my view ( John Willis ) there is no point in commissioning the lathe if a reasonable sized group of maintainers can't be found.

## Electrical Supply and Emergency Stop Switches

The Lathe has been tested with the inverter connected to a 13 amp plug on low speed but it blows the 13 amp fuse in the plug if the high speed range is selected.

Requirement from the Transwave Literature:

The incoming supply should be connected to the converter via an isolator and protection device (i.e. fuse or Type C "Motor Rated" circuit breaker)

# Commissioning the Hardinge Lathe

This device requires a 25 amp supply with 4mm cable for up to 20 metre run.

At some point we will want to run a tool post spindle or other mains operated tool with the lathe. I recommend fitting a switched supply with full ring main current capacity.

## Electrical Supply Cost

Ashfield Electrical quoted £1715 (inc VAT ) to install 2 ring mains with 17 sockets and replace the consumer unit with a 10 way one. I have taken 40% ( arbitrary figure ) to cover the extension socket and rounded up to the nearest hundred.

Guestimate: £700.00

## Emergency Stop Switches

### Design Notes

The lathe does not have any emergency stop buttons and the stop switch would be very difficult to operate if clothing or hair were caught in the rotating machinery. A three phase contactor, 2 emergency stop buttons, stop start buttons and a pull cord stop are include for this.

We could make a pull cord with 4 eye bolts, steel wire, limit switches, a spring and some scrap material for around £25 instead of approximately £110 for a commercial unit. This has not been priced as an option.

A double 13 amp socket disconnected by the emergency stop switches has been included to allow safe use of single phase power tools e.g. a tool post grinder. A 25 amp contactor is included for this.

The best place to locate 240 volt power is directly above the saddle with hooks or cleats to take up slack cable. A small version of the structure used to support the Laser cutter extraction would be suitable and would also support the cable emergency stop. Timber has been included for this.

There are no interlocks to cut power if the door on the lathe electrical cabinet is opened giving access to 440 volt power. Two limit switches are included for this, one for the lathe and one for the control cabinet. NB power would be present on the input cables to the control cabinet if it wasn't isolated externally.

The 3 phase converter literature state the converter should not be started under load. A 3 phase contactor with 440 volt coil and timer to ensure the lathe is not connected until after 440 volts is available. There is a reasonable case for mounting these items inside the converter if there is room.

Access control will be provided by a Hackspace card reader operating a switch in the control circuit. Bypassing access control will be made difficult by wiring the lathe directly to connectors in the cabinet rather than a plug and socket.

The lathe is 50 years old and insulation material will probably have lost considerable strength and could fail if much work is done to the lathe electrics. The emergency stop and related components will be installed in a separate box to minimise work around the lathe electrical systems and will not used existing contactors in the lathe. Use of the existing lathe circuitry would not allow us to provide 240 volt power for tools that is controlled by the lathes emergency stops.

# Commissioning the Hardinge Lathe

The 3 phase converter has the capacity to run other 3 phase equipment at the same time as this lathe. It would require 2 contactors and any necessary start / stop & emergency stop switches and access control. This could be done by

- 1 Providing a bigger box
- 2 Separating the 440 volt presence components into another box and adding a box for each machine.
3. Do nothing now and re-design the system if it happens.

Decision Required.

## Stop Switch Costs

Item	Notes	Cost Estimate
Card Access Control	Guess	£50
Wall Mounted metal box 300 x 250 x 150	<a href="https://www.expertelectrical.co.uk/metal-plastic-enclosures/chint-metal-enclosures">https://www.expertelectrical.co.uk/metal-plastic-enclosures/chint-metal-enclosures</a>	52.97
Chint NC1 contactor 12 amp 440 volt coil	<a href="https://www.expertelectrical.co.uk/motor-control-gear/chint-nc1-contactors">https://www.expertelectrical.co.uk/motor-control-gear/chint-nc1-contactors</a>	£10.14
Chint NC1 Contactor 12 amp 240 volt coil	<a href="https://www.expertelectrical.co.uk/motor-control-gear/chint-nc1-contactors">https://www.expertelectrical.co.uk/motor-control-gear/chint-nc1-contactors</a>	£10.41
Chint NC1 Contactor 25 amp 240 volt coil	<a href="https://www.expertelectrical.co.uk/motor-control-gear/chint-nc1-contactors">https://www.expertelectrical.co.uk/motor-control-gear/chint-nc1-contactors</a>	£19.48
Chint pneumatic timer 0.1 to 30 seconds	<a href="https://www.expertelectrical.co.uk/motor-control-gear/chint-pneumatic-timers">https://www.expertelectrical.co.uk/motor-control-gear/chint-pneumatic-timers</a>	30.38
2 off Banggood 1 NC emergency stop switches	<a href="http://www.banggood.com/Emergency-Stop-Push-Button-Waterproof-660V-10A-Red-Sign-Switch-p-935844.html?rmmds=search">http://www.banggood.com/Emergency-Stop-Push-Button-Waterproof-660V-10A-Red-Sign-Switch-p-935844.html?rmmds=search</a>	£10
Start Stop push button station	<a href="https://www.expertelectrical.co.uk/push-buttons-led-indicators/chint-np2-b213-2-position-push-button-station-red-and-green">https://www.expertelectrical.co.uk/push-buttons-led-indicators/chint-np2-b213-2-position-push-button-station-red-and-green</a>	£13.20
DINrail	<a href="https://www.expertelectrical.co.uk/din-rail-terminal-blocks/abb-entrelec-din-rail-terminals">https://www.expertelectrical.co.uk/din-rail-terminal-blocks/abb-entrelec-din-rail-terminals</a>	£2.83
Din rail contacts & wire markers guess	<a href="https://www.expertelectrical.co.uk/din-rail-terminal-blocks/abb-entrelec-din-rail-terminals">https://www.expertelectrical.co.uk/din-rail-terminal-blocks/abb-entrelec-din-rail-terminals</a>	£30
Cable, cable glands, fixings	guess based on estimate on the	£50

# Commissioning the Hardinge Lathe

Item	Notes	Cost Estimate
	lathe wiki page	
Omron rope pull emergency stop switch	<a href="https://www.expertelectrical.co.uk/limit-safety-switches/omron-emergency-stop-switch-40m-rope-span">https://www.expertelectrical.co.uk/limit-safety-switches/omron-emergency-stop-switch-40m-rope-span</a>	£99.90
Omron 5 metres wire rope	<a href="https://www.expertelectrical.co.uk/limit-safety-switches/omron-stainless-steel-rope">https://www.expertelectrical.co.uk/limit-safety-switches/omron-stainless-steel-rope</a>	£9.90
2 Banggood limit switches to detect open doors	<a href="http://www.banggood.com/ME8108-Waterproof-Momentary-AC-Limit-Switch-For-CNC-Mill-Laser-Plasma-p-926500.html?rmmds=search">http://www.banggood.com/ME8108-Waterproof-Momentary-AC-Limit-Switch-For-CNC-Mill-Laser-Plasma-p-926500.html?rmmds=search</a>	£6.50
Chint Indicator LED 230 volt ND16-GRN-240V	<a href="https://www.expertelectrical.co.uk/push-buttons-led-indicators/chint-led-indicators">https://www.expertelectrical.co.uk/push-buttons-led-indicators/chint-led-indicators</a>	2.45
timber to support the cord pull & 13 amp sockets	2 off 38mm x 144mm x 2.4m planed studwork - Wickes £8.99each	18
Total		416.16

## G10 Layout

The wood lathe is too close to the metal lathe for both to be operated safely at the same time. I recommend:

removing approximately 2 metres of thin bench

Moving the woodwork bench along 2 metres

Moving the wood lathe against the wall opposite the Hardinge

Making a small bench / cupboard to house the three phase converter between the Hardinge and end wall. This would provide a bench to place tools and work while operating the lathe.

putting a small bench in between the wood lathe and woodwork bench to support the grinder and go over the low green extractor. A pipe could run under the bottom shelf to provide extraction to any equipment used along that wall.

Move the pillar drill is moved to the end wall half way between the two lathes

Connect the tall extractor to the bandsaw and kept next to it.

Tidy the laser cutter chiller etc. and make a fitted desk for the computer.

Move the tool cabinets moved to back on to the computer desk.

# Commissioning the Hardinge Lathe

The cost has not been estimated but it would require a reasonable workforce to attend a weekend maintenance session.

## Taking the lathe off the Pallet.

The manual recommends lifting with slings under the coolant tray ( diagram in the manual on the wiki ). They say slings capable of withstanding 2000 lb ( 900 kg) are necessary

It also recommends use of a fork lift from the bottom but warns: "USE CAUTION as the machine is heavier at the front and more easily tipped using the truck lift method than a crane and sling"

Russ has offered to lend a gantry and Russ & I can provide heavy duty chain pulleys to lift at both ends.

I do not recommend levers because;

- I tried piling available bits of wood to pallet height before the lathe was delivered and bow & twist made them unstable,
- access is restricted on Nic's side of the lathe.

Contingency: 1 day hire of a 1 ton gantry if Russ's is not strong enough      £200

<http://www.brandontoolhire.co.uk/en/lifting-tackle/625-gantries-porta.html>

## Remaining Issues with the Lathe

Item	Notes	Cost
Reversing Switch	switch works but no end stop so difficult to find the position <a href="http://www.ebay.co.uk/itm/Panel-Mounting-3-Position-3-Phase-Rotary-Cam-Changeover-Switch-CA10-/191959653213?hash=item2cb1afdb5d:g:3TgAAOSwvzRXyD1a">http://www.ebay.co.uk/itm/Panel-Mounting-3-Position-3-Phase-Rotary-Cam-Changeover-Switch-CA10-/191959653213?hash=item2cb1afdb5d:g:3TgAAOSwvzRXyD1a</a>	£12
3 phase input termination	Floating chock block is probably not suitable	
Saddle drive pinion bearing	both bearings are worn with visible gap. Spindle need building up and turning down & replacement bearings. Russ has agreed to fix.	
Saddle drive rack	Toby Scott feels this needs replacing	
Cross feed backlash	Should be able to adjust this with the backlash adjustment in the nut.	
work lamp	50 volt bulb - make up a LED lamp for this voltage.	
Guard plastic	not very transparent either polish or replace	

## Lathe Tooling

Someone has donated many used tool steel lathe tools. Many appear to have been ground for a specific purpose but some may be useful for Hackspace use. They need to be sorted.

# Commissioning the Hardinge Lathe

The list below is what I would consider essential but I suspect there are at least as many opinions as lathe users.

Hopefully this list will result in donations of suitable tools and reduce the cost.

## Essential

Item	Notes	Cost Estimate
2MT fixed Centre carbide tipped	<a href="http://www.arceurotrade.co.uk/Catalogue/Centres/Morse-Taper-Dead-Centres---Carbide-Tipped">http://www.arceurotrade.co.uk/Catalogue/Centres/Morse-Taper-Dead-Centres---Carbide-Tipped</a>	£8.45
2MT tailstock chuck 2MT 13 mm	Arc Eurotrade <a href="http://www.arceurotrade.co.uk/Catalogue/Machines-Accessories/Lathes/SIEG-C3-SC2-SC3-Mini-Lathes/C3-SC2-SC3-Tailstock-Accessories/13mm-Tailstock-Chuck-and-Arbor">http://www.arceurotrade.co.uk/Catalogue/Machines-Accessories/Lathes/SIEG-C3-SC2-SC3-Mini-Lathes/C3-SC2-SC3-Tailstock-Accessories/13mm-Tailstock-Chuck-and-Arbor</a>	£21
Cutting tools	7 piece indexable 10mm shank turning tools <a href="http://www.workshopping.co.uk/product/indexable-10mm-lathe-turning-tool-set-7pc/SM3025CS6/">http://www.workshopping.co.uk/product/indexable-10mm-lathe-turning-tool-set-7pc/SM3025CS6/</a>	£98
Boring and internal threading	6 piece internal threading and boring set 10mm square <a href="http://www.arceurotrade.co.uk/Catalogue/Cutting-Tools/Lathe-Turning-Tools/6pc-Internal-Threading-and-Boring-Sets">http://www.arceurotrade.co.uk/Catalogue/Cutting-Tools/Lathe-Turning-Tools/6pc-Internal-Threading-and-Boring-Sets</a>	£50.56
nuts bolts & threaded rod to suit the faceplate threads	guess	£20
Total		198.01

## Optional

Members have asked about cutting key slots and milling etc. This gives some idea of the costs to do things like this and what we might end up spending if the lathe isn't managed effectively. There are many more things that could go on this list.

Item	Notes	Cost Estimate
2MT medium duty live centre set	<a href="http://www.arceurotrade.co.uk/Catalogue/C">http://www.arceurotrade.co.uk/Catalogue/C</a>	63.72

# Commissioning the Hardinge Lathe

Item	Notes	Cost Estimate
	entres/MT2-Medium-Duty-Multi-Purpose-Live-Centre-Set	
2MT sliding tailstock die holder set	<a href="http://www.arceurotrade.co.uk/Catalogue/Cutting-Tools/Sliding-Tailstock-Die-Holder-Sets">http://www.arceurotrade.co.uk/Catalogue/Cutting-Tools/Sliding-Tailstock-Die-Holder-Sets</a>	45.10
2MT half centre carbide tipped	<a href="http://www.arceurotrade.co.uk/Catalogue/Centres/Morse-Taper-Half-Centres---Carbide-Tipped">http://www.arceurotrade.co.uk/Catalogue/Centres/Morse-Taper-Half-Centres---Carbide-Tipped</a>	9.17
2 MT to 1 MT morse adaptor	<a href="http://www.arceurotrade.co.uk/Catalogue/Adaptors-Sleeves/Morse-Taper-Adaptors---Tang">http://www.arceurotrade.co.uk/Catalogue/Adaptors-Sleeves/Morse-Taper-Adaptors---Tang</a>	4.19
2 MT to 3 MT morse adaptor	<a href="http://www.arceurotrade.co.uk/Catalogue/Extension-Sockets/Morse-Taper-Extension-Sockets">http://www.arceurotrade.co.uk/Catalogue/Extension-Sockets/Morse-Taper-Extension-Sockets</a>	11.59
3 MT to 2 MT Morse adaptor	<a href="http://www.arceurotrade.co.uk/Catalogue/Adaptors-Sleeves/Morse-Taper-Adaptors---Tang">http://www.arceurotrade.co.uk/Catalogue/Adaptors-Sleeves/Morse-Taper-Adaptors---Tang</a>	4.3
Lathe faceplate clamps	Draper set form Workshopping.co.uk	29.53
Vertical Slide ( for milling )	Will need some work to interface to the Hardinge <a href="http://www.arceurotrade.co.uk/Catalogue/Machines-Accessories/Lathe-Accessories/Vertical-Slides/Vertical-Slide-5x4-Fixed">http://www.arceurotrade.co.uk/Catalogue/Machines-Accessories/Lathe-Accessories/Vertical-Slides/Vertical-Slide-5x4-Fixed</a>	91.26
Fly Cutter Set ( for milling )	<a href="http://www.arceurotrade.co.uk/Catalogue/Cutting-Tools/Fly-Cutters/Fly-Cutter-Set-12mm-Straight-Shank">http://www.arceurotrade.co.uk/Catalogue/Cutting-Tools/Fly-Cutters/Fly-Cutter-Set-12mm-Straight-Shank</a>	25.56
6 off tool bits 2 for each cutter	<a href="http://www.arceurotrade.co.uk/Catalogue/Cutting-Tools/Fly-Cutters/Fly-Cutter-Set-12mm-Straight-Shank">http://www.arceurotrade.co.uk/Catalogue/Cutting-Tools/Fly-Cutters/Fly-Cutter-Set-12mm-Straight-Shank</a>	£10.50
1kW spindle and inverter	Will need some work to interface to the Hardinge <a href="http://www.ebay.co.uk/itm/FOUR-BEAR-1-5KW-ER11-AIR-COOLED-SPINDLE-MOTOR-1-5KW-INVERTER-DRIVE-VFD-B4-CNC-/181903551285?hash=item2a5a4beb35:g:ILMAAOSwCQNWfgZ5">http://www.ebay.co.uk/itm/FOUR-BEAR-1-5KW-ER11-AIR-COOLED-SPINDLE-MOTOR-1-5KW-INVERTER-DRIVE-VFD-B4-CNC-/181903551285?hash=item2a5a4beb35:g:ILMAAOSwCQNWfgZ5</a>	£172
Total		466.92

## Consumables

# Commissioning the Hardinge Lathe

Item	Notes	Annual Cost Estimate
Coolant	3.5 gallon ( 16 litres ) change 4 x per year. 5 litres concentrate ( 5% in water ) approx £20 ebay	£20
molyslip grease	for the speed change axle	£10
paper towel	1 roll per week 6 off 2 ply blue Centrefeed rolls 100m <a href="https://www.direct365.co.uk/supplies/value-blue-centrefeed-rolls-2-ply-100m-case-of-6?utm_source=google&amp;utm_medium=cpc&amp;utm_term=&amp;utm_campaign=Supplies_PLA-Washrooms&amp;ito=GAG10470931729&amp;itc=GAC75071489569&amp;itkw=nil&amp;itaexid=&amp;itawnw=search&amp;itawmt=&amp;itadv=c&amp;gclid=CjwKEAiAyanCBRDkiO6M_rDroH0SJAAfZ4Klr5SSz6TdmuoKDZKVpu2vQaaM8r3Sk86ux8s7Kj_NfBoC8b_w_wcB">https://www.direct365.co.uk/supplies/value-blue-centrefeed-rolls-2-ply-100m-case-of-6?utm_source=google&amp;utm_medium=cpc&amp;utm_term=&amp;utm_campaign=Supplies_PLA-Washrooms&amp;ito=GAG10470931729&amp;itc=GAC75071489569&amp;itkw=nil&amp;itaexid=&amp;itawnw=search&amp;itawmt=&amp;itadv=c&amp;gclid=CjwKEAiAyanCBRDkiO6M_rDroH0SJAAfZ4Klr5SSz6TdmuoKDZKVpu2vQaaM8r3Sk86ux8s7Kj_NfBoC8b_w_wcB</a>	£57
Cutting tools	10% of new price	£15
general lubricating oil	Cheapest engine oil 5l per year	£15
Centre Drills	Arc Eurotrade range form £1.5 to 2.5 each say 6 per year	£12
total		129

## Induction

I suggest a multi stage induction process with

Be inducted into the G10 workshop

Demonstrate a responsible approach to workshop use by attending at least one workshop maintenance session.

Read lathe operation literature e.g. How to run a lathe by South Bend

then do the induction.

Inductions should be from written notes formally agreed as acceptable by the Hackspace community.

Inductors should be indemnified against claims for accidents resulting from poor advice.

# Commissioning the Hardinge Lathe

## Charging for use

We need to be clear about what will be provided and I suggest that tool steel blanks for specials are bought by the user.

I have a strongly held view that users of hackspace should put the time needed to run and maintain it back into the organisation. I recommend setting up a database for work done and this used as credit for time spent on any item of kit with access control. People would add their own maintenance time which would be visible to any member.

John Willis