

EMCO PC Turn 50 Lathe CNC Retrofit



| Revision | Date | Description |
|----------|------------|----------------------------|
| 1.0 | 14-05-2022 | Initial version |
| 1.1 | 05-10-2022 | Added Lathe tooling to BOM |

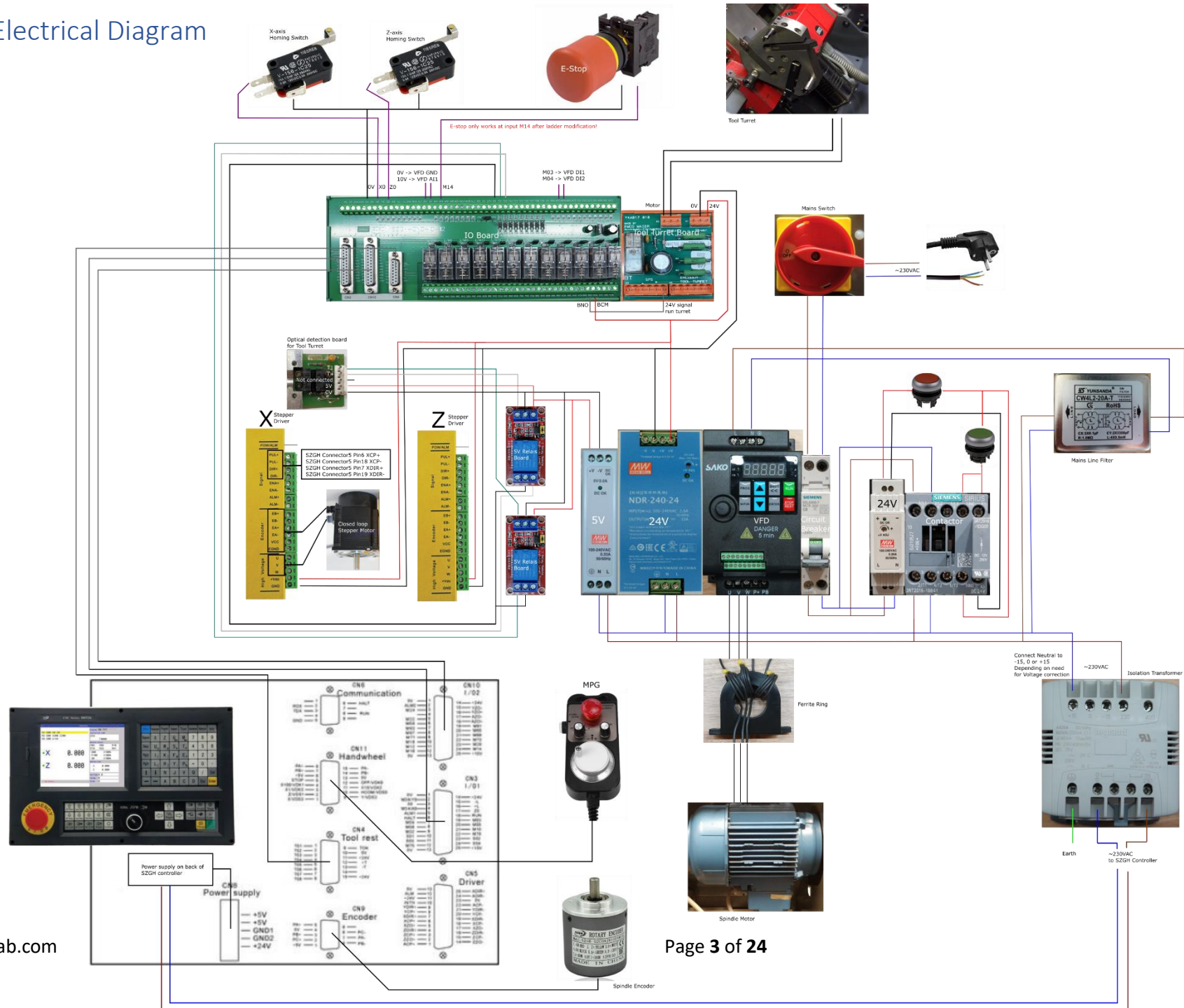
Robin

UptimeFab.com

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1. Electrical Diagram



2. Parts List (BOM)

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|---|-------------|----------------------|---|-----|--------------|----------|---|----------|
| SZGH CNC controller | SZGH | SZGH-990TDb | Aliexpress.com (Shenzhen Guanhong Automation Store) | 1 | € 344,16 | € 344,16 | https://www.aliexpress.com/item/32232109730.html?spm=a2g0s.9042311.0.0.18564c4dGFAZiV | |
| SZGH Rotary Encoder | SZGH | SZGH-52C08JR1024M05L | Aliexpress.com (Shenzhen Guanhong Automation Store) | 1 | € 56,00 | € 56,00 | https://www.aliexpress.com/item/32832333887.html?spm=a2g0s.9042311.0.0.18564c4dGFAZiV | |
| IO relay board with new 12 relays for CNC lathe or milling controller | SZGH | SZGH-CNC-10-12 | Aliexpress.com (Shenzhen Guanhong Automation Store) | 1 | € 48,00 | € 48,00 | https://www.aliexpress.com/item/4000680445333.html?spm=a2g0s.9042311.0.0.18564c4dGFAZiV | |
| SGHZ controller and accesoiries | N/A | N/A | Shipping | 1 | € 235,00 | € 235,00 | Indication, might differ per country | |
| SGHZ controller and accesoiries | N/A | N/A | Customs fee | 1 | € 130,00 | € 130,00 | Indication, might differ per country | |
| SZGH 4 axis Pendant (MPG) | SZGH | CHP004S100L002 | Aliexpress.com | 1 | € 96,80 | € 96,80 | https://www.aliexpress.com/item/32704534034.html?spm=2114.12010612.8148356.1.59c3427bQQpG5S | |

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|--|---|------------------|-----------------------|-----|--------------|----------|---|----------|
| Isolation Transformer 230V-230V, 160VA | Legrand Single Phase - Veiligheidstransformat or 044264 | | Elektrototaalmarkt.nl | 1 | € 86,82 | € 86,82 | https://www.elektrototaalmarkt.nl/legrand-single-phase-veiligheidstransformator-4171408 | |
| nema 23 closed loop stepper kit Nema23 1Nm | 3 phase closed loop stepper motor Lichuan LC57H355 3 phase closed loop stepper motor driver Lichuan LCDH357H | | Aliexpress.com | 2 | € 48,34 | € 96,68 | https://www.aliexpress.com/item/4000057310983.html?spm=a2g0s.9042311.0.0.18564c4dGFAZIV | |
| Zero Phase Reactor (Ferrite Ring) | Delta | RF220X00A | Damencnc.com | | | | https://www.damencnc.com/nl/delta-zero-phase-reactor-rf220x00a/a3183?c=61 | |
| VFD | SAKO (FTVOGUE) | SKI780-0D75G-1 | Amazon.nl | 1 | € 92,99 | € 92,99 | https://www.amazon.nl/omvormer-frequentieomvormer-transformator-snelheidsregelaar-frequentie/dp/B08252ZRB3/ref=sr_1_1?mk_nl_NL=%C3%85M%C3%85%C5%BD%C3%95%C3%91&crd=2A3OBG8SKRW5E&dchild=1&keywords=vfd+0.75&qid=1620299873&srefix=vfd%2Caps%2C179&sr=8-1 | |
| EMI filter | ? | CW4L2-20A-T | Amazon.nl | 1 | € 16,29 | € 16,29 | https://www.amazon.nl/s?_mk_nl_NL=%C3%85M%C3%85%C5%BD%C3%95%C3%91&i=aps&k=EMI%20filter&ref=nb_sb_noss_2&url=search-alias%3Daps | |

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|---|-----------------|----------------------------|-----------------------|-----|--------------|----------|---|----------|
| E-stop | EATON | M22-PV/K01 | elektrototaalmarkt.nl | 1 | € 29,61 | € 29,61 | https://www.elektrototaalmarkt.nl/eaton-moeller-m22pv-noodstop-4165539 | |
| E-stop text shield (NL-Noodstop) | EATON | M22-XZK-NL99 | elektrototaalmarkt.nl | 1 | € 3,59 | € 3,59 | https://www.elektrototaalmarkt.nl/eaton-moeller-rmq-titan-tekstschild-4169206 | |
| E-stop text shield (English-Emergency Stop) | EATON | M22-XZK-GB99 | elektrototaalmarkt.nl | 1 | € 3,59 | € 3,59 | https://www.elektrototaalmarkt.nl/eaton-moeller-rmq-titan-tekstschild-4169209 | |
| Key switch (optional) | EATON | M22-WRS | elektrototaalmarkt.nl | 1 | € 44,07 | € 44,07 | https://www.elektrototaalmarkt.nl/eaton-moeller-rmq-titan-sleutelschakelaar-4169131 | |
| M22 Mounting Adapter for front panel | EATON | M22-A | elektrototaalmarkt.nl | 1 | € 2,01 | € 2,01 | https://www.elektrototaalmarkt.nl/eaton-moeller-rmq-titan-bevestigingsadapter-4169006 | |
| Text shield carrier (optional) | EATON | M22S-ST-X | elektrototaalmarkt.nl | 1 | € 0,62 | € 0,62 | https://www.elektrototaalmarkt.nl/eaton-moeller-rmq-titan-tekstschilddrager-4169220 | |
| Feed-through terminal block Grey 2,5mm^2 | Phoenix Contact | PT 2 5 PHO PT (3209510) | Elektramat.nl | 10 | € 0,81 | € 8,10 | https://www.elektramat.nl/p/hoenix-contact-pt-2-5-pho-pt-veerdruk-aansluitklem/ | |
| Feed-through terminal block Blue 2,5mm^2 | Phoenix Contact | PT 2 5 BU PHO PT (3209523) | Elektramat.nl | 10 | € 0,81 | € 8,10 | https://www.elektramat.nl/p/hoenix-contact-pt-2-5-bu-pho-pt-veerdruk-aansluitklem/ | |

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|--|-----------------|-------------------------|---------------|-----|--------------|----------|---|----------|
| Terminal block end plate Grey | Phoenix Contact | D-ST2 5 PHO (3030417) | Elektramat.nl | 1 | € 0,40 | € 0,40 | https://www.elektramat.nl/p/hoenix-contact-d-st2-5-pho-eindplaat-2-5-grys/ | |
| Plug in bridge | Phoenix Contact | PHO FBS 2-3 5 (3213027) | Elektramat.nl | 1 | € 0,69 | € 0,69 | https://www.elektramat.nl/p/hoenix-contact-doorverbindingsbrug-3-polig-pho-fbs-2-3-5-3213027/ | |
| Feed-Through Terminal Block 1,5mm ² (used only for low voltage small diameter signal wires. If you only buy one type go for the larger 2,5mm ²) | Phoenix Contact | PT 1,5/S (3208100) | Elektramat.nl | 20 | € 0,60 | € 12,00 | https://www.elektramat.nl/p/hoenix-contact-pt-1-5-s-verbingsriigklem-3208100/ | |
| 3 wire splicing connectors box of 50pcs | Wago | 221-413 | Elektramat.nl | 1 | € 14,50 | € 14,50 | https://www.elektramat.nl/wago-verbindingklem-3-voudig-4mm-per-50-stuks-221-413/ | |
| 5 wire splicing connectors box of 25pcs | Wago | 221-415 | Elektramat.nl | 1 | € 11,50 | € 11,50 | https://www.elektramat.nl/wago-verbindingklem-5-voudig-4mm-per-25-stuks-221-415/ | |
| DIN-rail, set of 3 pcs | SJUNJIE | B08FFM7498 | Amazon.nl | 1 | € 8,99 | € 8,99 | https://www.amazon.nl/SJUNJIE-Montage-Slotted-Terminal-Schakelaar/dp/B08FFM7498/ref=sr_1_1?_mk_nl_NL=%C3%85M%C3%85%C5%BD%C3%95%C3%91&crd=2IEFG57KS9QZM&keywords=SJUNJIE+3Pcs+DIN&qid=164935279 | |

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|--|--------------------|------------------|---|-----|--------------|----------|---|----------|
| | | | | | | | 6&sprefix=sjunjie+3pcs+din%2Caps%2C58&sr=8-1 | |
| Power supply 24V for stepper drives (DIN rail mounted) | Mean Well | NDR-240-24 | Amazon.nl | 1 | € 54,90 | € 54,90 | https://www.amazon.nl/DIN-rail-voeding-NDR-240-24-SNT-0-10/dp/B08CS5QS7B/ref=sr_1?_mk_nl_NL=%C3%85M%C3%85%C5%BD%C3%95%C3%91&dchild=1&keywords=MeanWell+NDR-240-24&qid=1621976920&sr=8-1 | |
| Plastic Cabinet | BOXEXPERT | 500x350x190mm | Amazon.nl | 1 | € 52,10 | € 52,10 | https://www.amazon.nl/BOXEXPERT-kunststof-schakelkast-transparant-500x350x190mm/dp/B07C834R88/ref=sr_1_1?_mk_nl_NL=%C3%85M%C3%85%C5%BD%C3%95%C3%91&dchild=1&keywords=boxexpert+500x350&qid=1621977032&sr=8-1 | |
| Aluminium 2mm sheet back plate | N/A | 680x380mm | https://www.aluminiumopmaat.nl/ | 1 | € 13,01 | € 13,01 | https://www.aluminiumopmaat.nl/ | |
| Aluminium 2mm sheet bottom plate | N/A | 680x440mm | https://www.aluminiumopmaat.nl/ | 1 | € 11,58 | € 11,58 | https://www.aluminiumopmaat.nl/ | |
| Rubber Feet 38x25mm (set of 4 pcs) | Adam Hall Hardware | 4911 M4 AH | Amazon.nl | 1 | € 5,75 | € 5,75 | https://www.amazon.nl/Adam-Hall-Hardware-4911-M4/dp/B005JFDYLO/ref=sr_1_1?_mk_nl_NL=%C3%85M%C3%85%C5%BD%C3%95%C | |

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|---|-------------|------------------|--|-----|--------------|----------|--|----------|
| | | | | | | | 3%91&crd=SHMW87Q3DM4l&keywords=4911+M4+AH&qid=1649354754&sprefix=4911+m4+ah%2Caps%2C76&sr=8-1 | |
| Siemens Installatieautomaat C karakteristiek 8a 2P 1 beveiligd incl nul 1te 5SL6008-7 | Siemens | 5SL6008-7 | Elektrobode.nl | 1 | € 17,51 | € 17,51 | https://www.elektrobode.nl/products/siemens-installatieautomaat-c-karakteristiek-8a-2p-incl-nul-1te-5sl6008-7-5sl60087 | |
| Siemens 3RT2 Contactor 24VDC AC-3 9A 4KW | Siemens | 3RT2016-1BB41 | Elektrobode.nl | 1 | € 26,56 | € 26,56 | https://www.elektrobode.nl/products/siemens-contactor-ac34kw-1m-dc24v-3rt2016-1bb41 | |
| Siemens 3RT2916-1DG00 Diode | Siemens | 3RT2916-1DG00 | Elektrobode.nl | 1 | € 6,08 | € 6,08 | https://www.elektrobode.nl/products/siemens-ontstoordiode-dc12-250v-s00-3rt2916-1dg00 | |
| Siemens Limit Switch Roller Lever (Used as a door Switch) | Siemens | 3SE52320HE10 | Elektrobode.nl | 1 | € 24,64 | € 24,64 | https://www.elektrobode.nl/products/siemens-eindsch-1m-1v-rol-3se52320he10 | |
| Optocoupler board 2 channel | Unknown | D120 | Benselectronics.nl | 1 | € 2,99 | € 2,99 | https://www.benselectronics.nl/2-kanaals-optocoupler-board.html | |
| Brass MXL 20 teeth Timing Pulley Bore 8mm(D Shape) for belt width 15mm | Unknown | Unknown | Aliexpress.com (AliExpress 3D-belpulley Store) | 1 | € 8,70 | € 8,70 | https://www.aliexpress.com/item/32830633598.html?spm=a2g0s.9042311.0.0.7c5f4c4drWVOb8 | |

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|---|----------------------------------|--|---------------------------------|-----|--------------|----------|---|----------|
| Custom MXL belt | Powge B63 MXL 12.7mm (=0.5 inch) | Custom order for this specific width USD24,19 total for 10 belts | AliExpress POWGE Official Store | 1 | € 20,49 | € 20,49 | https://nl.aliexpress.com/item/738657464.html?spm=a2g0o.store_pc_groupList.8148356.15.33f64c94qPhrSA | |
| Step down DC-DC converter 3,2 - 40 V DC naar 1,25 - 35 V DC 2 A | Unknown | DAR00071 | 123-3d.nl | 2 | € 5,50 | € 11,00 | https://www.123-3d.nl/123-3D-Step-down-DC-DC-converter-3-2-40-V-DC-naar-1-25-35-V-DC-2-A-i3869-t13192.html | |
| Noctua Case Fan 60x60x25, 12V | Noctua | NF-A6x25 FLX | 123-3d.nl | 2 | € 14,50 | € 29,00 | https://www.123-3d.nl/Noctua-NF-A6x25-12-V-60x60x25-mm-3-pin-axiaal-FLX-ventilator-19162-i6882-t15055.html | |
| Ferrules (small sizes assortment) | TRU Components | T1903C023 | Conrad.nl | 1 | € 6,97 | € 6,97 | https://www.conrad.nl/nl/p/tru-components-t1903c023-adereindhuls-assortiment-0-14-mm-0-25-mm-0-34-mm-0-50-mm-deels-ge-soleerd-grijs-lichtbl-2102503.html | |
| 1 Channel relais board 5V | Unknown | H53 | Ben's Electronis | 1 | € 3,49 | € 3,49 | https://www.benselectronics.nl/1-kanaals-relais-board-hoog-laag.html | |
| DIN Rail clamp | Delock | 65961 | Reichelt | 4 | € 8,12 | € 32,48 | https://www.reichelt.nl/nl/nl/din-railklem-voor-printplaten-4-stuks-delock-65961-p248517.html?&trstct=pol_0&nbc=1 | |

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|---|--------------------|------------------------------|--------------------|-----|--------------|----------|---|----------|
| GT2 timing belt assortment set (not used) | BHGT / nychuangtuo | | Amazon.nl | 1 | € 10,03 | € 10,03 | | |
| Ball Bearing 6006-2Z | SKF | 6006-2Z | Techniekwebshop.nl | 2 | € 6,38 | € 12,76 | | |
| GT2 80teeth pulley 6mm belt 8mm bore | Powge | 80T-2GT (6mm belt, 8mm bore) | Aliexpress | 2 | € 10,89 | € 21,78 | https://www.aliexpress.com/item/32782605159.html?spm=a2g0o.cart.0.0.590d3c00HUY7cG&mp=1 | |
| GT2 belt 400mm 200 teeth, set of 5 pcs | Powge | 400-2GT | Aliexpress | 1 | € 11,56 | € 11,56 | https://nl.aliexpress.com/item/1858498241.html?spm=a2g0o.store_pc_groupList.8148356.19.bf2723eaoNYAKf | |
| M6 Lever | Unknown | 02823 | HBM | 1 | € 1,99 | € 1,99 | https://www.hbm-machines.com/nl/p/hbm-metalen-snelversteller-met-inwendig-draad | |

Tooling and accessories

Tool sets

| | | | | | | | | |
|--|---------|---------|------------|---|---------|---------|---|--|
| 7pcs set Carbide inserts with tool holders 10mm shank (12mm also fits) | Unknown | Unknown | Aliexpress | 1 | € 33,87 | € 33,87 | https://nl.aliexpress.com/item/4000317910586.html?spm=a2g0o.productlist.0.0.27655e80pj00LJ&algo_pvid=d34118df-b156-4cb6-970d-2b613f18285a&algo_exp_id=d34118df-b156-4cb6-970d-2b613f18285a-1&pdp_ext_f=%7B%22sku_id%22%3A%2212000015570520904%22%7D&pdp_pi=-1%3B33.87%3B-1%3B0.46%40salePrice%3BU3B3Bsearch-mainSearch | |
|--|---------|---------|------------|---|---------|---------|---|--|

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|---|-------------|-------------------|------------|-----|--------------|----------|---|----------|
| | | | | | | | spons&psc=1&spLa=ZW5icnlwdGVkUXVhbGhmaWVvYPUeYMTTE1SVQxU0NOT0s3JmVuY3J5cHRIZElkPUeWMTQxNjEzMiRlPVZgRTNRSERaUSZlbnNyeXB0ZWRBZEIkPUeWmzc4MDc0M0VHQ1IMQTdEVUtaQSZ3aWRnZXROYW1lPXNwX2FOZiZhY3Rpb249Y2xpY2tSZWRpcmVidCZkb05vdExvZ0NsYWNRPXRYdWU= | |
| Carbide insert for Aluminium 35 degree, 0.2mm tool radius | Unknown | VCGT110302 AK H01 | Aliexpress | 10 | € 1,10 | € 10,95 | https://www.aliexpress.com/item/1005002722877871.html?spm=a2g0o.store_pc_all.Product.8148356.1.829d2598Zl3Fpw&pdp_npi=2%40dis%21EUR%21%E2%82%AC%201%2C94%21%E2%82%AC%201%2C07%21%21%21%21%21%402100bdb16649920274953819ea5b5%2112000021865384630%21sh | |
| PCD 35 degree insert | Unknown | PCD, VCGT110302 | Aliexpress | 2 | € 6,90 | € 13,80 | https://www.aliexpress.com/item/1005001429554109.html?spm=a2g0o.store_pc_all.Product.8148356.3.829d2598jP9MMU&pdp_npi=2%40dis%21EUR%21%E2%82%AC%2010%2C38%21%E2%82%AC%206%2C75%21%21%21%21%21%402100bdb16649920274953819ea5b5%2112000016082960098%21sh | |
| Tool holder for VCGT insert | Unknown | SVJCR, 1212H11 | Aliexpress | 1 | € 12,44 | € 12,44 | https://www.aliexpress.com/item/1005001498641345.html?spm=a2g0o.store_pc_all.Product.8148356.1.47ca29e9ETdxzA&pdp_npi=2%40dis%21EUR%21%E2%82%AC%2016%2C08%21%E2%82%AC%2012%2C22%21%21%21%21%21%402100bb5116649922201024516e1b68%2112000016356844726%21sh | |
| Threading Tools | | | | | | | | |

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|--|-------------|------------------|------------|-----|--------------|----------|---|----------|
| Threading Insert for aluminium / brass | Unknown | 11ER 050ISO K15 | Amazon.nl | 10 | € 1,31 | € 13,05 | https://www.amazon.nl/draaibank-Threading-invoegen-Carbide-Aluminium/dp/B081QZ8K7V/ref=sr_1_1?mk_nl_NL=%C3%85M%C3%85C5%BD%C3%95C3%91&crd=Z688R MF2ZYM&keywords=11ER+050ISO+K15&qid=1649351125&srefix=11er+050iso+k15%2Caps%2C64&sr=8-1 | |
| Threading Insert for aluminium / brass | Unknown | 11ER A60 K15 | Aliexpress | 10 | € 1,04 | € 10,37 | https://www.aliexpress.com/item/4000395986824.html?spm=a2g0o.store_pc_allProduct.8148356.3.614d5368MEzf6b&pdp_npi=2%40dis%21EUR%21%E2%82%AC%202%2C31%21%E2%82%AC%201%2C04%21%21%21%21%402100bde316649931228566320ed413%2112000020808844795%21sh | |
| PCD threading insert for aluminium / brass | Unknown | 11ER AG60 PCD | Aliexpress | 1 | € 13,74 | € 13,74 | https://www.aliexpress.com/item/1005003243231730.html?spm=a2g0o.productlist.0.0.64712c29DuET2U&algo_pv_id=f641df0e-ece9-46e3-ae33-a0af9cbbcca9&algo_exp_id=f641df0e-ece9-46e3-ae33-a0af9cbbcca9-6&pdp_ext_f=%7B%22sku_id%22%3A%2212000024871588822%22%7D&pdp_npi=2%40dis%21EUR%2126.64%2113.85%21%21%21%21%402100bb4c16649935754091652edd15%2112000024871588822%21sea&curPageLogUi d=MhIAiF48RVkg | |
| Thread Gauge | Unknown | 02691 | HBM | 1 | € 7,99 | € 7,99 | https://www.hbm-machines.com/nl/p/hbm-draadmeter-metrische-withworth | |

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|--|-------------|-------------------------------|------------|-----|--------------|----------|---|---|
| Internal threading tool 60 degree, minimal thread size M4. | MZG | STIR30120-60 | Aliexpress | 1 | € 9,12 | € 9,12 | https://www.aliexpress.com/item/4000832814149.html?spm=a2g0o.store_pc_allProduct.8148356.1.4b294546iqUYga&pdp_npi=2%40dis%21EUR%21%E2%82%AC%2012%2C67%21%E2%82%AC%209%2C12%21%21%21%21%21%400b0a050b16649894314757620eed62%2110000008695504570%21sh | |
| Internal threading tool 60 degree, minimal thread size M6. | MZG | STIR40150-60 | Aliexpress | 1 | € 9,12 | € 9,12 | https://www.aliexpress.com/item/4000832814149.html?spm=a2g0o.store_pc_allProduct.8148356.1.4b294546iqUYga&pdp_npi=2%40dis%21EUR%21%E2%82%AC%2012%2C67%21%E2%82%AC%209%2C12%21%21%21%21%21%400b0a050b16649894314757620eed62%2110000008695504570%21sh | |
| Parting / Grooving tools tools | | | | | | | | |
| Carbide parting tool insert CTP15FRN ZP15 | MZG | CTP15FRN ZP15 | Aliexpress | 10 | € 6,58 | € 65,83 | https://www.aliexpress.com/item/33008598785.html?spm=a2g0o.store_pc_allProduct.8148356.5.68db6f58P1Jjin&pdp_npi=2%40dis%21EUR%21%E2%82%AC%2082%2C30%21%E2%82%AC%2065%2C83%21%21%21%21%21%402100bdd016649886922212332e95c9%2112000028673346398%21sh | Parting tool, 1.5 mm wide. Intended for cutting stainless steel. Small parts. |
| Tool Holder for CTP parting tool insert | MZG | CTPR08 CTPR10 / CTPR08 CTPR12 | Aliexpress | 1 | € 15,19 | € 15,19 | https://www.aliexpress.com/item/33010159166.html?spm=a2g0o.store_pc_allProduct.8148356.1.1d625570Ci8GO W&pdp_npi=2%40dis%21EUR%21%E2%82%AC%2030%2C38%21%E2%82%AC%2024%2C30%21%21%21%21%21%402100bb49166498897364 | I have both the 10mm and 12mm variant. Both fit in the Emco turret. 12mm is the |

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|---|-----------------------|------------------|------------|-----|--------------|----------|---|--|
| | | | | | | | 47794ee73a%2167074073691%21sh | preferred option for rigidity. |
| Carbide parting tool insert CTPA, 10FRN | TUGE Tool Store | CTPA, 10FRN | Aliexpress | 10 | € 8,74 | € 87,35 | https://www.aliexpress.com/item/1005003582863855.html?spm=a2g0o.store_pc_all.Product.8148356.1.676c574fRvs2Mx&pdp_npi=2%40dis%21EUR%21%E2%82%AC%208%2C74%21%E2%82%AC%208%2C74%21%21%21%21%21%402100bb4916649903544814577ee6fb%2112000026372479055%21sh | parting tool, 1.0 mm wide. Intended for cutting brass and Aluminium, small parts. |
| Tool holder for CTPA parting tool inserts | CVCVCV Official Store | CTPAR12 | Aliexpress | 1 | € 15,33 | € 15,33 | https://www.aliexpress.com/item/1005002439948384.html?spm=a2g0o.store_pc_all.Product.8148356.1.6bec7b2cVpzE6F&pdp_npi=2%40dis%21EUR%21%E2%82%AC%2024%2C91%21%E2%82%AC%2014%2C95%21%21%21%21%21%402100bddd16649909233367854e0dab%2112000020664645303%21sh | 12mm tool holder, RIGHT version, which means the insert is on the LEFT side |
| HSS Parting tool 8 mm, model1 | Unknown | 01969 | HBM | 1 | € 4,99 | € 4,99 | https://www.hbm-machines.com/nl/p/hbm-afsteekhouder-met-hss-mes | Requires modification of tool holder. Otherwise tool cannot be set low enough to reach center. |
| HSS Parting tool 10 mm, model1 | Unknown | 01970 | HBM | 1 | € 4,99 | € 4,99 | https://www.hbm-machines.com/nl/p/hbm-afsteekhouder-met-hss-mes | Requires modification of tool holder. Otherwise tool cannot be set |

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|--------------------------------------|-------------|------------------|-----------|-----|--------------|----------|---|--|
| | | | | | | | | low enough to reach center. |
| HSS Parting Tool 10 mm, model2 | Unknown | 2265 | HBM | 1 | € 9,99 | € 9,99 | https://www.hbm-machines.com/nl/p/hbm-afsteekhouder-met-hss-mes-model-2 | Requires modification of tool holder. Otherwise tool cannot be set low enough to reach center. |
| Parting Blade 8mm holder, 8mm blade | | 6S06.3.21 | Hogetex | 1 | € 14,40 | € 14,40 | https://www.hogetex.com/afsteekhouder-met-hss-afsteekblad-met-spaanbreker | |
| Parting Blade 8mm holder, 10mm blade | Unknown | 6S06.3.22 | Hogetex | 1 | € 16,20 | € 16,20 | https://www.hogetex.com/afsteekhouder-met-hss-afsteekblad-met-spaanbreker | |
| HSS parting blade 8mm | Unknown | 6S06.3.31 | Hogetex | 1 | € 5,60 | € 5,60 | https://www.hogetex.com/afsteekhouder-met-hss-afsteekblad-met-spaanbreker | |
| HSS parting blade 10mm | Unknown | 6S06.3.32 | Hogetex | 1 | € 7,00 | € 7,00 | https://www.hogetex.com/afsteekhouder-met-hss-afsteekblad-met-spaanbreker | |
| Drilling / Boring tools | | | | | | | | |
| Stub Drill set | Alpen | 100906100 | Amazon.nl | 1 | € 25,49 | € 25,49 | https://www.amazon.nl/Alpen-100906100-HSS-ECO-TM-PZ-Boren/dp/B00MDIFU0M/ref | |

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|---|-------------|------------------|------------|-----|--------------|----------|---|--|
| | | | | | | | =sr 1 1? mk nl NL=%C3%85M%C3%85%C5%BD%C3%95%C3%91&crd=10TRQXVDG8UEZ&keywords=Alpen+100906100&qid=1649351276&sprefix=alpen+100906100%2Caps%2C71&sr=8-1 | |
| Center Drill set | Walfront | CMSBNAN01774 | Amazon.nl | 1 | € 10,69 | € 10,69 | https://www.amazon.nl/Center-Boor-Stuks-Centerboren-Metaal/dp/B076XWBB1Q/ref=sr_1_1?mk_nl_NL=%C3%85M%C3%85%C5%BD%C3%95%C3%91&crd=21Y6BELAX8247&keywords=CMSBNAN01774&qid=1649351431&sprefix=cmsbnan01774%2Caps%2C61&sr=8-1 | |
| Carbide PCB Drill Bit 10pcs 0.3-1.2mm 1/8 Shank | XCAN | N/A | Aliexpress | 1 | € 3,83 | € 3,83 | https://www.aliexpress.com/item/1005004003118963.html?spm=a2g0o.store_pc_groupList.8148356.43.55527241n95xmb&pdp_npi=2%40dis%21EUR%21%E2%82%AC%208%2C50%21%E2%82%AC%203%2C83%21%21%21%21%21%400b0a0ac216649900500124338e88d0%2112000027710552250%21sh | |
| Carbide Boring tool, minimum diameter 3 mm | MZG | SBFR30100R010-D4 | Aliexpress | 1 | € 6,43 | € 6,43 | https://www.aliexpress.com/item/4000833154299.html?spm=a2g0o.store_pc_allProduct.8148356.1.3f8c251aBiibxi&pdp_npi=2%40dis%21EUR%21%E2%82%AC%2012%2C67%21%E2%82%AC%209%2C12%21%21%21%21%21%400b0a050b16649897207677586eed62%2110000008697094724%21sh | |
| Carbide Boring tool, minimum diameter 5 mm | MZG | SBFR50200R020-D6 | Aliexpress | 1 | € 9,65 | € 9,65 | https://www.aliexpress.com/item/4000833154299.html?spm=a2g0o.store_pc_allProduct.8148356.1.3f8c251aBiibxi&pdp_npi=2%40dis%21EUR%21%E2%82%AC%2012%2C67%21%E2%82%AC%209%2C12%21%21%21%21%21%400b0a050b16649897207677586eed62%2110000008697094724%21sh | Used in Emco lathe retrofit video part 5 for enlarging pulley inner diameter |

| Description | Brand, type | Type/part number | Supplier | Qty | Price (Euro) | Subtotal | Link | Comments |
|---|------------------|------------------|------------------|-----|--------------|----------|---|----------|
| | | | | | | | C12%21%21%21%21%21%400b0a050b16649897207677586eed62%2110000008697094724%21sh | |
| Miscellaneous | | | | | | | | |
| ER20 collet holder (for emco compact 5) | RCM-Machines.com | RCFUC5ER20 | RCM-Machines.com | 1 | € 55,85 | € 55,85 | https://www.rcm-machines.com/en/rcm-production/chucker/spannzangenfutter-er20-fuer-emco-compact-5/rcfuc5er20 | |
| 13pcs 1-13mm ER20 Spring Collet Set | HomdMarket | B07G6WMDVK | Amazon.nl | 1 | € 22,96 | € 22,96 | https://www.amazon.nl/1-13mm-Spring-Collet-Workholding-Graveren/dp/B07G6WMDVK/ref=sr_1_6?__mk_nl_NL=%C3%85M%C3%85C5%BD%C3%95C3%91&crd=2MLOZ42Q3QK1P&keywords=ER20+Spring+Collet+Set&qid=1649351573&sprefix=er20+spring+collet+set%2Caps%2C69&sr=8-6 | |

3. SZGH Controller IO

| Name | IO | Description | Used in this retrofit? |
|--------------------------|-----|-----------------------------|--|
| No.00 Alarm | M80 | | |
| No.01 Alarm | M81 | | |
| No.02 Alarm | M82 | | |
| No.03 Alarm | M83 | | |
| No.04 Alarm | M84 | | |
| Door Is Open | M85 | | |
| No.05 Alarm | M86 | | |
| No.06 Alarm | M87 | | |
| No.07 Alarm | M88 | | |
| Non Lubricate Oil | M89 | | |
| Spindle Don't Chuck well | M90 | | |
| No.10 Alarm | M91 | | |
| +5V Undervoltage | M92 | | |
| +24V Undervoltage | M93 | | |
| No.11 Alarm | M94 | | |
| No.12 Alarm | M95 | | |
| T01 | X00 | Tool1 position input signal | Tool1 position input signal |
| T02 | X01 | Tool1 position input signal | Signal for eacht turret position (counting turret) |
| T03 | X02 | Tool1 position input signal | |
| T04 | X03 | Tool1 position input signal | |
| T05 | X04 | Tool1 position input signal | |
| T06 | X05 | Tool1 position input signal | |
| T07 | X06 | Tool1 position input signal | |
| T08 | X07 | Tool1 position input signal | |
| M34/A0 | X08 | Zero point of A axis | Not used |
| -L | X09 | Negative limit | Not used |
| +L | X10 | Positive limit | Not used |
| M36/Y0 | X11 | Zero point of Y axis | Not used |
| X0 | X12 | Zero point of X axis | Home switch X axis |
| Z0 | X13 | Zero point of Z axis | Home switch Z axis |
| KRUN | X14 | Run | Not used |
| KHALT | X15 | Pause | Not used |
| XZ0 | X16 | | |
| ZZ0 | X17 | | |
| KLEFT | X18 | | |
| KRIGHT | X19 | | |
| STOP | X20 | E-stop | E-stop button on pendant |
| TOK | X21 | | |
| ALM | X22 | | |
| ALM1 | X23 | Alarm1 of spindle | |
| ALM2 | X24 | Alarm2 of machine tool | |
| M28 | X25 | User defined input2 | |

| Name | IO | Description | Used in this retrofit? |
|------|-----|---------------------------------|--|
| M24 | X26 | User defined input 7 | |
| M22 | X27 | M01 quasi-stop input | |
| M18 | X28 | User defined input1 | |
| M12 | X29 | User defined input3 | |
| M14 | X30 | User defined input4 | Used for external E-stop. Ladder has been modified for this to work. |
| M16 | X31 | User defined input5 | |
| M61 | Y00 | User defined output 1 | |
| M63 | Y01 | User defined output 2 | |
| M65 | Y02 | User defined output 3 | |
| M67 | Y03 | User defined output 4 | |
| M69 | Y04 | User defined output 5 | |
| M71 | Y05 | User defined output 6 | |
| M73 | Y06 | User defined output 7 | |
| M59 | Y07 | Huff (mist?) output | Not used |
| M32 | Y08 | Lubrication | Not used |
| M79 | Y09 | Tailstock | Not used |
| M10 | Y10 | Chuck | Not used |
| M08 | Y11 | Coolant | Not used |
| M05 | Y12 | Stop Spindle | |
| M04 | Y13 | Spindle Counter Clockwise | |
| M03 | Y14 | Spindle Clockwise | |
| M75 | Y15 | Spindle control mode for C-axis | Not used |
| LRUN | Y16 | | |
| INTH | Y17 | | |
| +T | Y18 | Control rotation of turret | Rotate Turret |
| -T | Y19 | Control rotation of turret | Not used (Turret rotates back into position automatically) |
| S04 | Y20 | Spindle fourth gear | |
| S03 | Y21 | Spindle third gear | |
| S02 | Y22 | Spindle second gear | |
| S01 | Y23 | Spindle first gear | |
| K01 | Y24 | | |
| K02 | Y25 | | |
| K03 | Y26 | | |
| Y27 | | | |
| Y28 | | | |
| Y29 | | | |
| H | Y30 | | |
| | Y31 | | |
| | X32 | | |
| | X33 | | |
| | X34 | | |
| | X35 | | |

| Name | IO | Description | Used in this retrofit? |
|------|-----|-------------|------------------------|
| | X36 | | |
| | X37 | | |
| | X38 | | |
| | X39 | | |
| | X40 | | |
| | X41 | | |
| | X42 | | |
| | X43 | | |
| | X44 | | |
| | X45 | | |
| | X46 | | |
| G | X47 | | |
| | Y32 | | |
| | Y33 | | |
| | Y34 | | |
| | Y35 | | |
| | Y36 | | |
| | Y37 | | |
| | Y38 | | |
| | Y39 | | |
| | Y40 | | |
| | Y41 | | |
| | Y42 | | |
| | Y43 | | |
| | Y44 | | |
| | Y45 | | |
| | Y46 | | |
| | Y47 | | |
| | Y48 | | |
| | Y49 | | |
| | Y50 | | |
| | Y51 | | |
| | Y52 | | |
| | Y53 | | |
| | Y54 | | |
| | Y55 | | |
| | Y56 | | |
| | Y57 | | |
| | Y58 | | |
| | Y59 | | |
| | Y60 | | |
| | Y61 | | |
| | Y62 | | |
| | Y63 | | |

4. VFD Parameters – Sako SKI780-0D75G-1

In the table below the settings are listed that I have either changed, or might be of interest. For the full parameter list and description, refer to the user manual.

| Parameter code | Description | My Setting | Description |
|----------------|----------------------|-----------------------------------|---|
| P0-01 | Motor Control Mode | 0: Sensorless flux vector control | Default was V/F control (2). This gave a high pith noise mainly when accelerating and decelerating. The Flux vector control is a method where amplitude frequency and phase are varied to keep the motor at the intended speed. This is an efficient method to control a motor and adapts to the motor dynamics without the need for encoder feedback. |
| P0-015 | Carrier frequency | 16 kHz | This is the switching frequency of the VFD. A higher frequency generates a cleaner waveform, reduces high pitch noise from the motor and increases efficiency. There are however also downsides: Reduces the life of the VFD, generates more heat and increases the EMI, which may affect the functioning of other components in the system. So there is a tradeoff. I am setting this as high as possible to reduce noise, but might have to lower it if I run into issues with EMI. |
| P0-17 | Acceleration time | 3sec | Default: 10 |
| | | | For now I have set this to 3 seconds, will test later if this can be further decreased. |
| | | | This is applies to the maximum RPM, so it would only take half the time if you program the spindle to 50% of the maximum RPM |
| P0-18 | Deceleration time | 3sec | Default:10 |
| | | | For now I have set this to 3 seconds, will test later if this can be further decreased. |
| | | | Similar to the acceleration time this also applies to decelerating from the maximum RPM to zero. |
| P0-19 | Time Unit | sec | Default:1 |
| P1-00 | Motor Type Selection | 0 | Common Asynchronous Motor (default) |
| P1-01 | Rated Motor Power | 0.4kW | Rounded up from 0.37kW |
| P1-02 | Rated Motor Voltage | 230VAC | Rated motor voltage for the Delta Configuration |

| Parameter code | Description | My Setting | Description |
|----------------|------------------------------|-------------------|---|
| P1-03 | Rated motor current | 2.1A | Rated motor current for the Delta Configuration. Setting this should allow the VFD's electronic overload function to stop the motor and generate a fault based on a calculated overload value based on current, frequency motor characteristics and time. |
| P1-04 | Rated motor frequency | 50Hz | For now I have this at 50 Hz, which leads to a maximum of 1370 RPM. I will see how far I want to increase this later. |
| P1-05 | Rated motor rotational speed | 1370 RPM (@ 50Hz) | Initial maximum set value. After Replacing the spindle bearings, which were worn out, I will increase this max RPM |
| P1-10 | No load current | 0.63A | This is set to 30% of FLA for now: $0.3 * 2.1 = 0.63A$ |
| P1-37 | Auto Tuning | 0 | Left Auto tuning off for now, test auto tuning later. |