# LAMPIRAN

**Lampiran 1. Tautan Video Simulasi Kinematika dan Dinamika**

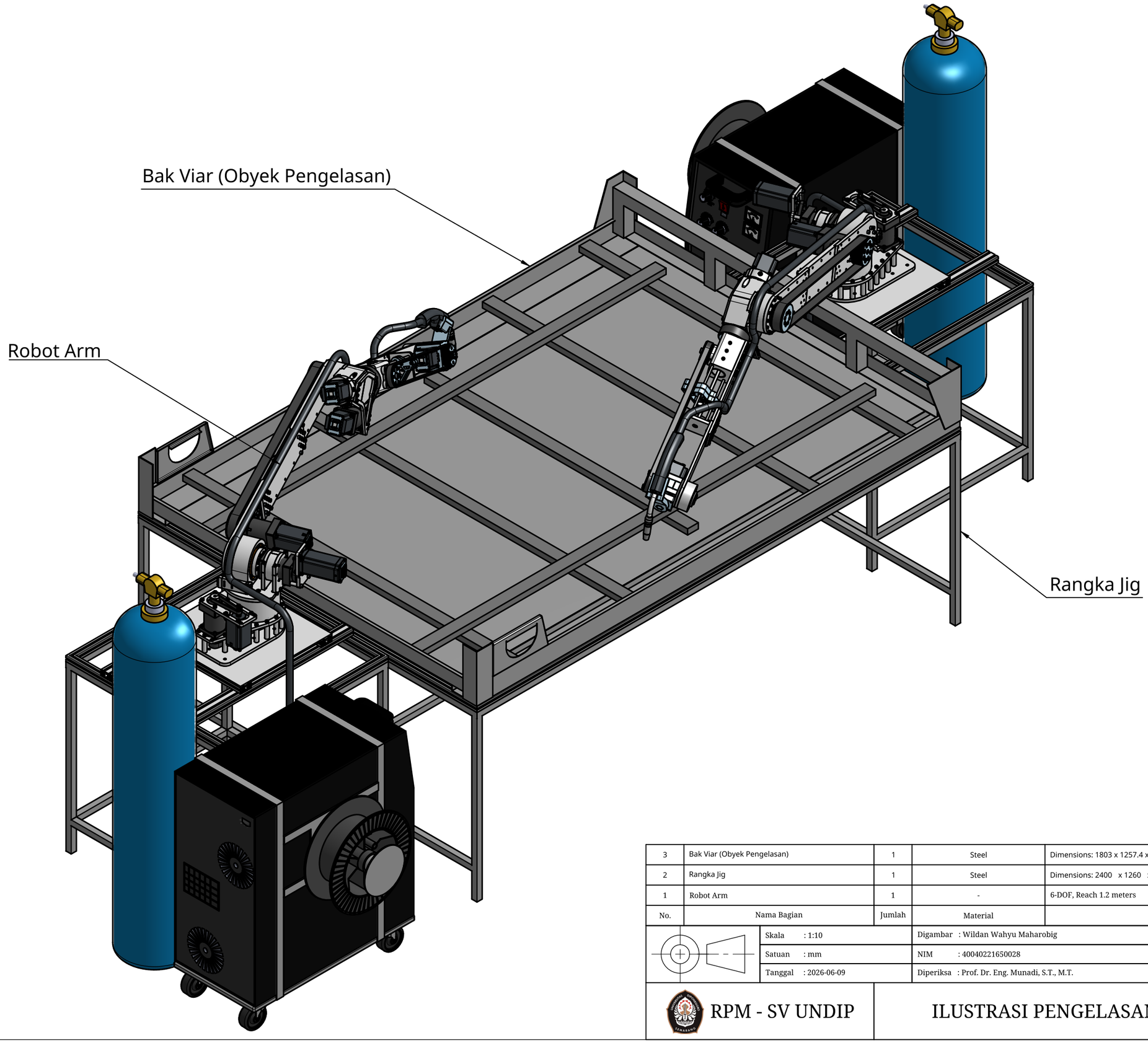


https://bit.ly/simulasi-kinematika-dan-dinamika

**Lampiran 2. Tautan Video Contoh Operasional Gerak Robot**



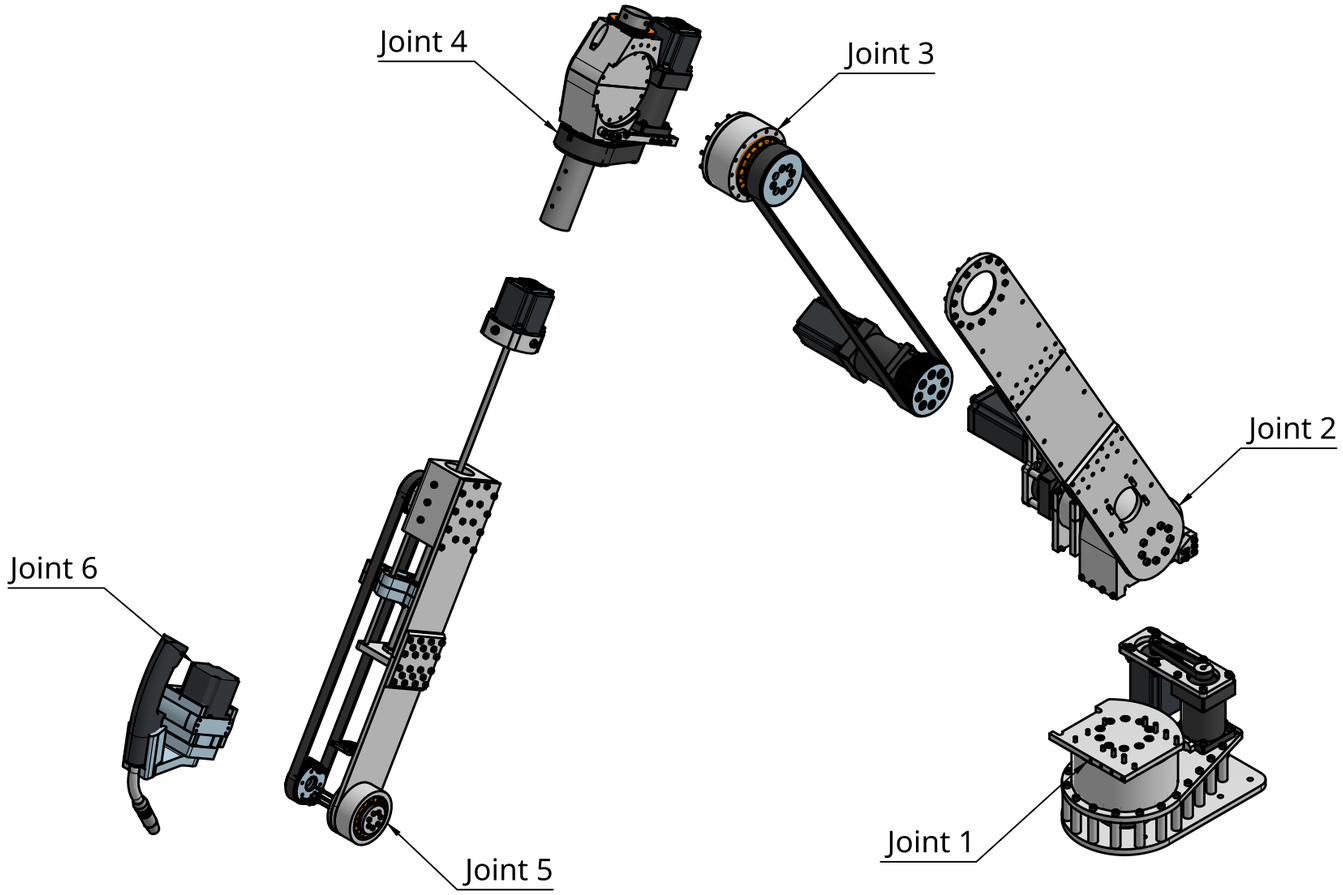
https://bit.ly/contoh-operasional-gerak-robot



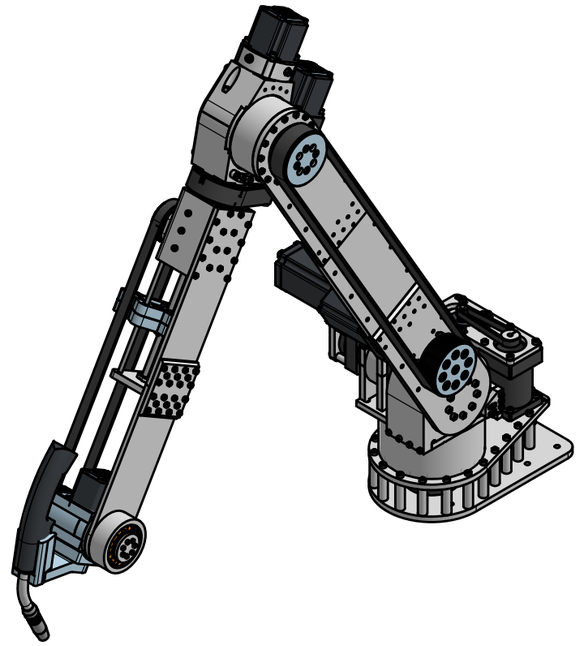

| No. | Nama Bagian | Jumlah | Material | Spesifikasi / Dimensi |
|---|---|---|---|---|
| 3 | Bak Viar (Obyek Pengelasan) | 1 | Steel | Dimensions: 1803 x 1257.4 x 195.7 mm |
| 2 | Rangka Jig | 1 | Steel | Dimensions: 2400 x 1260 x 675 mm |
| 1 | Robot Arm | 1 | - | 6-DOF, Reach 1.2 meters |

| | | | |
|---|---|---|---|
| Skala : 1:10 | Digambar : Wildan Wahyu Maharobig | Keterangan: | |
| Satuan : mm | NIM : 40040221650028 | | |
| Tanggal : 2026-06-09 | Diperiksa : Prof. Dr. Eng. Munadi, S.T., M.T. | | |

| | | | |
|---|---|---|---|
| RPM - SV UNDIP | ILUSTRASI PENGELASAN | 1/8 | A3 |




Exploded View

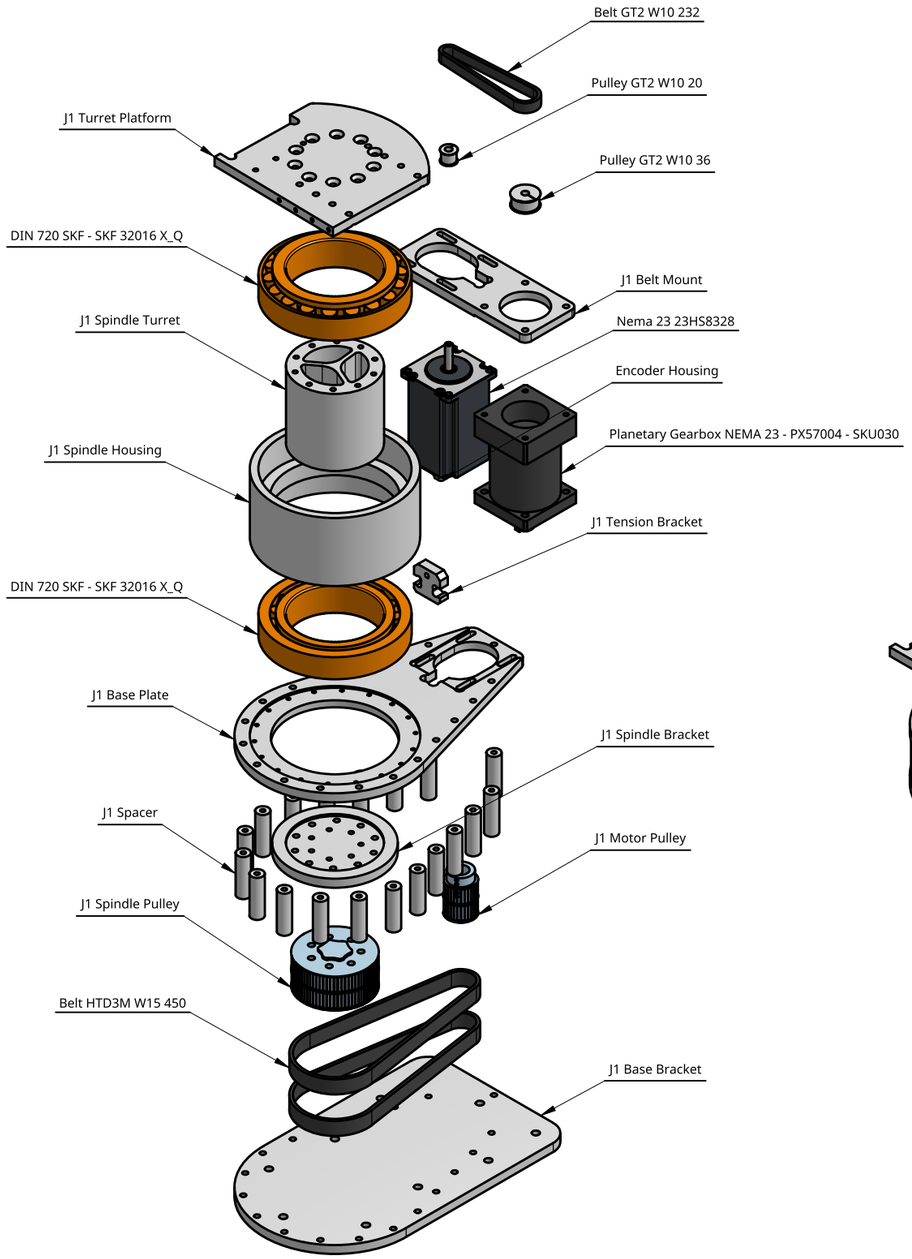


Assembly View

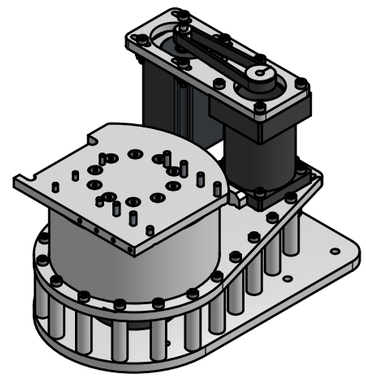
| No. | Nama Bagian | Jumlah | Material | Spesifikasi / Dimensi |
|---|---|---|---|---|
| 6 | Joint 6 | 1 | - | Actuator: Stepper 23HS5628 (1.26Nm) |
| 5 | Joint 5 | 1 | - | Actuator: Stepper 23HS5628 (1.26Nm) |
| 4 | Joint 4 | 1 | - | Actuator: Stepper 23HS5628 (1.26Nm) |
| 3 | Joint 3 | 1 | - | Actuator: Stepper Motor 23HS8328 (2.2Nm) |
| 2 | Joint 2 | 1 | - | Actuator: Stepper Motor 5718HB6401 (3.6Nm) |
| 1 | Joint 1 | 1 | - | Actuator: Stepper Motor 23HS8328 (2.2Nm) |

| | | | |
|---|---|---|---|
| Skala : 1:8 | Digambar : Wildan Wahyu Maharobig | Keterangan: | |
| Satuan : mm | NIM : 40040221650028 | | |
| Tanggal : 2026-06-09 | Diperiksa : Prof. Dr. Eng. Munadi, S.T., M.T. | | |

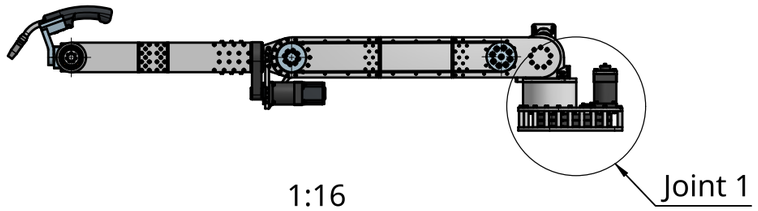
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|---|---|---|---|
| RPM - SV UNDIP | *EXPLODED VIEW* | 2/8 | A3 |




Exploded View



Assembly View



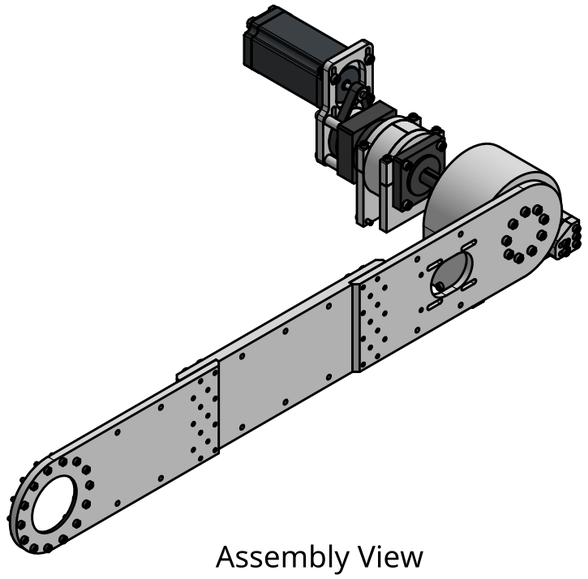

1:16

Full Assembly

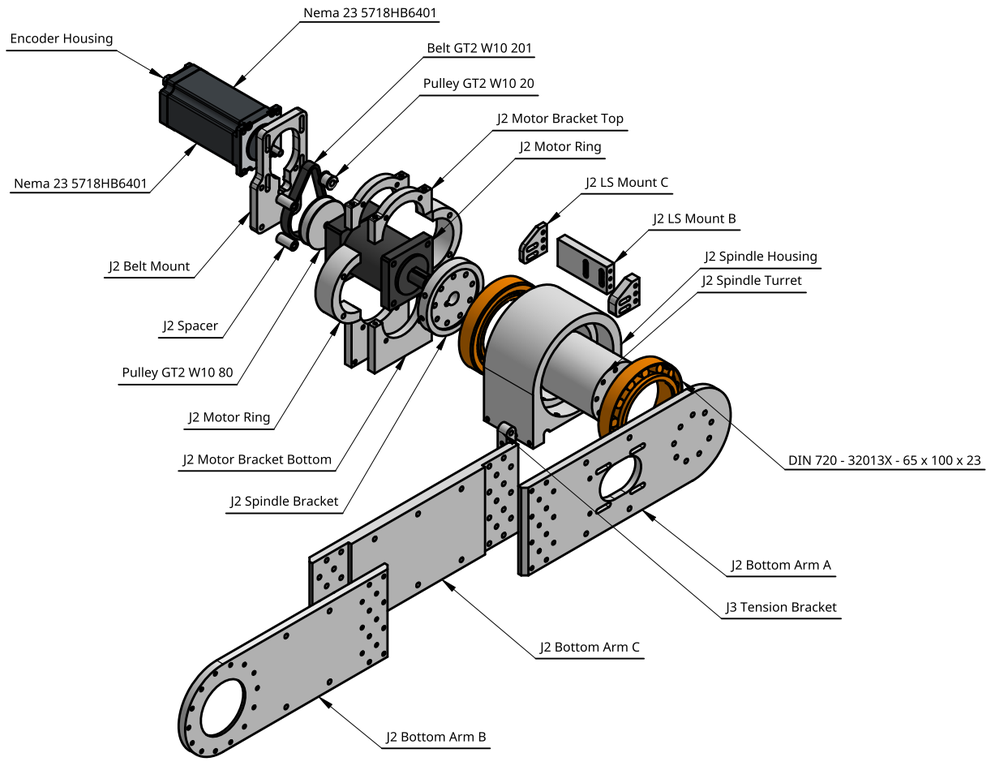
| | | | |
|---|---|---|---|
| 30 | Hex socket countersunk head screw M4x0.7 x 15 | 3 | Steel |
| 29 | Hex socket countersunk head screw M5x0.8 x 20 | 6 | Steel |
| 28 | Hex thin nut grade A & B M5 | 4 | Steel |
| 27 | Hex socket head cap screw M5x0.80 x 14 | 4 | Steel |
| 26 | Hex thin nut grade A & B M4 | 4 | Stainless Steel |
| 25 | Hex socket head cap screw M5x0.80 x 25 | 5 | Steel |
| 24 | Hex socket countersunk head screw M5x0.8 x 30 | 1 | Steel |
| 23 | Hex socket countersunk head screw M5x0.8 x 40 | 7 | Steel |
| 22 | Hex socket head cap screw M3x0.50 x 16 | 18 | Steel |
| 21 | Hex socket head cap screw M5x0.80 x 20 | 23 | Steel |
| 20 | Hex socket countersunk head screw M5x0.8 x 15 | 41 | Steel |
| 19 | Encoder | 1 | N/A |
| 18 | Belt GT2 W10 232 | 1 | Silicone Rubber |
| 17 | Pulley GT2 W10 36 | 1 | Aluminum - 5052 |
| 16 | Pulley GT2 W10 20 | 1 | Aluminum - 5052 |
| 15 | Belt HTD3M W15 450 | 2 | Silicone Rubber |
| 14 | J1 Spindle Pulley | 1 | ABS |
| 13 | J1 Motor Pulley | 1 | ABS |
| 12 | Nema 23 23HS8328 | 1 | Stainless Steel |
| 11 | J1 Belt Mount | 1 | Aluminum - 5052 |
| 10 | Planetary Gearbox NEMA 23 - PX57004 - SKU030 | 1 | Stainless Steel |
| 9 | DIN 720 SKF - SKF 32016 X_Q | 2 | Stainless Steel |
| 8 | J1 Spindle Bracket | 1 | Aluminum - 5052 |
| 7 | J1 Turret Platform | 1 | Aluminum - 5052 |
| 6 | J1 Spindle Turret | 1 | Aluminum - 5052 |
| 5 | J1 Spindle Housing | 1 | Aluminum - 6061 |
| 4 | J1 Tension Bracket | 1 | Aluminum - 5052 |
| 3 | J1 Base Plate | 1 | Aluminum - 5052 |
| 2 | J1 Spacer | 19 | Aluminum - 6061 |
| 1 | J1 Base Bracket | 1 | Aluminum - 5052 |
| **Item** | **Name** | **Quantity** | **Material** |

| | | |
|---|---|---|
| Skala : 1:5 | Digambar : Wildan Wahyu Maharobig | Keterangan: |
| Satuan : mm | NIM : 40040221650028 | |
| Tanggal : 2026-06-09 | Diperiksa : Prof. Dr. Eng. Munadi, S.T., M.T. | |

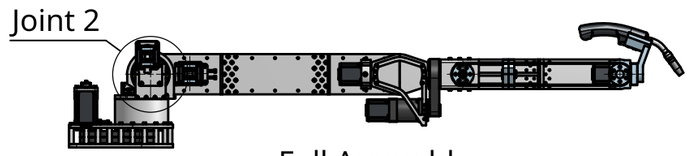
RPM - SV UNDIP | *EXPLODED JOINT 1* | 3/8 | A3



Assembly View




Exploded View

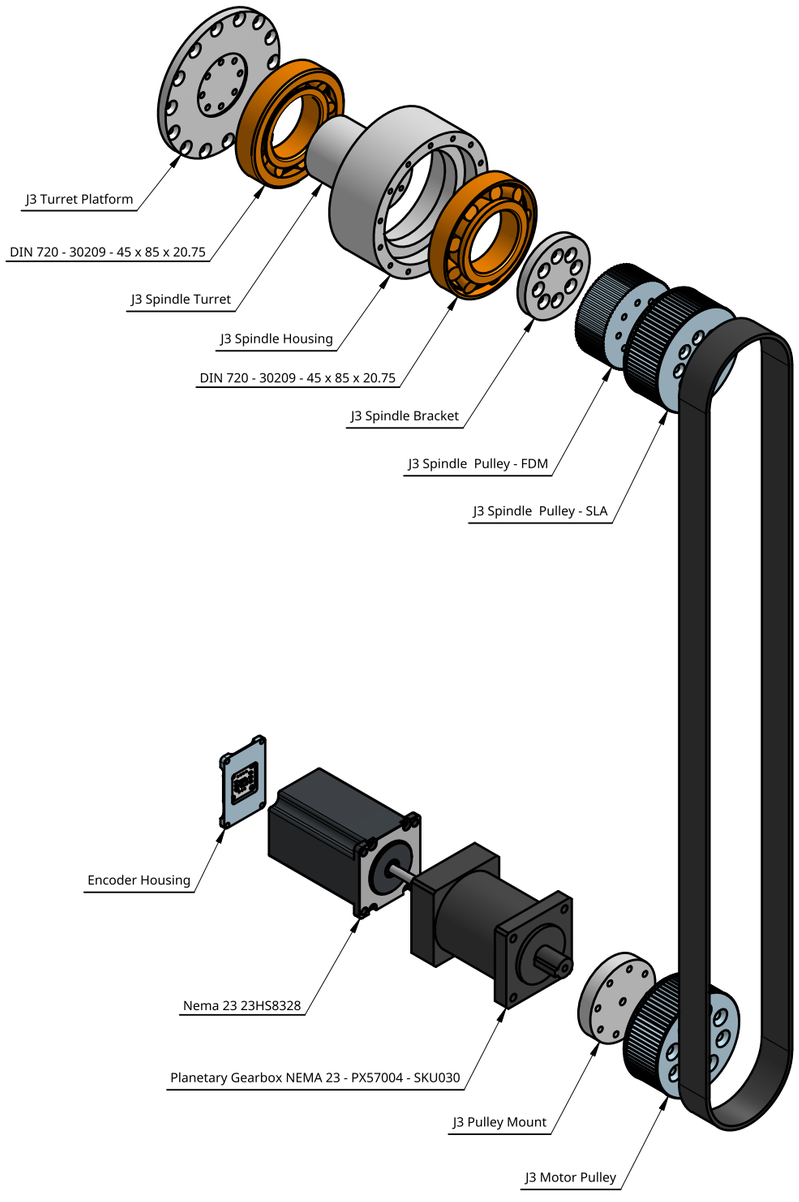



Full Assembly

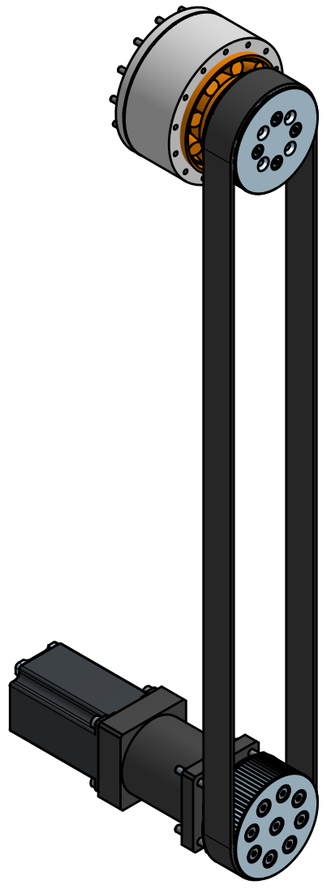
1:16

| Item | Name | Quantity | Material |
|---|---|---|---|
| 36 | Hex thin nut grade A & B M5 | 3 | Steel |
| 35 | Hex socket head cap screw M5x0.80 x 55 | 4 | Steel |
| 34 | Hex socket head cap screw M4x0.70 x 10 | 5 | Steel |
| 33 | Hex socket head cap screw M4x0.70 x 35 | 4 | Steel |
| 32 | Hex socket head cap screw M5x0.80 x 30 | 2 | Steel |
| 31 | Hex socket head cap screw M5x0.80 x 35 | 5 | Steel |
| 30 | Hex socket head cap screw M4x0.70 x 20 | 4 | Steel |
| 29 | Hex socket countersunk head screw M5x0.8 x 20 | 9 | Steel |
| 28 | Hex socket head cap screw M5x0.80 x 20 | 14 | Steel |
| 27 | Hex socket head cap screw M5x0.80 x 16 | 28 | Steel |
| 26 | Hex socket head cap screw M4x0.70 x 15 | 23 | Steel |
| 25 | J2 Spacer | 3 | Aluminum - 6061 |
| 24 | Encoder | 1 | N/A |
| 23 | Belt GT2 W10 201 | 1 | Silicone Rubber |
| 22 | Pulley GT2 W10 80 | 1 | Aluminum - 5052 |
| 21 | Pulley GT2 W10 20 | 1 | Aluminum - 5052 |
| 20 | J2 LS Mount C | 1 | Aluminum - 5052 |
| 19 | J2 LS Mount B | 1 | Aluminum - 5052 |
| 18 | J2 LS Mount A | 1 | Aluminum - 5052 |
| 17 | Nema 23 5718HB6401 | 1 | Stainless Steel |
| 16 | J2 Belt Mount | 1 | Aluminum - 5052 |
| 15 | J2 Motor Ring | 1 | Aluminum - 6061 |
| 14 | J2 Motor Ring | 1 | Aluminum - 6061 |
| 13 | J2 Motor Support Top | 1 | Aluminum - 5052 |
| 12 | J2 Motor Support Bottom | 1 | Aluminum - 5052 |
| 11 | J2 Motor Bracket Top | 1 | Aluminum - 5052 |
| 10 | J2 Motor Bracket Bottom | 1 | Aluminum - 5052 |
| 9 | Planetary Gearbox NEMA 23 - PX57004 - SKU030 | 1 | Stainless Steel |
| 8 | DIN 720 - 32013X - 65 x 100 x 23 | 2 | Stainless Steel |
| 7 | J2 Spindle Bracket | 1 | Aluminum - 5052 |
| 6 | J2 Spindle Turret | 1 | Aluminum - 6061 |
| 5 | J3 Tension Bracket | 1 | Aluminum - 5052 |
| 4 | J2 Bottom Arm C | 1 | Aluminum - 5052 |
| 3 | J2 Bottom Arm B | 1 | Aluminum - 5052 |
| 2 | J2 Bottom Arm A | 1 | Aluminum - 5052 |
| 1 | J2 Spindle Housing | 1 | Aluminum - 5052 |

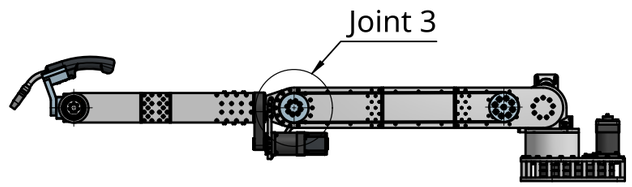
| | | | |
|---|---|---|---|
| Skala : 1:6 | Digambar : Wildan Wahyu Maharobig | Keterangan: | |
| Satuan : mm | NIM : 40040221650028 | | |
| Tanggal : 2026-06-09 | Diperiksa : Prof. Dr. Eng. Munadi, S.T., M.T. | | |
| RPM - SV UNDIP | *EXPLODED JOINT 2* | 4/8 | A3 |




Exploded View



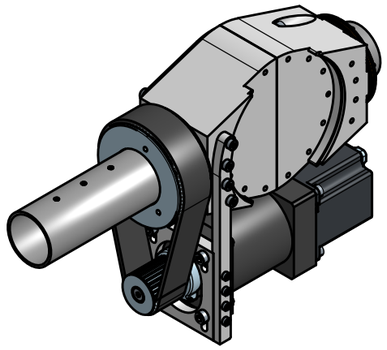
Assembly View



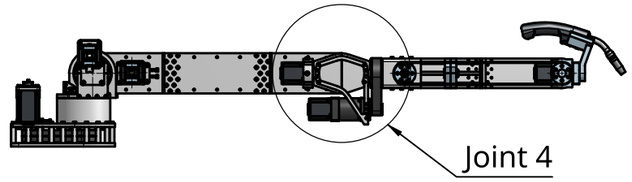

1:16
Full Assembly

| Item | Name | Quantity | Material |
|---|---|---|---|
| 21 | Hex socket countersunk head screw M5x0.8 x 45 | 1 | Steel |
| 20 | Hex socket countersunk head screw M4x0.7 x 40 | 4 | Steel |
| 19 | Hex socket countersunk head screw M4x0.7 x 15 | 26 | Steel |
| 18 | Hex thin nut grade A & B M5 | 4 | Steel |
| 17 | Hex socket head cap screw M5x0.80 x 30 | 4 | Steel |
| 16 | Hex socket head cap screw M5x0.80 x 14 | 4 | Steel |
| 15 | Hex socket head cap screw M4x0.70 x 10 | 2 | Steel |
| 14 | Hex socket countersunk head screw M5x0.8 x 25 | 8 | Steel |
| 13 | Encoder | 1 | N/A |
| 12 | Nema 23 23HS8328 | 1 | Stainless Steel |
| 11 | Belt HTD3M W25 dis650 | 1 | Silicone Rubber |
| 10 | J3 Spindle  Pulley - SLA | 1 | ABS |
| 9 | J3 Spindle  Pulley - FDM | 1 | PLA |
| 8 | J3 Motor Pulley | 1 | ABS |
| 7 | J3 Pulley Mount | 1 | Aluminum - 5052 |
| 6 | Planetary Gearbox NEMA 23 - PX57004 - SKU030 | 1 | Stainless Steel |
| 5 | DIN 720 - 30209 - 45 x 85 x 20.75 | 2 | Stainless Steel |
| 4 | J3 Spindle Bracket | 1 | Aluminum - 5052 |
| 3 | J3 Turret Platform | 1 | Aluminum - 5052 |
| 2 | J3 Spindle Turret | 1 | Aluminum - 6061 |
| 1 | J3 Spindle Housing | 1 | Aluminum - 6061 |

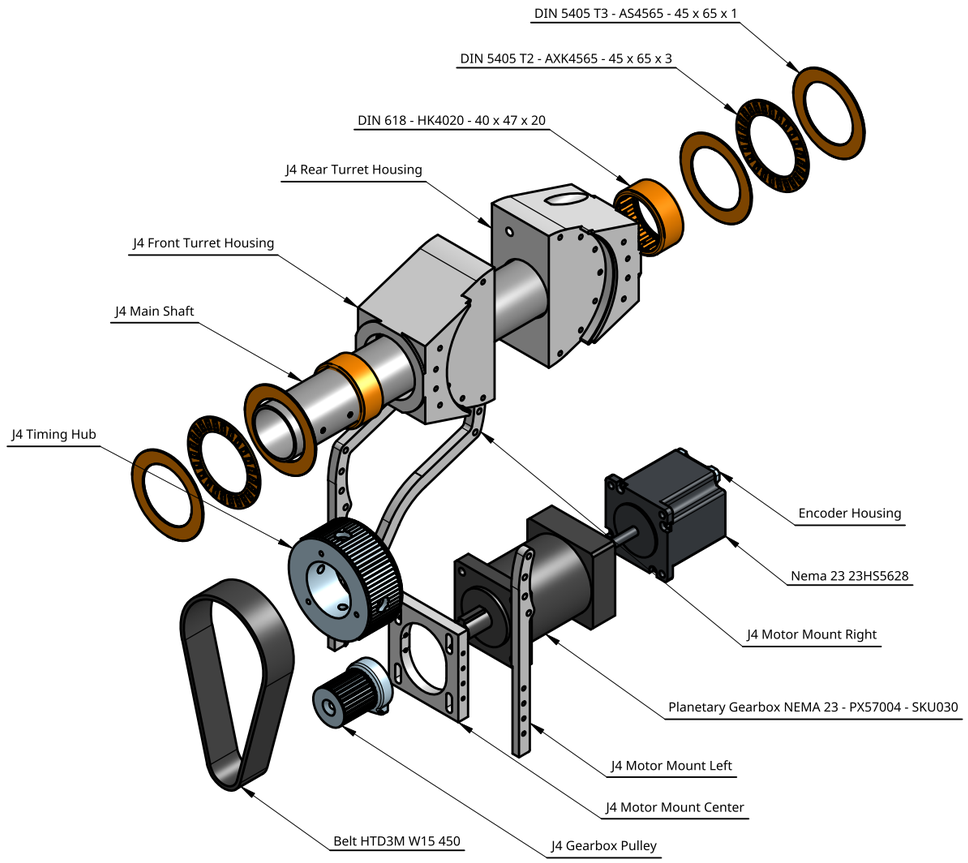
| | | | |
|---|---|---|---|
| Skala : 1:4 | Digambar : Wildan Wahyu Maharobig | Keterangan: | |
| Satuan : mm | NIM : 40040221650028 | | |
| Tanggal : 2026-06-09 | Diperiksa : Prof. Dr. Eng. Munadi, S.T., M.T. | | |
| RPM - SV UNDIP | *EXPLODED JOINT 3* | 5/8 | A3 |



Assembly View




1:16
Full Assembly

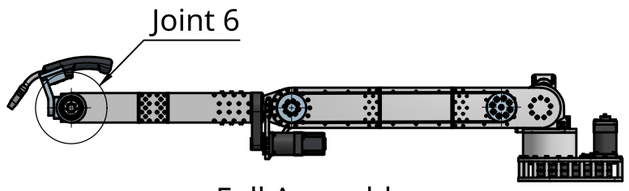



Exploded View

| Item | Name | Quantity | Material |
|---|---|---|---|
| 23 | Hex socket countersunk head screw M5x0.8 x 30 | 1 | Steel |
| 22 | Hex socket head cap screw M5x0.80 x 16 | 4 | Steel |
| 21 | Hex thin nut grade A & B M5 | 4 | Steel |
| 20 | Hex socket head cap screw M5x0.80 x 25 | 4 | Steel |
| 19 | Hex socket head cap screw M5x0.80 x 14 | 4 | Steel |
| 18 | Hex socket head cap screw M6x1.00 x 45 | 2 | Steel |
| 17 | Hex socket head cap screw M3x0.50 x 10 | 8 | Steel |
| 16 | Hex socket head cap screw M4x0.70 x 15 | 12 | Steel |
| 15 | Encoder | 1 | N/A |
| 14 | Nema 23 23HS5628 | 1 | Stainless Steel |
| 13 | Belt HTD3M W15 450 | 1 | Silicone Rubber |
| 12 | J4 Timing Hub | 1 | ABS |
| 11 | J4 Gearbox Pulley | 1 | ABS |
| 10 | Planetary Gearbox NEMA 23 - PX57004 - SKU030 | 1 | Stainless Steel |
| 9 | J4 Motor Mount Right | 1 | Aluminum - 5052 |
| 8 | J4 Motor Mount Left | 1 | Aluminum - 5052 |
| 7 | J4 Motor Mount Center | 1 | Aluminum - 5052 |
| 6 | DIN 5405 T3 - AS4565 - 45 x 65 x 1 | 4 | Stainless Steel |
| 5 | DIN 5405 T2 - AXK4565 - 45 x 65 x 3 | 2 | Stainless Steel |
| 4 | DIN 618 - HK4020 - 40 x 47 x 20 | 2 | Stainless Steel |
| 3 | J4 Main Shaft | 1 | Stainless Steel |
| 2 | J4 Rear Turret Housing | 1 | Aluminum - 6061 |
| 1 | J4 Front Turret Housing | 1 | Aluminum - 6061 |

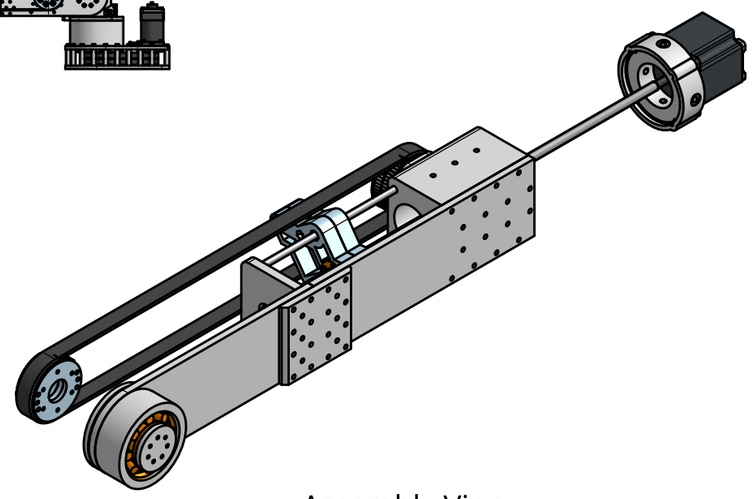
| | | | |
|---|---|---|---|
| Skala : 1:4 | Digambar : Wildan Wahyu Maharobig | Keterangan: | |
| Satuan : mm | NIM : 40040221650028 | | |
| Tanggal : 2026-06-09 | Diperiksa : Prof. Dr. Eng. Munadi, S.T., M.T. | | |

| | | | |
|---|---|---|---|
| RPM - SV UNDIP | *EXPLODED JOINT 4* | 6/8 | A3 |

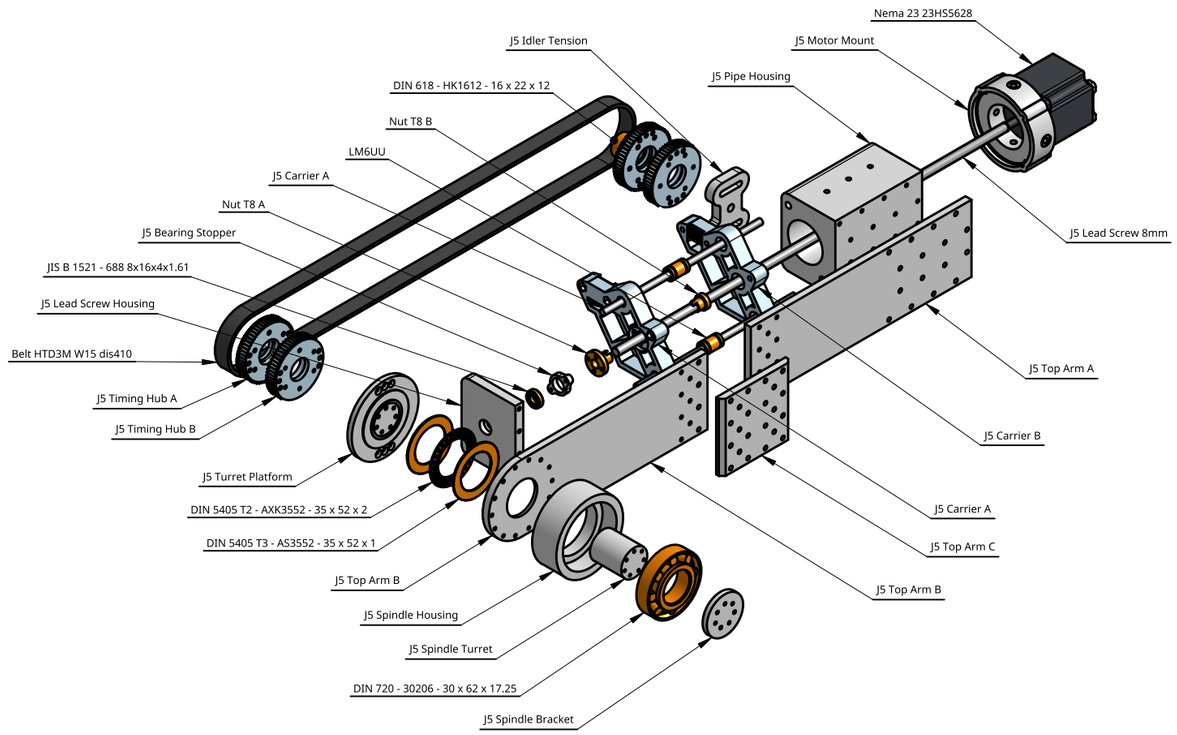



Full Assembly

1:16



Assembly View

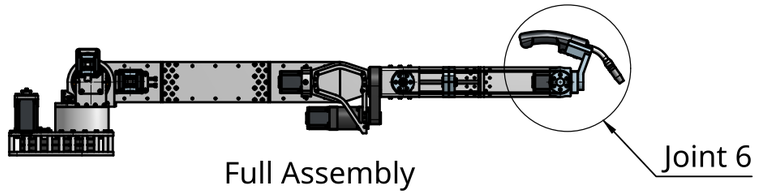



Exploded View

| Item | Name | Quantity | Material |
|---|---|---|---|
| 44 | Hex socket countersunk head screw M3x0.5 x 40 | 6 | Steel |
| 43 | Hex socket head cap screw M3x0.50 x 30 | 6 | Steel |
| 42 | Hex thin nut grade A & B M4 | 3 | Steel |
| 41 | Hex thin nut grade A & B M3 | 16 | Steel |
| 40 | Hex socket countersunk head screw M3x0.5 x 20 | 4 | Steel |
| 39 | Hex socket head cap screw M5x0.80 x 16 | 2 | Steel |
| 38 | Hex socket head cap screw M8x1.25 x 30 | 1 | Steel |
| 37 | Chamfered plain washer normal M10 | 1 | Steel |
| 36 | Hex socket countersunk head screw M3x0.5 x 14 | 26 | Steel |
| 35 | Hex socket countersunk head screw M3x0.5 x 10 | 7 | Steel |
| 34 | Hex socket head cap screw M3x0.50 x 10 | 7 | Steel |
| 33 | Hex socket head cap screw M4x0.70 x 15 | 34 | Steel |
| 32 | Hex socket head cap screw M4x0.70 x 25 | 13 | Steel |
| 31 | Hex socket head cap screw M5x0.80 x 14 | 4 | Steel |
| 30 | Hex socket head cap screw M5x0.80 x 20 | 4 | Steel |
| 29 | Belt HTD3M W15 dis410 | 1 | Silicone Rubber |
| 28 | Nema 23 23HS5628 | 1 | Stainless Steel |
| 27 | J5 Motor Mount | 1 | Aluminum - 6061 |
| 26 | DIN 618 - HK1612 - 16 x 22 x 12 | 1 | Stainless Steel |
| 25 | J5 Timing Hub B | 2 | ABS |
| 24 | J5 Timing Hub A | 2 | ABS |
| 23 | J5 Bearing Post | 1 | Aluminum - 5052 |
| 22 | J5 Idler Tension | 1 | Aluminum - 5052 |
| 21 | LM6UU | 2 | Stainless Steel |
| 20 | Nut T8 B | 1 | Brass |
| 19 | Nut T8 A | 1 | Brass |
| 18 | JIS B 1521 - 688 8x16x4x1.61 | 1 | Stainless Steel |
| 17 | J5 Lead Screw 8mm | 1 | Stainless Steel |
| 16 | J5 Rod 6mm | 2 | Stainless Steel |
| 15 | DIN 5405 T3 - AS3552 - 35 x 52 x 1 | 2 | Stainless Steel |
| 14 | DIN 5405 T2 - AXK3552 - 35 x 52 x 2 | 1 | Stainless Steel |
| 13 | DIN 720 - 30206 - 30 x 62 x 17.25 | 1 | Stainless Steel |
| 12 | J5 Spindle Bracket | 1 | Aluminum - 5052 |
| 11 | J5 Turret Platform | 1 | Aluminum - 5052 |
| 10 | J5 Spindle Turret | 1 | Aluminum - 6061 |
| 9 | J5 Spindle Housing | 1 | Aluminum - 6061 |
| 8 | J5 Top Arm C | 1 | Aluminum - 5052 |
| 7 | J5 Top Arm B | 1 | Aluminum - 5052 |
| 6 | J5 Top Arm A | 1 | Aluminum - 5052 |
| 5 | J5 Bearing Stopper | 1 | Aluminum - 5052 |
| 4 | J5 Lead Screw Housing | 1 | Aluminum - 5052 |
| 3 | J5 Carrier B | 1 | PLA |
| 2 | J5 Carrier A | 1 | PLA |
| 1 | J5 Pipe Housing | 1 | Aluminum - 5052 |

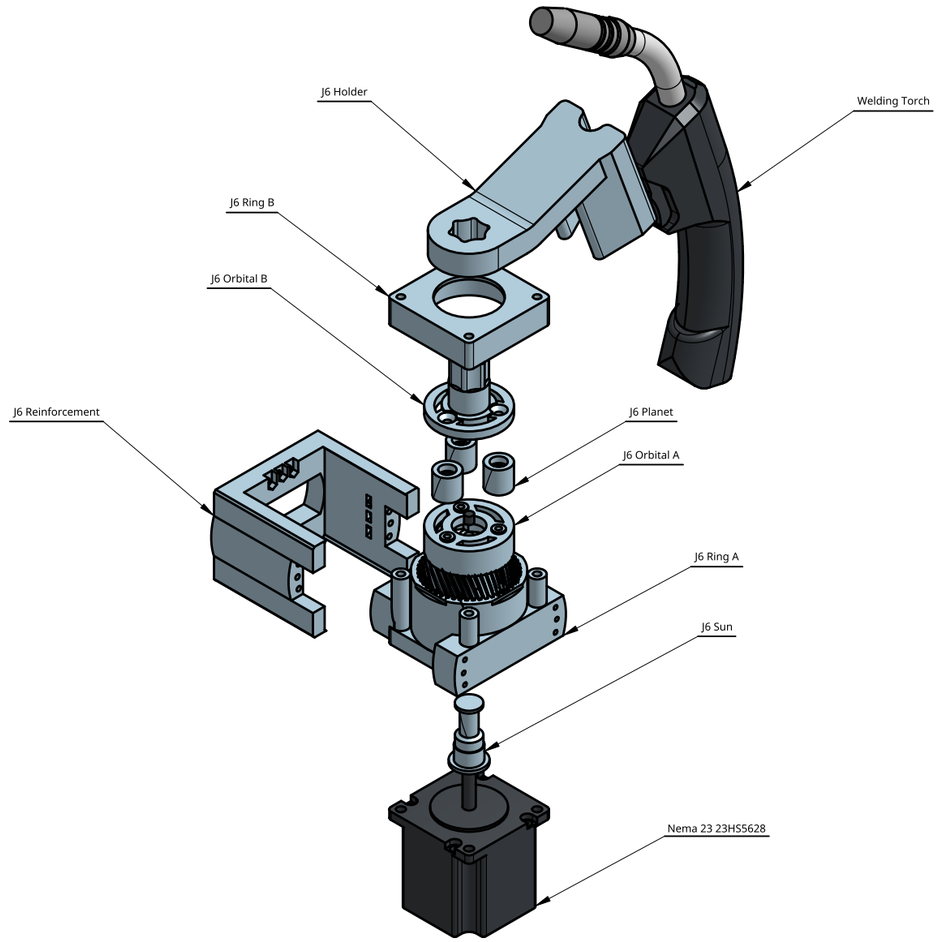
| | | | |
|---|---|---|---|
| Skala : 1:5 | Digambar : Wildan Wahyu Maharobig | Keterangan: | |
| Satuan : mm | NIM : 40040221650028 | | |
| Tanggal : 2026-06-09 | Diperiksa : Prof. Dr. Eng. Munadi, S.T., M.T. | | |

| | | | |
|---|---|---|---|
| RPM - SV UNDIP | *EXPLODED JOINT 5* | 7/8 | A3 |

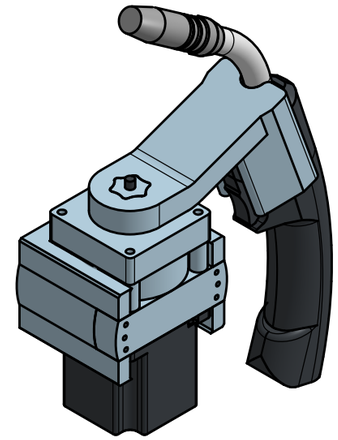



Full Assembly

1:16




Exploded View



Assembly View

| Item | Name | Quantity | Material |
|---|---|---|---|
| 10 | Welding Torch | 1 | ABS |
| 9 | J6 Holder | 1 | PLA |
| 8 | Nema 23 23HS5628 | 1 | Stainless Steel |
| 7 | J6 Reinforcement | 1 | PLA |
| 6 | J6 Orbital B | 1 | PLA |
| 5 | J6 Planet | 3 | ABS |
| 4 | J6 Orbital A | 1 | PLA |
| 3 | J6 Sun | 1 | ABS |
| 2 | J6 Ring B | 1 | PLA |
| 1 | J6 Ring A | 1 | ABS |

| | | | |
|---|---|---|---|
| Skala : 1:3 | Digambar : Wildan Wahyu Maharobig | Keterangan: | |
| Satuan : mm | NIM : 40040221650028 | | |
| Tanggal : 2026-06-09 | Diperiksa : Prof. Dr. Eng. Munadi, S.T., M.T. | | |

| | | | |
|---|---|---|---|
| RPM - SV UNDIP | *EXPLODED JOINT 6* | 8/8 | A3 |