

# OPERATION AND MAINTENANCE MANUAL

Model: M701

Equipment S/N: M70101125

Document Date / Rev.:1 NOVEMBER 2025

## 1-INTRODUCTION

## 2-SPECIFICATIONS

## 3-INSTALLATION

## 4-OPERATION & MAINTENANCE

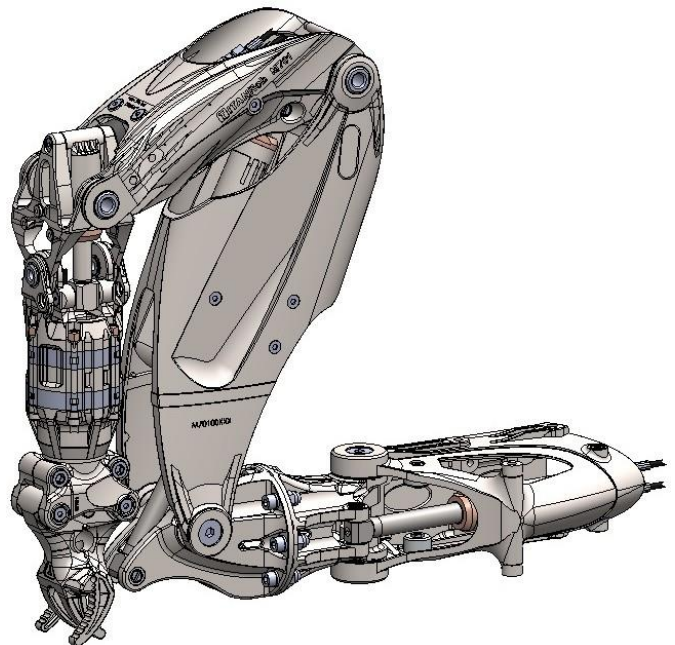
## 5-DOCUMENTS & DRAWINGS

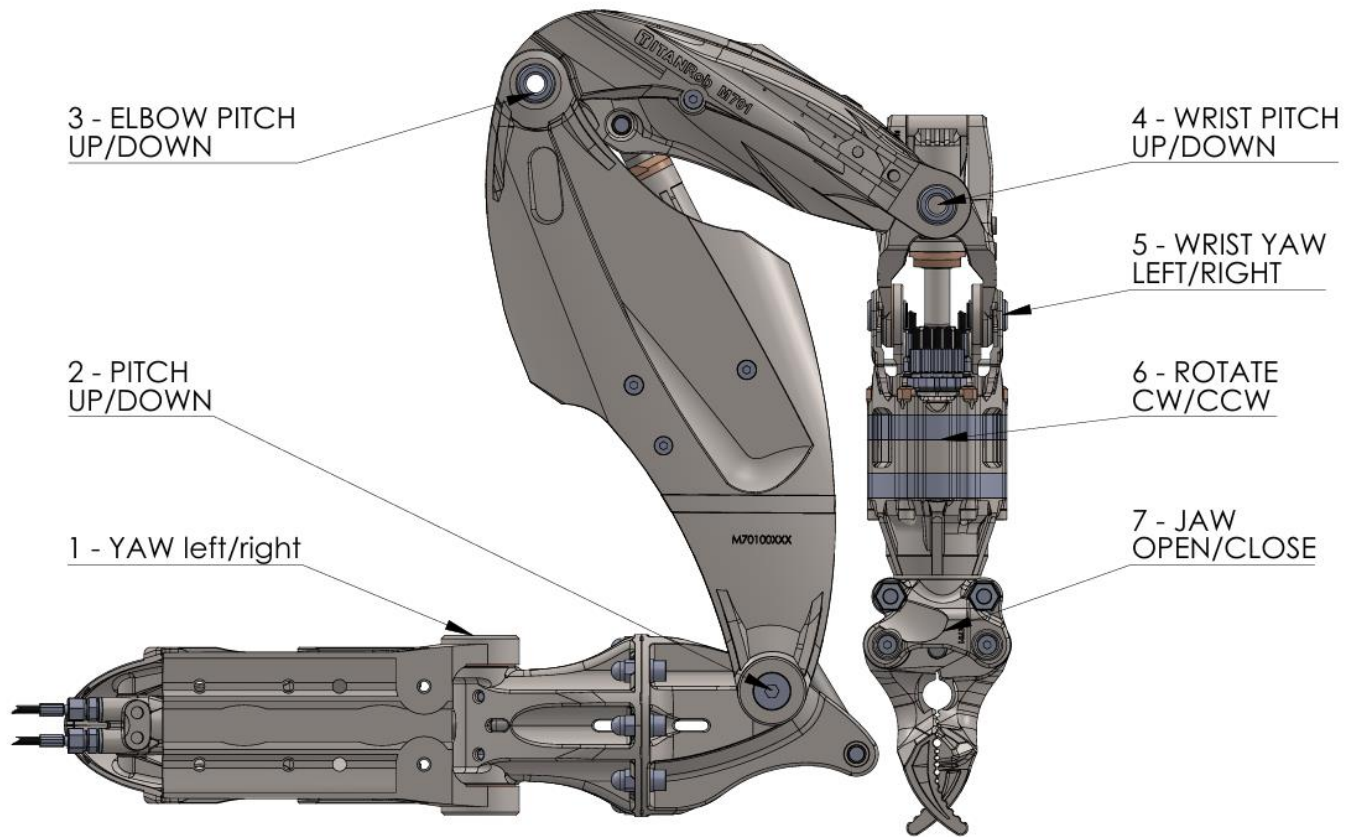
### 1-INTRODUCTION

The TITANROB is a titanium built hydraulic manipulator designed for heavy duty subsea applications on ROV (Remote Operated Vehicle) submarine operations. It is a manipulator with enhanced characteristics on weight/power ration and capabilities: By using titanium as main material, lower weight and more mechanical characteristics are achieved, allowing improved dimensioning.

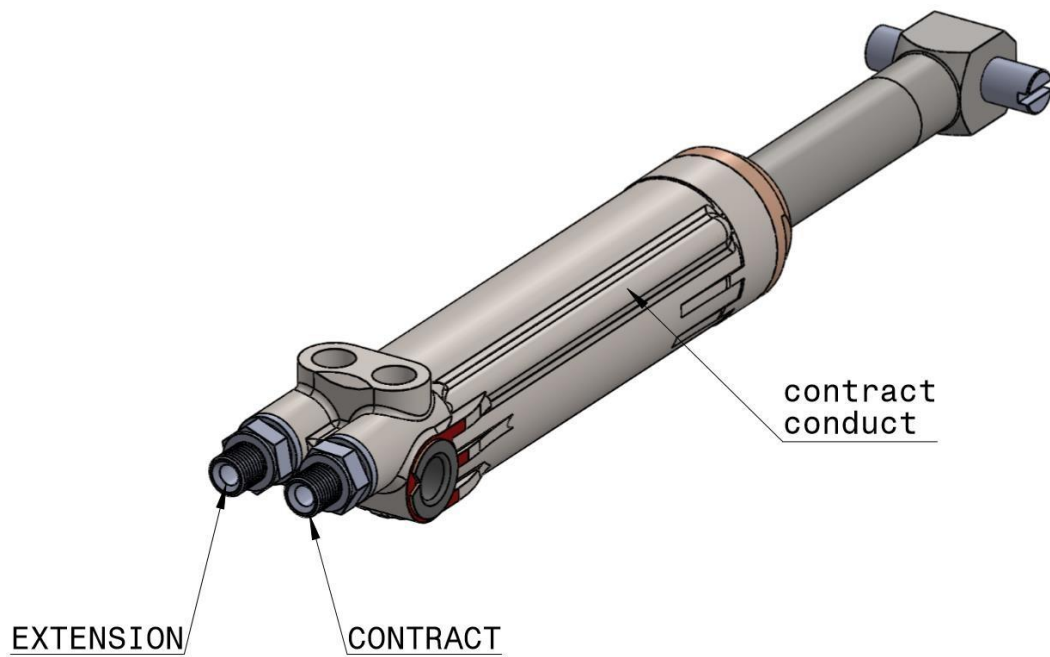
By using the same hydraulic power supply, the ROV vehicle has a more powerful and rugged tool, with lower weight and dimensions allowing lower buoyancy needs, and thus improving the ROV vehicle overall capabilities.

The M701 is a seven function hydraulic manipulator developed for Light Work Class ROVs. Resistant, lightweight and reliable, it's designed for heavy duty ROV works improving performance and operation. It could be rate operated by any low power (1kW) hydraulic power unit and a five function with drain/comp line valve pack fitted in the ROV vehicle.

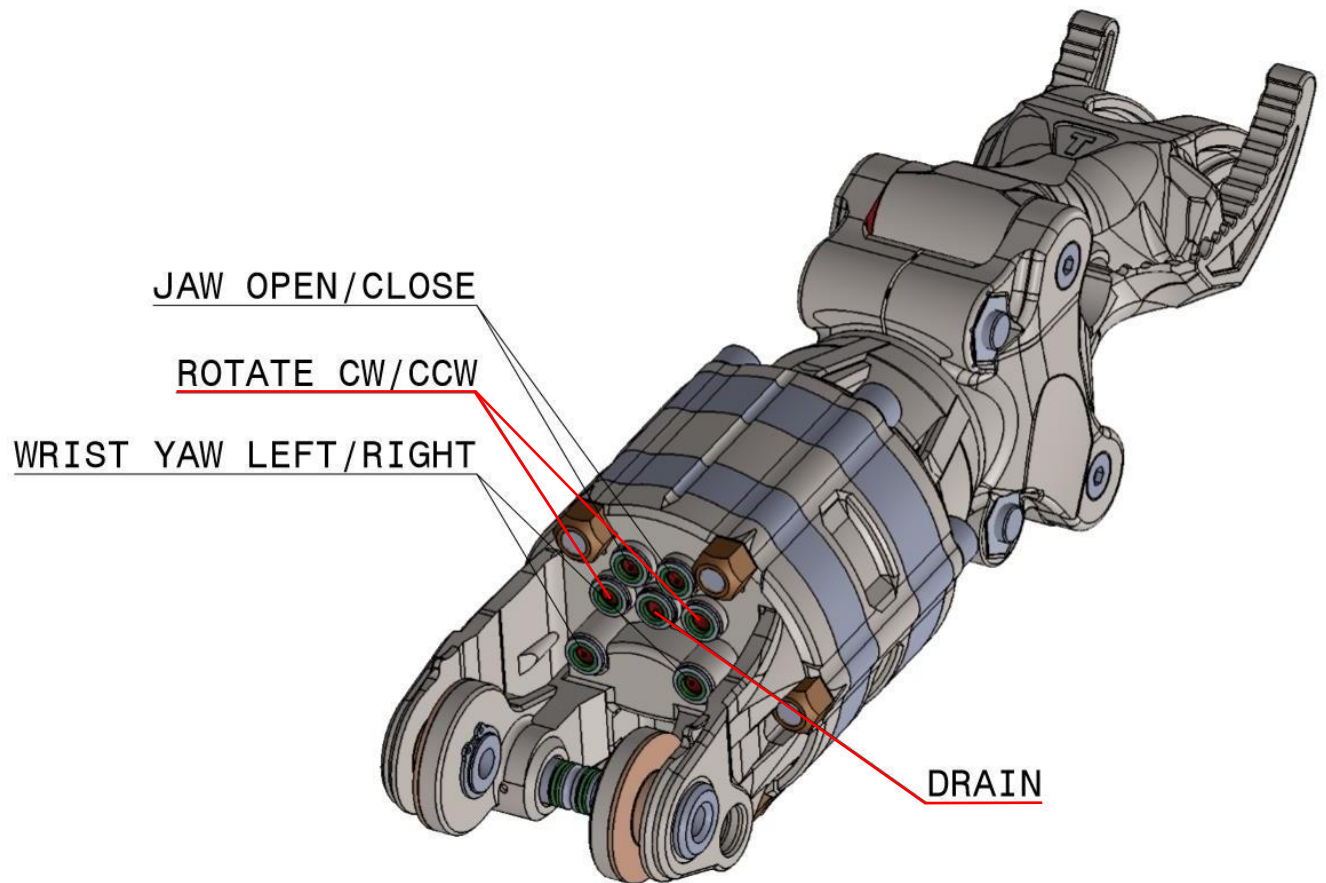




**M701 Functions**



**CYLINDER CONDUCTS**



**MOTOR CONDUCTS**

## 2-SPECIFICATIONS

### GENERAL SPECIFICATIONS

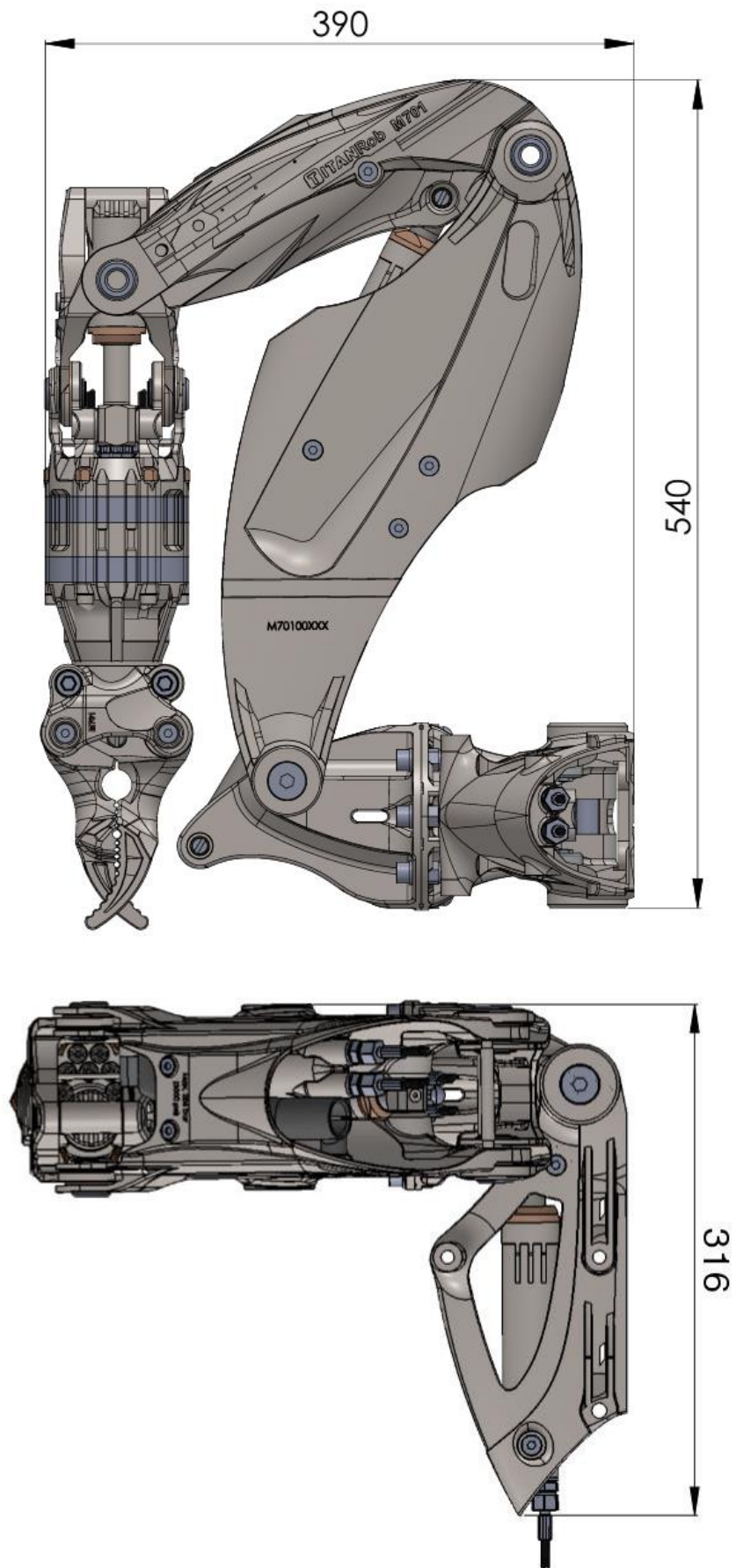
|                                                       |                                 |
|-------------------------------------------------------|---------------------------------|
| Depth rating (m)                                      | 3000                            |
| Weight in air (kg)                                    | 16,5 Kg                         |
| Weight in water (kg)                                  | 12,5 Kg                         |
| Maximum reach (mm)                                    | 1235 mm                         |
| Lift at full extension (kg)                           | 40 @ 140 bar (2031 psi)         |
| Maximum lift (kg)                                     | 50 @ 140 bar (2031 psi)         |
| Jaw Grip (kgf)                                        | 80 kgf                          |
| Yaw Torque (Nm)                                       | 30 Nm                           |
| Dimensions stowed LxWxH (mm)                          | 316 x 382 x 519 mm              |
| Operating temperature (°C), limited by hyd. Oil specs | -5 / +55 °C                     |
| Construction Main Materials                           | Ti6Al4V Titanium<br>AISI 316 SS |

### FUNCTIONS

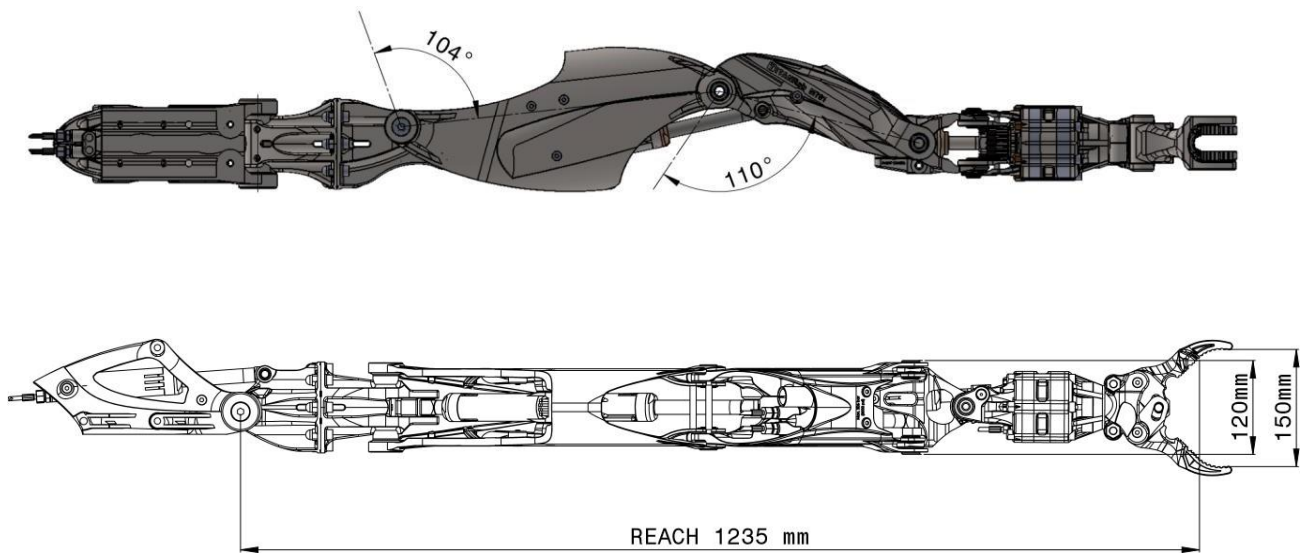
|                              |                    |
|------------------------------|--------------------|
| SHOULDER Azimuth (Yaw) (deg) | 120° (+90° / -30°) |
| SHOULDER Pitch (deg)         | 104°               |
| ELBOW Pitch (deg)            | 110°               |
| WRIST Pitch                  | 120°               |
| WRIST Yaw                    | 120°               |
| JAW Rotate (deg)             | 360° continuous    |
| JAW Opening (mm)             | 150 mm             |

### HYDRAULIC REQUERIMENTS

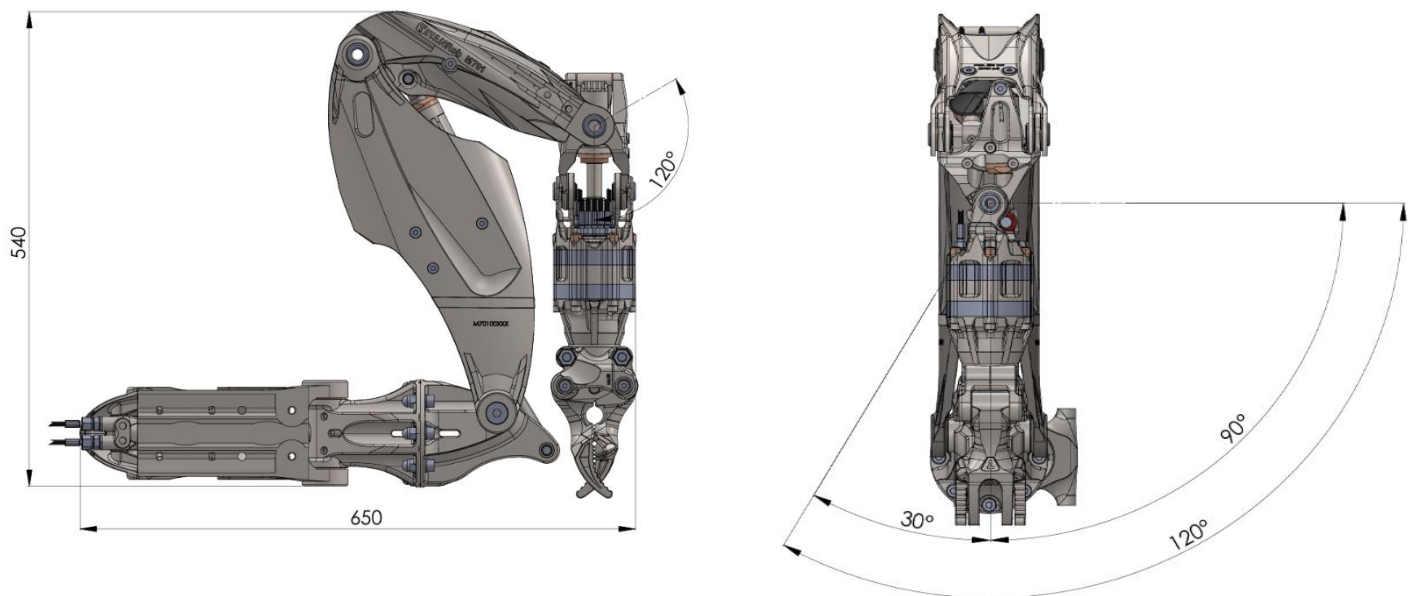
|                           |                     |
|---------------------------|---------------------|
| Hydraulic Oil type        | Mineral / Synthetic |
| Standard Hydraulic Oil    | ISO 32 / 46 / 68    |
| Viscosity grade           | ISO 22 to ISO 150   |
| Operating pressure (bar)  | 140 - 207 bar       |
| Operating Flow Rate (lpm) | Min 1.1 lpm         |
| Test Pressure (bar)       | 240 (3481 psi)      |
| Max. Oil Temp. (C)        | 55 C                |
| Oil cleanliness           | 20/16 (ISO 4406)    |



*M701 Stowed dimensions*



*M701 reach dimensions*



### 3-INSTALLATION

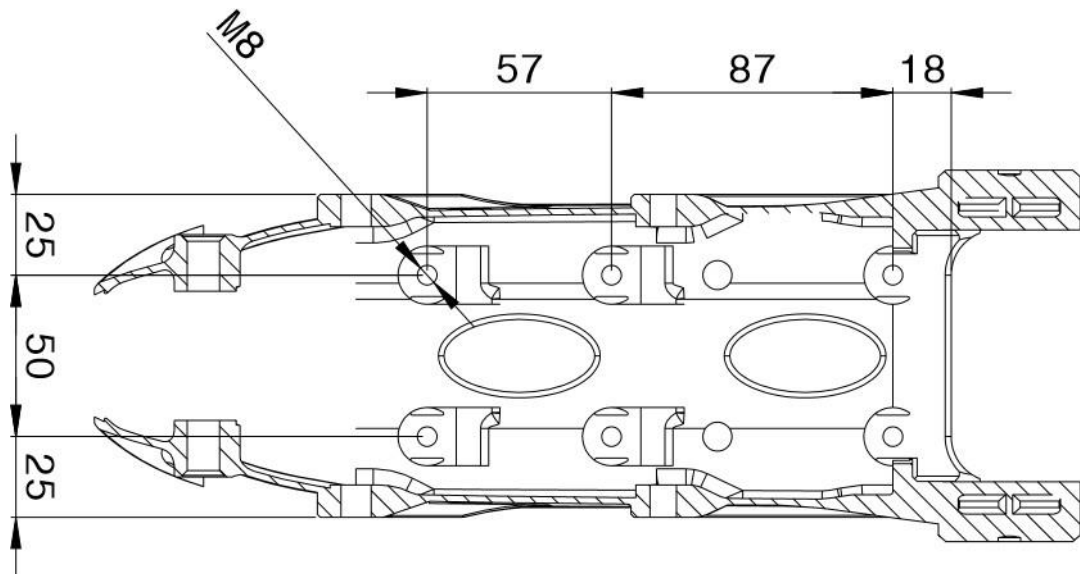
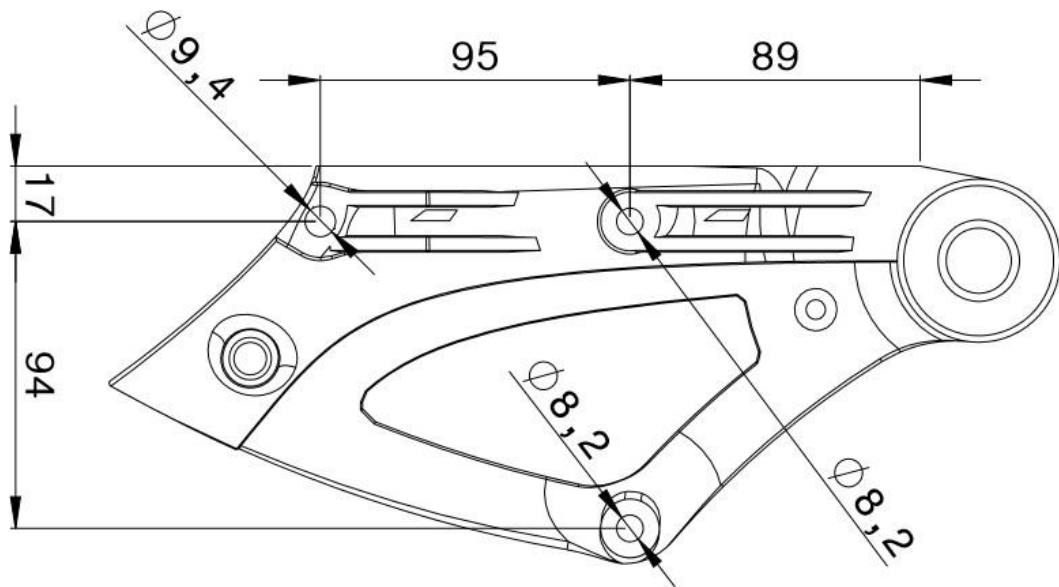
The 7 function hydraulic manipulator M701 has 15 hoses to be straight connected to the solenoid valve pack of the ROV hydraulic closed circuit; ten hoses for functions from A1/B1 to A7/B7 and a drain/compensation hose (TT). See annexed list of hoses/functions

- **SAFETY NOTICE:** This is a hydraulic powered equipment, all personnel must wear protective clothing and goggles. Keep a safe area around the equipment when in operation. Ensure that all power is OFF and without pressure when disassembling any of this equipment or carrying out maintenance work. Any maintenance work must be carried out in accordance with standard safety procedures for hydraulic equipment

- **TECHNICAL NOTE:** Shoulder YAW Right / Left (cylinder Extend/Retract) function should be connected to A1 or B1 port depending on Starboard or Port side position of the manipulator. See annexed list of hoses/functions

- Oil supply should be of 140 bar (210 bar maximum), with an average flow of 0,8 l/min. Recommended oil ISO32 (as Shell Tellus T32) with preferable filter rating of 10µm
- Manip valve pack should be supplied with pilot operated solenoid valves with cross piloted check valves, and flow control valves for each function. Equipment must be pressure compensated at all times through the drain (TT) port
- The manip must be bolted and secured to the ROV frame, all hoses fitted and secured, avoiding twists and sharp bends. Check that the Manipulator does not interfere with other vehicle equipment
- All personnel must stand clear of the equipment. Power up HPU and carry out full movements in all its functions. Check oil pressure. Check for leaks
- With the elbow positioned fully up, carefully bleed air by losing the drain (TT) hose fitting on valve pack end, continuously operating the Yaw rotating function for both directions, and other functions up to their end positions. Also bleed the main oil reservoir/compensator
- Carry out several movement test up to maximum extension and bleed until there isn't any air in the system
- Test the system performance and adjust each flow rate valve to the requested movement speed
- Carry out pre and Post-Dive checks for every dive: fixing bolts tight condition, hydraulic fittings condition and if there is any oil leak, bleed air, oil reservoir level, hydraulic pressure, check movements and adjust flow control, etc.

## SUPPORTING BASE HOLE PATTERN



#### 4- OPERATION & MAINTENANCE

The system will be operated as a ROV ancillary hydraulic equipment operated by the vehicle valve pack.

Please stand clear of the equipment when carrying out pre-dive deck checks.

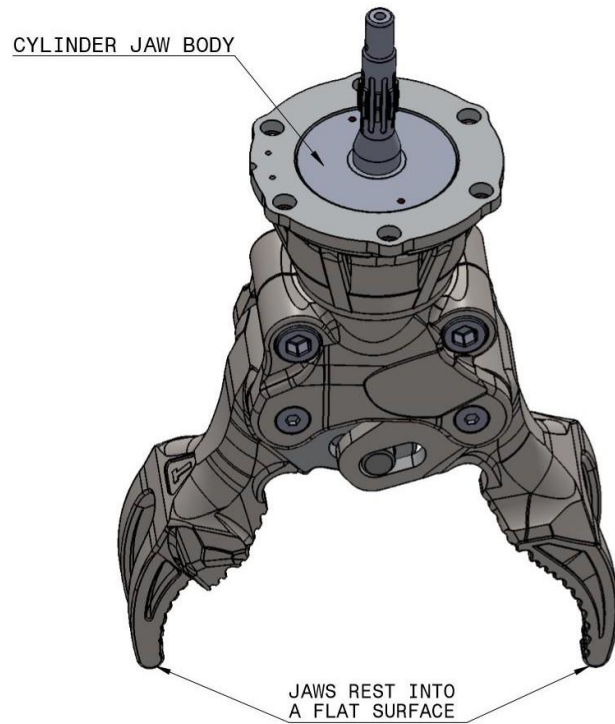
Follow up above point 3 recommended instructions.

Manipulator movements (speed) could be adjusted by the regulation of the valve pack flow control valves.

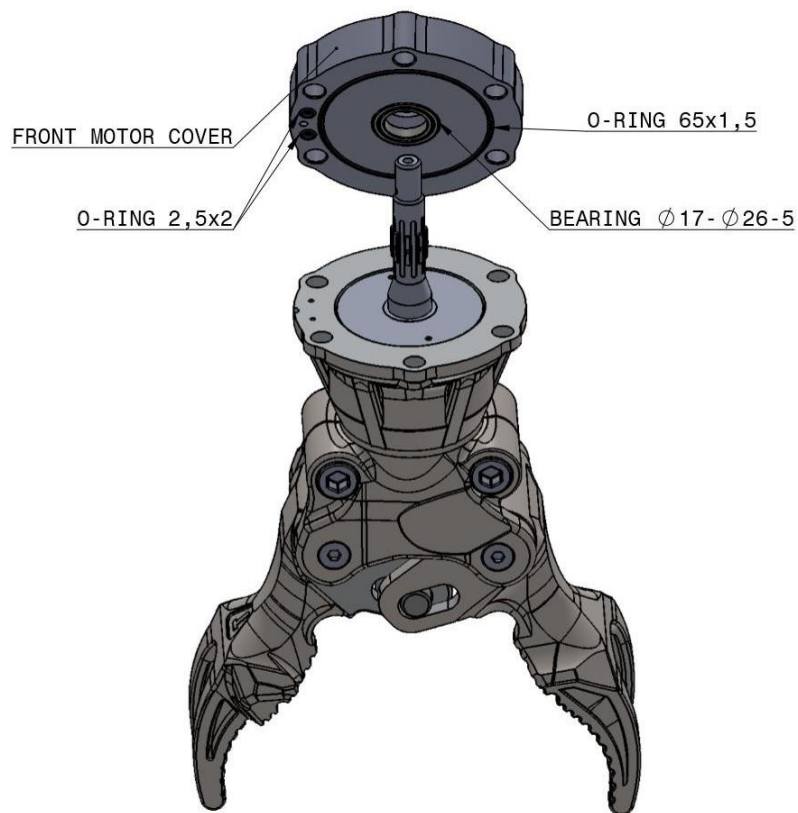
The Maintenance routine would be as follows:

- The equipment should be washed down with fresh water after ROV recovery on deck, removing any rest of sand from the inner sides of the shoulder flange
  - Inspect the equipment for wear or damage after work
  - The cutter blades are specifically dimensioned to fit each manipulator, therefore blades can't be exchanged
  - Inspect all hoses and fittings condition after work
  - Apply Litium LP2 grease on exposed shafts and hydraulic cylinder rod
  - Use underwater lubricant as "Aqua shield" or "Aqualube" grease on fixing bolts and fitting threads
  - When any ROV Pre-Dive check, confirm functionality and if any oil leakage
  - Bleed for air in the Hyd. Circuit and check oil condition regularly
  - Hydraulic cylinders can be field maintained replacing relevant seals and O-Rings:
    - \*Use Molikote 55 grease for O-Rings
    - \*Use Loctite 243 mid sealant for the piston rod thread inside the piston
    - \*Use hydraulic oil when replacing cylinder seals
- (see annexed Main Cylinder and Jaw Cylinder drawings)

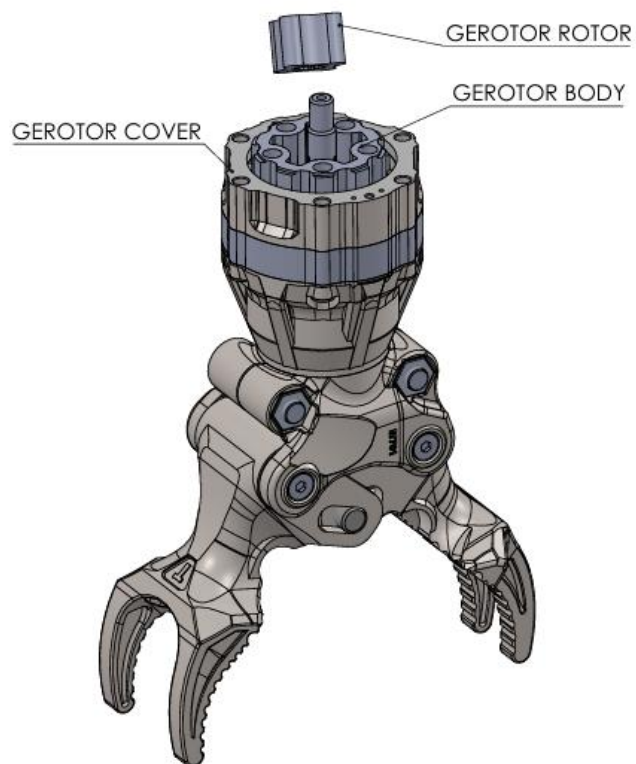
## MAINTENANCE - MOTOR ASSEMBLING



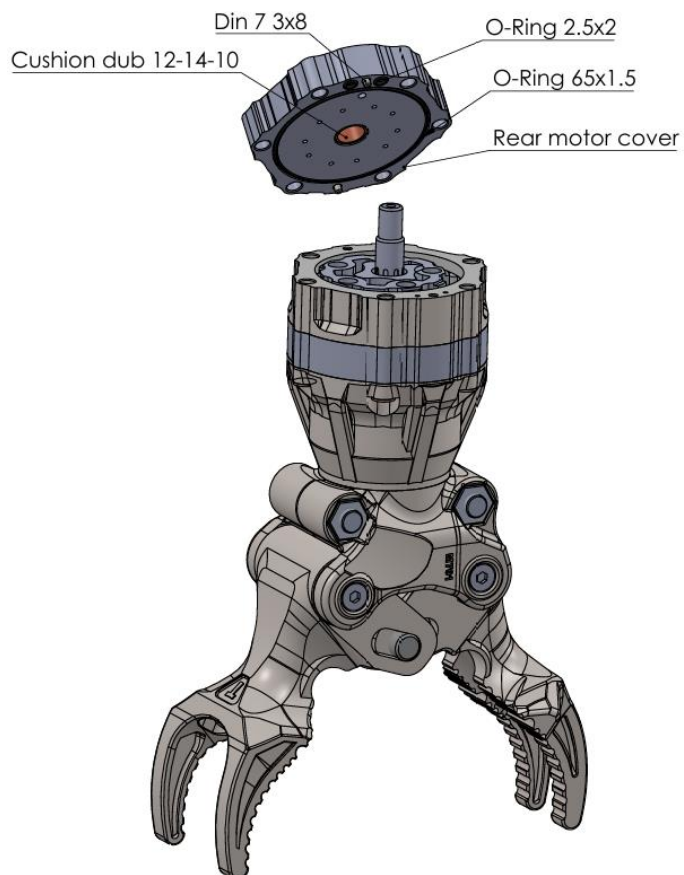
## Motor mounting - Step 1



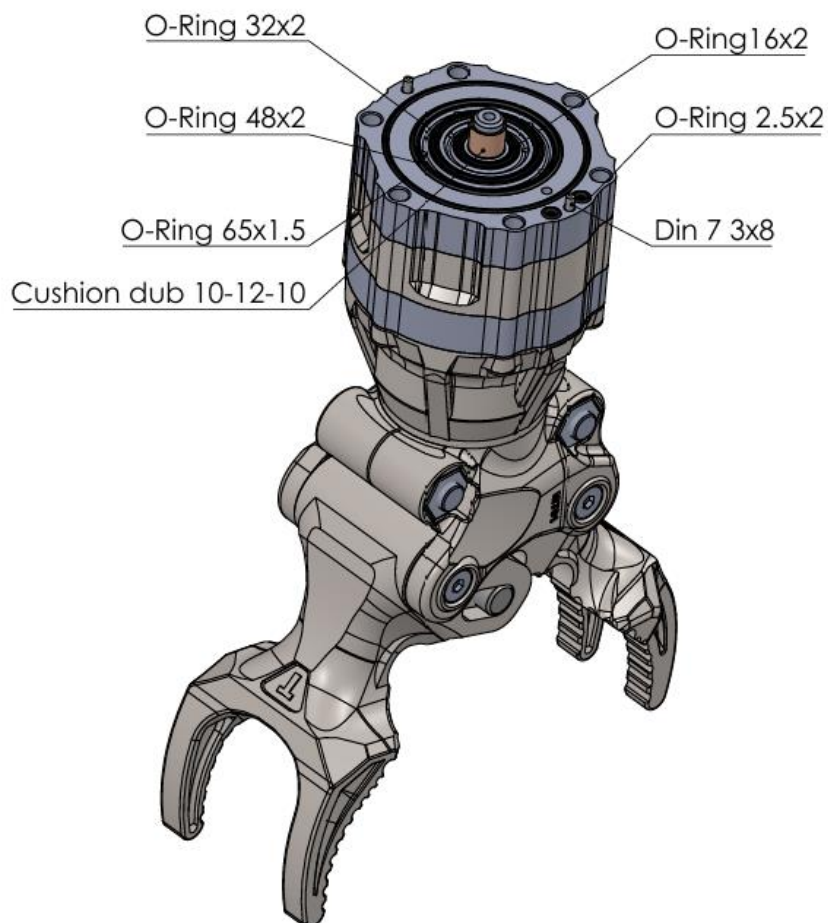
## Motor mounting - Step 2



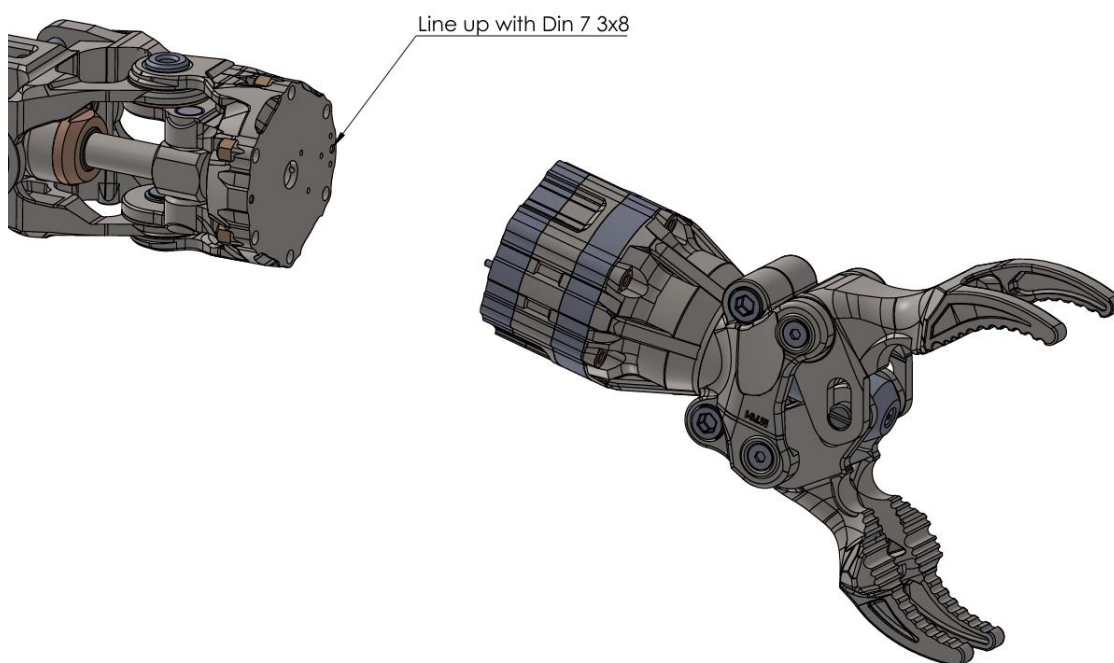
### Motor mounting - Step 3



### Motor mounting - Step 4



Motor mounting - Step 5



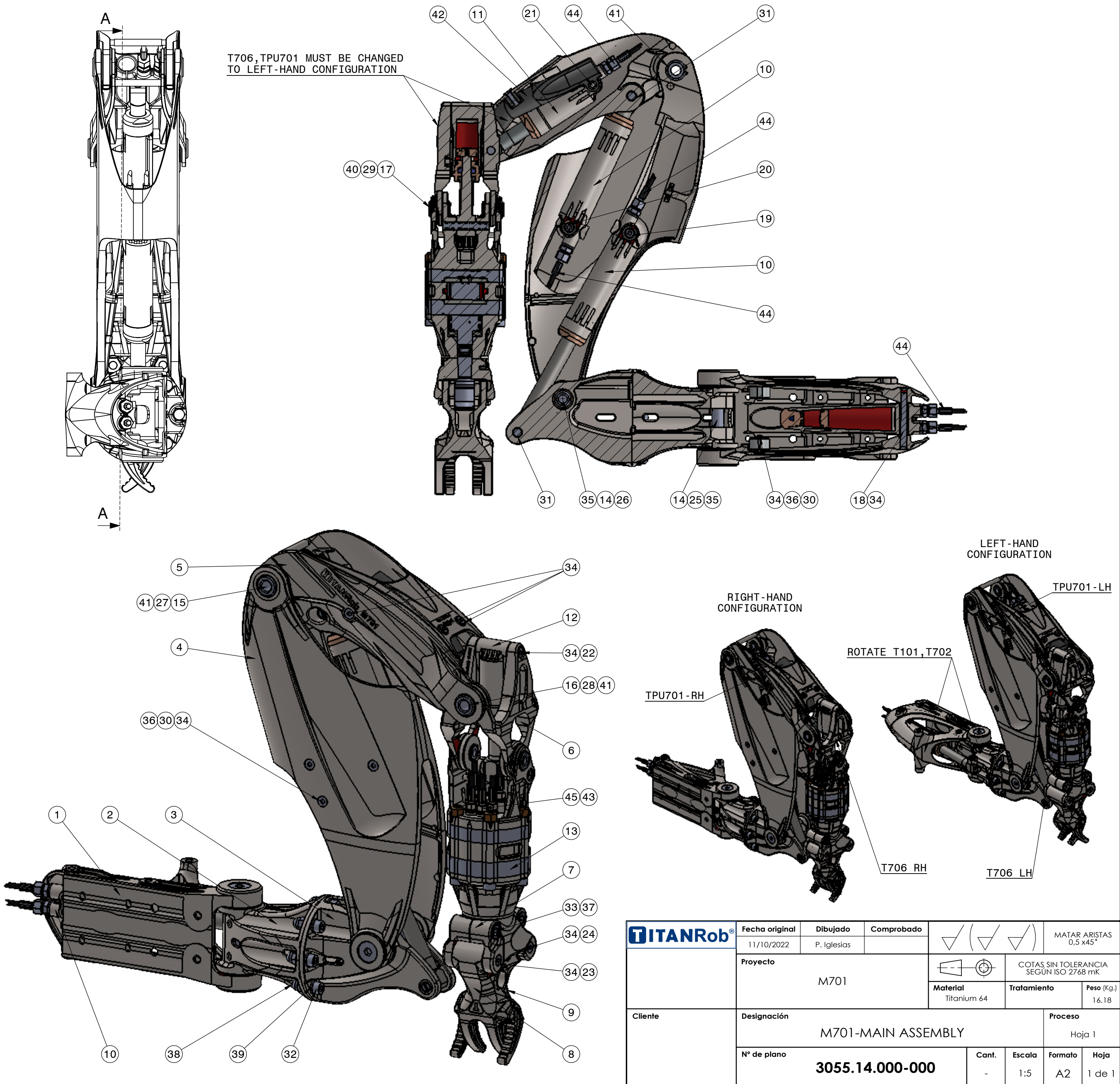
Motor mounting - Step 6

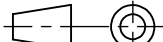
## **5.-DOCUMENTS & DRAWINGS:**

- M701 7F MANIPULATOR MAIN ASSEMBLY DRAWING
- CYLINDER MAIN ASSEMBLY DRAWING (Ø30x100 mm)
- WRIST PITCH CYLINDER DRAWING (Ø30x100 mm)
- WRIST YAW CYLINDER DRAWING (Ø20x200 mm)
- JAW ACTUATOR DRAWING (Ø36x32 mm)
- HYDRAULIC HOSE LIST

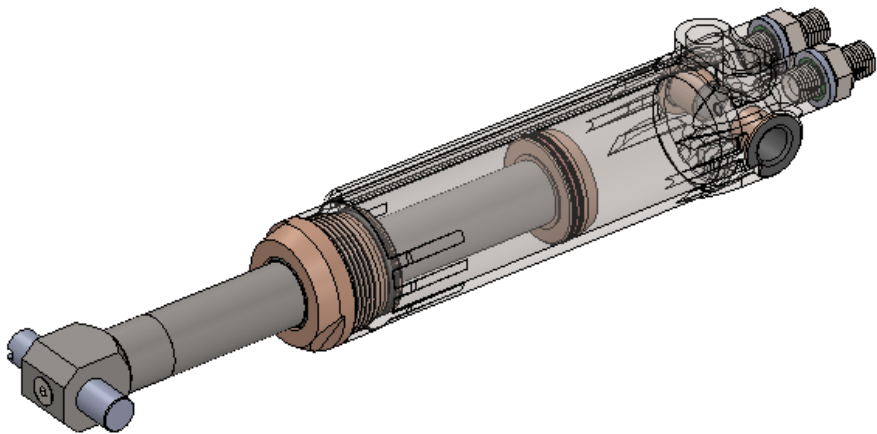
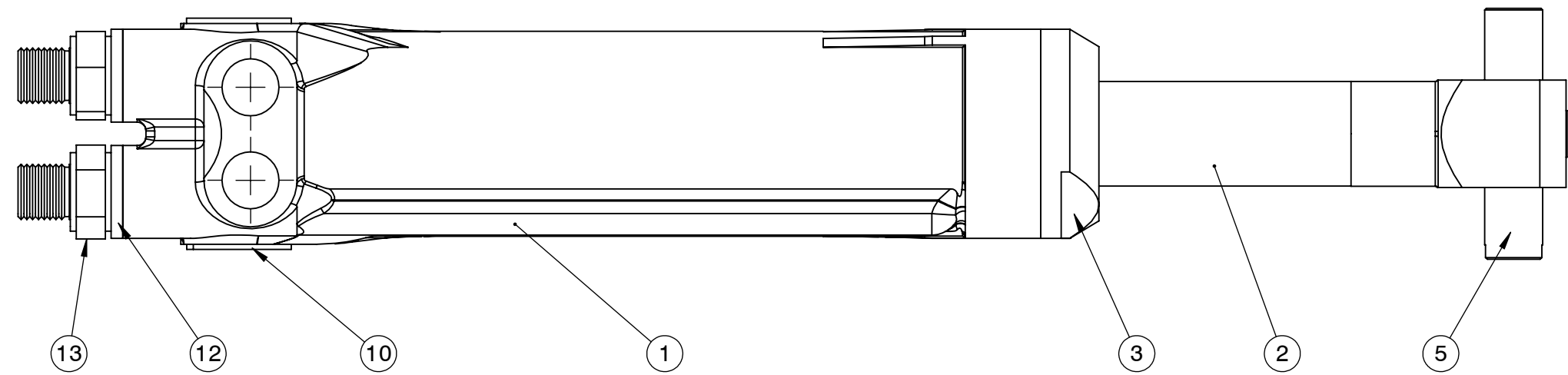
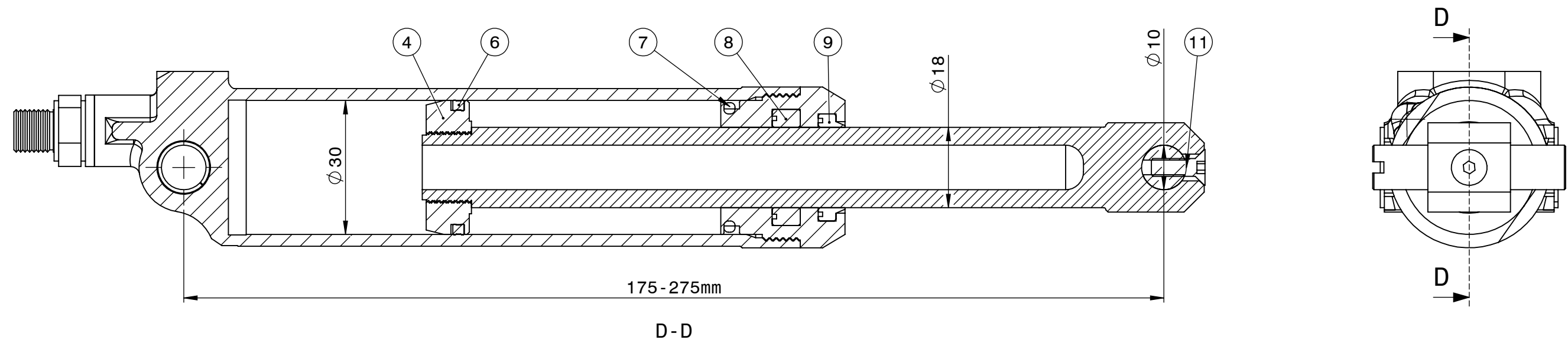
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| ITEM | REF.                | DESCRIPTION                        | QTY. |
|------|---------------------|------------------------------------|------|
| 1    | T101                | SUPPORTING BASE                    | 1    |
| 2    | T702                | YAW FLANGE                         | 1    |
| 3    | T703                | PITCH FLANGE                       | 1    |
| 4    | T704                | UPPER ARM                          | 1    |
| 5    | T705                | FOREARM                            | 1    |
| 6    | T706 RH             | WRIST PITCH FLANGE - RH            | 1    |
| 7    | T711                | JAW BODY                           | 1    |
| 8    | T712                | NARROW JAW                         | 1    |
| 9    | T713                | WIDE JAW                           | 1    |
| 10   | 3053.14.000-100     | CYLINDER MAIN ASSY.                | 3    |
| 11   | 3055.14.000-200     | WRIST PITCH CYLINDER               | 1    |
| 12   | 3055.14.000-300     | WRIST YAW CYLINDER                 | 1    |
| 13   | 3055.14.000-400     | JAW ACTUADOR ASSEMBLY              | 1    |
| 14   | A316-102-D20L105    | YAW SHAFT N°1 & N°2                | 2    |
| 15   | A316-703 D20L29     | PITCH SHAFT N°3                    | 2    |
| 16   | A316-704 D20L24     | WRIST PITCH SHAFT N°4              | 2    |
| 17   | A316-705 D16L26     | WRIST YAW SHAFT N°5                | 2    |
| 18   | A316-101-D10L67     | SHAFT CYL.N°1                      | 1    |
| 19   | A316-706 D10L90     | SHAFT CYL. N° 2                    | 1    |
| 20   | A316-707 D10L67     | SAFT CYL. N°3                      | 1    |
| 21   | T717                | SHAFT CYL. N°4                     | 1    |
| 22   | A316-708 D10L58     | SHAFT CYL. N°5                     | 1    |
| 23   | CU202-D10L58        | NARROW JAW SHAFT                   | 1    |
| 24   | CU203-D10L68        | WIDE JAW SHAFT                     | 1    |
| 25   | CU701               | BRONZE BUSH N°1                    | 2    |
| 26   | CU702               | BRONZE BUSH N°2                    | 2    |
| 27   | CU703               | BRONZE BUSH N°3                    | 2    |
| 28   | CU704               | BRONZE BUSH N°4                    | 2    |
| 29   | CU705               | BRONZE BUSH N°5                    | 2    |
| 30   | 3053.14.000-304-R01 | ANODE Ø24                          | 4    |
| 31   | 673.152             | CUSHION DUB 10-12-18-12            | 6    |
| 32   | DIN 912 M8x20       | ALLEN BOLT M8x20                   | 8    |
| 33   | DIN 912 M10x45      | ALLEN BOLT M10x40                  | 2    |
| 34   | DIN 7991 M6x20      | COUNTERSUNK BOLT M6x20             | 20   |
| 35   | DIN 7991 M12x20     | COUNTERSUNK BOLT M12x20            | 4    |
| 36   | DIN 934 M6          | M6 NUT                             | 4    |
| 37   | DIN 934 M10         | M10 NUT                            | 2    |
| 38   | DIN 1587 M8         | ACORN NUT M8                       | 8    |
| 39   | DIN 127 M8          | LOCK WASHER M8                     | 8    |
| 40   | DIN 471 D16         | CIRCLIP Ø16                        | 2    |
| 41   | DIN 471 D20         | CIRCLIP Ø20                        | 4    |
| 42   | TPU701-RH_R01       | HOSE GUIDE - RIGHT HAND CONFIG.    | 1    |
| 43   | C-XAM490006         | BONDED WASHER M6 AISI316           | 7    |
| 44   | HOSE GAS-JIC        | DN2 HOSE - 1/8" BSPP - FEM. SWIVEL | 8    |
| 45   | HOSE M6-JIC         | DN2 HOSE - M6 MALE FITTING         | 7    |



|          |                      |                                       |            |                                                                                                  |                |                                           |                           |                    |
|----------|----------------------|---------------------------------------|------------|--------------------------------------------------------------------------------------------------|----------------|-------------------------------------------|---------------------------|--------------------|
| ITANRob® | Fecha original       | Dibujado                              | Comprobado | <div>✓ ( ✓ ✓ )</div>                                                                             |                |                                           | MATAR ARISTAS<br>0.5 x45° |                    |
|          | 11/10/2022           | P. Iglesias                           |            |                                                                                                  |                |                                           |                           |                    |
|          | Proyecto<br><br>M701 |                                       |            | <div></div> |                | COTAS SIN TOLERANCIA<br>SEGÚN ISO 2768 mK |                           |                    |
|          |                      |                                       |            | Material<br>Titanium 64                                                                          | Tratamiento    | Peso (Kg.)<br>16.18                       |                           |                    |
|          | Cliente              | Designación<br><br>M701-MAIN ASSEMBLY |            |                                                                                                  |                |                                           | Proceso<br><br>Hoja 1     |                    |
|          |                      | Nº de plano<br><br>3055.14.000-000    |            |                                                                                                  | Cant.<br><br>- | Escala<br><br>1:5                         | Formato<br><br>A2         | Hoja<br><br>1 de 1 |

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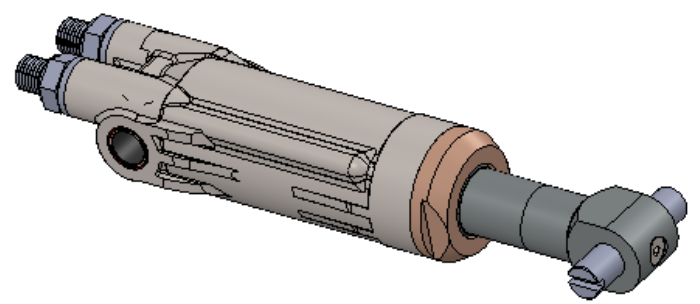
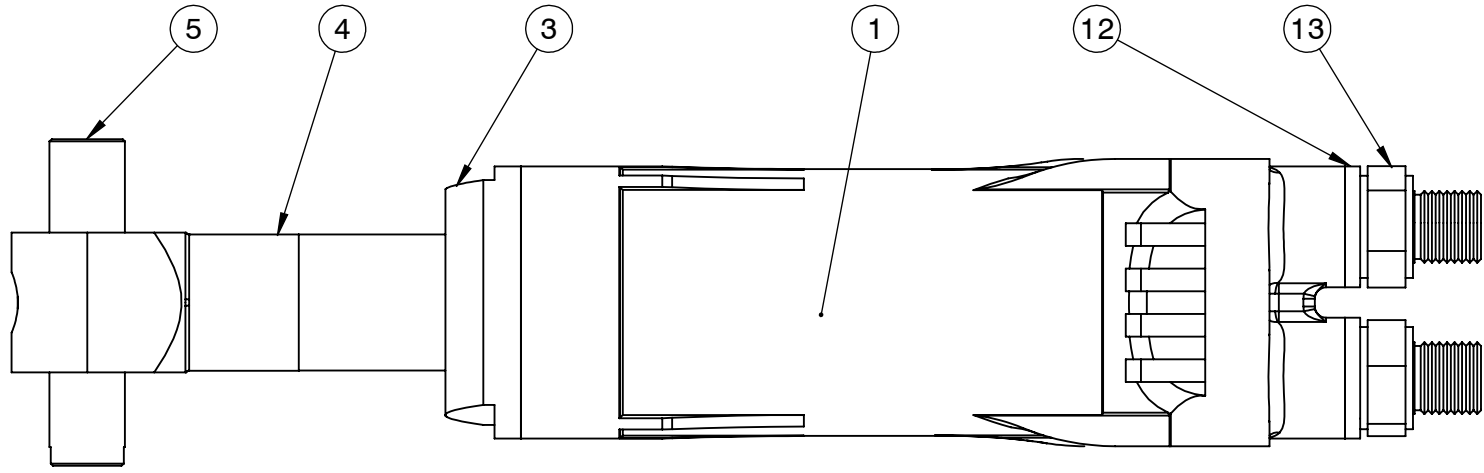
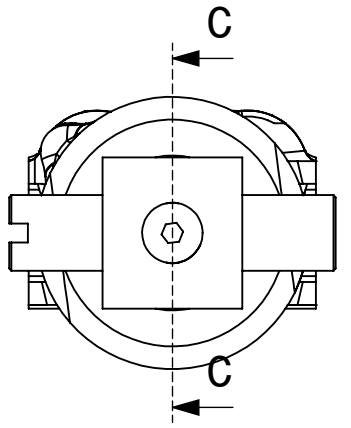
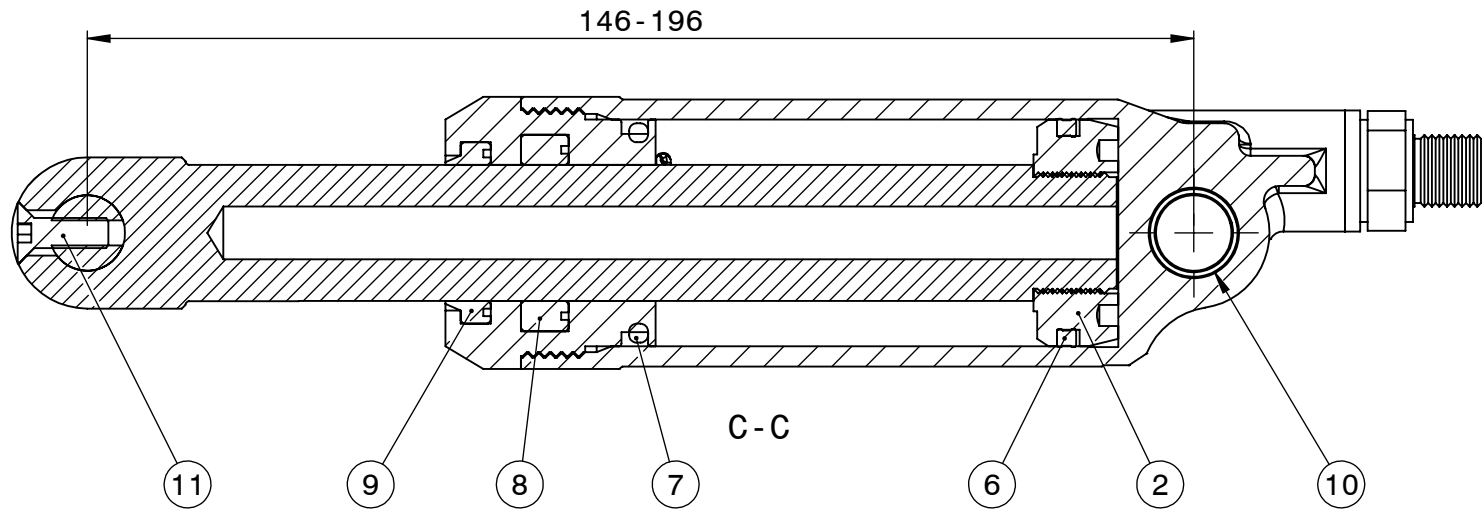


( 1 : 2 )

| ITEM | REF.                | DESCRIPTION                   | QTY. |
|------|---------------------|-------------------------------|------|
| 1    | T110                | CYLINDER BODY Ø30X100         | 1    |
| 2    | T118                | PISTON ROD Ø18x100            | 1    |
| 3    | CU110               | CYLINDER HEAD                 | 1    |
| 4    | CU111               | PISTON Ø30                    | 1    |
| 5    | A316-110-D10L43     | ROD PIN                       | 1    |
| 6    | 3053.14.000-310     | PISTON SEAL PU88 Ø30          | 1    |
| 7    | 472.147             | O-RING 24 x 2,5               | 1    |
| 8    | 640.300             | ROD SEAL Ø18                  | 1    |
| 9    | 337.847 - WIPER D18 | WIPER SEAL Ø18                | 1    |
| 10   | 673.152             | CUSHION DUB 10-12-18-12       | 2    |
| 11   | DIN 7991 M4x12 A4   | COUNTERSUNK BOLT M4X12        | 1    |
| 12   | C-XAM480002         | BONDED WASHER G1/8" AISI316   | 2    |
| 13   | C-XRC60180202       | FITTING BSPP 1/8" M-M AISI316 | 2    |

|  |                                    |                                        |            |                                                                               |                   |                                           |                           |  |
|--|------------------------------------|----------------------------------------|------------|-------------------------------------------------------------------------------|-------------------|-------------------------------------------|---------------------------|--|
|  | Fecha original                     | Dibujado                               | Comprobado | <div><div><div></div></div><div><div></div></div><div><div></div></div></div> |                   |                                           | MATAR ARISTAS<br>0,5 x45° |  |
|  | 21/09/2022                         | P. Iglesias                            |            |                                                                               |                   |                                           |                           |  |
|  | Proyecto<br><br>M701 - G501 - M501 |                                        |            |                                                                               |                   | COTAS SIN TOLERANCIA<br>SEGÚN ISO 2768 mK |                           |  |
|  |                                    |                                        |            | Material                                                                      |                   | Tratamiento                               | Peso (Kg.)<br>0.70        |  |
|  | Cliente                            | Designación<br><br>CYLINDER MAIN ASSY. |            |                                                                               |                   |                                           | Proceso<br><br>Hoja 1     |  |
|  | Nº de plano<br><br>3053.14.000-100 |                                        |            | Cant.<br><br>-                                                                | Escala<br><br>1:1 | Formato<br><br>A3                         | Hoja<br><br>1 de 1        |  |

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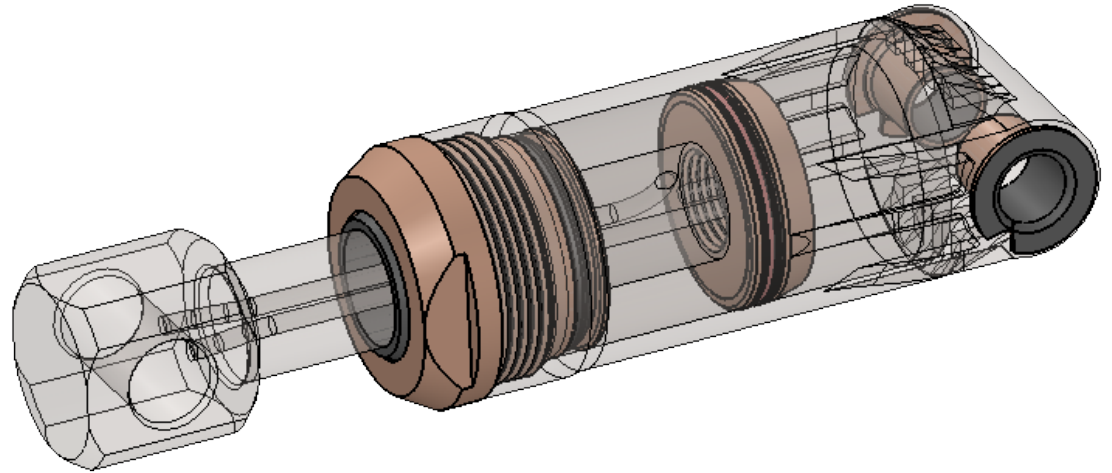
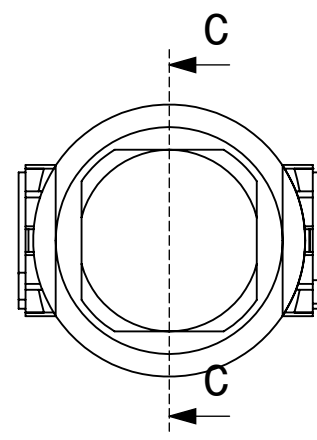
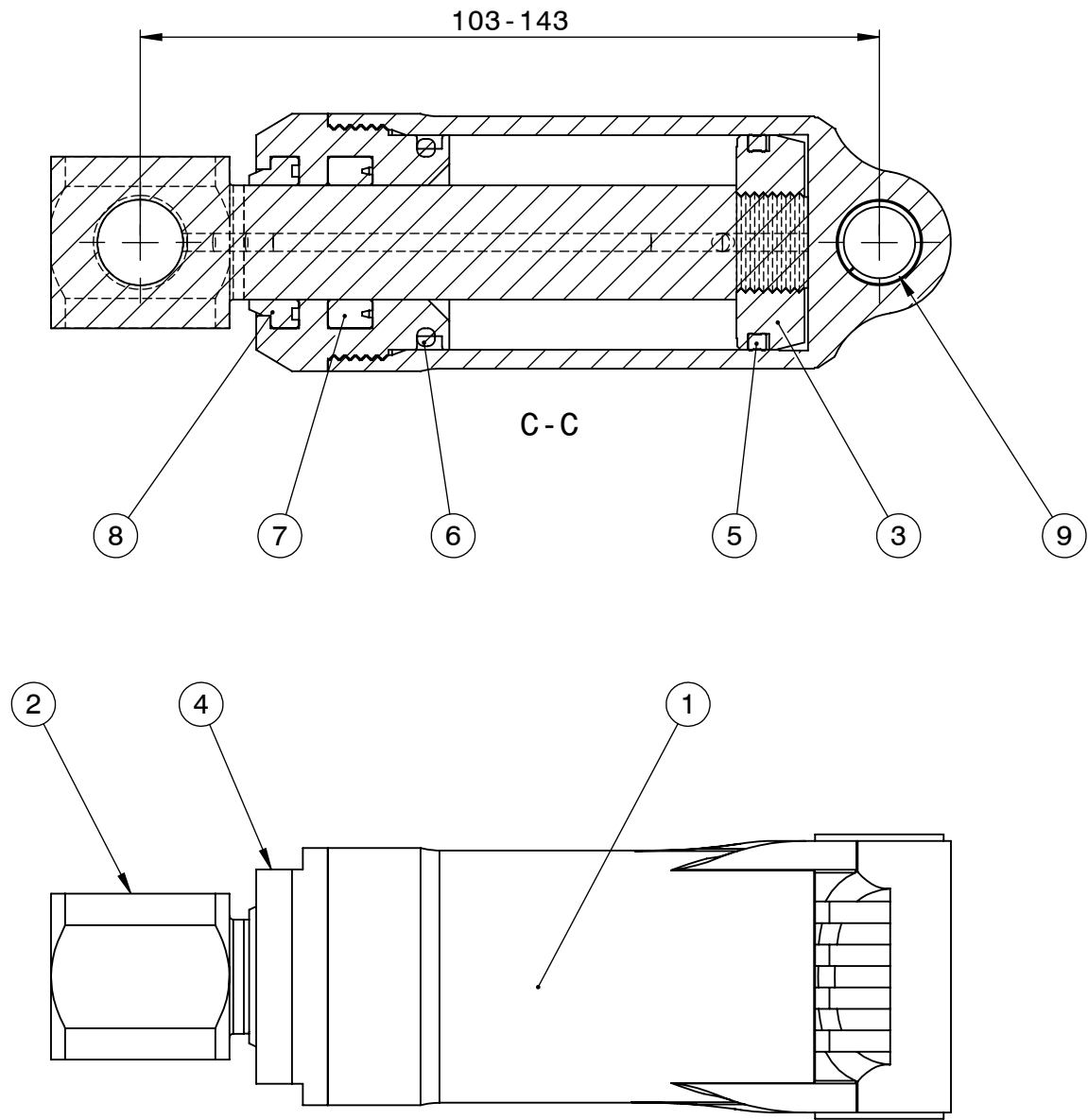


(1 : 2)

| ITEM | REF.              | DESCRIPTION                   | QTY. |
|------|-------------------|-------------------------------|------|
| 1    | T714_R05          | CYLINDER BODY Ø30X100         | 1    |
| 2    | CU111             | PISTON Ø30                    | 1    |
| 3    | CU110             | CYLINDER HEAD                 | 1    |
| 4    | A316-712          | ROD Ø18X50                    | 1    |
| 5    | A316-110-D10L43   | ROD PIN                       | 1    |
| 6    | 3053.14.000-310   | PISTON SEAL PU88 Ø30          | 1    |
| 7    | 472.147           | O-RING 24 x 2,5               | 1    |
| 8    | 640.300           | ROD SEAL Ø18                  | 1    |
| 9    | 337.847           | WIPER SEAL Ø18                | 1    |
| 10   | 594.341           | CUSHION DUB 10-12-10          | 2    |
| 11   | DIN 7991 M4x12 A4 | COUNTERSUNK BOLT M4X12        | 1    |
| 12   | C-XAM480002       | BONDED WASHER G1/8" AISI316   | 2    |
| 13   | C-XRC60180202     | FITTING BSPP 1/8" M-M AISI316 | 2    |

|                 |                      |             |            |                        |                                        |              |
|-----------------|----------------------|-------------|------------|------------------------|----------------------------------------|--------------|
|                 | Fecha original       | Dibujado    | Comprobado | MATAR ARISTAS 0,5 x45° |                                        |              |
|                 | 02/01/2023           | P. Iglesias |            |                        |                                        |              |
|                 | Proyecto             |             |            |                        | COTAS SIN TOLERANCIA SEGÚN ISO 2768 mK |              |
| Cliente         | M701                 |             |            | Material               | Tratamiento                            | Peso (Kg.)   |
|                 |                      |             |            | -                      |                                        | 0.63         |
|                 | Designación          |             |            |                        | Proceso                                |              |
|                 | WRIST PITCH CYLINDER |             |            |                        | Hoja 1                                 |              |
|                 | Nº de plano          |             |            | Cant.                  | Escala                                 | Formato Hoja |
| 3055.14.000-200 |                      |             | -          | 1:1                    | A3                                     | 1 de 1       |

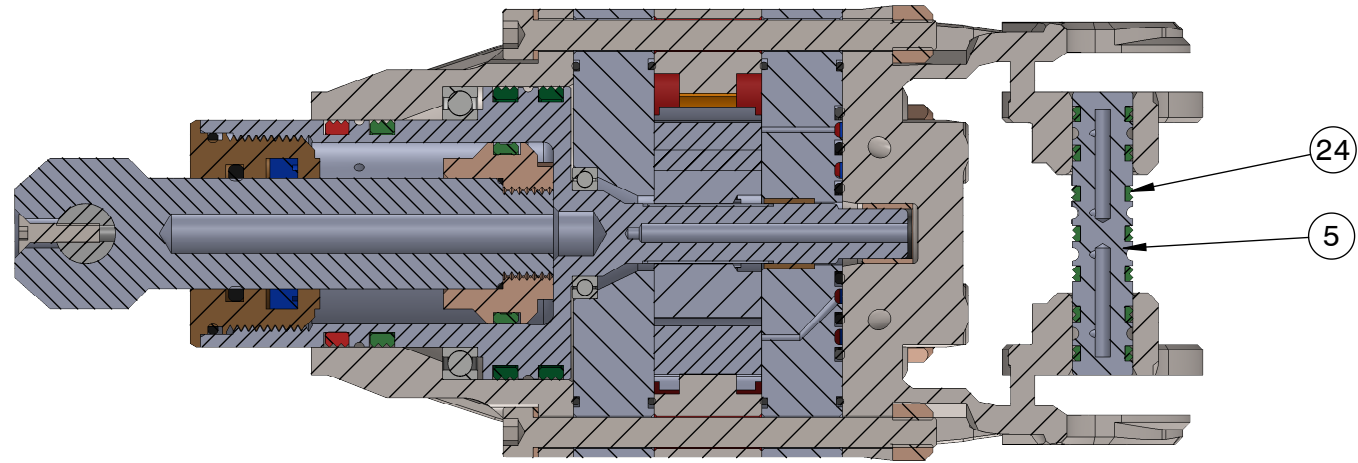
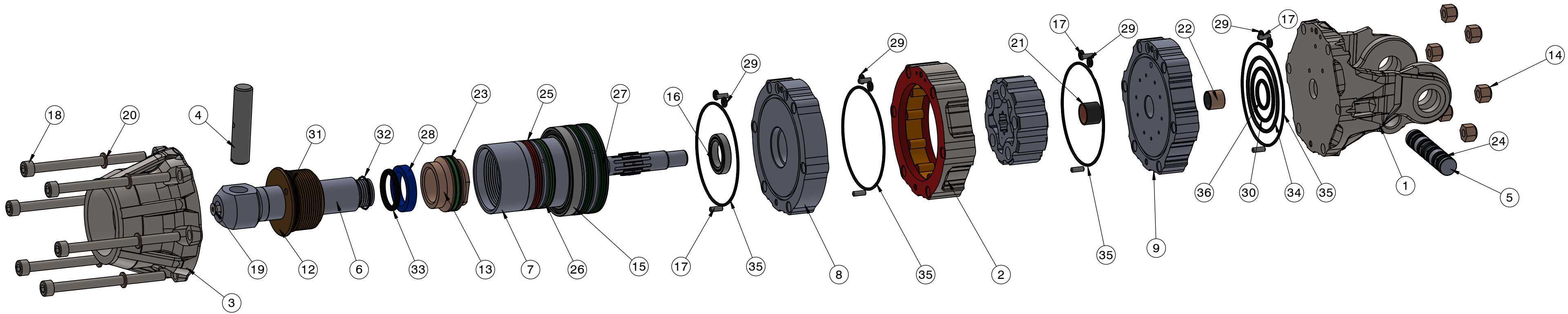
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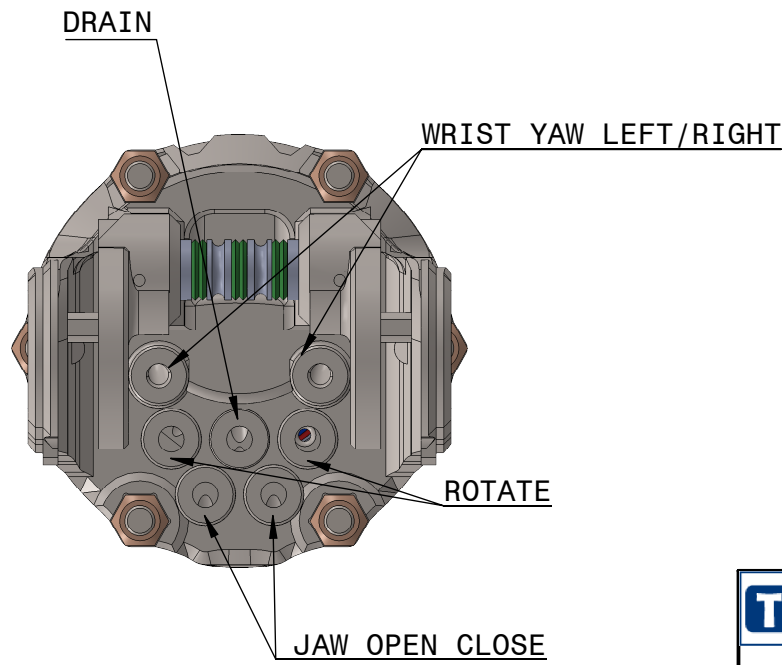
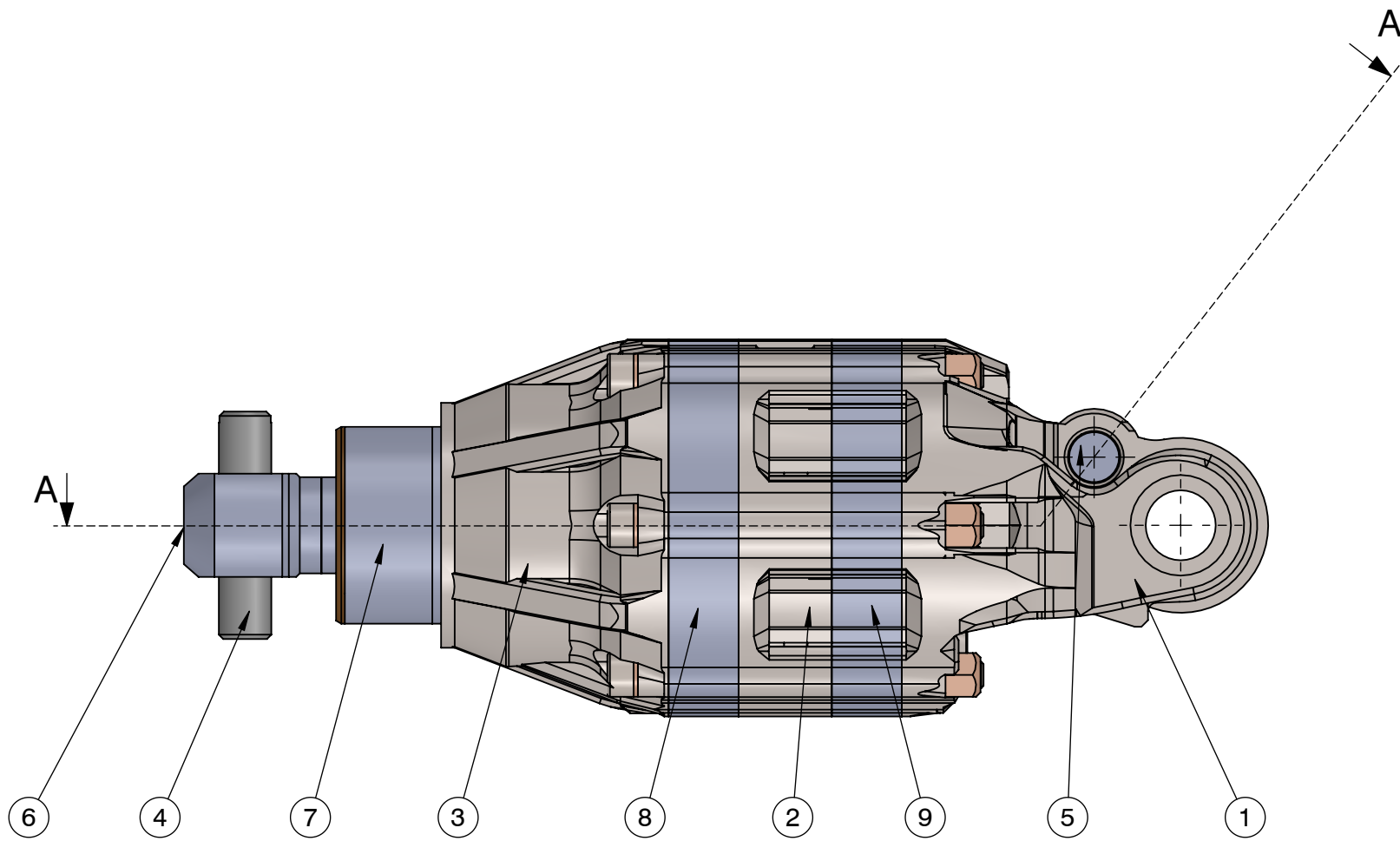
| ITEM | REF.            | DESCRIPTION             | QTY. |
|------|-----------------|-------------------------|------|
| 1    | T715_R03        | CYLINDER BODY Ø30X100   | 1    |
| 2    | T716            | PISTON ROD Ø16X40       | 1    |
| 3    | CU707           | PISTON Ø30 M14          | 1    |
| 4    | CU706           | CYLINDER HEAD           | 1    |
| 5    | 3053.14.000-310 | PISTON SEAL PU88 Ø30    | 1    |
| 6    | 472.147         | O-RING 24 x 2,5         | 1    |
| 7    | 504.050         | ROD SEAL Ø16            | 1    |
| 8    | 647.935         | WIPER SEAL Ø16          | 1    |
| 9    | 673.152         | CUSHION DUB 10-12-18-12 | 2    |

|                    |                |             |            |             |             |                                           |
|--------------------|----------------|-------------|------------|-------------|-------------|-------------------------------------------|
|                    | Fecha original | Dibujado    | Comprobado |             |             | MATAR ARISTAS<br>0,5 x45°                 |
|                    | 02/01/2023     | P. Iglesias |            |             |             |                                           |
|                    | Proyecto       |             |            |             |             | COTAS SIN TOLERANCIA<br>SEGÚN ISO 2768 mK |
| Cliente            | M701           |             |            | Material    | Tratamiento | Peso (Kg.)                                |
|                    |                |             |            | Titanium 64 | -           | 0.40                                      |
|                    | Designación    |             |            | Proceso     |             |                                           |
| WRIST YAW CYLINDER |                |             | Hoja 1     |             |             |                                           |
| Nº de plano        |                |             | Cant.      | Escala      | Formato     | Hoja                                      |
| 3055.14.000-300    |                |             | -          | 1:1         | A3          | 1 de 1                                    |

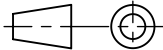
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A-A ( 1 : 1.5 )



| ITEM | REF .               | DESCRIPTION            | QTY . |
|------|---------------------|------------------------|-------|
| 1    | T707 - R06          | WRIST FLANGE           | 1     |
| 2    | T708 - R06          | GEROTOR COVER          | 1     |
| 3    | T710 - R06          | WRIST COVER            | 1     |
| 4    | A316-212            | ROD PIN                | 1     |
| 5    | A316-709 D12L56 R02 | WRIST YAW PIN          | 1     |
| 6    | T719                | ROD Ø22                | 1     |
| 7    | A316-711 - R03      | CYLINDER JAW BODY      | 1     |
| 8    | A316-719 - R02M6    | FRONT MOTOR COVER      | 1     |
| 9    | A316-720 - R01M6    | REAR MOTOR COVER       | 1     |
| 10   | HS703 - R02         | GEROTOR BODY           | 1     |
| 11   | HS704               | GEROTOR ROTOR          | 1     |
| 12   | CU231               | CYLINDER HEAD          | 1     |
| 13   | CU708               | PISTON Ø36             | 1     |
| 14   | CU710 - R01M6       | M6 NUT                 | 6     |
| 15   | 61809-45587         | BEARING Ø45-Ø58-7      | 1     |
| 16   | 61803-17265         | BEARING Ø17-Ø26-5      | 1     |
| 17   | DIN 7 3x8           | PIN Ø3X8               | 8     |
| 18   | DIN 912 M6x80       | ALLEN BOLT M6X80 TI    | 6     |
| 19   | DIN 7991 M4x16      | COUNTERSUNK BOLT M4x16 | 1     |
| 20   | 552.521             | COPPER WASHER 6-10-1   | 6     |
| 21   | 672.915             | CUSHION DUB 12-14-10   | 1     |
| 22   | 594.341             | CUSHION DUB 10-12-10   | 1     |
| 23   | 3054.14.000-307     | PISTON SEAL PU88 Ø36   | 1     |
| 24   | M700C - PU002       | CYLINDER PIN ROT SEAL  | 7     |
| 25   | PU003               | ROT SEAL PU88 Ø45      | 1     |
| 26   | 3054.14.000-306     | ROT SEAL PU88 Ø45      | 1     |
| 27   | M700C - PU001       | SEAL ROT PU88 Ø58      | 2     |
| 28   | 640.326             | ROD SEAL Ø22           | 1     |
| 29   | 340.653             | O-RING 2,5 x 2         | 8     |
| 30   | 596.999             | O-RING 32 x 2          | 1     |
| 31   | 342.415             | O-RING 34 x 2          | 1     |
| 32   | 345.023             | O-RING 20 x 1          | 1     |
| 33   | 424.339             | O-RING 21 x 3          | 1     |
| 34   | 308.023             | O-RING 46x2            | 1     |
| 35   | 430.919             | O-RING 65x1,5          | 4     |
| 36   | 463.828             | O-RING 16 x 2          | 1     |

|                                                                                       |                      |                                          |            |                                                                                                                |                   |                                           |                           |
|---------------------------------------------------------------------------------------|----------------------|------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------|---------------------------|
|  | Fecha original       | Dibujado                                 | Comprobado | <div><div><div><div></div></div></div><div><div><div></div></div></div><div><div><div></div></div></div></div> |                   |                                           | MATAR ARISTAS<br>0,5 x45° |
|                                                                                       | 16/12/2025           | P. Iglesias                              |            |                                                                                                                |                   |                                           |                           |
|                                                                                       | Proyecto<br><br>M701 |                                          |            |                           |                   | COTAS SIN TOLERANCIA<br>SEGÚN ISO 2768 mK |                           |
|                                                                                       |                      |                                          |            | Material<br><br>Titanium 64/ AISI 316/ CuNiAl                                                                  |                   | Peso (Kg.)                                |                           |
|                                                                                       | Cliente              | Designación<br><br>JAW ACTUATOR ASSEMBLY |            |                                                                                                                |                   |                                           | Proceso<br><br>Hoja 1     |
| Nº de plano<br><br>3055.14.000-400                                                    |                      |                                          |            | Cant.<br><br>-                                                                                                 | Escala<br><br>1:2 | Formato<br><br>A2                         | Hoja<br><br>1 de 1        |



**TITANROB TECHNOLOGIES**  
**STANDARD SPARE KIT-HYDRAULIC HOSE LIST**

|           |                  |            |                 |
|-----------|------------------|------------|-----------------|
| Equipment | M701 Manipulator | Ref.       | 3055.14.000     |
| S/N       | M701 011         | Date       | 1 NOVEMBER 2025 |
| Assembly  | HYDRAULIC HOSES  | Revised by | P. IGLESIAS     |

| No. | FUNCTION                           | Actuator (RIGHT CONFIG) | Valve Pack Port No. | Hose Length (mm) | Manip end Fitting  | V Pack end Fitting  | Hose Type          |
|-----|------------------------------------|-------------------------|---------------------|------------------|--------------------|---------------------|--------------------|
| 1   | SHOULDER / ARM Azimuth (Yaw) RIGHT | Retract (RH)            | A1                  | 2000             | BSPP 1/8" F Swivel | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 2   | SHOULDER / ARM Azimuth (Yaw) LEFT  | Extend (RH)             | B1                  | 2000             | BSPP 1/8" F Swivel | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 3   | SHOULDER / ARM Pitch UP            | Extend                  | A2                  | 2840             | BSPP 1/8" F Swivel | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 4   | SHOULDER / ARM Pitch DOWN          | Retract                 | B2                  | 2840             | BSPP 1/8" F Swivel | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 5   | ELBOW / FOREARM Pitch UP           | Extend                  | A3                  | 3040             | BSPP 1/8" F Swivel | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 6   | ELBOW / FOREARM Pitch DOWN         | Retract                 | B3                  | 3040             | BSPP 1/8" F Swivel | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 7   | WRIST / HAND Pitch up              | Extend                  | A4                  | 2990             | BSPP 1/8" F Swivel | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 8   | WRIST / HAND Pitch DOWN            | Retract                 | B4                  | 2990             | BSPP 1/8" F Swivel | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 9   | WRIST / HAND RIGHT                 | Retract                 | A5                  | 3360             | M6x1 Male          | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 10  | WRIST / HAND LEFT                  | Extend                  | B5                  | 3360             | M6x1 Male          | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 11  | JAW Rotate CW                      | Rotate CCW              | A6                  | 3360             | M6x1 Male          | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 12  | JAW Rotate CWW                     | Rotate CW               | B6                  | 3360             | M6x1 Male          | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 13  | DRAIN                              | N/A                     | TT                  | 3360             | M6x1 Male          | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 14  | JAW CLOSE                          | Retract                 | A7                  | 3360             | M6x1 Male          | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |
| 15  | JAW OPEN                           | Extend                  | B7                  | 3360             | M6x1 Male          | JIC 7/16" F. Swivel | DN2 – TS8552101 00 |