

File N°	TW_CM_210_010	Reference Drawings	XXXX210 / XXXX211
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment, Crane, Slings		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Helmet



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	“X” Axis Servomotor Disassembly
3	“X” Axis Servomotor Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL

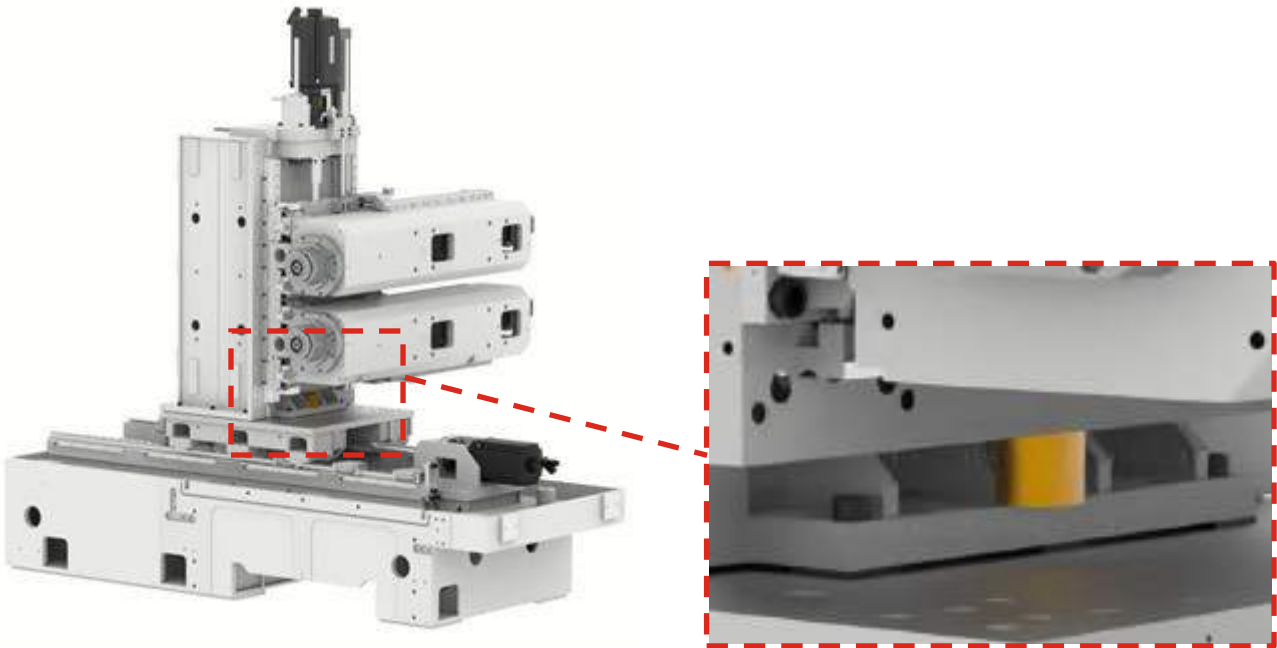


TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Move the “Y” axis until the carriage makes contact with the lower stop.



- 3 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 4 Switch off the machine (Refer to the Service Manual).
- 5 If the machine has “Y” Axis Manual Blocking Device, proceed with the following steps.  
If the machine does not have “Y” Axis Manual Blocking Device, skip the following steps and continue to the disassembly.

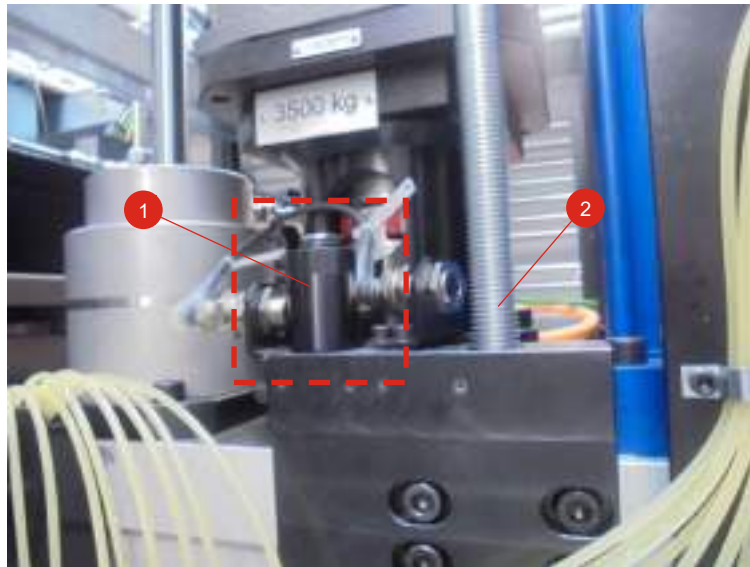


WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY LEVELS AND WORK PROCEDURES APPROVED (BA).



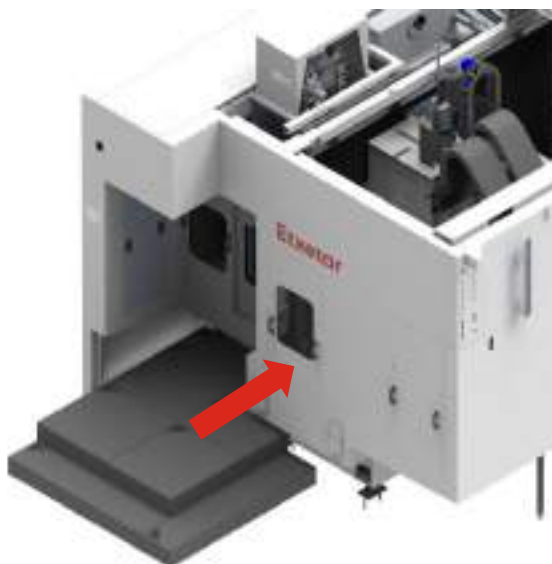
AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

- 6** Untighten the M20 nut from the resting position (Pos.1) and lock the “Y” Axis with it (Pos.2).



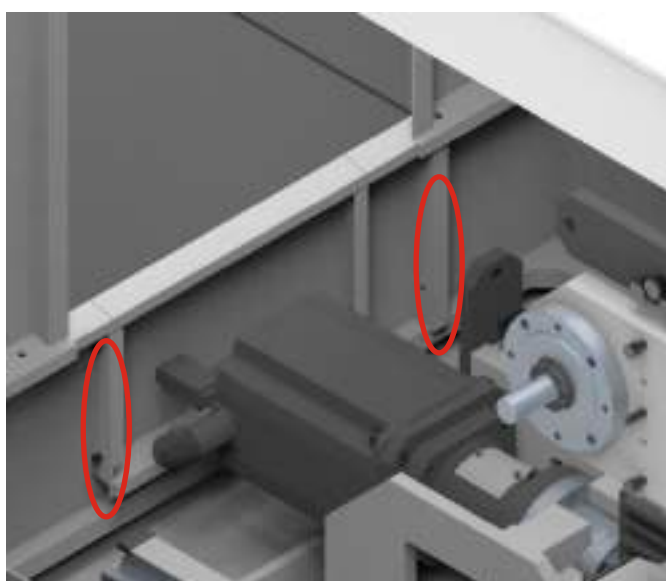
### 4. PROCEDURE DESCRIPTION: "X" AXIS SERVOMOTOR DISASSEMBLY

- 7 Access the 3 Axis Module Panel and disassemble it.



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 8 Disassemble the Machine Fairing Protection to access the "X" Axis Servomotor.



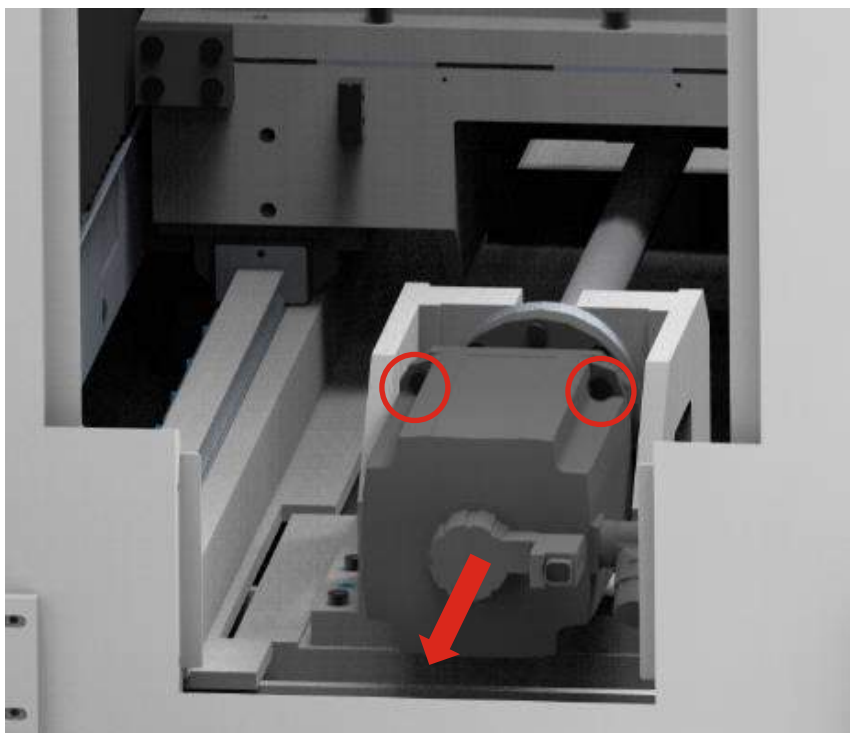
- 9** Disassemble the “X” Axis Servomotor electrical connections.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 10** Secure the “X” Axis Servomotor using a crane and slings.

- 11** Disassemble the 4 screws fixing the Servomotor and extract it.



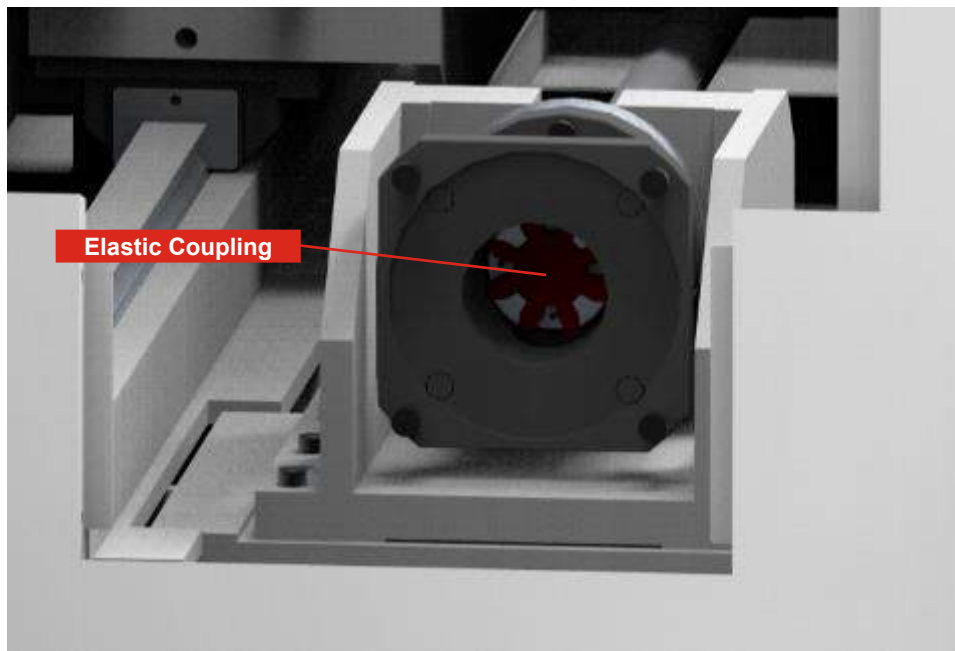


BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 12 Disassemble the “X” Axis Servomotor Elastic Coupling.



## 5. PROCEDURE DESCRIPTION: ELEMENT REPLACEMENT AND ASSEMBLY

- 13 Replace the “X” Axis Servomotor and the Elastic Coupling for new ones.
- 14 To assemble the “X” Axis Servomotor, follow the disassembly steps in reverse order.

## 6. CONSIDERATIONS FOR ASSEMBLY



ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm



FOR MORE INFORMATION ABOUT THE SERVOMOTOR COUPLING, REFER TO THE KTR MANUAL



### 4.1 Components of the coupling

Components of ROTEX® GS clamping hubs, hub type 2.0, 2.1, 2.5 or 2.6

Component	Quantity	Description
1	2	Clamping hub
2	1	Spider
3	2	Cap screw DIN EN ISO 4762

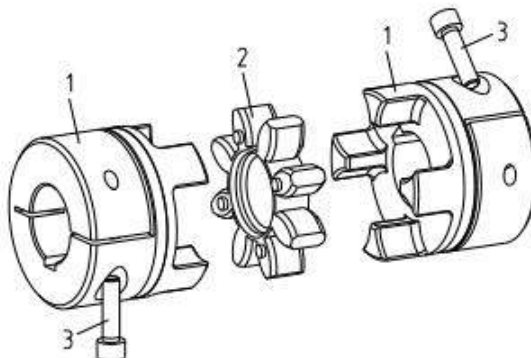


Illustration 14: ROTEX® GS clamping hub

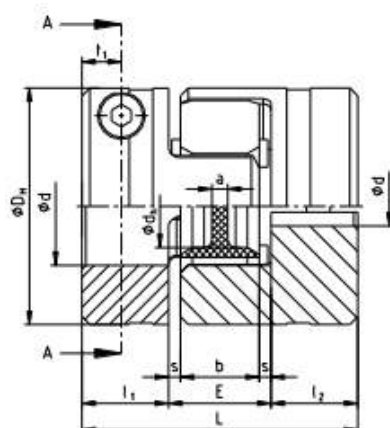


Illustration 4: ROTEX® GS hub type 2.0 (from size 5 - 14)

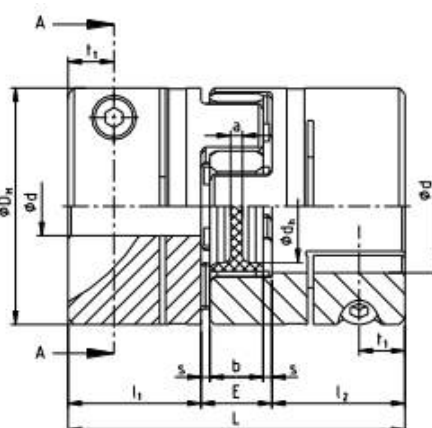


Illustration 5: ROTEX® GS hub type 2.5 (from size 19 - 90)

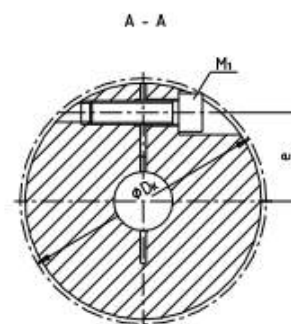


Table 4: Dimensions - clamping hubs

Size	Dimensions <sup>1)</sup> [mm]											Clamping screw DIN EN ISO 4029: (ROTEX® GS 5 - DIN EN ISO 1207)				
	D	D <sub>n</sub>	d <sub>n</sub>	L	l <sub>1</sub>	l <sub>2</sub>	M, N	E	b	s	a	M <sub>1</sub>	l <sub>1</sub>	a	D <sub>2</sub>	T <sub>L</sub> [Nm]
Hub material - aluminium																
5	-	10	-	15	5	-	5	4	0.5	4.0	M1.2	2.5	3.5	11.4	- <sup>1)</sup>	
7	-	14	-	22	7	-	8	6	1.0	6.0	M2	3.5	5.0	16.5	0.37	
9	-	20	7.2	30	10	-	10	8	1.0	1.5	M2.5	5.0	7.5	23.4	0.78	
12	-	25	8.5	34	11	-	12	10	1.0	3.5	M3	5.0	9.0	27.5	1.34	
14	-	30	10.5	35	11	-	13	10	1.5	2.0	M3	5.0	11.5	32.2	1.34	
19	-	40	18	68	25	-	18	12	2.0	3.0	M6 <sup>2)</sup>	11.0	14.5 <sup>2)</sup>	46.0	10.5 <sup>2)</sup>	
24	-	55	27	78	30	-	18	14	2.0	3.0	M6	10.5	20.0	57.5	10.5	
28	-	65	30	90	35	-	20	15	2.5	4.0	M6	11.5	25.0	73.0	25	
38	-	80	38	114	45	-	24	18	3.0	4.0	M8	15.5	30.0	83.5	25	
Hub material - steel																
42	85	95	46	126	50	28	25	20	3.0	4.0	M10	18	32.0	93.5	60	
48	95	105	51	140	58	32	28	21	3.5	4.0	M12	21	36.0	105.0	120	
55	110	120	60	160	65	37	30	22	4.0	4.5	M12	28	42.5	119.5	120	
65	115	135	68	185	75	47	35	26	4.5	4.5	M12	33	45.0	124.0	120	
75	135	160	80	210	85	53	40	30	5.0	5.0	M16	36	51.0	147.5	206	
90	160	200	104	245	100	62	45	34	5.5	6.5	M20	40	60.0	176.0	580	

1) Slotted screw, tightening torque not defined

2) Size 19: Bore Ø22 - Ø24 with 2-off clamping screws M4, T<sub>L</sub> = 2.9 Nm and dimension e = 15.0

3) Transmittable friction torques of clamping hubs see table 6

## 4.5 Assembly of the clamping hubs (hub types 2.0, 2.1, 2.5, 2.6, 2.8 and 2.9)

The power transmission of ROTEX® GS clamping hubs (hub type 2.0, 2.5 and 2.8) is frictionally engaged. With hub type 2.1, 2.6 and 2.9 a feather key additionally provides for positive locking power transmission.



**If used in potentially explosive atmospheres all screw connections must be secured against working loose additionally, e. g. conglomerating with Loctite (average strength).**

- Clean and degrease the hub bore and the shaft.
- Lightly detach the clamping screws.
- Slip the hub onto the shaft. Please observe dimension  $l_1$  or  $l_2$ .
- Tighten the clamping screws at the tightening torques specified in table 4.  
With hub type 2.8 or 2.9 (with feather keyway) the screws have to be tightened alternately in equal steps at the tightening torques specified in table 6.



Illustration 20: Assembly of clamping hub

Please note: hub type 2.8 or 2.9 have 2 clamping screws



**The transmittable friction torques of the clamping hubs depend on the bore diameter.**



**Hubs, clamping hubs or similar types without feather keyway may be used in category 3 only and are marked with category 3 accordingly.**



**If the clamping screws are not tightened at the correct tightening torque, there is the risk of**  
a) a fracture of the hub and plastic deformation with a too high tightening torque  $T_A$   
b) early slipping, untightening of the screws with a too low tightening torque  $T_A$

### 4.1 Components of the coupling

Components of ROTEX® GS clamping ring hubs, hub type 6.0 light, 6.0 steel or 6.0

Component	Quantity	Description
1.1	2	Clamping ring
1.2	2	Clamping ring hub
2	1	Spider
3	see table 5, 6 and 7	Cap screw DIN EN ISO 4762

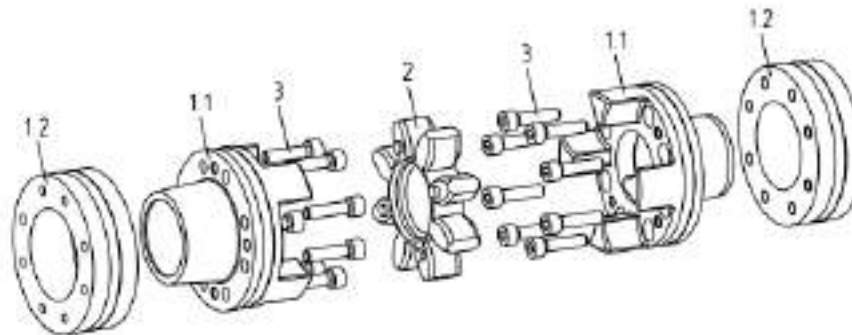


Illustration 17: ROTEX® GS clamping ring hub

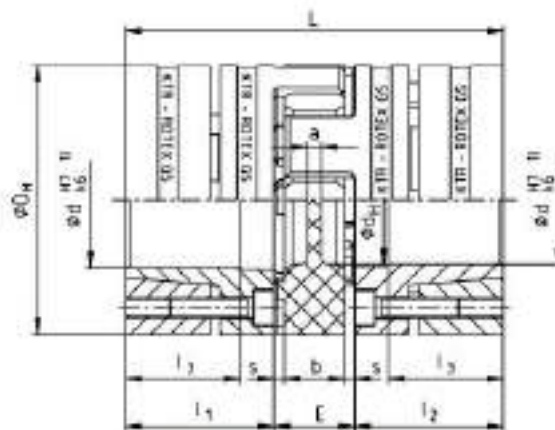


Illustration 9: ROTEX® GS, clamping ring hubs

Extraction thread  $M_i$  between clamping screws.

Clamping ring hub 6.0 light with block mounting (hub and clamping ring mounted as a block)

t) From Ø55 tolerance G7/m6

Table 6: Dimensions - Clamping ring hubs 6.0 light, 6.0 steel and 6.0

Size	Dimensions <sup>2)</sup> (mm)									Clamping screws DIN EN ISO 4762			
	D <sub>h</sub> <sup>3)</sup>	d <sub>h</sub>	L	L <sub>1</sub> , L <sub>2</sub>	L <sub>3</sub>	E	b	s	a	M	z <sup>4)</sup>	T <sub>A</sub> [Nm]	M <sub>i</sub>
<b>6.0 light (size 14 - 48)</b>													
Material of hub/clamping ring - aluminium													
Hub material - aluminium/clamping ring material - steel													
14	30	10.5	50	18.5	13.5	13	10	1.5	2.0	M3	4	1.34	M3
19	40	18	65	25	18	16	12	2.0	3.0	M4	5	3	M4
24	55	27	78	30	22	18	14	2.0	3.0	M5	4	6	M5
28	65	30	90	35	27	20	15	2.5	4.0	M5	8	8	M5
38	80	38	114	45	35	24	18	3.0	4.0	M6	8	10	M6
42	95	48	128	50	38	26	20	3.0	4.0	M8	4	25	M8
48	105	51	140	56	41	28	21	3.5	4.0	M10	4	49	M10
<b>6.0 steel (size 19 - 90)</b>													
Material of hub and clamping ring - steel													
19	40	18	65	25	18	16	12	2.0	3.0	M4	5	4.1	M4
24	55	27	78	30	22	18	14	2.0	3.0	M5	4	8.5	M5
28	65	30	90	35	27	20	15	2.5	4.0	M5	8	8.5	M5
38	80	38	114	45	35	24	18	3.0	4.0	M6	8	14	M6
42	95	48	128	50	38	26	20	3.0	4.0	M8	4	41	M8
48	105	51	140	56	41	28	21	3.5	4.0	M10	4	69	M10
55	120	60	160	65	46	30	22	4.0	4.5	M10	4	69	M10
65	135	68	185	75	55	35	26	4.5	4.5	M12	4	120	M12
75	160	80	210	85	63	40	30	5.0	5.0	M12	5	120	M12
90	200	104	245	100	75	45	34	5.5	6.5	M18	5	295	M18

2)  $\varnothing D_h + 2$  mm with high speeds for expansion of spider

3) z = Number each clamping ring hub

4) Consider transmittable friction torques of the respective clamping ring hubs 6.0 light, 6.0 steel and 6.0 (see table 9 to 11)



#### 4.6 Assembly of clamping ring hubs (hub type 6.0 light, 6.0 steel and 6.0)

The power transmission of **ROTEX® GS** clamping hubs is frictionally engaged. The necessary surface pressure is transmitted via the clamping ring with internal taper to the taper hub and consequently to the shaft. The friction torques specified in table 5 to 7 consider a fit pair H7/k6, from Ø55 G7/m6. With a bigger fitting tolerance the friction torques specified in table 9 to 11 are reduced.

The strength and dimensions of the shafts (specifically hollow shafts) have to be dimensioned such that sufficient safety against plastic deformation is ensured. This may roughly be reviewed as per the following criterion.

For clamping connections with hollow shafts the required internal diameter of the hollow shaft  $d_{IW}$  is calculated based on the following formula:

$$d_{IW} \leq d \cdot \sqrt{\frac{R_{p0,2} - 2 \cdot p_w}{R_{p0,2}}} \quad [\text{mm}]$$

Shear stress on the internal shaft diameter for hollow shaft:

$$\sigma_{tIW} \approx - \frac{2 \cdot p_w}{1 - C_w^2} \quad [\text{N/mm}^2]$$

Shear stress for solid shaft:

$$\sigma_{tW} = - p_w \quad [\text{N/mm}^2]$$

$R_{p0,2}$  = yield strength of shaft material  $[\text{N/mm}^2]$   
 $p_w$  = surface pressure of hub/shaft  $[\text{N/mm}^2]$

$d_{IW}$  = internal diameter of hollow shaft  $[\text{mm}]$   
 $d$  = shaft diameter  $[\text{mm}]$   
 $C_w$  =  $d_{IW} / d$

The strength required is not provided if the hollow shaft bore exceeds the max. internal bore calculated or if the shear stress exceeds the yield strength of the material.  
 For a detailed calculation please contact KTR.



**If used in potentially explosive atmospheres all screw connections must be secured against working loose additionally, e. g. conglomerating with Loctite (average strength).**

- Clean the hub bore and shaft and review for dimensional accuracy, afterwards lubricate with a thin oil (e. g. Castrol 4 in 1, Klüber Quietsch-Ex or WD 40).



**Oils and greases containing molybdenum disulfide or other high-pressure additives as well as internal lubricants must not be used.**

- Lightly untighten the clamping screw and pull the clamping ring from the hub only marginally to make sure that the clamping ring is fitted loosely.
- Shift the clamping ring hub onto the shaft. Dimension  $l_3$  should at least be observed (see table 8).
- Tighten the clamping screws evenly crosswise gradually to the tightening torque specified in table 8. Repeat this process until all clamping screws have reached the tightening torque.

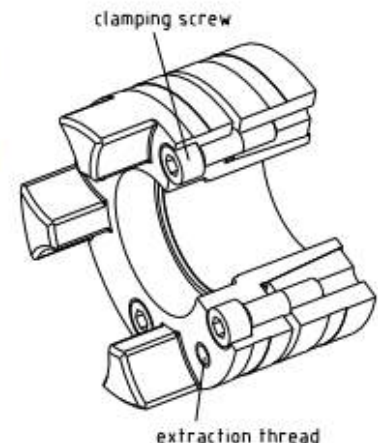


Illustration 21: Assembly of clamping ring hub with clamping ring



**If the clamping screws are not tightened at the correct tightening torque, there is the risk of**  
 a) a fracture of the hubs/cams and plastic deformation with a too high tightening torque  $T_A$   
 b) early slipping, untightening of the screws with a too low tightening torque  $T_A$

- **Applies with hub type 6.0 light only:**  
 Tighten the clamping screws evenly gradually and crosswise at 1/3 or 2/3 tightening torque  $T_A$ , respectively (see table 8) until the ring gets in contact. Afterwards tighten the screws at the tightening torque mentioned in table 8 one after another.

### 4.7 Disassembly of clamping ring hubs (hub type 6.0 light, 6.0 steel and 6.0)

Unscrew the clamping screws evenly one after another. During every revolution every screw may only be unscrewed by half a turn. Unscrew all clamping screws by 3 - 4 pitches.

Remove the screws located next to the extraction threads and screw them into the respective extraction threads until they fit.

The clamping ring is released by tightening the screws in the extraction threads evenly gradually and crosswise.



**If these hints are not observed, the operation of the coupling may be affected.**

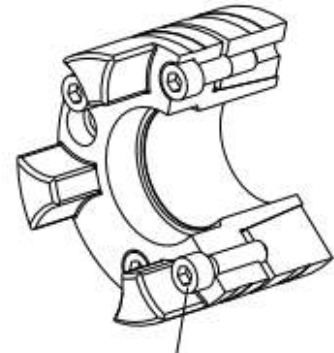


Illustration 22: Disassembly of clamping ring hub with clamping ring

If the assembly is repeated the bore of the hub and shaft have to be cleaned and afterwards lubricated with a thin oil (e. g. Castrol 4 in 1, Klüber Quietsch-Ex or WD 40). The same applies for the taper surfaces of clamping ring hub and clamping ring.



**Oils and greases containing molybdenum disulfide or other high-pressure additives as well as internal lubricants must not be used.**

#### Applies with hub type 6.0 light only:



If the assembly is repeated the taper surfaces, bores of the hub and the shaft have to be cleaned. The bore of the hub and shaft have to be lubricated with thin oil (e. g. Castrol 4 in 1, Klüber Quietsch-Ex or WD 40). Lightly paint the taper surfaces of the clamping ring hub or clamping ring with the grease Gleitmo 800, afterwards twist the components against one another by one revolution in order to spread the grease evenly.

### 7. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

15	Switch on the machine (Refer to the Service Manual).
16	Close and lock the safety door to access the machine. (Refer to the Service Manual)
17	Carry out greasing cycles.
18	Carry out the alignment and “0” reference of the “X” Axis.



CHECK THE MACHINE AXIS ALIGNMENT PROCEDURES DESCRIBED IN THE SERVICE MANUAL

File N°	TW_CM_210_002	Reference Drawings	XXXX210 / XXXX211
Mechanical Personnel	2	Electrical Personnel	0
Duration	120'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Safety Brake Disassembly
3	Safety Brake Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION



### 3. MACHINE DISCONNECTION

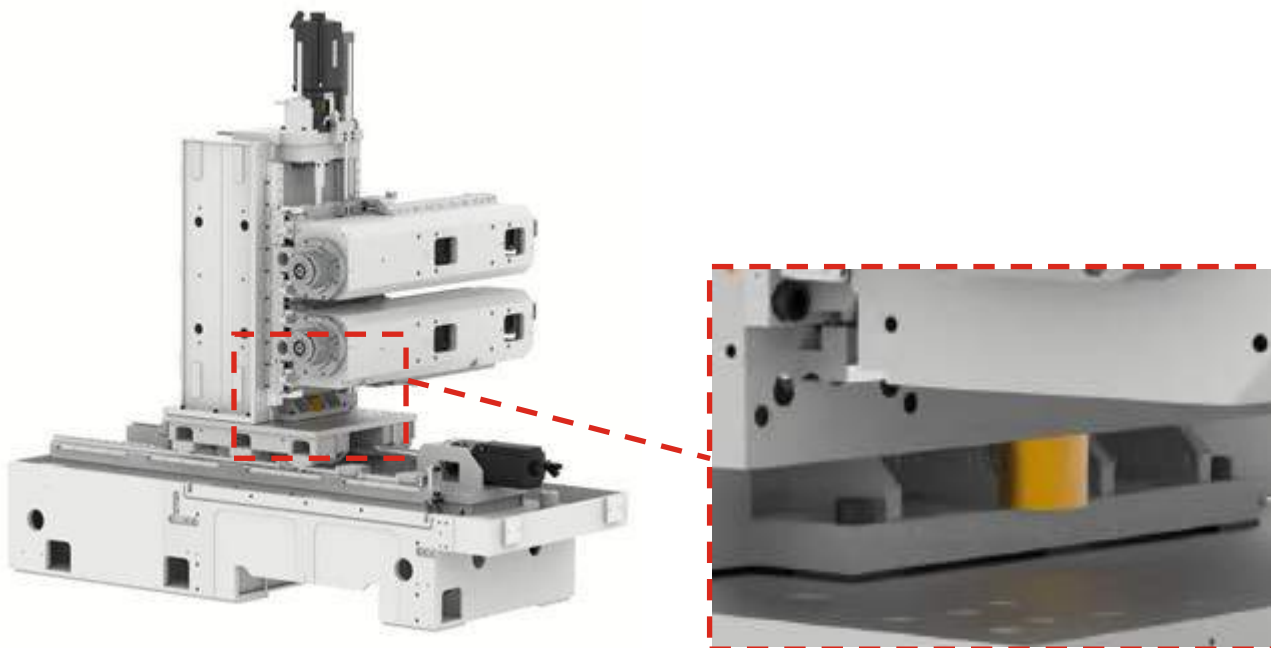
- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Using the Main Panel of the machine, open the Load / Unload Automatic Door.



- 3 Using the Robot, disassemble the Clamping Fixture from the machine.
- 4 Connect the Handheld Unit to the Main Control Panel.
- 5 Open the 3 Axis Module panel door to access to the rear side of the 3 Axis Module.



- 6 Move the "Y" axis until the carriage makes contact with the lower stop.



- 7 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 8 Switch off the machine (Refer to the Service Manual).
- 9 If the machine has "Y" Axis Manual Blocking Device, proceed with the following steps.  
If the machine does not have "Y" Axis Manual Blocking Device, skip the following steps and continue to the disassembly.

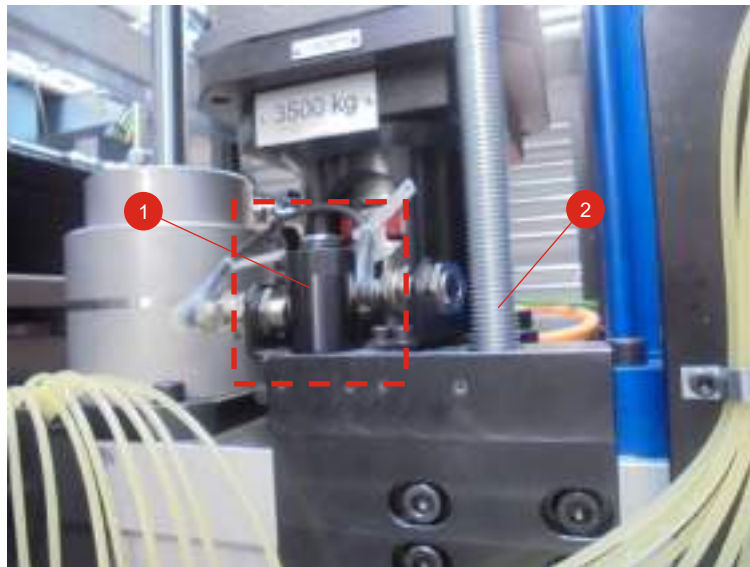


WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY LEVELS AND WORK PROCEDURES APPROVED (BA).



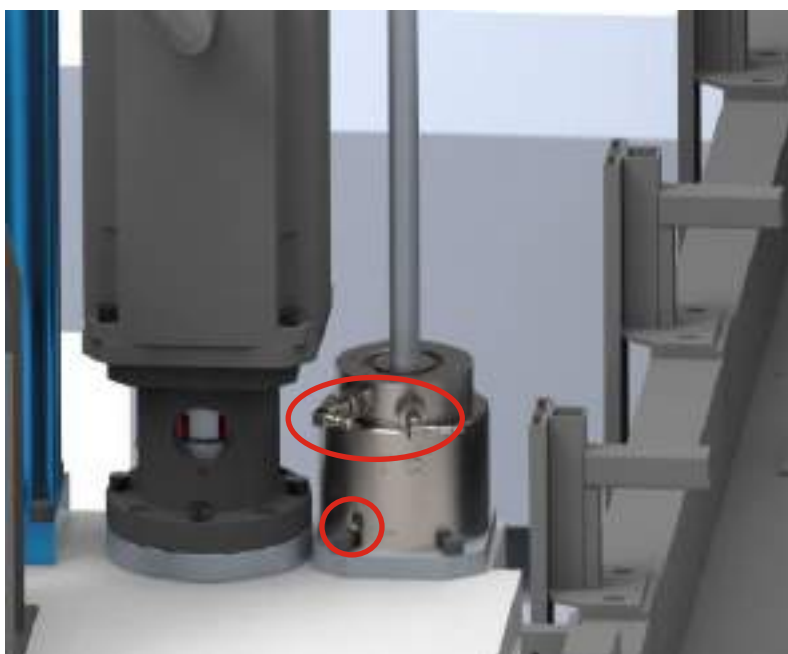
AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

- 10** Untighten the M20 nut from the resting position (Pos.1) and lock the "Y" Axis with it (Pos.2).

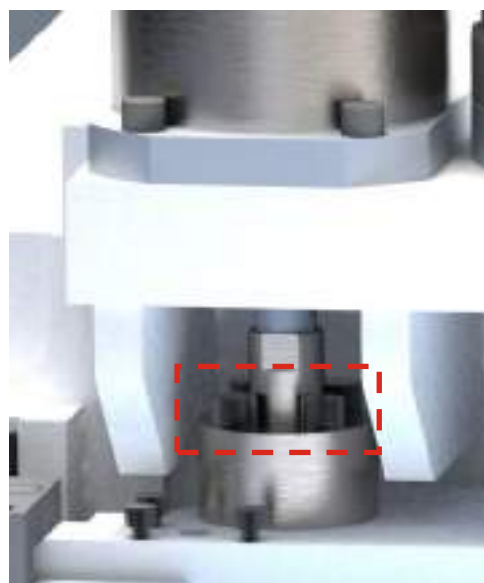


## 4. PROCEDURE DESCRIPTION: SAFETY BRAKE DISASSEMBLY

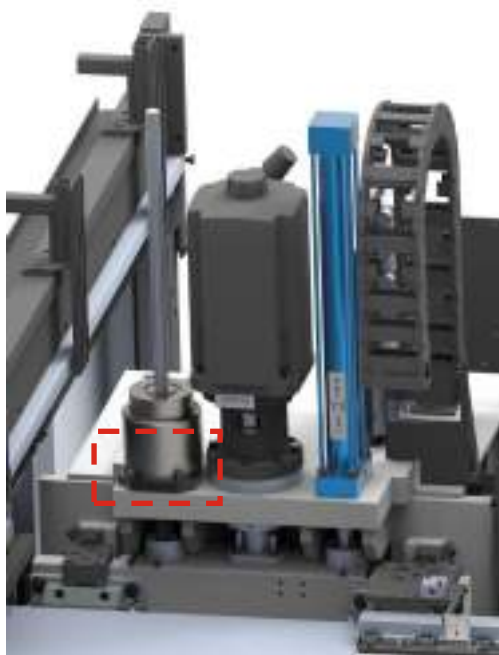
11	Access the 3 Axis Module.
12	Disassemble the Fluid and Electrical connections of the Safety Brake.



13	Disassemble the screws fixing the Safety Brake Rod to the “Y” Axis Carriage.
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- 14** Disassemble the screws fixing the Safety Brake to the Column and extract it.



- 15** Connect the "L" Pneumatic Connection of the Safety Brake to the Pneumatic Line with the minimum pressure to release the brake and disassemble the Safety Brake Rod.



- 16** Disassemble the screws fixing the Safety Brake against the Base Plate.



### 5. PROCEDURE DESCRIPTION: SAFETY BRAKE REPLACEMENT AND ASSEMBLY

17	Replace the Safety Brake for new one.
18	To assemble the Safety Brake, follow the disassembly steps in reverse order.

### 6. CONSIDERATIONS FOR ASSEMBLY



ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm

## 7. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

19	Switch on the machine (Refer to the Service Manual).
20	Close and lock the safety door to access the machine. (Refer to the Service Manual)



FOR MORE INFORMATION ABOUT THE SAFETY BRAKE, REFER TO THE ATTACHMENT FOLDER



File N°	TW_CM_210_003	Reference Drawings	XXXX210 / XXXX211
Mechanical Personnel	1	Electrical Personnel	9
Duration	20'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

### 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Safety Brake Detectors Disassembly
3	Safety Brake Detectors Replacement and Assembly
4	Machine Connection

### 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHenever a maintenance task needs to be conducted, the operator or the maintenance personnel must ensure that only them can operate the machine in accordance to the safety standards and approved work procedures



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

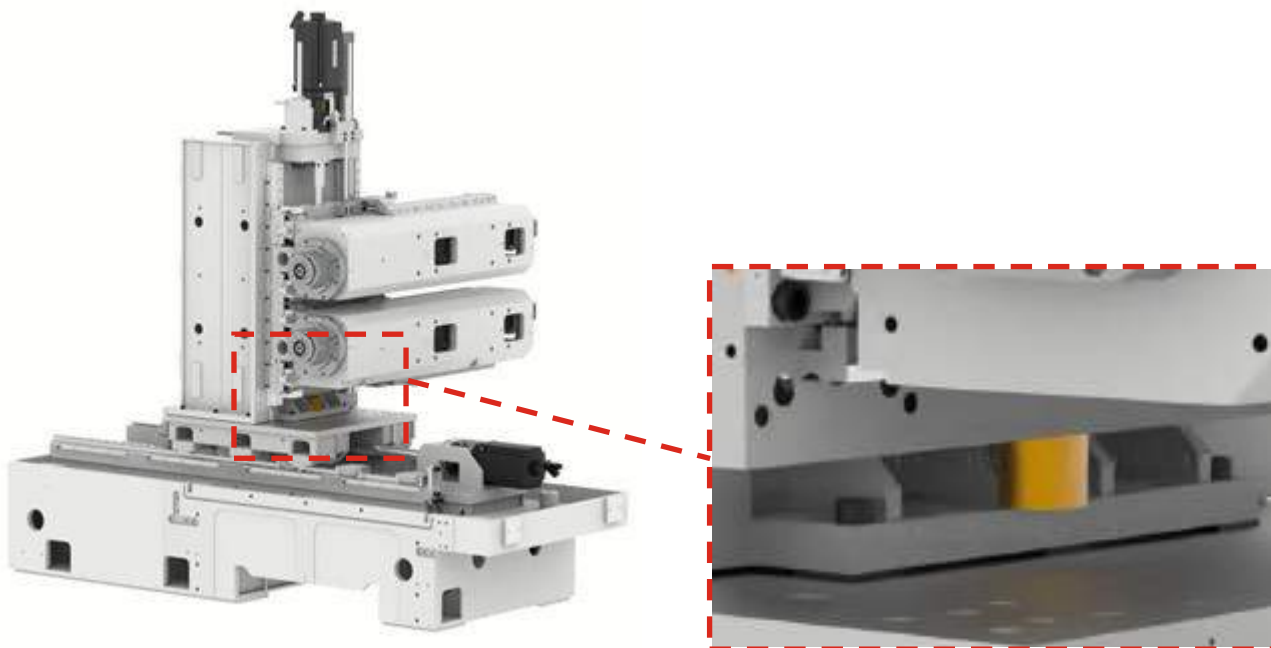
- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Using the Main Panel of the machine, open the Load / Unload Automatic Door.



- 3 Using the Robot, disassemble the Clamping Fixture from the machine.
- 4 Connect the Handheld Unit to the Main Control Panel.
- 5 Open the 3 Axis Module panel door to access to the rear side of the 3 Axis Module.



- 6 Move the "Y" axis until the carriage makes contact with the lower stop.



- 7 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 8 Switch off the machine (Refer to the Service Manual).
- 9 If the machine has "Y" Axis Manual Blocking Device, proceed with the following steps.  
If the machine does not have "Y" Axis Manual Blocking Device, skip the following steps and continue to the disassembly.

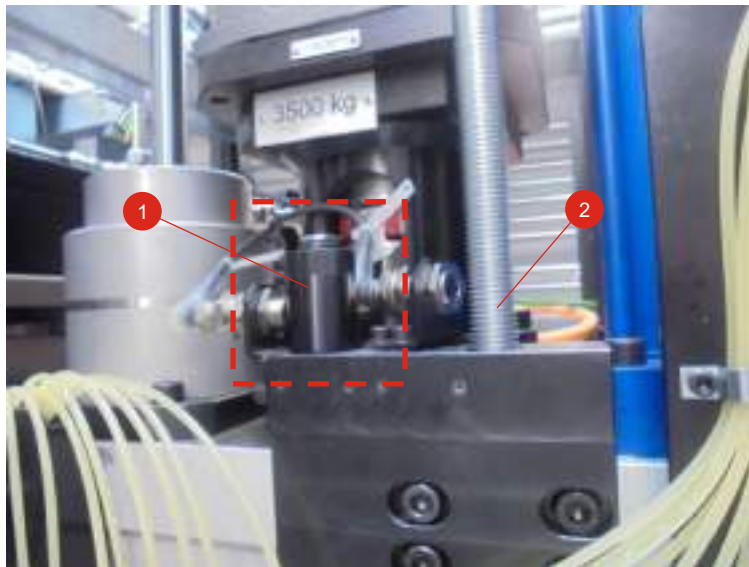


WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY LEVELS AND WORK PROCEDURES APPROVED (BA).



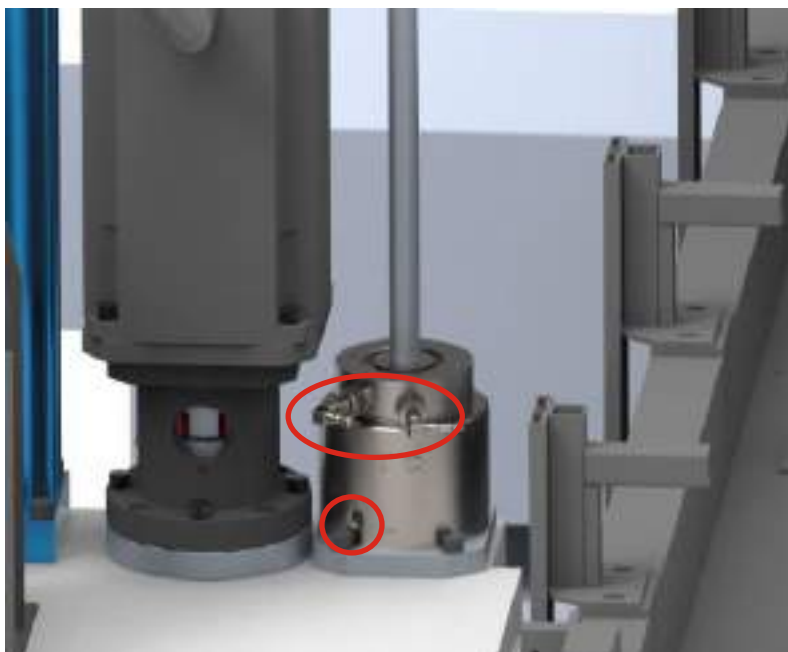
AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

- 10** Untighten the M20 nut from the resting position (Pos.1) and lock the "Y" Axis with it (Pos.2).



### 4. PROCEDURE DESCRIPTION: SAFETY BRAKE DETECTORS DISASSEMBLY

11	Access the 3 Axis Module.
12	Disassemble the Electrical connections of the Safety Brake.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 5. PROCEDURE DESCRIPTION: SAFETY BRAKE DETECTORS REPLACEMENT AND ASSEMBLY

13	Replace the Safety Brake Detectors for new ones.
14	To assemble the Safety Brake Detectors, follow the disassembly steps in reverse order.

### 6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

15	Switch on the machine (Refer to the Service Manual).
16	Close and lock the safety door to access the machine. (Refer to the Service Manual)



FOR MORE INFORMATION ABOUT THE SAFETY BRAKE, REFER TO THE ATTACHMENT FOLDER





File N°	TW_CM_210_008	Reference Drawings	XXXX210 / XXXX211
Mechanical Personnel	X	Electrical Personnel	X
Duration	60'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

### 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Hydraulic Cylinder Disassembly
3	Hydraulic Cylinder Replacement and Assembly
4	Machine Connection

### 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

**3. MACHINE DISCONNECTION**

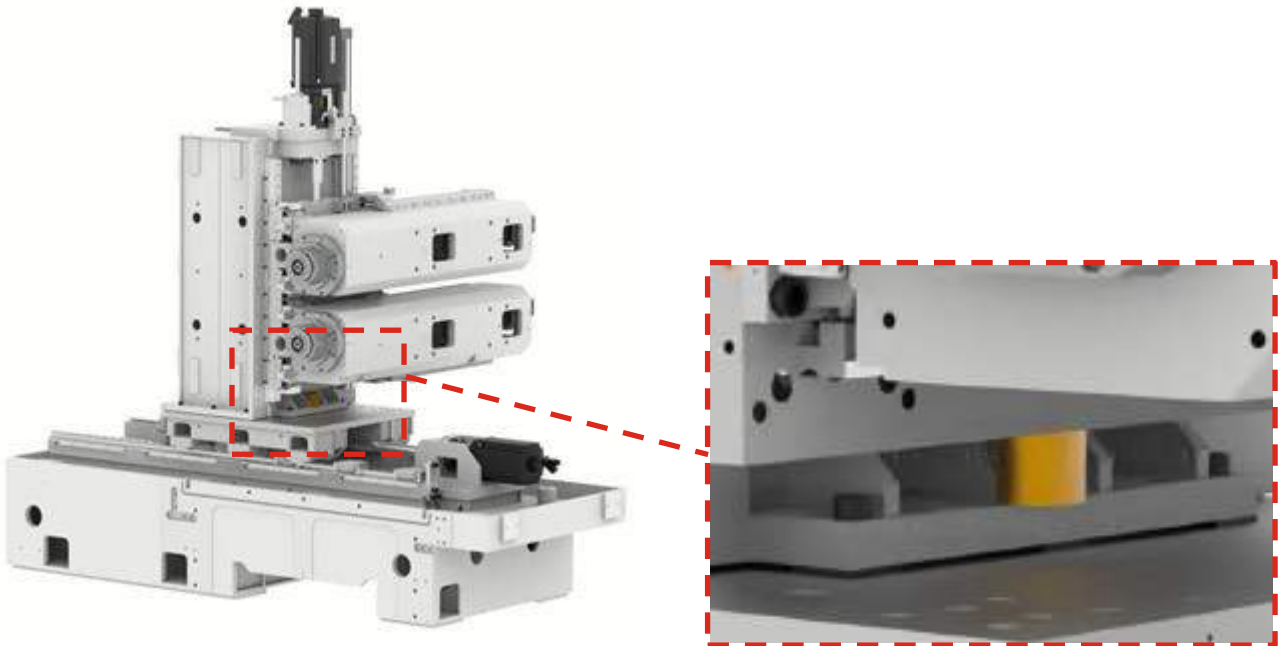
- |   |   |
|---|---|
| 1 | Clean and prepare the area where the maintenance task is going to take place. |
| 2 | Using the Main Panel of the machine, open the Load / Unload Automatic Door.   |



- |   |  |
|---|--|
| 3 | Using the Robot, disassemble the Clamping Fixture from the machine.                |
| 4 | Connect the Handheld Unit to the Main Control Panel.                               |
| 5 | Open the 3 Axis Module panel door to access to the rear side of the 3 Axis Module. |



- 6 Move the "Y" axis until the carriage makes contact with the lower stop.



- 7 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 8 Switch off the machine (Refer to the Service Manual).
- 9 If the machine has "Y" Axis Manual Blocking Device, proceed with the following steps.  
If the machine does not have "Y" Axis Manual Blocking Device, skip the following steps and continue to the disassembly.

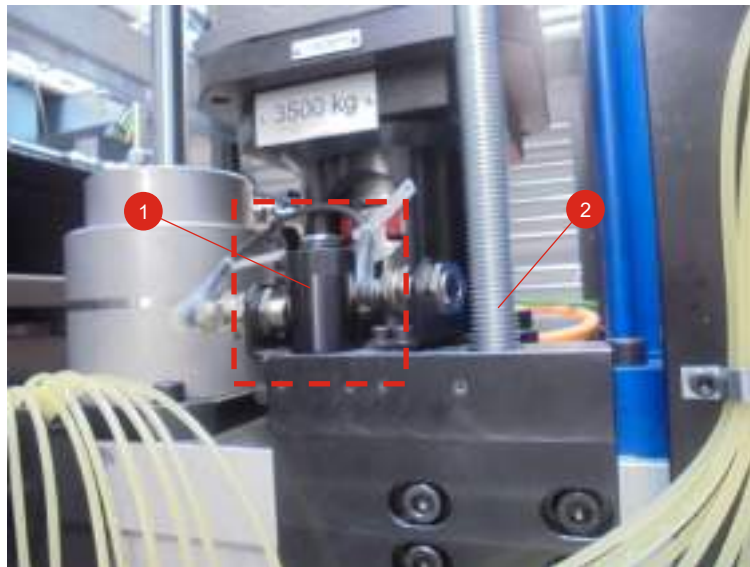


WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY LEVELS AND WORK PROCEDURES APPROVED (BA).



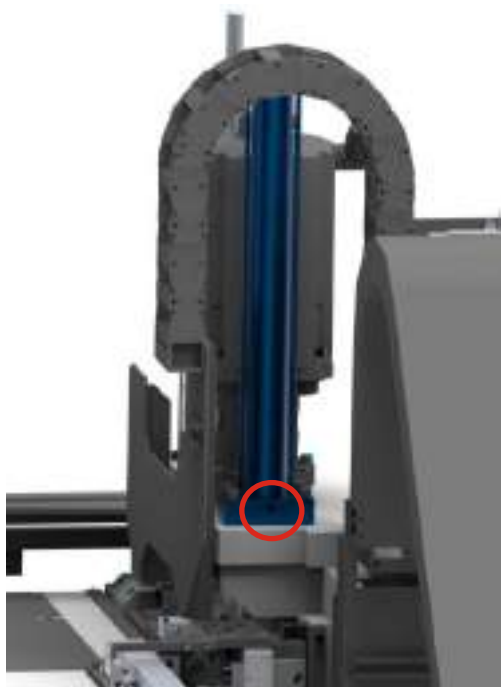
AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

- 10** Untighten the M20 nut from the resting position (Pos.1) and lock the "Y" Axis with it (Pos.2).



**4. PROCEDURE DESCRIPTION: HYDRAULIC CYLINDER DISASSEMBLY**

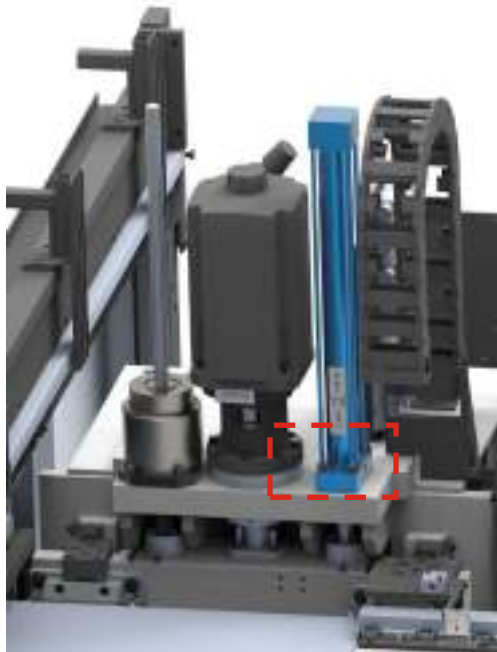
- |    |  |
|----|--|
| 11 | Access the 3 Axis Module.                                    |
| 12 | Disassemble the Fluid connections of the Hydraulic Cylinder. |



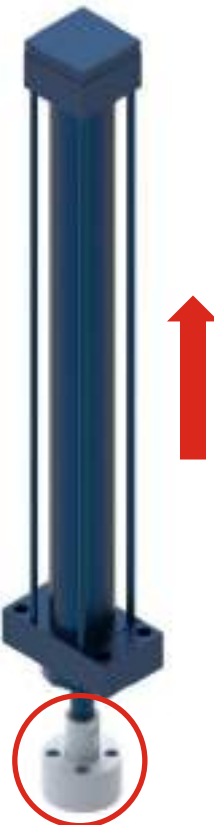
- |    |  |
|----|--|
| 13 | Disassemble the screws fixing the Hydraulic Cylinder Rod to the "Y" Axis Carriage. |
|----|--|



- 14** Disassemble the screws fixing the Hydraulic Cylinder to the Column and extract it.



- 15** Disassemble the Hydraulic Cylinder front coupling and extract it.



**5. PROCEDURE DESCRIPTION: ELEMENT REPLACEMENT AND ASSEMBLY**

16	Replace the Hydraulic Cylinder for new one.
17	To assemble the hydraulic Cylinder, follow the disassembly steps in reverse order.

**6. CONSIDERATIONS FOR ASSEMBLY**

ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm



### 7. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

18	Switch on the machine (Refer to the Service Manual).
19	Close and lock the safety door to access the machine. (Refer to the Service Manual)



File N°	TW_CM_210_009	Reference Drawings	XXXX210 / XXXX211
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	"X" Axis Linear Encoder Disassembly
3	"Y" Axis Linear Encoder Disassembly
4	"Z" Axis Linear Encoder Disassembly
5	Linear Encoder Replacement and Assembly
6	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
3	Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



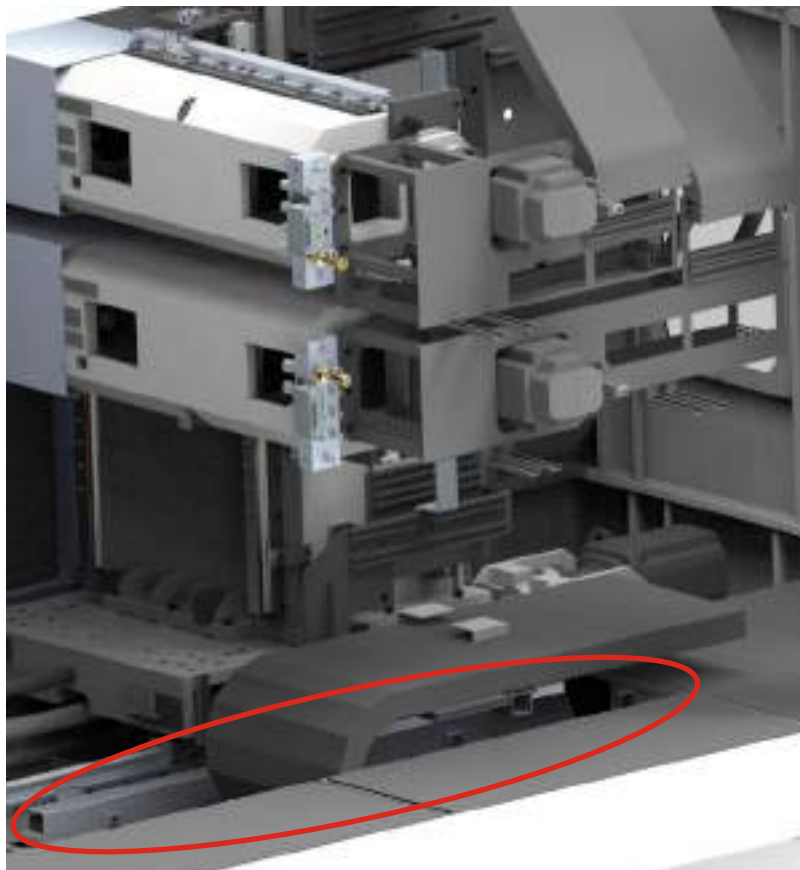
AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: "X" AXIS LINEAR ENCODER DISASSEMBLY

- 4 Open the 3 Axis Module panel door and access to the rear side of the 3 Axis Module.



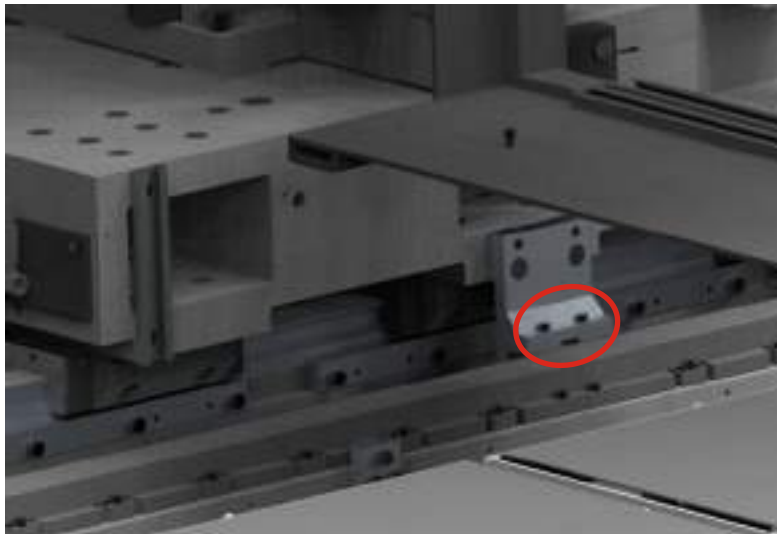
- 5 Disassemble the "X" Axis Linear Encoder Protection.



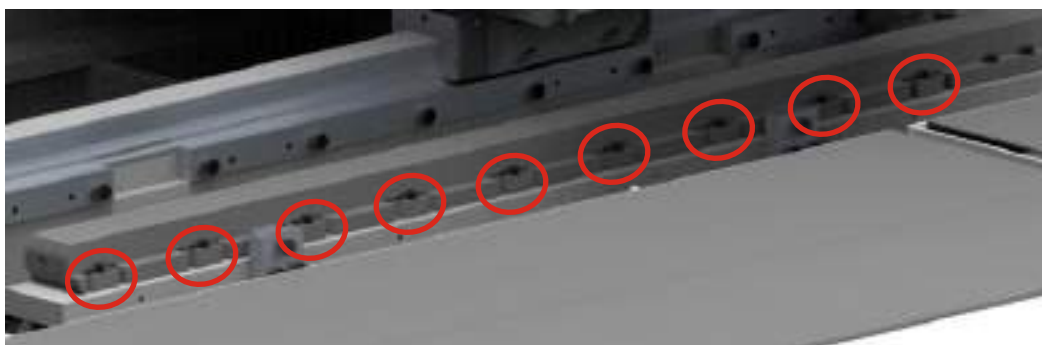


CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 6 Disassemble the screws fixing the "X" Axis Linear Encoder Reader Head to the "X" Axis Carriage.
- 7 Extract the setting Shims adjusting the position of the Linear Encoder Reader Head.



- 8 Disassemble the "X" Axis Linear Encoder from the Frame and extract it with the Reader Head.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

## 5. PROCEDURE DESCRIPTION: "Y" AXIS LINEAR ENCODER DISASSEMBLY

9	Disassemble the screws fixing the "Y" Axis Linear Encoder Reader Head to the "Y" Axis Carriage.
10	Extract the setting Shims adjusting the position of the Linear Encoder Reader Head.



11	Disassemble the "Y" Axis Linear Encoder from the Frame and extract it with the Reader Head.
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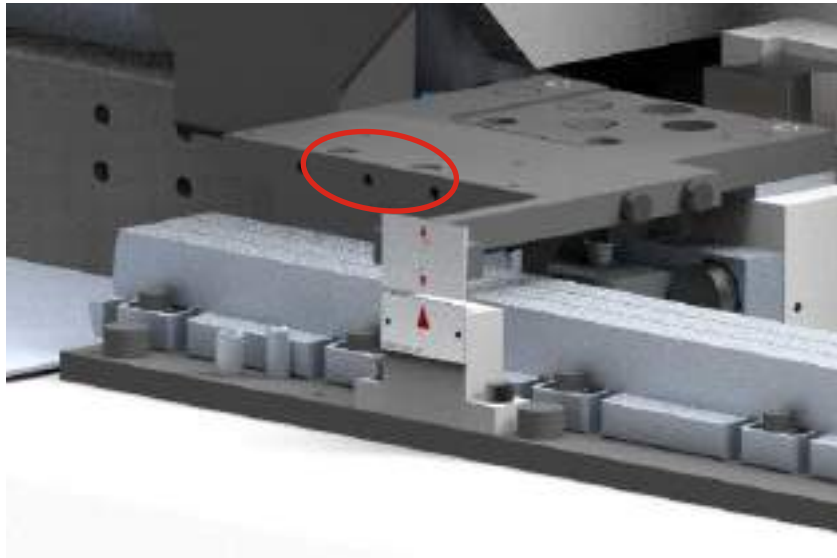


BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

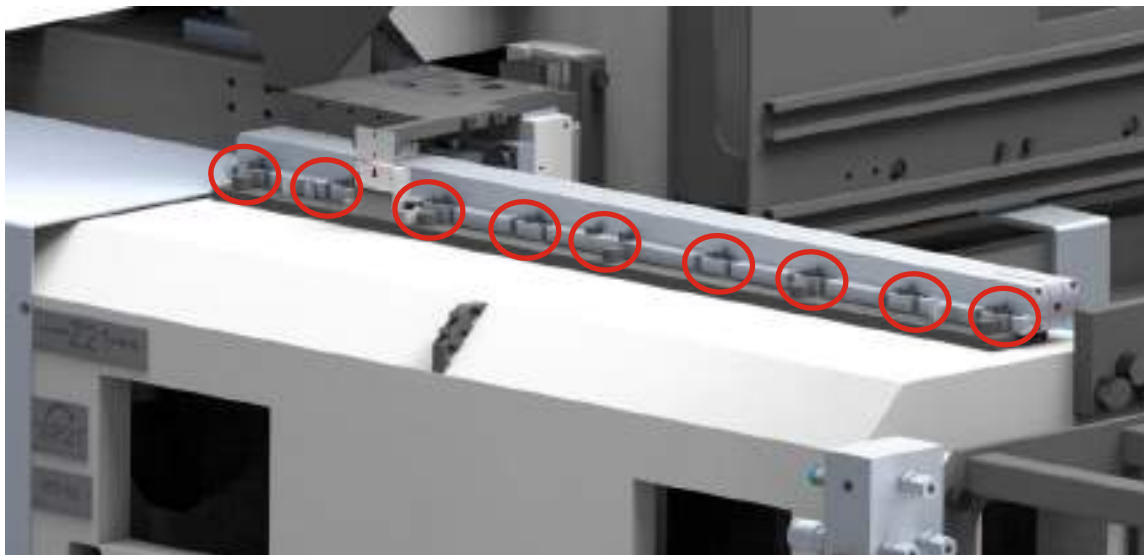


### 6. PROCEDURE DESCRIPTION: "Z" AXIS LINEAR ENCODER DISASSEMBLY

- 12 Disassemble the screws fixing the "Z" Axis Linear Encoder Reader Head to the "Z" Axis Carriage.
- 13 Extract the setting Shims adjusting the position of the Linear Encoder Reader Head.



- 14 Disassemble the "Z" Axis Linear Encoder from the Frame and extract it with the Reader Head.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

**7. PROCEDURE DESCRIPTION: LINEAR ENCODER REPLACEMENT AND ASSEMBLY**

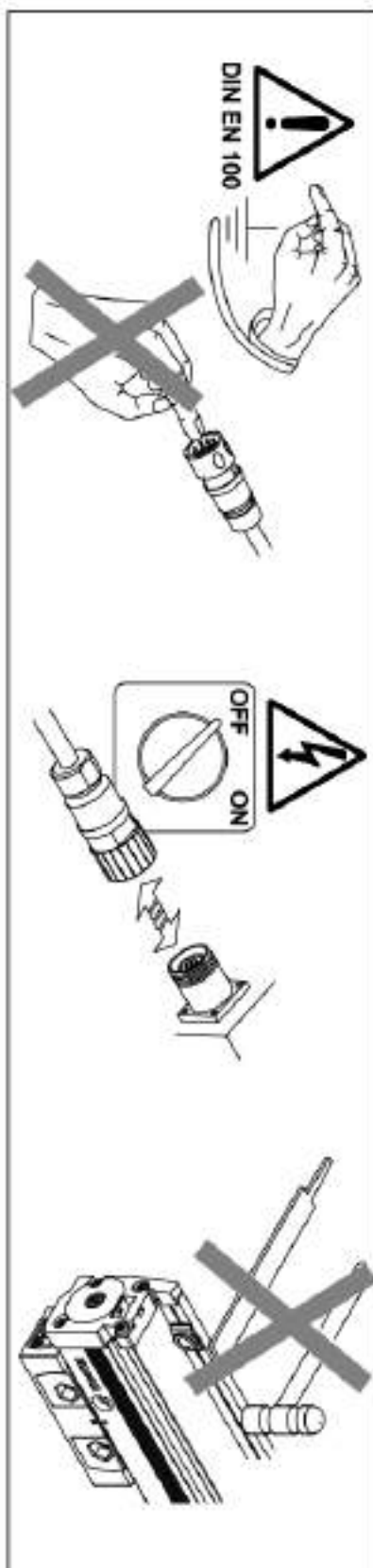
15	Replace the Linear Encoder for new one.
16	To assemble the Linear Encoder, follow the disassembly steps in reverse order.



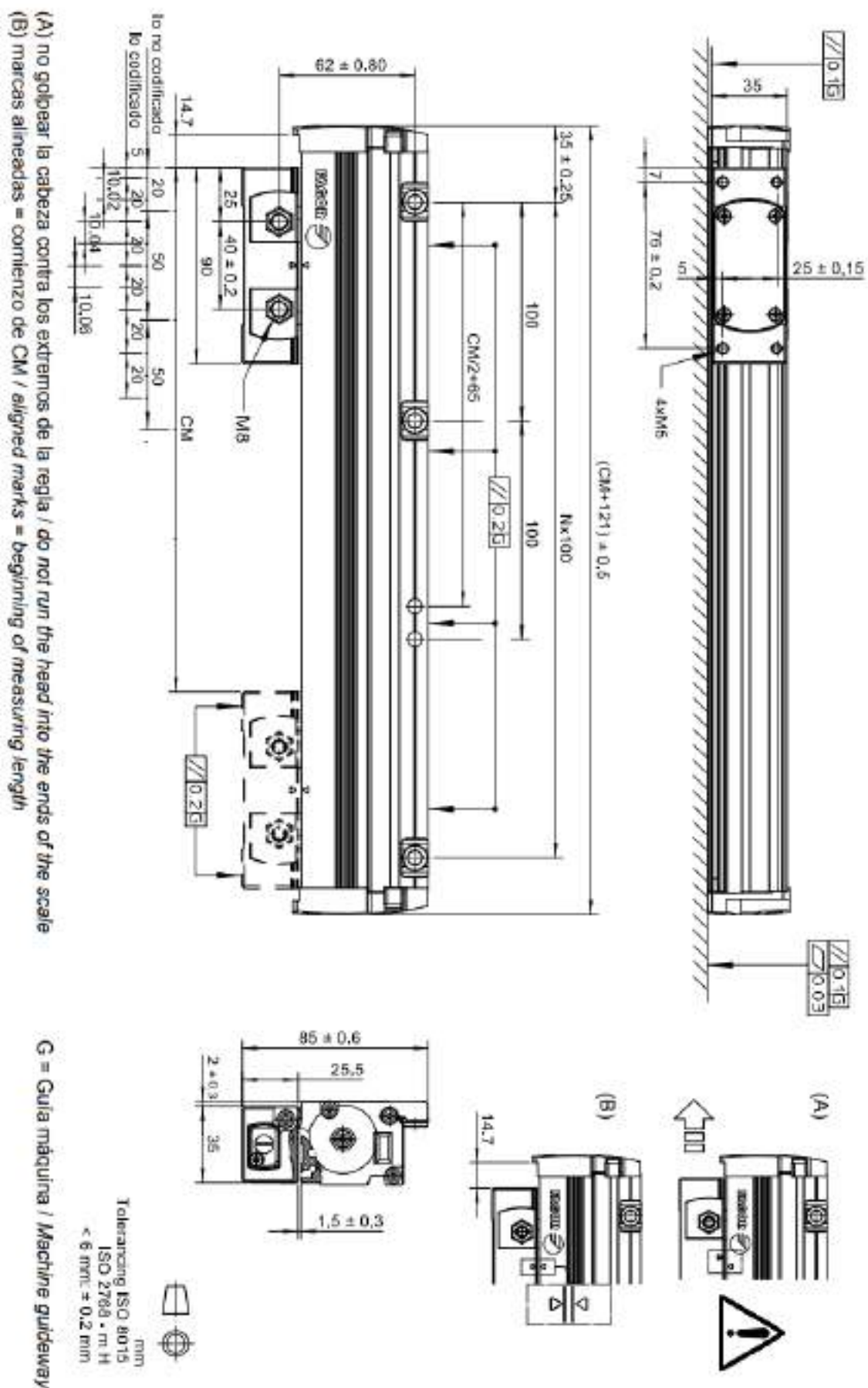
BEFORE STARTING THE ASSEMBLY PROCESS, READ CAREFULLY THE CONSIDERATIONS FOR ASSEMBLY SECTION

### 8. CONSIDERATIONS FOR ASSEMBLY

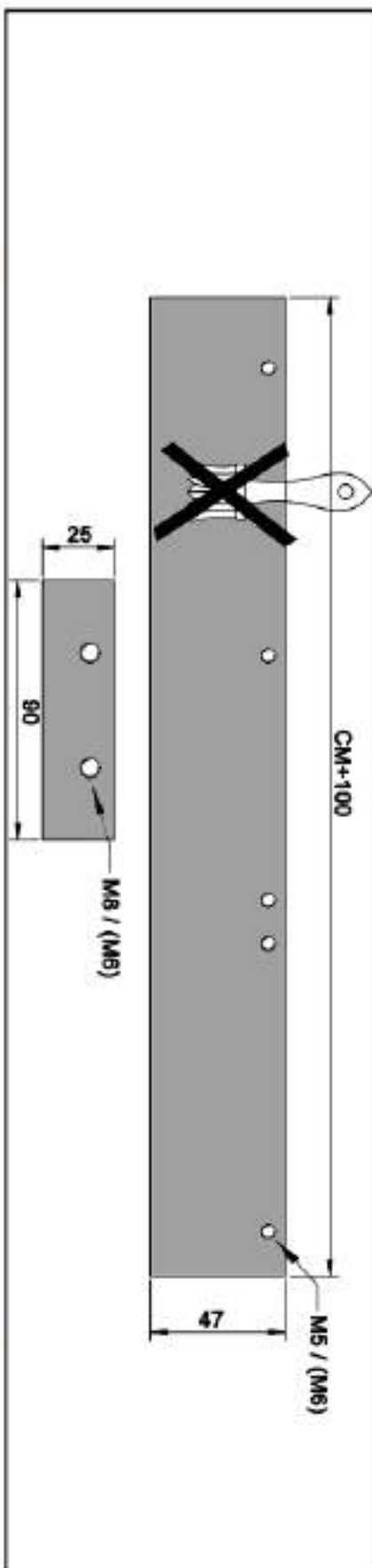
Precaución / Caution



### Dimensiones / Dimensions

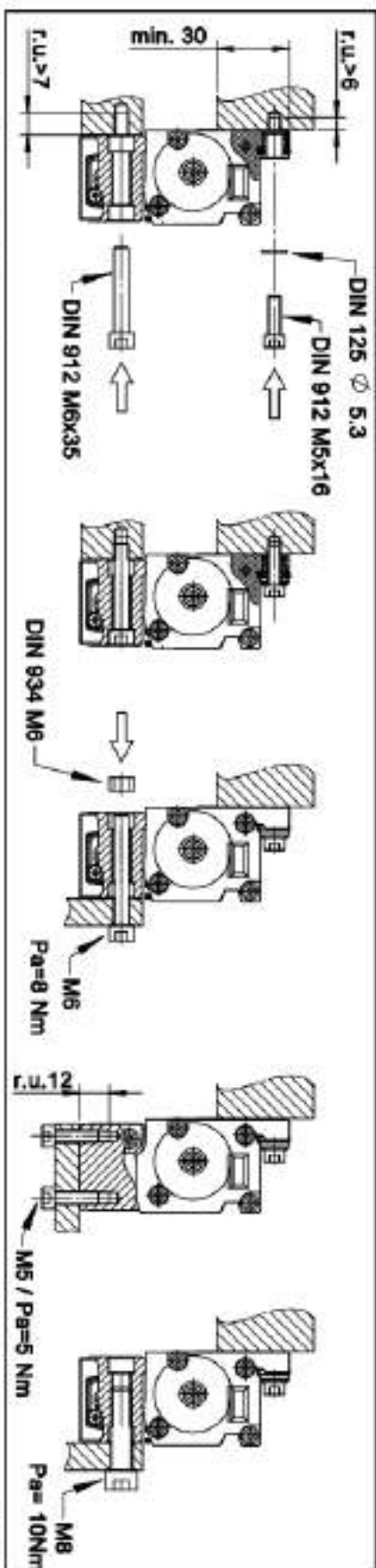


### Posibilidades de montaje / Mounting possibilities



Realizar los agujeros para amarrar la regla.  
El área sombreada debe estar libre de pintura.

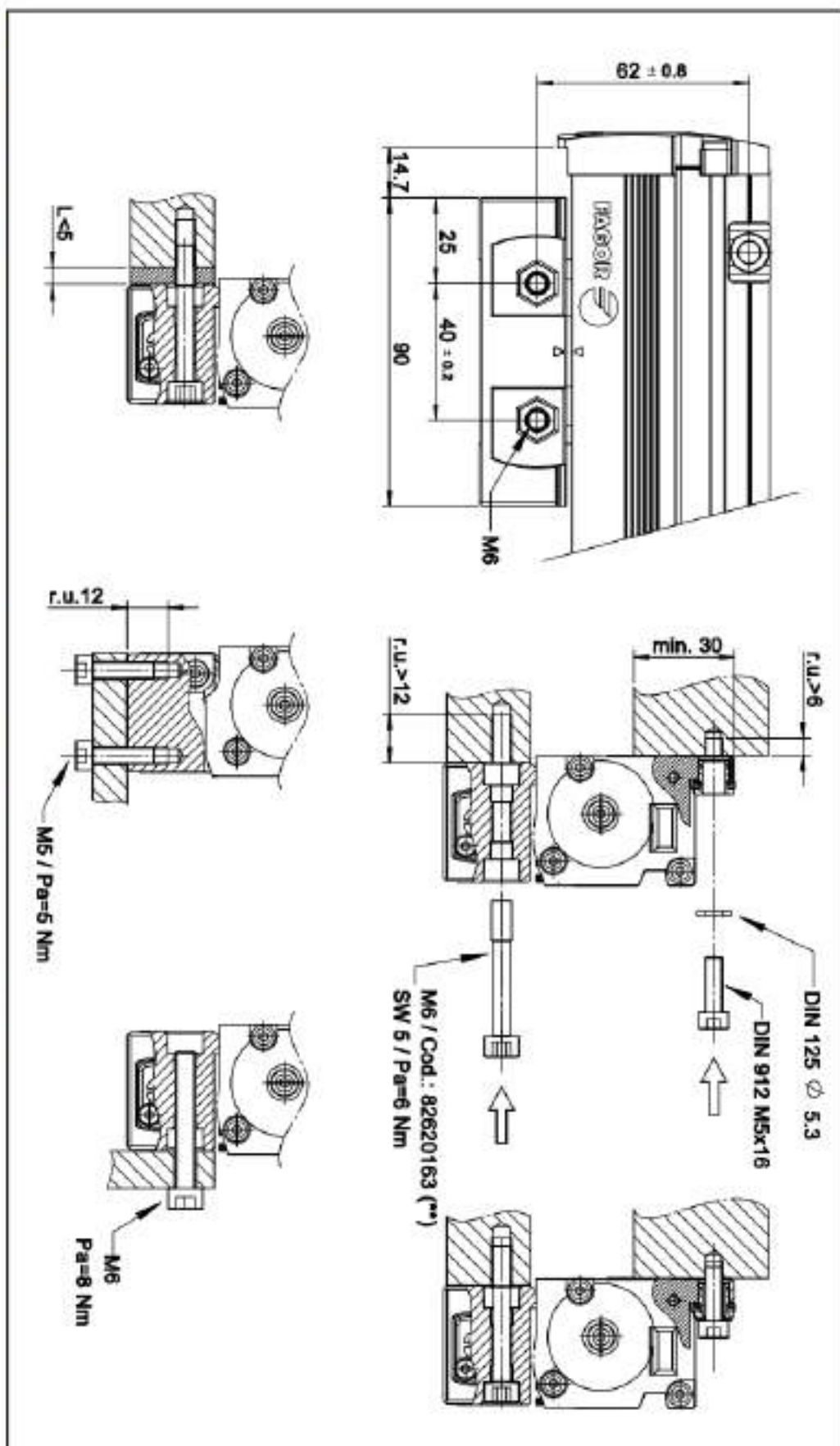
Make the holes to secure the scale.  
The shaded area must be free of paint.



Opciones de montaje de la regla.  
r.u. = rosca útil  
Pa = par de apriete

Scale mounting possibilities  
r.u. = useful thread  
Pa = tightening torque

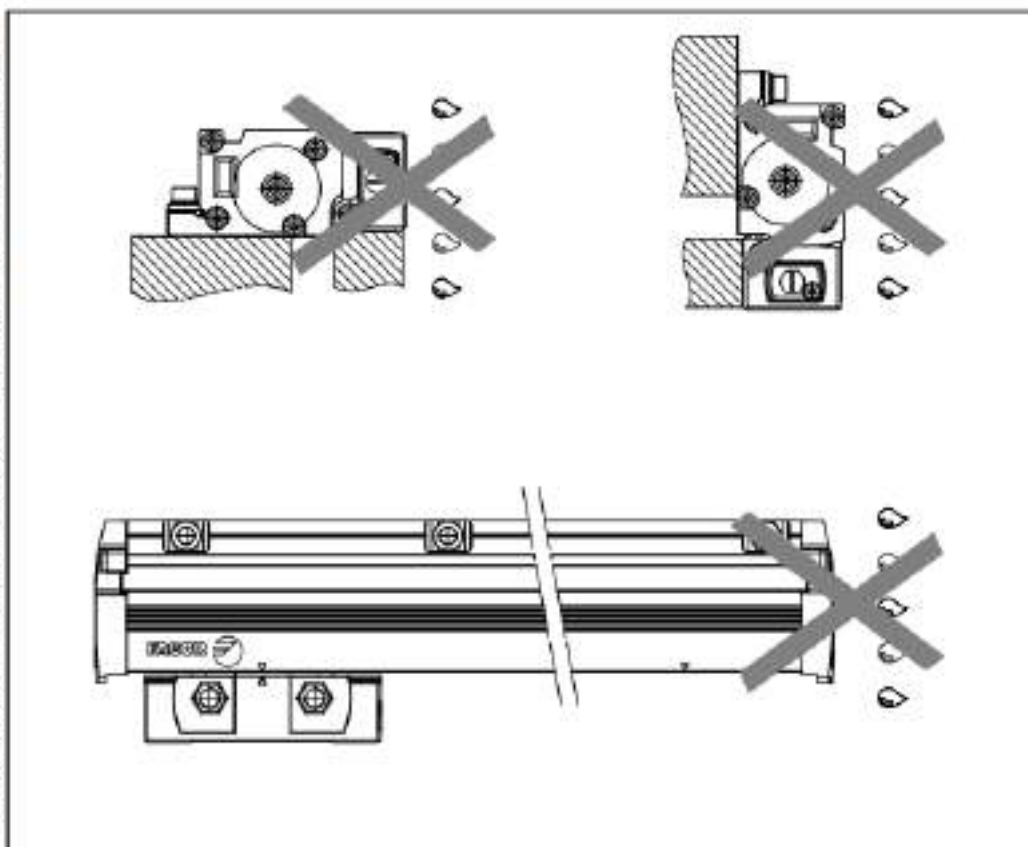
## Opción cabeza con rosca M6 / M6 Threaded head option



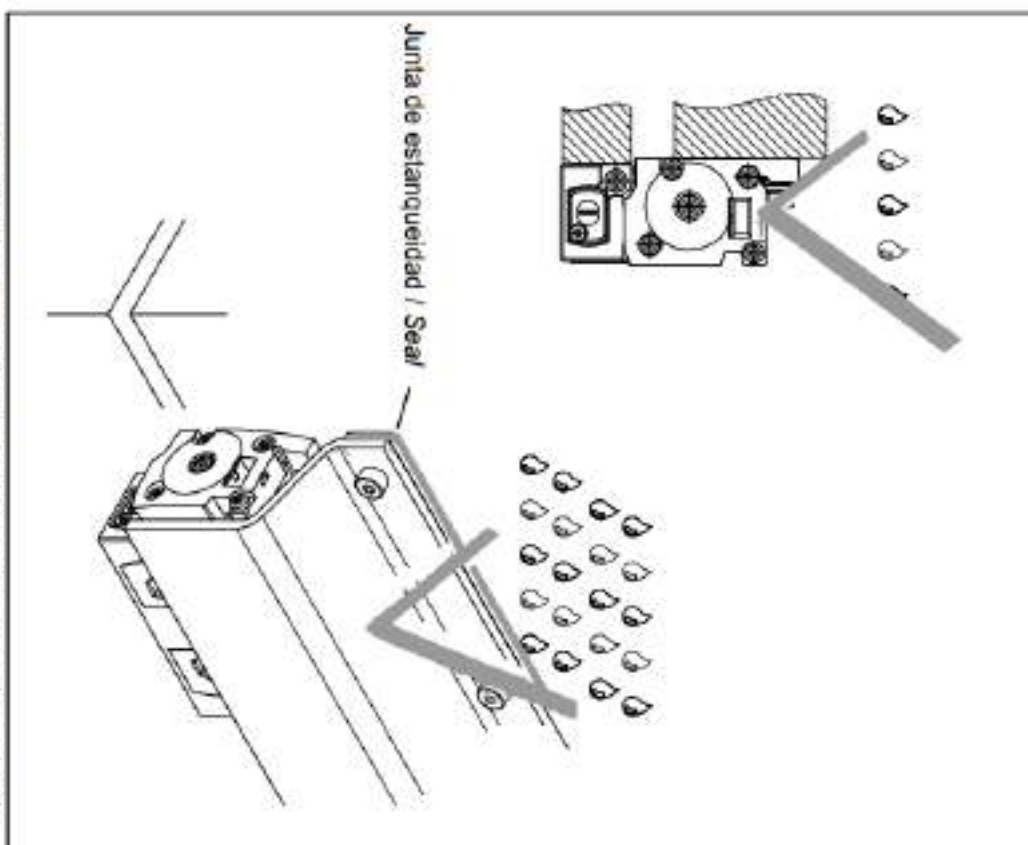
(\*\*) Material exclusivo suministrado por Fagor. Código indicado para realizar pedido de unidades adicionales  
 Exclusive material supplied by Fagor. Code shown for ordering additional units.

(SW) Tamaño de la llave hexagonal / Size of Allen wrench



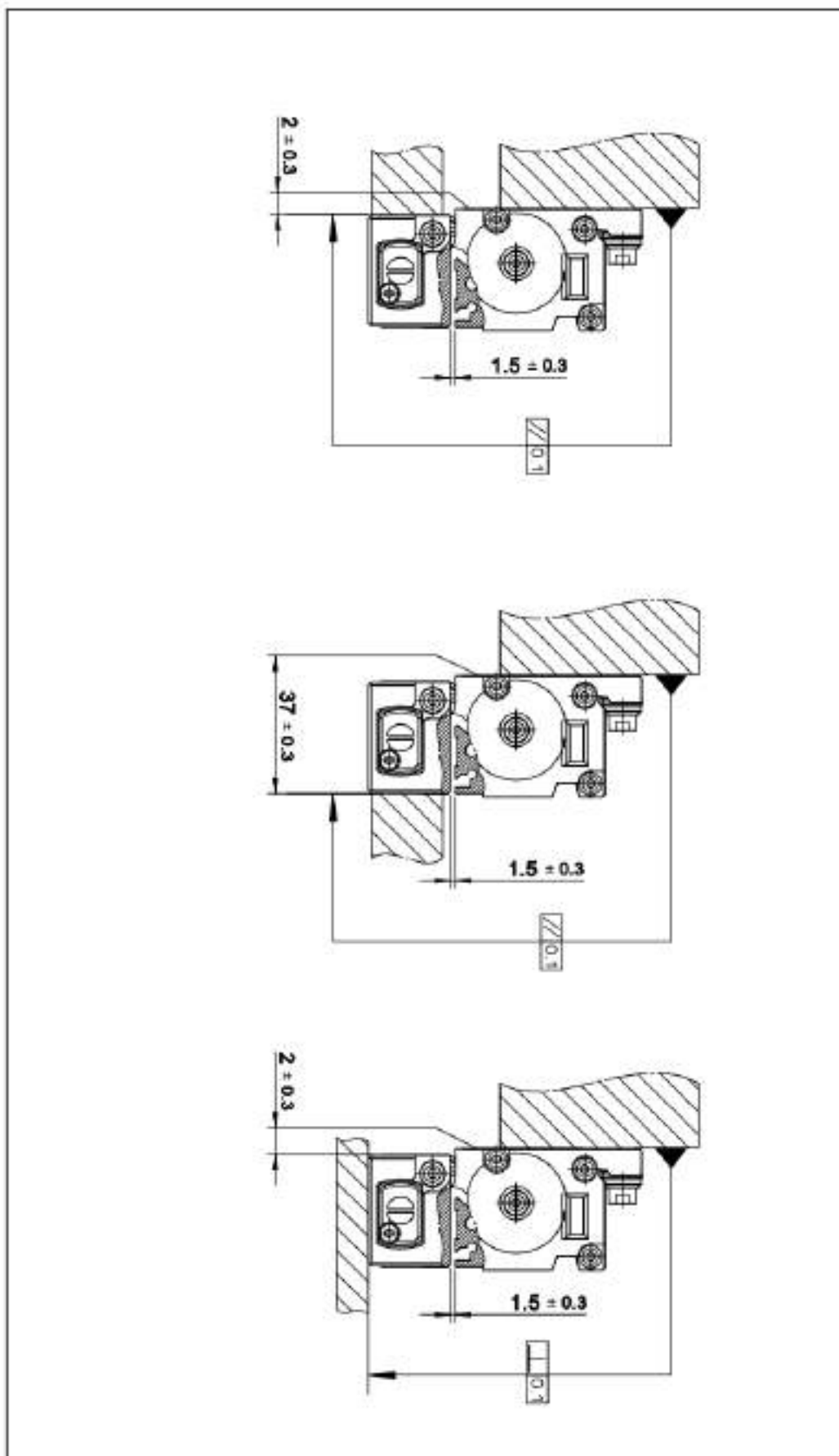


Evitar orientar los labios de estanqueidad a la exposici3n de posibles fuentes de contaminaci3n  
Avoid orienting the sealing lips towards pollution sources



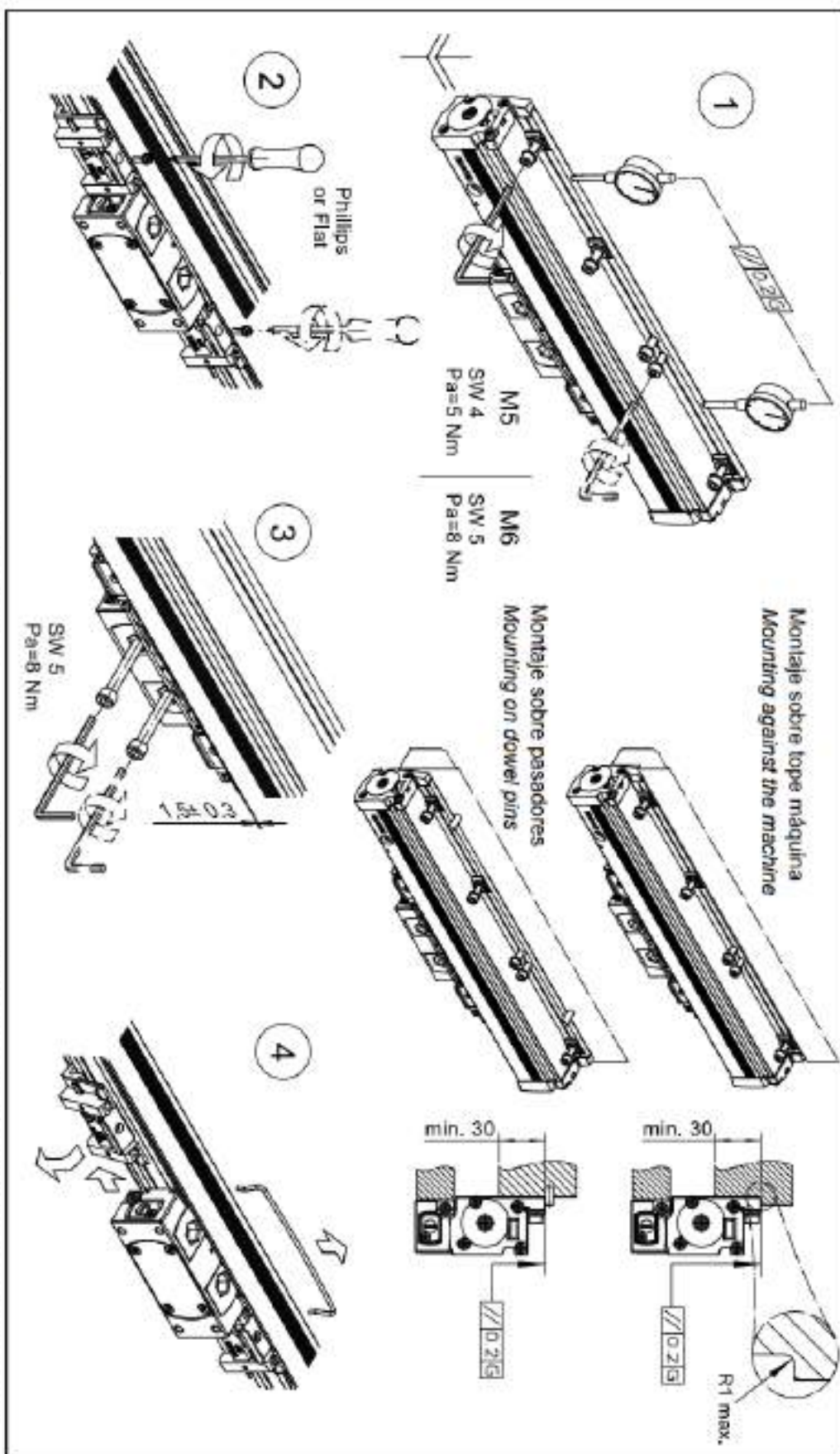
En ambientes muy contaminantes, conviene proteger la regla.  
Utilizar juntas de estanqueidad para evitar filtraciones  
In very polluted environments, the scale should be protected.  
Use seals to prevent filtrations.

**Posibilidades de montaje, tolerancias / Mounting possibilities, tolerances**

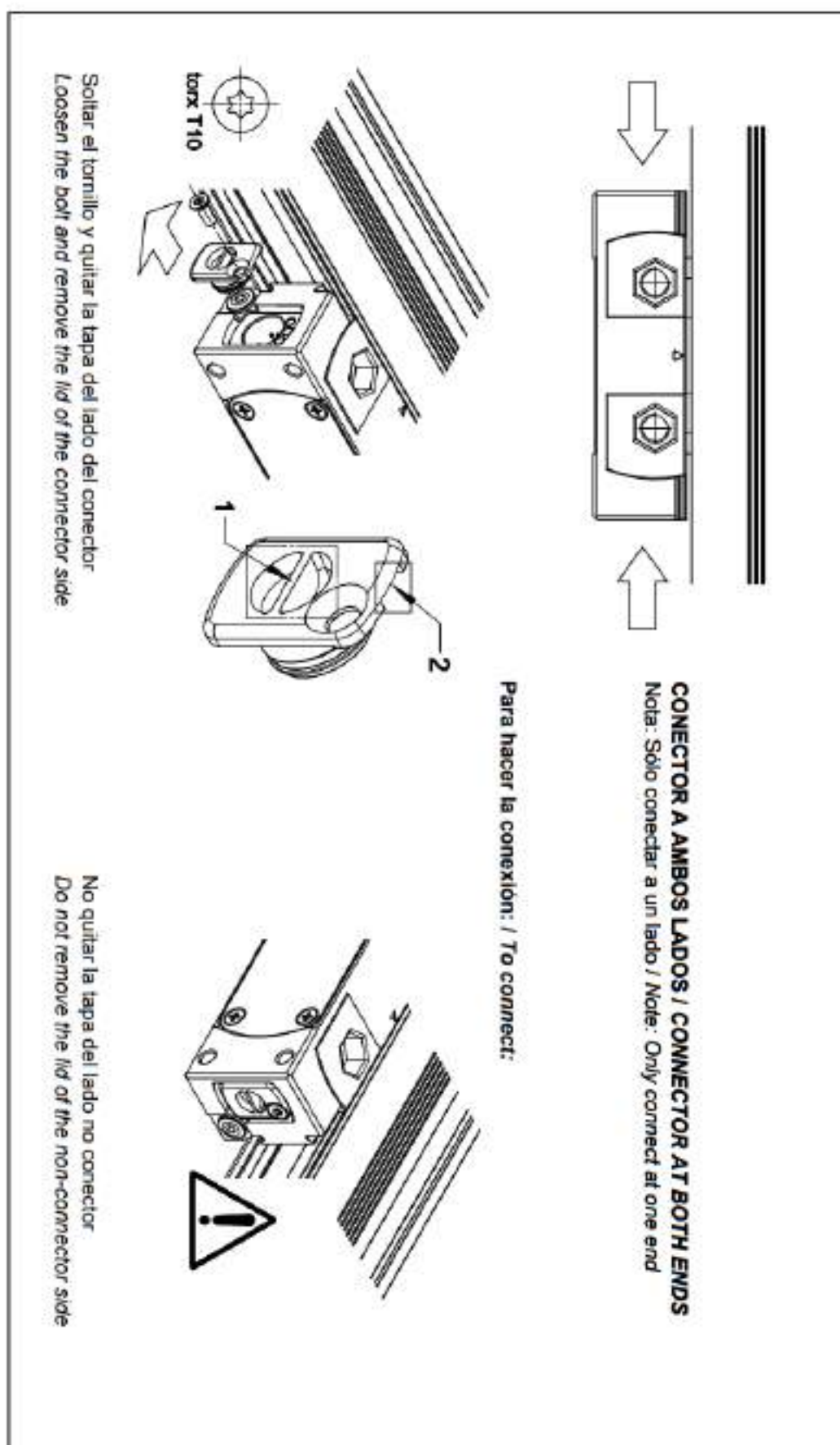




1. Premontar y alinear la regla. Una vez alineada, apretar los tornillos.
2. Quitar los tornillos de las piezas de embalaje y posicionar la cabeza.
3. Meter los tornillos de la cabeza y apretar.
4. Quitar las piezas de embalaje de la cabeza.



1. Premount and align the scale. Once aligned, fasten the screws.
2. Remove the screws of the packing parts and position the reader head.
3. Insert the head screws and fasten them.
4. Remove the packing parts of the reader head.





**9. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES**

<b>17</b>	Switch on the machine (Refer to the Service Manual).
<b>18</b>	Close and lock the safety door to access the machine. (Refer to the Service Manual)
<b>19</b>	Carry out greasing cycles.
<b>20</b>	Carry out the alignment and "0" reference of the "X - Y - Z" Axis.



CHECK THE MACHINE AXIS ALIGNMENT PROCEDURES DESCRIBED IN THE SERVICE MANUAL



File N°	TW_CM_210_011	Reference Drawings	XXXX210 / XXXX211
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment, Crane, Slings		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Helmet



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	“Y” Axis Servomotor Disassembly
3	“Y” Axis Servomotor Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL

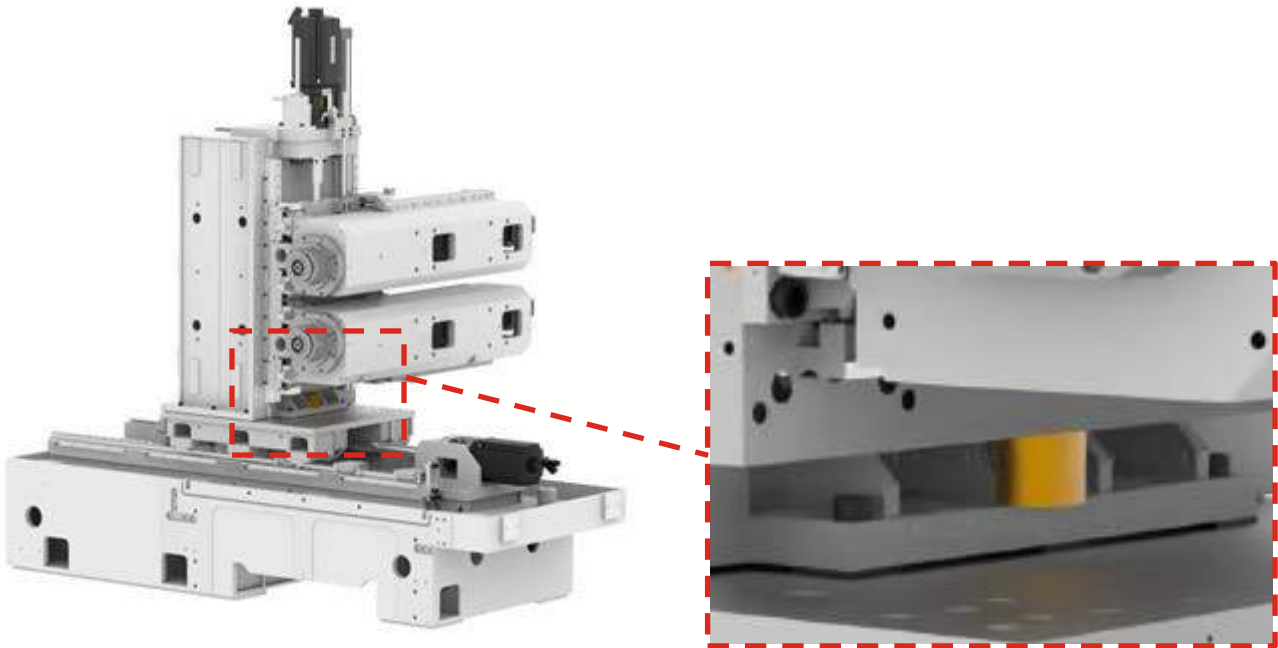


TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Move the “Y” axis until the carriage makes contact with the lower stop.



- 3 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 4 Switch off the machine (Refer to the Service Manual).
- 5 If the machine has “Y” Axis Manual Blocking Device, proceed with the following steps.  
If the machine does not have “Y” Axis Manual Blocking Device, skip the following steps and continue to the disassembly.

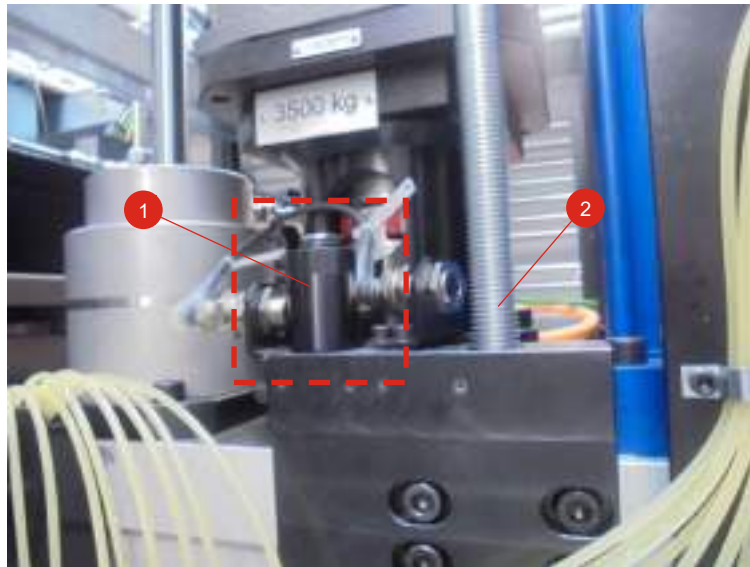


WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY LEVELS AND WORK PROCEDURES APPROVED (BA).



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

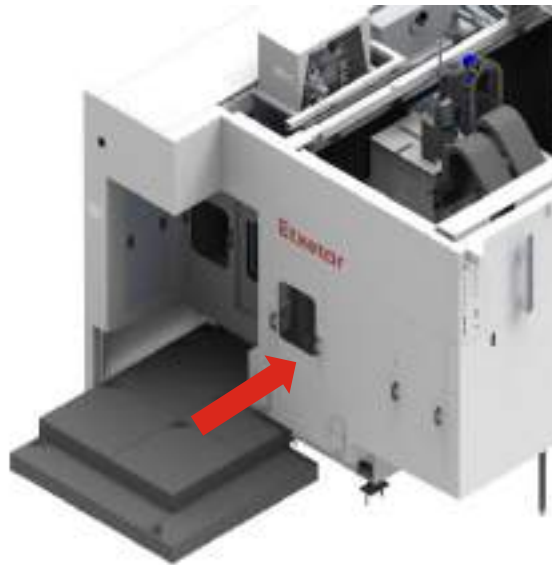
- 6** Untighten the M20 nut from the resting position (Pos.1) and lock the “Y” Axis with it (Pos.2).





### 4. PROCEDURE DESCRIPTION: “Y” AXIS SERVOMOTOR DISASSEMBLY

- 7 Access the 3 Axis Module Panel and disassemble it.



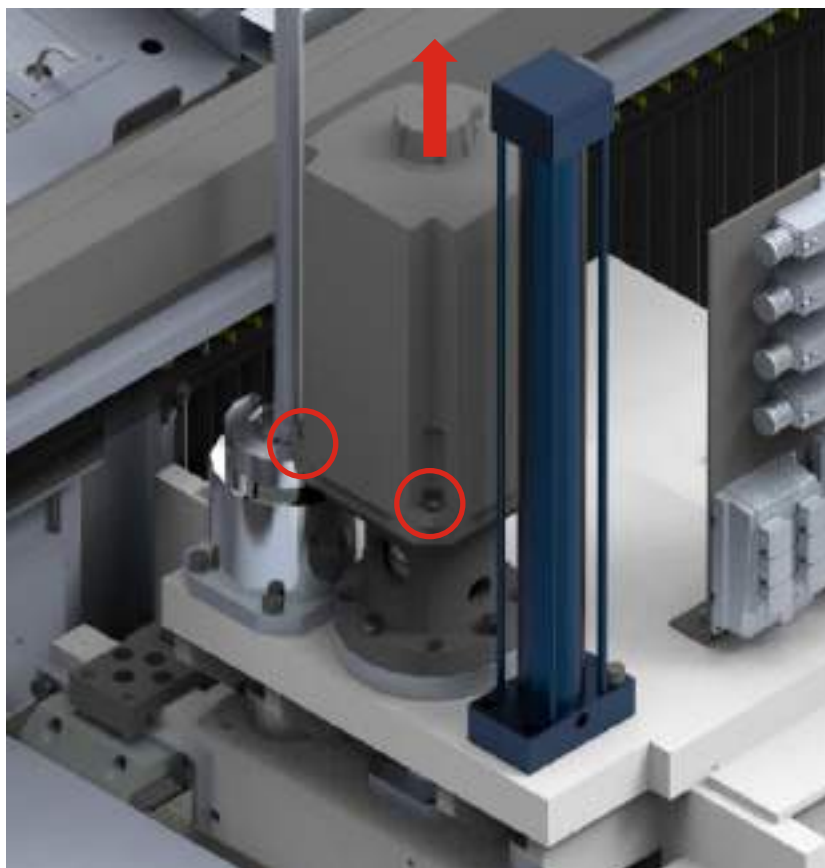
FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 8 Disassemble the “Y” Axis Servomotor electrical connections.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

9	Secure the “Y” Axis Servomotor using a crane and slings.
10	Disassemble the 4 screws fixing the Servomotor and extract it.

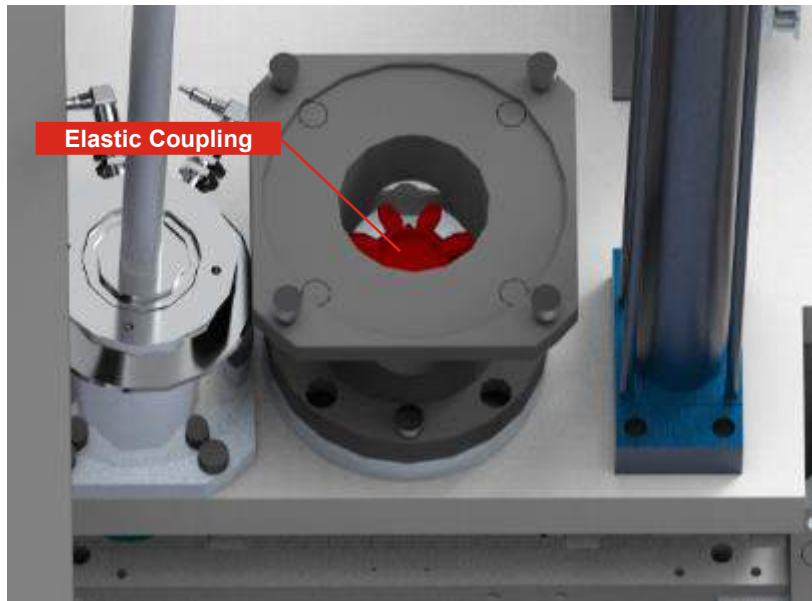


BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 11 Disassemble the “X” Axis Servomotor Elastic Coupling.



## 5. PROCEDURE DESCRIPTION: ELEMENT REPLACEMENT AND ASSEMBLY

- 12 Replace the “Y” Axis Servomotor and the Elastic Coupling for new ones.
- 13 To assemble the “Y” Axis Servomotor, follow the disassembly steps in reverse order.

## 6. CONSIDERATIONS FOR ASSEMBLY



ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm



FOR MORE INFORMATION ABOUT THE SERVOMOTOR COUPLING, REFER TO THE KTR MANUAL

### 4.1 Components of the coupling

Components of ROTEX® GS clamping hubs, hub type 2.0, 2.1, 2.5 or 2.6

Component	Quantity	Description
1	2	Clamping hub
2	1	Spider
3	2	Cap screw DIN EN ISO 4762

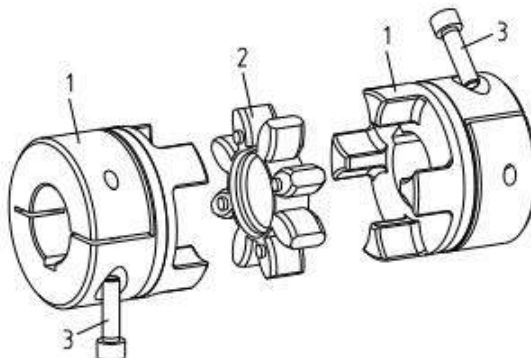


Illustration 14: ROTEX® GS clamping hub

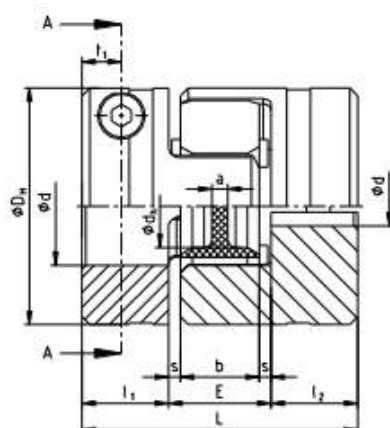


Illustration 4: ROTEX® GS hub type 2.0 (from size 5 - 14)

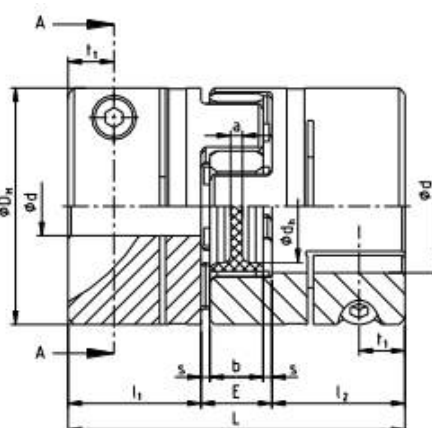


Illustration 5: ROTEX® GS hub type 2.5 (from size 19 - 90)

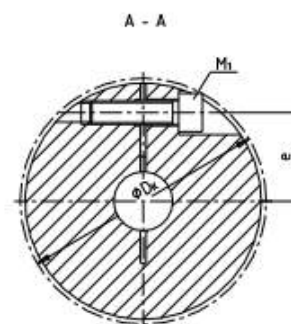


Table 4: Dimensions - clamping hubs

Size	Dimensions <sup>1)</sup> [mm]											Clamping screw DIN EN ISO 4029: (ROTEX® GS 5 - DIN EN ISO 1207)				
	D	D <sub>n</sub>	d <sub>n</sub>	L	l <sub>1</sub>	l <sub>2</sub>	M, N	E	b	s	a	M <sub>1</sub>	l <sub>1</sub>	a	D <sub>2</sub>	T <sub>L</sub> [Nm]
Hub material - aluminium																
5	-	10	-	15	5	-	5	4	0.5	4.0	M1.2	2.5	3.5	11.4	- <sup>1)</sup>	
7	-	14	-	22	7	-	8	6	1.0	6.0	M2	3.5	5.0	16.5	0.37	
9	-	20	7.2	30	10	-	10	8	1.0	1.5	M2.5	5.0	7.5	23.4	0.78	
12	-	25	8.5	34	11	-	12	10	1.0	3.5	M3	5.0	9.0	27.5	1.34	
14	-	30	10.5	35	11	-	13	10	1.5	2.0	M3	5.0	11.5	32.2	1.34	
19	-	40	18	68	25	-	18	12	2.0	3.0	M6 <sup>2)</sup>	11.0	14.5 <sup>2)</sup>	46.0	10.5 <sup>2)</sup>	
24	-	55	27	78	30	-	18	14	2.0	3.0	M6	10.5	20.0	57.5	10.5	
28	-	65	30	90	35	-	20	15	2.5	4.0	M6	11.5	25.0	73.0	26	
38	-	80	38	114	45	-	24	18	3.0	4.0	M8	15.5	30.0	83.5	25	
Hub material - steel																
42	85	95	46	126	50	28	25	20	3.0	4.0	M10	18	32.0	93.5	60	
48	95	105	51	140	58	32	28	21	3.5	4.0	M12	21	36.0	105.0	120	
55	110	120	60	160	65	37	30	22	4.0	4.5	M12	26	42.5	119.5	120	
65	115	135	68	185	75	47	35	26	4.5	4.5	M12	33	45.0	124.0	120	
75	135	160	80	210	85	53	40	30	5.0	5.0	M16	36	51.0	147.5	206	
90	160	200	104	245	100	62	45	34	5.5	6.5	M20	40	60.0	176.0	580	

1) Slotted screw, tightening torque not defined

2) Size 19: Bore Ø22 - Ø24 with 2-off clamping screws M4, T<sub>L</sub> = 2.9 Nm and dimension e = 15.0

3) Transmittable friction torques of clamping hubs see table 6



## 4.5 Assembly of the clamping hubs (hub types 2.0, 2.1, 2.5, 2.6, 2.8 and 2.9)

The power transmission of ROTEX® GS clamping hubs (hub type 2.0, 2.5 and 2.8) is frictionally engaged. With hub type 2.1, 2.6 and 2.9 a feather key additionally provides for positive locking power transmission.



**If used in potentially explosive atmospheres all screw connections must be secured against working loose additionally, e. g. conglomerating with Loctite (average strength).**

- Clean and degrease the hub bore and the shaft.
- Lightly detach the clamping screws.
- Slip the hub onto the shaft. Please observe dimension  $l_1$  or  $l_2$ .
- Tighten the clamping screws at the tightening torques specified in table 4.  
With hub type 2.8 or 2.9 (with feather keyway) the screws have to be tightened alternately in equal steps at the tightening torques specified in table 6.



Illustration 20: Assembly of clamping hub

Please note: hub type 2.8 or 2.9 have 2 clamping screws



**The transmittable friction torques of the clamping hubs depend on the bore diameter.**



**Hubs, clamping hubs or similar types without feather keyway may be used in category 3 only and are marked with category 3 accordingly.**



**If the clamping screws are not tightened at the correct tightening torque, there is the risk of**  
a) a fracture of the hub and plastic deformation with a too high tightening torque  $T_A$   
b) early slipping, untightening of the screws with a too low tightening torque  $T_A$

### 4.1 Components of the coupling

Components of ROTEX® GS clamping ring hubs, hub type 6.0 light, 6.0 steel or 6.0

Component	Quantity	Description
1.1	2	Clamping ring
1.2	2	Clamping ring hub
2	1	Spider
3	see table 5, 6 and 7	Cap screw DIN EN ISO 4762

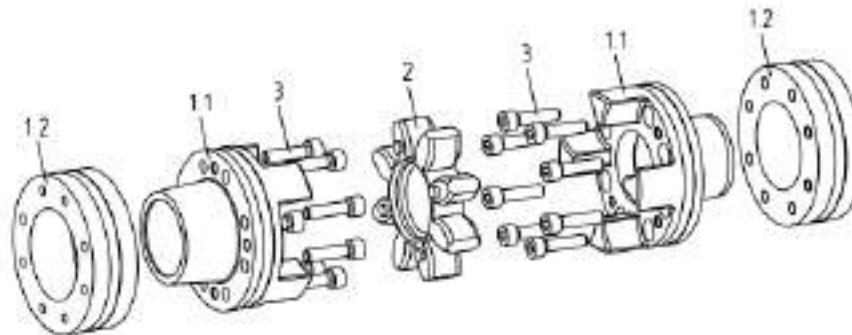


Illustration 17: ROTEX® GS clamping ring hub

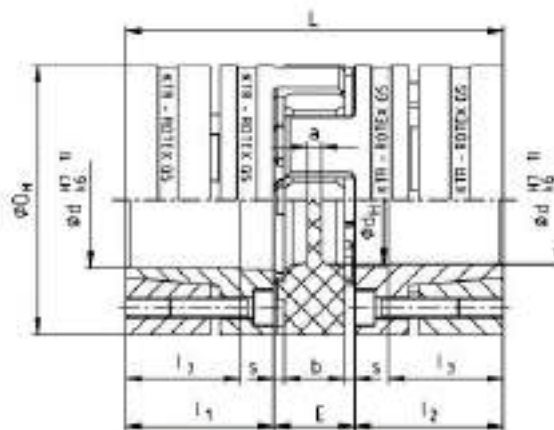


Illustration 9: ROTEX® GS, clamping ring hubs

Extraction thread M1 between clamping screws.

Clamping ring hub 6.0 light with block mounting (hub and clamping ring mounted as a block)

1) From Ø55 tolerance G7/m6

Table 6: Dimensions - Clamping ring hubs 6.0 light, 6.0 steel and 6.0

Size	Dimensions <sup>2)</sup> (mm)									Clamping screws DIN EN ISO 4762			
	D <sub>h</sub> <sup>3)</sup>	d <sub>h</sub>	L	L <sub>1</sub> , L <sub>2</sub>	L <sub>3</sub>	E	b	s	a	M	z <sup>3)</sup>	T <sub>A</sub> [Nm]	M <sub>1</sub>
<b>6.0 light (size 14 - 48)</b>													
Material of hub/clamping ring - aluminium													
Hub material - aluminium/clamping ring material - steel													
14	30	10.5	50	18.5	13.5	13	10	1.5	2.0	M3	4	1.34	M3
19	40	18	65	25	18	16	12	2.0	3.0	M4	5	3	M4
24	55	27	78	30	22	18	14	2.0	3.0	M5	4	6	M5
28	65	30	90	35	27	20	15	2.5	4.0	M5	6	8	M5
38	80	38	114	45	35	24	18	3.0	4.0	M6	8	10	M6
42	95	48	128	50	38	26	20	3.0	4.0	M8	4	25	M8
48	105	51	140	56	41	28	21	3.5	4.0	M10	4	49	M10
<b>6.0 steel (size 19 - 90)</b>													
Material of hub and clamping ring - steel													
19	40	18	65	25	18	16	12	2.0	3.0	M4	5	4.1	M4
24	55	27	78	30	22	18	14	2.0	3.0	M5	4	8.5	M5
28	65	30	90	35	27	20	15	2.5	4.0	M5	6	8.5	M5
38	80	38	114	45	35	24	18	3.0	4.0	M6	8	14	M6
42	95	48	128	50	38	26	20	3.0	4.0	M8	4	41	M8
48	105	51	140	56	41	28	21	3.5	4.0	M10	4	69	M10
55	120	60	160	65	46	30	22	4.0	4.5	M10	4	69	M10
65	135	68	185	75	55	35	26	4.5	4.5	M12	4	120	M12
75	160	80	210	85	63	40	30	5.0	5.0	M12	5	120	M12
90	200	104	245	100	75	45	34	5.5	6.5	M16	5	295	M16

2) Ø D<sub>h</sub> + 2 mm with high speeds for expansion of spider

3) z = Number each clamping ring hub

4) Consider transmittable friction torques of the respective clamping ring hubs 6.0 light, 6.0 steel and 6.0 (see table 9 to 11)



#### 4.6 Assembly of clamping ring hubs (hub type 6.0 light, 6.0 steel and 6.0)

The power transmission of **ROTEX® GS** clamping hubs is frictionally engaged. The necessary surface pressure is transmitted via the clamping ring with internal taper to the taper hub and consequently to the shaft. The friction torques specified in table 5 to 7 consider a fit pair H7/k6, from Ø55 G7/m6. With a bigger fitting tolerance the friction torques specified in table 9 to 11 are reduced.

The strength and dimensions of the shafts (specifically hollow shafts) have to be dimensioned such that sufficient safety against plastic deformation is ensured. This may roughly be reviewed as per the following criterion.

For clamping connections with hollow shafts the required internal diameter of the hollow shaft  $d_{IW}$  is calculated based on the following formula:

$$d_{IW} \leq d \cdot \sqrt{\frac{R_{p0,2} - 2 \cdot p_w}{R_{p0,2}}} \quad [\text{mm}]$$

Shear stress on the internal shaft diameter for hollow shaft:

$$\sigma_{tIW} \approx - \frac{2 \cdot p_w}{1 - C_w^2} \quad [\text{N/mm}^2]$$

Shear stress for solid shaft:

$$\sigma_{tW} = - p_w \quad [\text{N/mm}^2]$$

$R_{p0,2}$  = yield strength of shaft material  $[\text{N/mm}^2]$   
 $p_w$  = surface pressure of hub/shaft  $[\text{N/mm}^2]$

$d_{IW}$  = internal diameter of hollow shaft  $[\text{mm}]$   
 $d$  = shaft diameter  $[\text{mm}]$   
 $C_w$  =  $d_{IW} / d$

The strength required is not provided if the hollow shaft bore exceeds the max. internal bore calculated or if the shear stress exceeds the yield strength of the material.  
 For a detailed calculation please contact KTR.



**If used in potentially explosive atmospheres all screw connections must be secured against working loose additionally, e. g. conglomerating with Loctite (average strength).**

- Clean the hub bore and shaft and review for dimensional accuracy, afterwards lubricate with a thin oil (e. g. Castrol 4 in 1, Klüber Quietsch-Ex or WD 40).



**Oils and greases containing molybdenum disulfide or other high-pressure additives as well as internal lubricants must not be used.**

- Lightly untighten the clamping screw and pull the clamping ring from the hub only marginally to make sure that the clamping ring is fitted loosely.
- Shift the clamping ring hub onto the shaft. Dimension  $l_3$  should at least be observed (see table 8).
- Tighten the clamping screws evenly crosswise gradually to the tightening torque specified in table 8. Repeat this process until all clamping screws have reached the tightening torque.

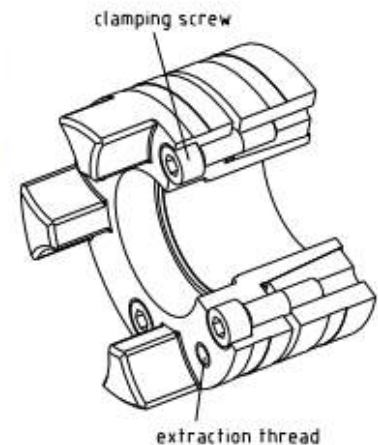


Illustration 21: Assembly of clamping ring hub with clamping ring



**If the clamping screws are not tightened at the correct tightening torque, there is the risk of**  
 a) a fracture of the hubs/cams and plastic deformation with a too high tightening torque  $T_A$   
 b) early slipping, untightening of the screws with a too low tightening torque  $T_A$

- **Applies with hub type 6.0 light only:**  
 Tighten the clamping screws evenly gradually and crosswise at 1/3 or 2/3 tightening torque  $T_A$ , respectively (see table 8) until the ring gets in contact. Afterwards tighten the screws at the tightening torque mentioned in table 8 one after another.



### 4.7 Disassembly of clamping ring hubs (hub type 6.0 light, 6.0 steel and 6.0)

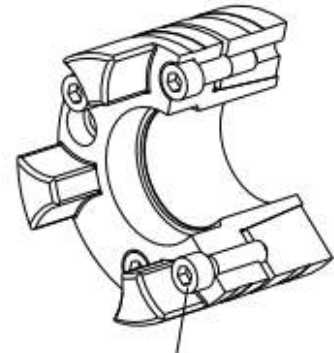
Unscrew the clamping screws evenly one after another. During every revolution every screw may only be unscrewed by half a turn. Unscrew all clamping screws by 3 - 4 pitches.

Remove the screws located next to the extraction threads and screw them into the respective extraction threads until they fit.

The clamping ring is released by tightening the screws in the extraction threads evenly gradually and crosswise.



**If these hints are not observed, the operation of the coupling may be affected.**



clamping screw in  
extraction thread

Illustration 22: Disassembly of clamping  
ring hub with clamping ring

If the assembly is repeated the bore of the hub and shaft have to be cleaned and afterwards lubricated with a thin oil (e. g. Castrol 4 in 1, Klüber Quietsch-Ex or WD 40). The same applies for the taper surfaces of clamping ring hub and clamping ring.



**Oils and greases containing molybdenum disulfide or other high-pressure additives as well as internal lubricants must not be used.**

#### Applies with hub type 6.0 light only:



**If the assembly is repeated the taper surfaces, bores of the hub and the shaft have to be cleaned. The bore of the hub and shaft have to be lubricated with thin oil (e. g. Castrol 4 in 1, Klüber Quietsch-Ex or WD 40). Lightly paint the taper surfaces of the clamping ring hub or clamping ring with the grease Gleitmo 800, afterwards twist the components against one another by one revolution in order to spread the grease evenly.**

### 7. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

14	Switch on the machine (Refer to the Service Manual).
15	Close and lock the safety door to access the machine. (Refer to the Service Manual)
16	Carry out greasing cycles.
17	Carry out the alignment and “0” reference of the “Y” Axis.



CHECK THE MACHINE AXIS ALIGNMENT PROCEDURES DESCRIBED IN THE SERVICE MANUAL

File N°	TW_CM_210_012	Reference Drawings	XXXX210 / XXXX211
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment, Crane, Slings		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Helmet



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	“Z” Axis Servomotor Disassembly
3	“Z” Axis Servomotor Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL

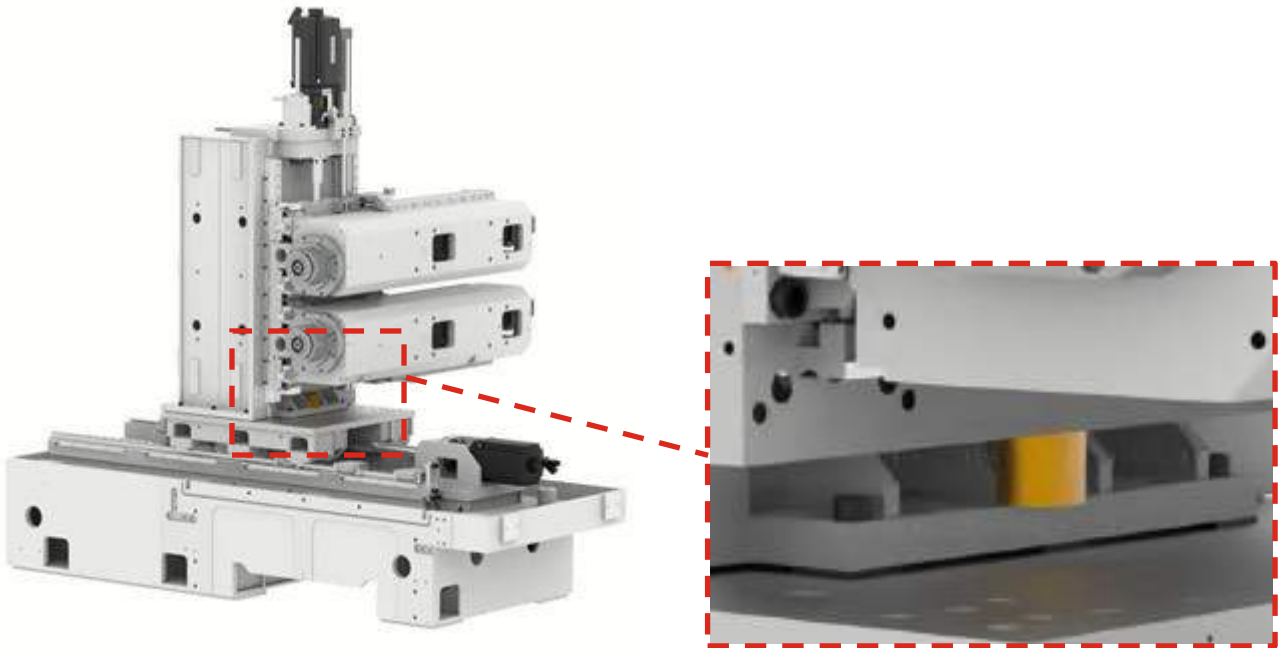


TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Move the “Y” axis until the carriage makes contact with the lower stop.



- 3 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 4 Switch off the machine (Refer to the Service Manual).
- 5 If the machine has “Y” Axis Manual Blocking Device, proceed with the following steps.  
If the machine does not have “Y” Axis Manual Blocking Device, skip the following steps and continue to the disassembly.

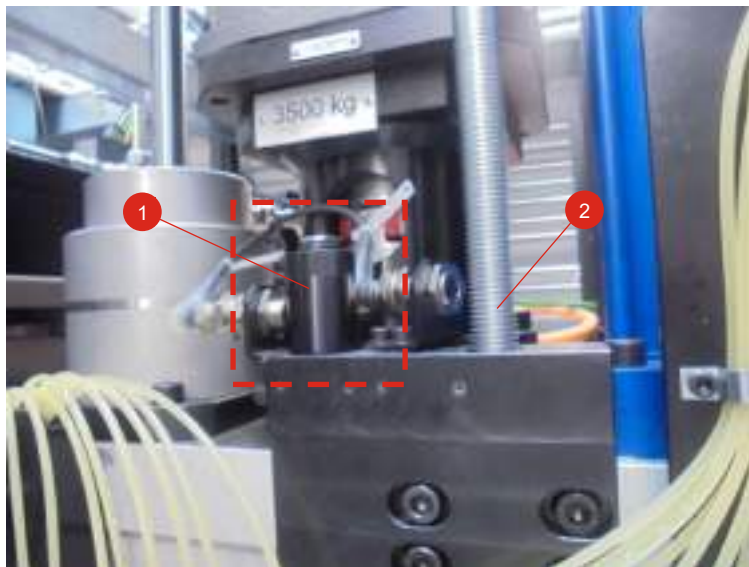


WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY LEVELS AND WORK PROCEDURES APPROVED (BA).



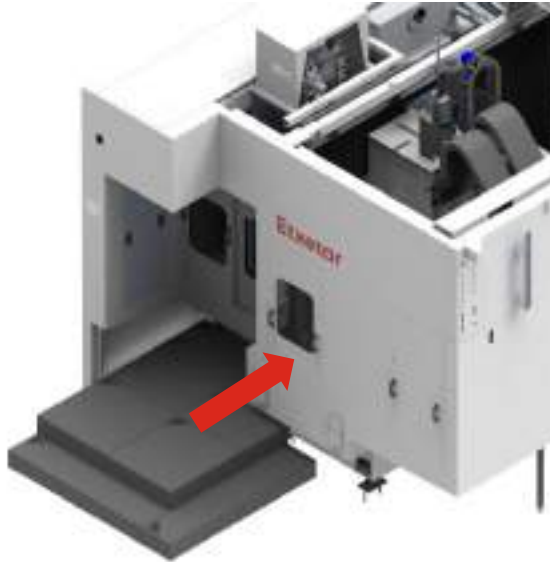
AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

- 6** Untighten the M20 nut from the resting position (Pos.1) and lock the “Y” Axis with it (Pos.2).



### 4. PROCEDURE DESCRIPTION: “Z” AXIS SERVOMOTOR DISASSEMBLY

- 7 Access the 3 Axis Module Panel and disassemble it.



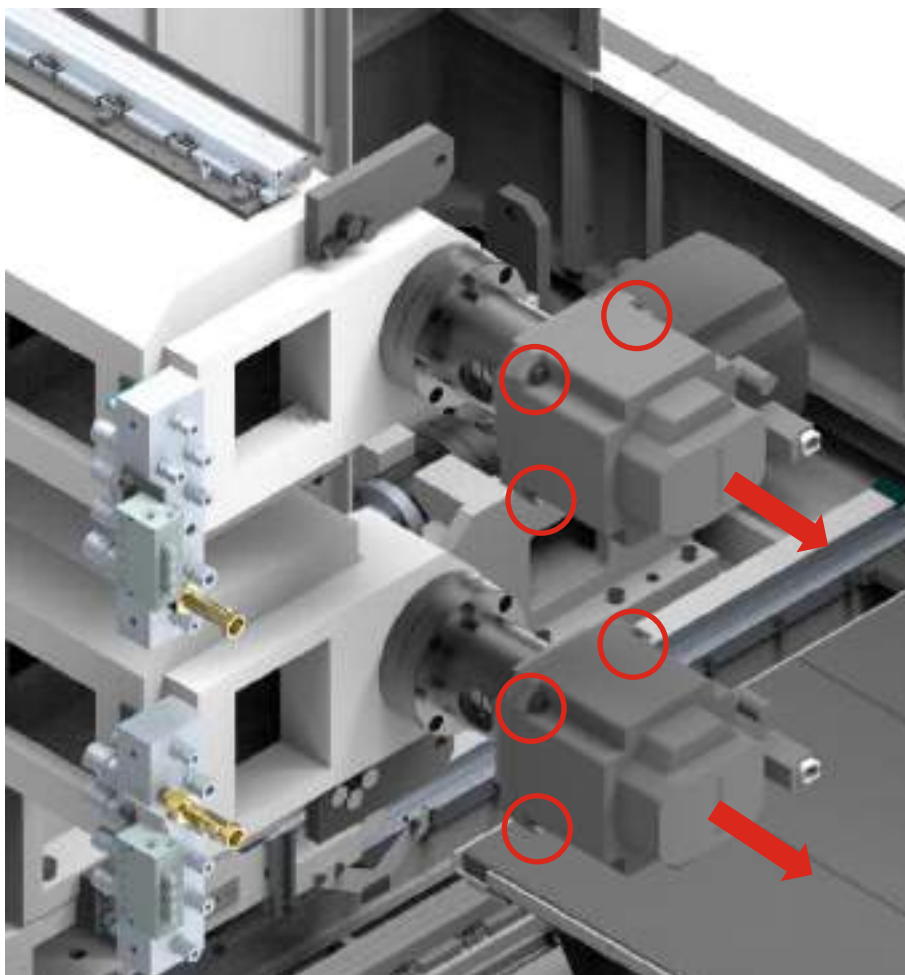
FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 8 Disassemble the “X” Axis Servomotor electrical connections.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

9	Secure the “Z” Axis Servomotor using a crane and slings.
10	Disassemble the 4 screws fixing the Servomotor and extract it.



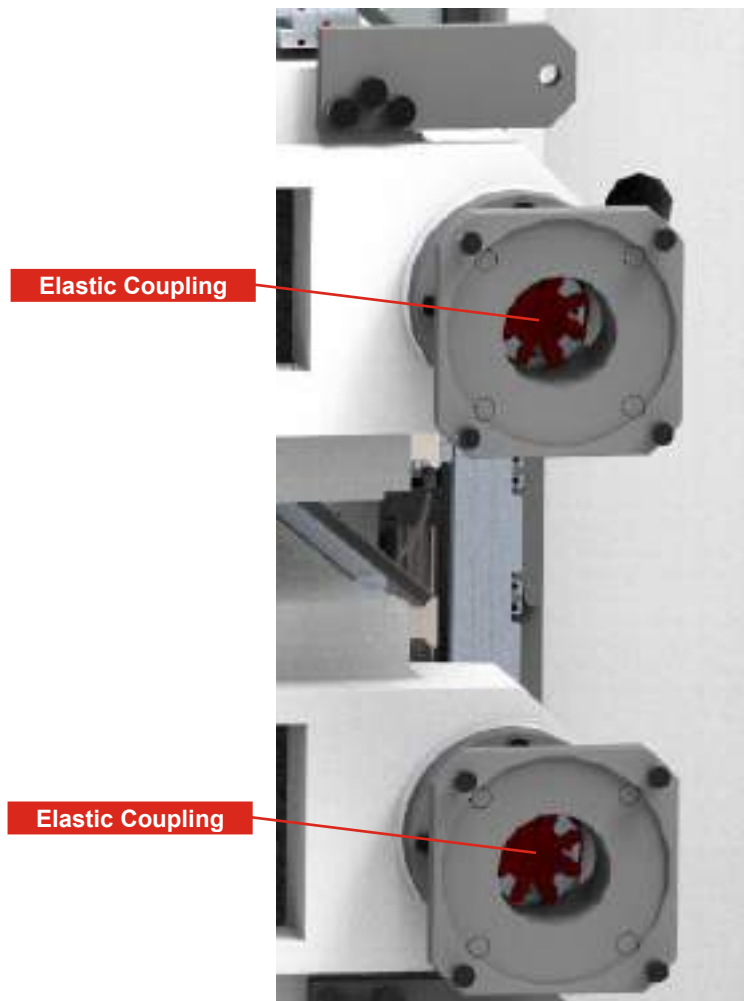
BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



- 11 Disassemble the “Z” Axis Servomotor Elastic Coupling.



## 5. PROCEDURE DESCRIPTION: ELEMENT REPLACEMENT AND ASSEMBLY

- 12 Replace the “Z” Axis Servomotor and the Elastic Coupling for new ones.
- 13 To assemble the “Z” Axis Servomotor, follow the disassembly steps in reverse order.

## 6. CONSIDERATIONS FOR ASSEMBLY



ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm



FOR MORE INFORMATION ABOUT THE SERVOMOTOR COUPLING, REFER TO THE KTR MANUAL

### 4.1 Components of the coupling

Components of ROTEX® GS clamping hubs, hub type 2.0, 2.1, 2.5 or 2.6

Component	Quantity	Description
1	2	Clamping hub
2	1	Spider
3	2	Cap screw DIN EN ISO 4762

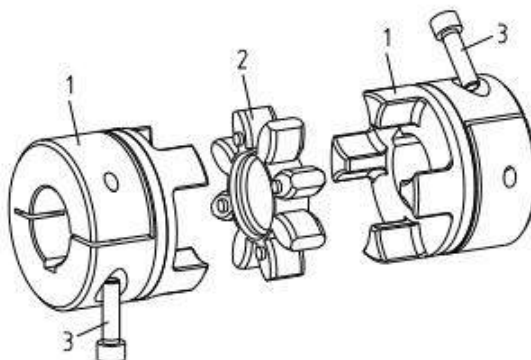


Illustration 14: ROTEX® GS clamping hub

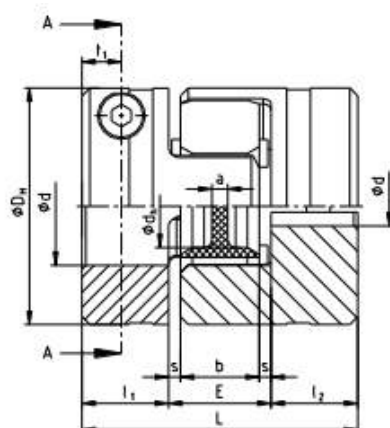


Illustration 4: ROTEX® GS hub type 2.0 (from size 5 - 14)

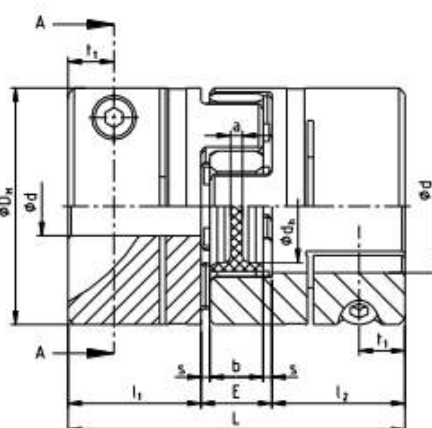


Illustration 5: ROTEX® GS hub type 2.5 (from size 19 - 90)

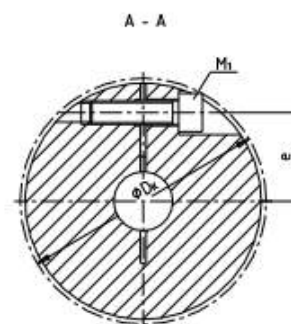


Table 4: Dimensions - clamping hubs

Size	Dimensions <sup>1)</sup> [mm]											Clamping screw DIN EN ISO 4029: (ROTEX® GS 5 - DIN EN ISO 1207)				
	D	D <sub>H</sub>	d <sub>H</sub>	L	l <sub>1</sub>	l <sub>2</sub>	M, N	E	b	s	a	M <sub>1</sub>	l <sub>1</sub>	a	D <sub>2</sub>	T <sub>L</sub> [Nm]
Hub material - aluminium																
5	-	10	-	15	5	-	5	4	0.5	4.0	M1.2	2.5	3.5	11.4	- <sup>1)</sup>	
7	-	14	-	22	7	-	8	6	1.0	6.0	M2	3.5	5.0	16.5	0.37	
9	-	20	7.2	30	10	-	10	8	1.0	1.5	M2.5	5.0	7.5	23.4	0.78	
12	-	25	8.5	34	11	-	12	10	1.0	3.5	M3	5.0	9.0	27.5	1.34	
14	-	30	10.5	35	11	-	13	10	1.5	2.0	M3	5.0	11.5	32.2	1.34	
19	-	40	18	68	25	-	18	12	2.0	3.0	M6 <sup>2)</sup>	11.0	14.5 <sup>2)</sup>	46.0	10.5 <sup>2)</sup>	
24	-	55	27	78	30	-	18	14	2.0	3.0	M6	10.5	20.0	57.5	10.5	
28	-	65	30	90	35	-	20	15	2.5	4.0	M6	11.5	25.0	73.0	26	
38	-	80	38	114	45	-	24	18	3.0	4.0	M8	15.5	30.0	83.5	25	
Hub material - steel																
42	85	95	46	126	50	28	25	20	3.0	4.0	M10	18	32.0	93.5	60	
48	95	105	51	140	58	32	28	21	3.5	4.0	M12	21	36.0	105.0	120	
55	110	120	60	160	65	37	30	22	4.0	4.5	M12	26	42.5	119.5	120	
65	115	135	68	185	75	47	35	26	4.5	4.5	M12	33	45.0	124.0	120	
75	135	160	80	210	85	53	40	30	5.0	5.0	M16	36	51.0	147.5	206	
90	160	200	104	245	100	62	45	34	5.5	6.5	M20	40	60.0	176.0	580	

1) Slotted screw, tightening torque not defined

2) Size 19: Bore Ø22 - Ø24 with 2-off clamping screws M4, T<sub>L</sub> = 2.9 Nm and dimension e = 15.0

3) Transmittable friction torques of clamping hubs see table 6

**4.5 Assembly of the clamping hubs (hub types 2.0, 2.1, 2.5, 2.6, 2.8 and 2.9)**

The power transmission of ROTEX® GS clamping hubs (hub type 2.0, 2.5 and 2.8) is frictionally engaged. With hub type 2.1, 2.6 and 2.9 a feather key additionally provides for positive locking power transmission.



**If used in potentially explosive atmospheres all screw connections must be secured against working loose additionally, e. g. conglomerating with Loctite (average strength).**

- Clean and degrease the hub bore and the shaft.
- Lightly detach the clamping screws.
- Slip the hub onto the shaft. Please observe dimension  $l_1$  or  $l_2$ .
- Tighten the clamping screws at the tightening torques specified in table 4.  
With hub type 2.8 or 2.9 (with feather keyway) the screws have to be tightened alternately in equal steps at the tightening torques specified in table 6.



Illustration 20: Assembly of clamping hub

Please note: hub type 2.8 or 2.9 have 2 clamping screws



**The transmittable friction torques of the clamping hubs depend on the bore diameter.**



**Hubs, clamping hubs or similar types without feather keyway may be used in category 3 only and are marked with category 3 accordingly.**



**If the clamping screws are not tightened at the correct tightening torque, there is the risk of**  
 a) a fracture of the hub and plastic deformation with a too high tightening torque  $T_A$   
 b) early slipping, untightening of the screws with a too low tightening torque  $T_A$



### 4.1 Components of the coupling

Components of ROTEX® GS clamping ring hubs, hub type 6.0 light, 6.0 steel or 6.0

Component	Quantity	Description
1.1	2	Clamping ring
1.2	2	Clamping ring hub
2	1	Spider
3	see table 5, 6 and 7	Cap screw DIN EN ISO 4762

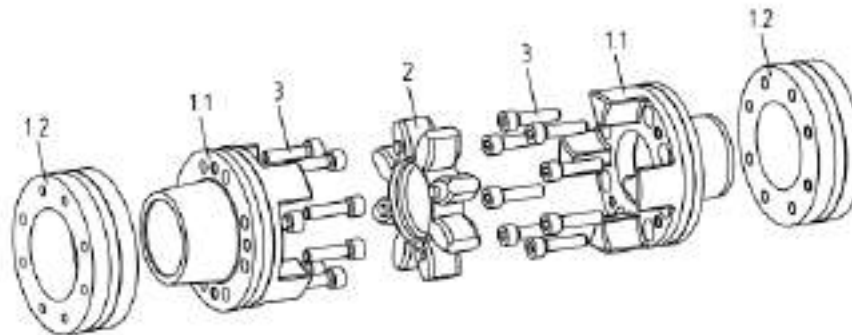


Illustration 17: ROTEX® GS clamping ring hub

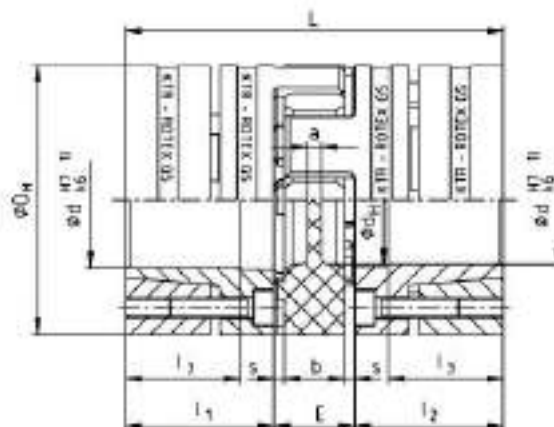


Illustration 9: ROTEX® GS, clamping ring hubs

Extraction thread M1 between clamping screws.

Clamping ring hub 6.0 light with block mounting (hub and clamping ring mounted as a block)

1) From Ø55 tolerance G7/m6

Table 6: Dimensions - Clamping ring hubs 6.0 light, 6.0 steel and 6.0

Size	Dimensions <sup>2)</sup> (mm)										Clamping screws DIN EN ISO 4762			
	D <sub>h</sub> <sup>3)</sup>	d <sub>h</sub>	L	L <sub>1</sub> , L <sub>2</sub>	L <sub>3</sub>	E	b	s	a	M	z <sup>3)</sup>	T <sub>A</sub> [Nm]	M <sub>1</sub>	
<b>6.0 light (size 14 - 48)</b>														
Material of hub/clamping ring - aluminium														
Hub material - aluminium/clamping ring material - steel														
14	30	10.5	50	18.5	13.5	13	10	1.5	2.0	M3	4	1.34	M3	
19	40	18	65	25	18	16	12	2.0	3.0	M4	5	3	M4	
24	55	27	78	30	22	18	14	2.0	3.0	M5	4	6	M5	
28	65	30	90	35	27	20	15	2.5	4.0	M5	6	8	M5	
38	80	38	114	45	35	24	18	3.0	4.0	M6	8	10	M6	
42	95	48	128	50	38	26	20	3.0	4.0	M8	4	25	M8	
48	105	51	140	56	41	28	21	3.5	4.0	M10	4	49	M10	
<b>6.0 steel (size 19 - 90)</b>														
Material of hub and clamping ring - steel														
19	40	18	65	25	18	16	12	2.0	3.0	M4	5	4.1	M4	
24	55	27	78	30	22	18	14	2.0	3.0	M5	4	8.5	M5	
28	65	30	90	35	27	20	15	2.5	4.0	M5	6	8.5	M5	
38	80	38	114	45	35	24	18	3.0	4.0	M6	8	14	M6	
42	95	48	128	50	38	26	20	3.0	4.0	M8	4	41	M8	
48	105	51	140	56	41	28	21	3.5	4.0	M10	4	69	M10	
55	120	60	160	65	46	30	22	4.0	4.5	M10	4	69	M10	
65	135	68	185	75	55	35	26	4.5	4.5	M12	4	120	M12	
75	160	80	210	85	63	40	30	5.0	5.0	M12	5	120	M12	
90	200	104	245	100	75	45	34	5.5	6.5	M18	5	295	M18	

2) Ø D<sub>h</sub> + 2 mm with high speeds for expansion of spider

3) z = Number each clamping ring hub

4) Consider transmittable friction torques of the respective clamping ring hubs 6.0 light, 6.0 steel and 6.0 (see table 9 to 11)

#### 4.6 Assembly of clamping ring hubs (hub type 6.0 light, 6.0 steel and 6.0)

The power transmission of **ROTEX® GS** clamping hubs is frictionally engaged. The necessary surface pressure is transmitted via the clamping ring with internal taper to the taper hub and consequently to the shaft. The friction torques specified in table 5 to 7 consider a fit pair H7/k6, from Ø55 G7/m6. With a bigger fitting tolerance the friction torques specified in table 9 to 11 are reduced.

The strength and dimensions of the shafts (specifically hollow shafts) have to be dimensioned such that sufficient safety against plastic deformation is ensured. This may roughly be reviewed as per the following criterion.

For clamping connections with hollow shafts the required internal diameter of the hollow shaft  $d_{IW}$  is calculated based on the following formula:

$$d_{IW} \leq d \cdot \sqrt{\frac{R_{p0,2} - 2 \cdot p_w}{R_{p0,2}}} \quad [\text{mm}]$$

Shear stress on the internal shaft diameter for hollow shaft:

$$\sigma_{tIW} \approx - \frac{2 \cdot p_w}{1 - C_w^2} \quad [\text{N/mm}^2]$$

Shear stress for solid shaft:

$$\sigma_{tW} = - p_w \quad [\text{N/mm}^2]$$

$R_{p0,2}$  = yield strength of shaft material  $[\text{N/mm}^2]$   
 $p_w$  = surface pressure of hub/shaft  $[\text{N/mm}^2]$

$d_{IW}$  = internal diameter of hollow shaft  $[\text{mm}]$   
 $d$  = shaft diameter  $[\text{mm}]$   
 $C_w$  =  $d_{IW} / d$

The strength required is not provided if the hollow shaft bore exceeds the max. internal bore calculated or if the shear stress exceeds the yield strength of the material.  
 For a detailed calculation please contact KTR.



**If used in potentially explosive atmospheres all screw connections must be secured against working loose additionally, e. g. conglomerating with Loctite (average strength).**

- Clean the hub bore and shaft and review for dimensional accuracy, afterwards lubricate with a thin oil (e. g. Castrol 4 in 1, Klüber Quietsch-Ex or WD 40).



**Oils and greases containing molybdenum disulfide or other high-pressure additives as well as internal lubricants must not be used.**

- Lightly untighten the clamping screw and pull the clamping ring from the hub only marginally to make sure that the clamping ring is fitted loosely.
- Shift the clamping ring hub onto the shaft. Dimension  $l_3$  should at least be observed (see table 8).
- Tighten the clamping screws evenly crosswise gradually to the tightening torque specified in table 8. Repeat this process until all clamping screws have reached the tightening torque.

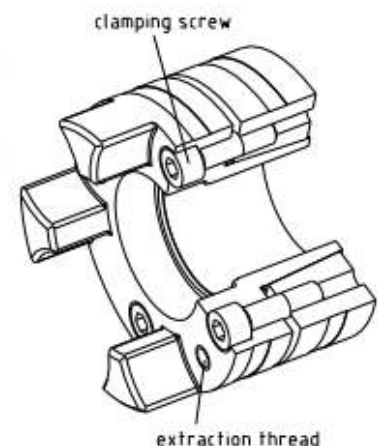


Illustration 21: Assembly of clamping ring hub with clamping ring



**If the clamping screws are not tightened at the correct tightening torque, there is the risk of**  
 a) a fracture of the hubs/cams and plastic deformation with a too high tightening torque  $T_A$   
 b) early slipping, untightening of the screws with a too low tightening torque  $T_A$

- **Applies with hub type 6.0 light only:**

Tighten the clamping screws evenly gradually and crosswise at 1/3 or 2/3 tightening torque  $T_A$ , respectively (see table 8) until the ring gets in contact. Afterwards tighten the screws at the tightening torque mentioned in table 8 one after another.



### 4.7 Disassembly of clamping ring hubs (hub type 6.0 light, 6.0 steel and 6.0)

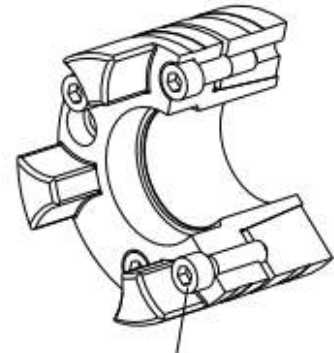
Unscrew the clamping screws evenly one after another. During every revolution every screw may only be unscrewed by half a turn. Unscrew all clamping screws by 3 - 4 pitches.

Remove the screws located next to the extraction threads and screw them into the respective extraction threads until they fit.

The clamping ring is released by tightening the screws in the extraction threads evenly gradually and crosswise.



**If these hints are not observed, the operation of the coupling may be affected.**



clamping screw in  
extraction thread

Illustration 22: Disassembly of clamping  
ring hub with clamping ring

If the assembly is repeated the bore of the hub and shaft have to be cleaned and afterwards lubricated with a thin oil (e. g. Castrol 4 in 1, Klüber Quietsch-Ex or WD 40). The same applies for the taper surfaces of clamping ring hub and clamping ring.



**Oils and greases containing molybdenum disulfide or other high-pressure additives as well as internal lubricants must not be used.**

#### Applies with hub type 6.0 light only:



**If the assembly is repeated the taper surfaces, bores of the hub and the shaft have to be cleaned. The bore of the hub and shaft have to be lubricated with thin oil (e. g. Castrol 4 in 1, Klüber Quietsch-Ex or WD 40). Lightly paint the taper surfaces of the clamping ring hub or clamping ring with the grease Gleitmo 800, afterwards twist the components against one another by one revolution in order to spread the grease evenly.**



### 7. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

14	Switch on the machine (Refer to the Service Manual).
15	Close and lock the safety door to access the machine. (Refer to the Service Manual)
16	Carry out greasing cycles.
17	Carry out the alignment and “0” reference of the “Z” Axis.



CHECK THE MACHINE AXIS ALIGNMENT PROCEDURES DESCRIBED IN THE SERVICE MANUAL

File N°	TW_CM_260_001	Reference Drawings	XXXX260
Mechanical Personnel	1	Electrical Personnel	0
Duration	120'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment, Crane, Slings		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Helmet



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	“A” Axis Protections Disassembly
3	“A” Axis Drive System Disassembly
4	“A” Axis Indexing Table Disassembly
5	Element Replacement and Assembly
6	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Using the Main Panel of the machine, open the Load / Unload Automatic Door.



- 3 Using the Robot, disassemble the Clamping Fixture from the machine.
- 4 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 5 Switch off the machine (Refer to the Service Manual).



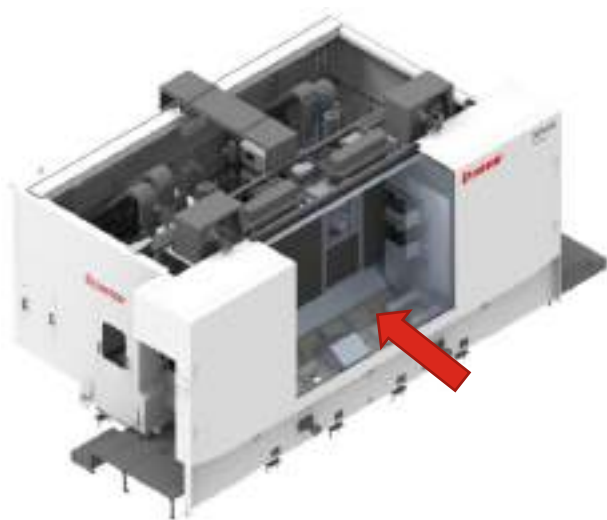
WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



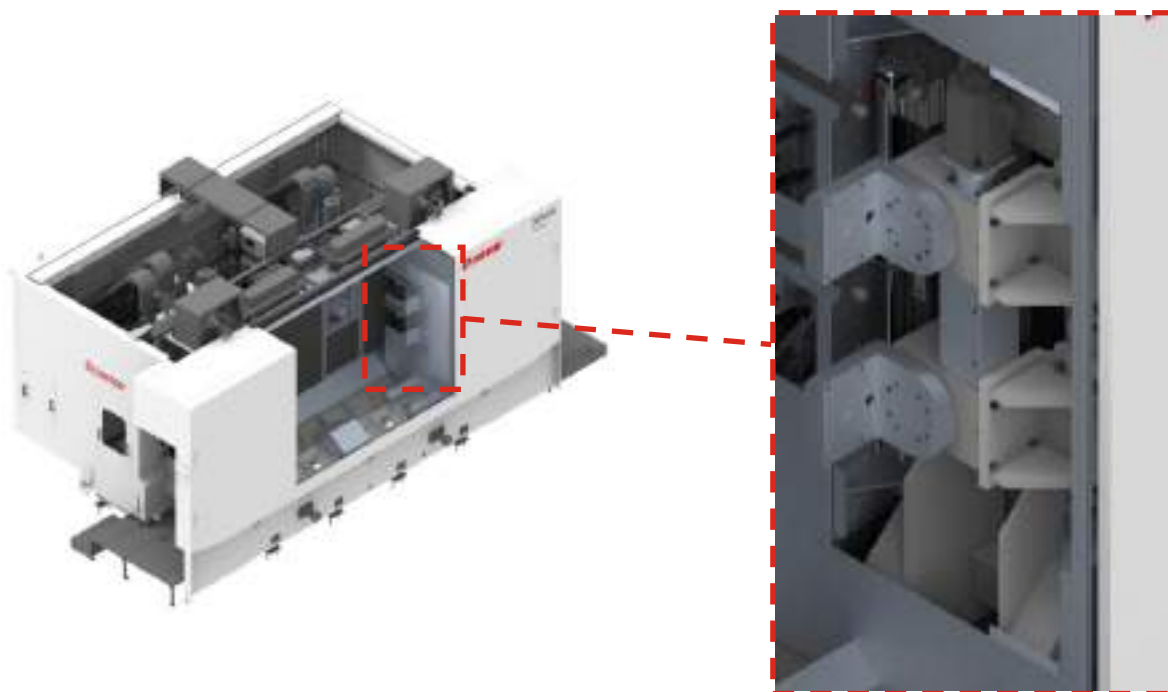
AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: “A” AXIS PROTECTION DISASSEMBLY

- 6 Access the Clamping Fixture area.



- 7 Disassemble the “A” Axis Protections from both sides of the machine.





CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 5. PROCEDURE DESCRIPTION: “A” AXIS DRIVE SYSTEM DISASSEMBLY

- 8 Disassemble the “A” Axis Servomotor electrical connections.



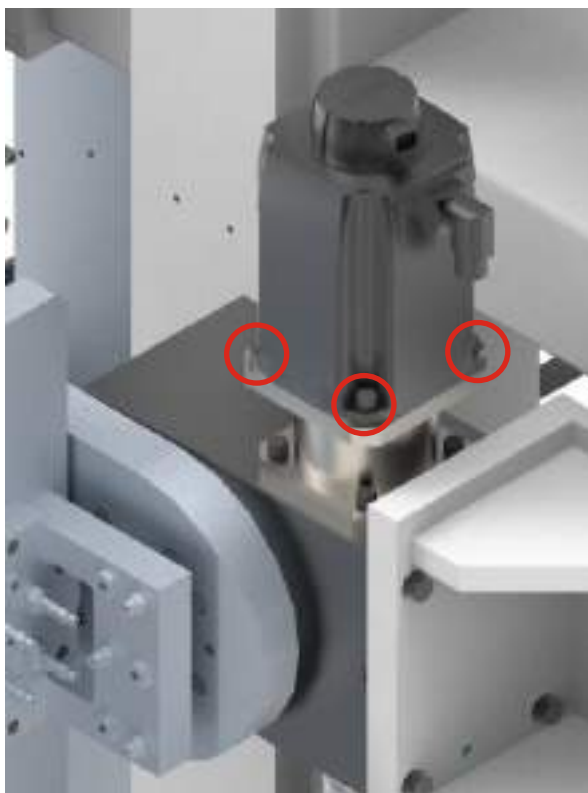
BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 9 Secure the servomotor with the crane and slings before proceeding to disassemble the servomotor.





- 10** Disassemble the 4 screws fixing the Servomotor and extract it.

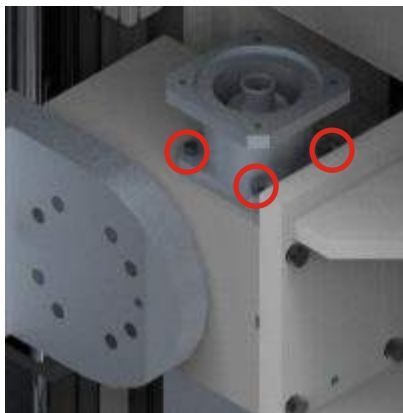


POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

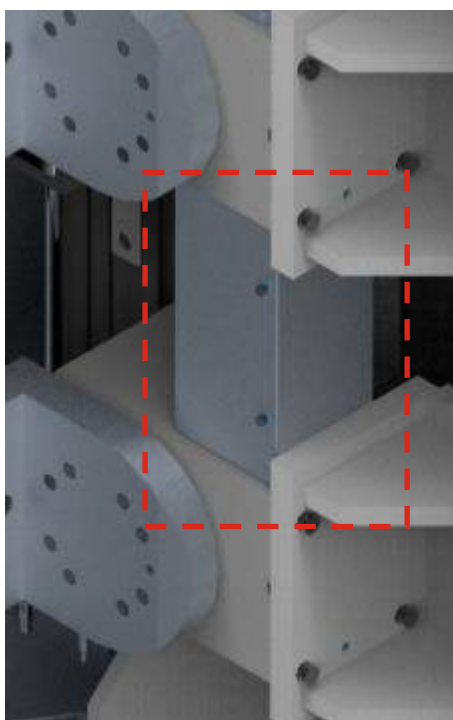
- 11** Extract the Elastic Coupling of the servomotor.



- 12 Disassemble the 4 screws fixing the Servomotor Support and extract it.

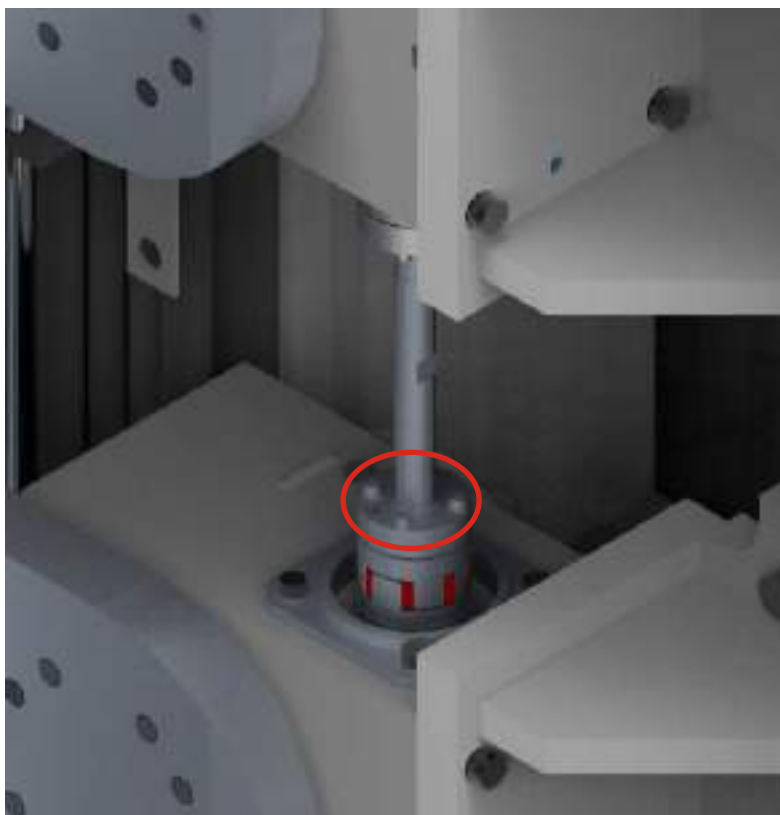


- 13 Disassemble plates covering the transmission system.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 14 Disassemble screws of the drive coupling on both sides of the transmission shaft and extract it.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

## 6. PROCEDURE DESCRIPTION: “A” AXIS INDEXING TABLE DISASSEMBLY

15	Place a container underneath the “A” Axis Hydraulic and Coolant connections to avoid the spilling of the fluids.
16	Disassemble the Hydraulic and Coolant connections from the rear side of the “A” Axis Indexing Table.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

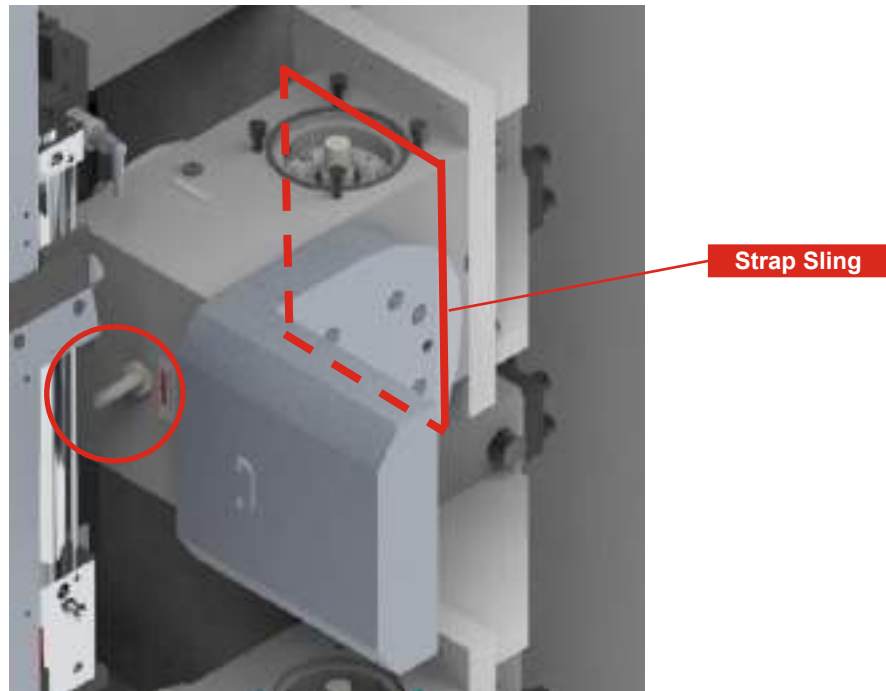


BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

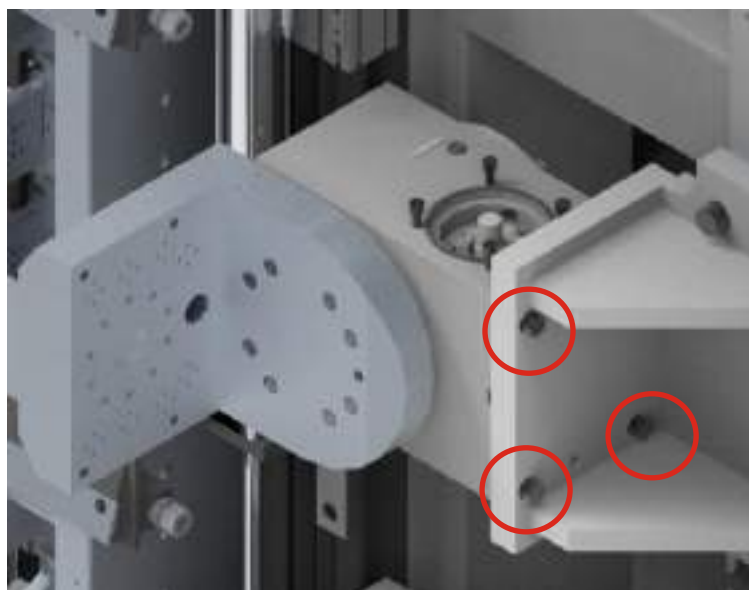


FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

17	Access the side of the "A" Axis Indexing Table and tie a sling to the eyebolt.
18	In addition to the sling, strap another sling around the front part of the Indexing Table to balance the weight.
19	Strap both sling to the crane and make them tight in order to avoid the falling of the Indexing Table when taking out the screws holding it into position.



20	On the other side of the "A" Axis, disassemble the 4 screws fixing the "A" Axis Indexing Table to the machine and extract it.
----	---





BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 7. PROCEDURE DESCRIPTION: ELEMENT REPLACEMENT AND ASSEMBLY

21	Replace the "A" Axis for new one.
22	To assemble the "A" Axis, follow the disassembly steps in reverse order.

### 8. CONSIDERATIONS FOR ASSEMBLY



ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm



**9. MASCHINENSTART / AXIS REFERENCE PROCEDURES**

<b>23</b>	Switch on the machine (Refer to the Service Manual).
<b>24</b>	Close and lock the safety door to access the machine. (Refer to the Service Manual)
<b>25</b>	Carry out the alignment and “0” reference of the “A” Axis.



CHECK THE MACHINE AXIS ALIGNMENT PROCEDURES DESCRIBED IN THE SERVICE MANUAL

File N°	TW_CM_260_002	Reference Drawings	XXXX260
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	“A” Axis Protections Disassembly
3	“A” Axis Rotary Joint Disassembly
4	Element Replacement and Assembly
5	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Using the Main Panel of the machine, open the Load / Unload Automatic Door.



- 3 Using the Robot, disassemble the Clamping Fixture from the machine.
- 4 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 5 Switch off the machine (Refer to the Service Manual).



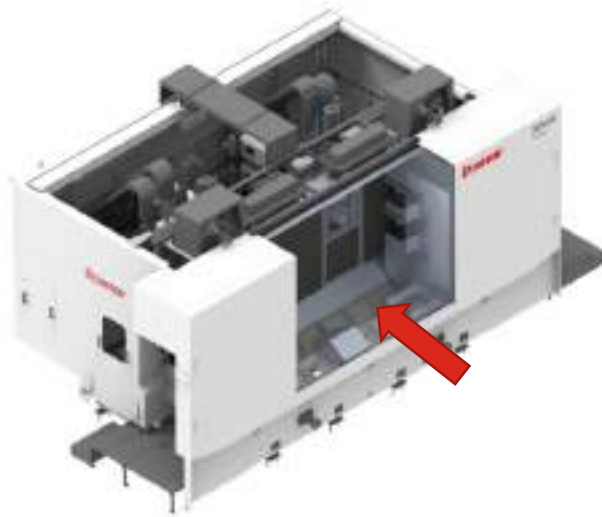
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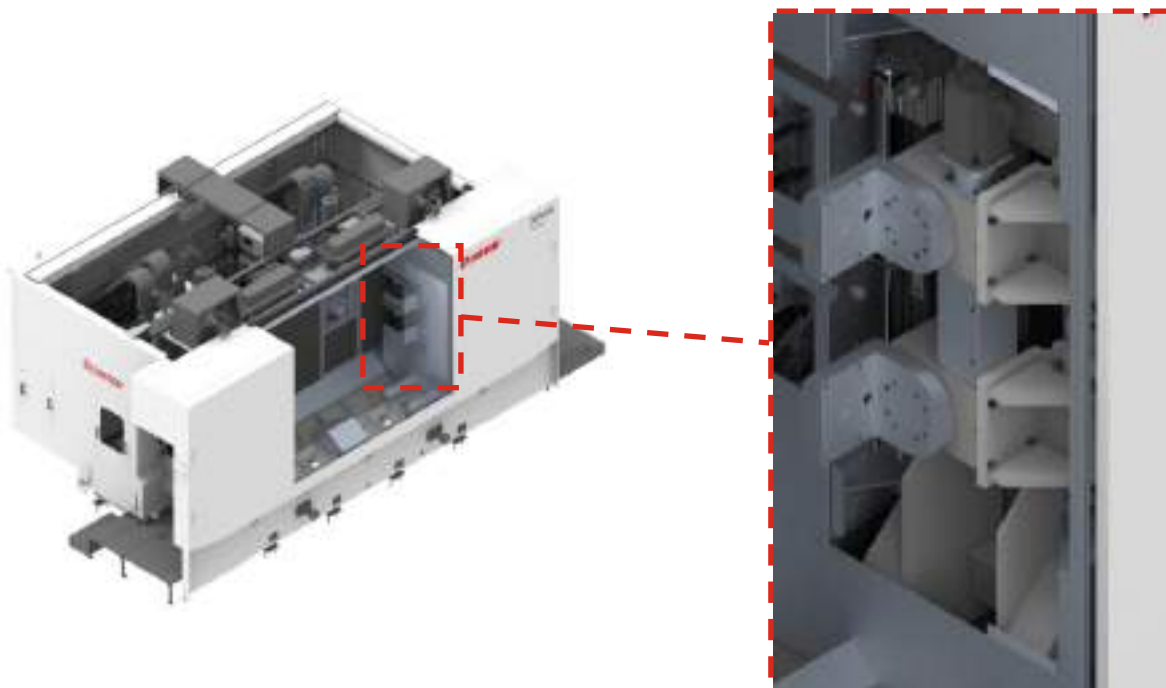
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## 4. PROCEDURE DESCRIPTION: “A” AXIS PROTECTION DISASSEMBLY

- 6 Access the Clamping Fixture area.



- 7 Disassemble the “A” Axis Protections from both sides of the machine.





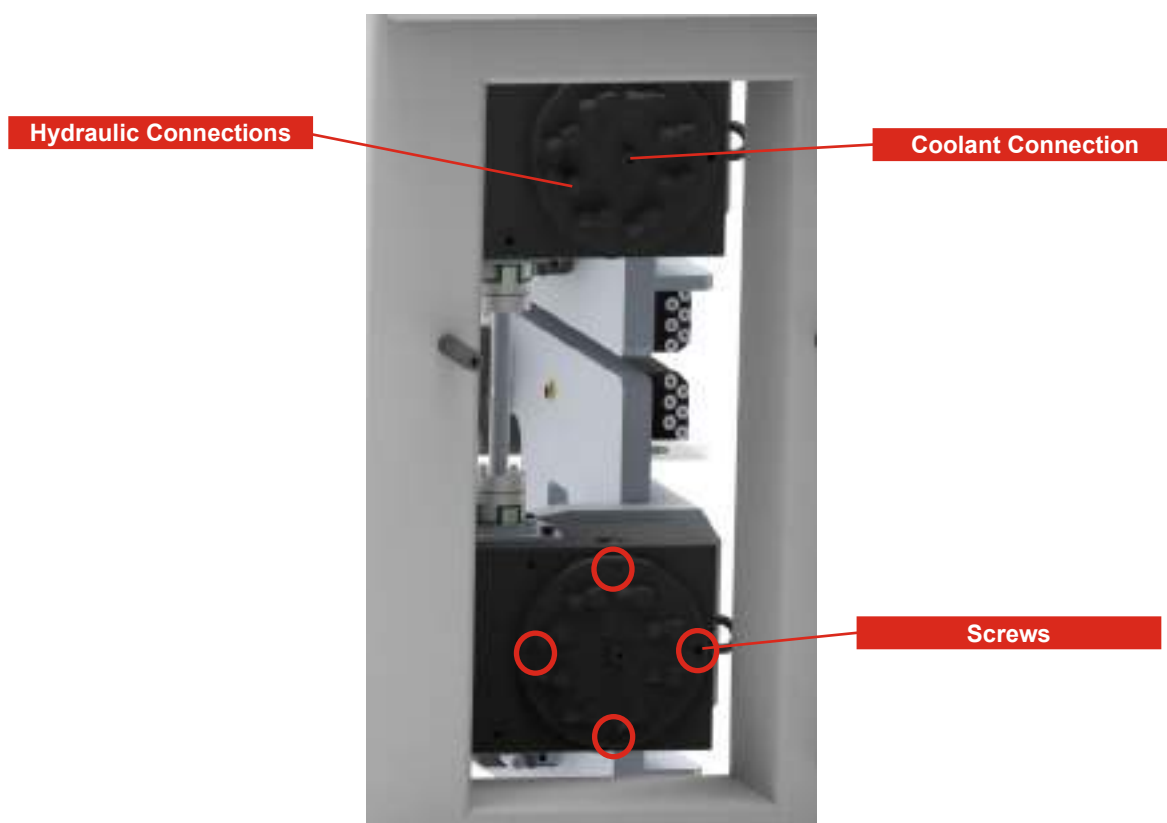
CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

## 5. PROCEDURE DESCRIPTION: “A” AXIS ROTARY JOINT DISASSEMBLY

8	Place a container underneath the “A” Axis Hydraulic and Coolant connections to avoid the spillage of the fluids.
9	Disassemble the Hydraulic and Coolant connections from the rear side of the “A” Axis Indexing Table.
10	Disassemble the screws locking the Rotary Joint in place and extract it.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



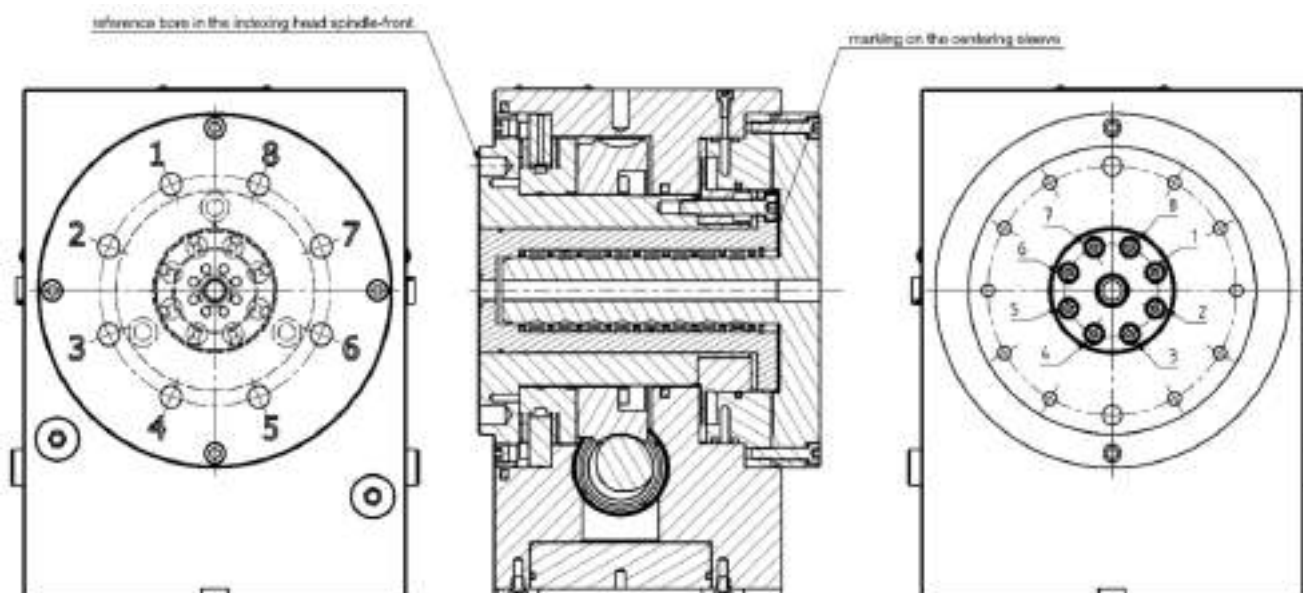
### 6. PROCEDURE DESCRIPTION: "A" AXIS ROTARY JOINT REPLACEMENT AND ASSEMBLY

- 11 Replace the "A" Axis Rotary Joint O-rings for new ones.
- 12 To assemble the "A" Axis Rotary Joint, follow the disassembly steps in reverse order.

### 7. CONSIDERATIONS FOR ASSEMBLY



WHEN MOUNTING THESE ROTARY JOINTS INTO THE UNITS, THE MARKING ON THE CENTERING SLEEVE MUST BE IN THE SAME POSITION AS THE REFERENCE BORE IN THE INDEXING HEAD SPINDLE-FRONT.



## 8. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

13	Switch on the machine (Refer to the Service Manual).
14	Close and lock the safety door to access the machine. (Refer to the Service Manual)

File N°	TW_CM_260_003	Reference Drawings	XXXX260
Mechanical Personnel	1	Electrical Personnel	0
Duration	120'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment, Crane, Slings		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Gloves



Safety Vest



Safety Helmet



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	“A” Axis Protections Disassembly
3	“A” Axis Servomotor Disassembly
4	Element Replacement and Assembly
5	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Using the Main Panel of the machine, open the Load / Unload Automatic Door.



- 3 Using the Robot, disassemble the Clamping Fixture from the machine.
- 4 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 5 Switch off the machine (Refer to the Service Manual).



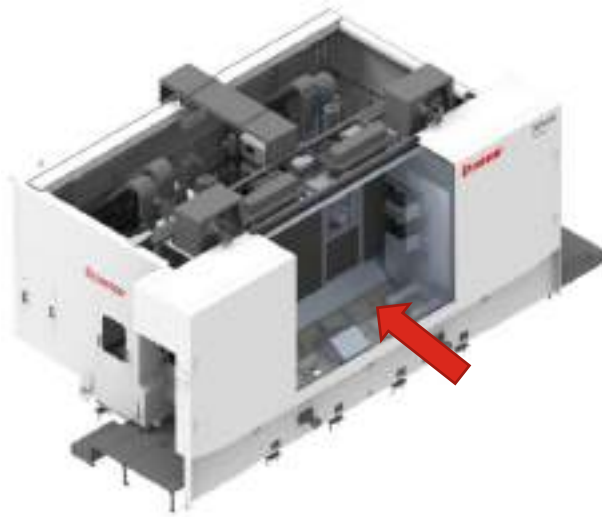
WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



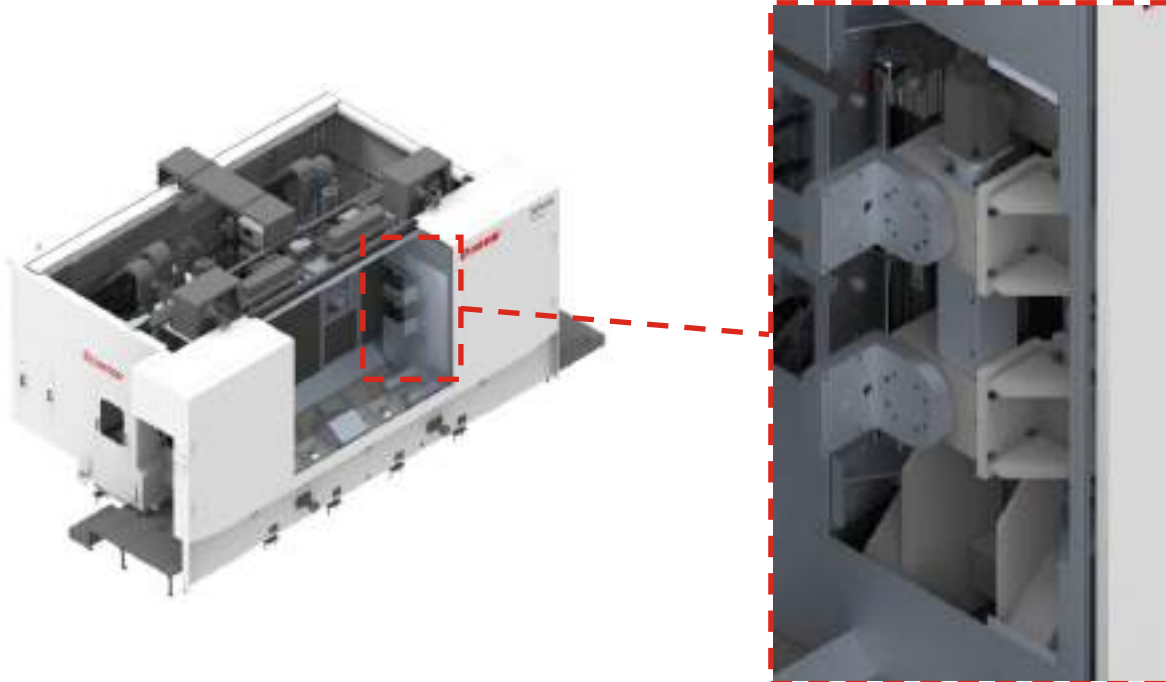
AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: "A" AXIS PROTECTION DISASSEMBLY

- 6 Access the Clamping Fixture area.



- 7 Disassemble the "A" Axis Protections from both sides of the machine.





CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



## 5. PROCEDURE DESCRIPTION: "A" AXIS SERVOMOTOR DISASSEMBLY

- 8 Disassemble the "A" Axis Servomotor electrical connections.

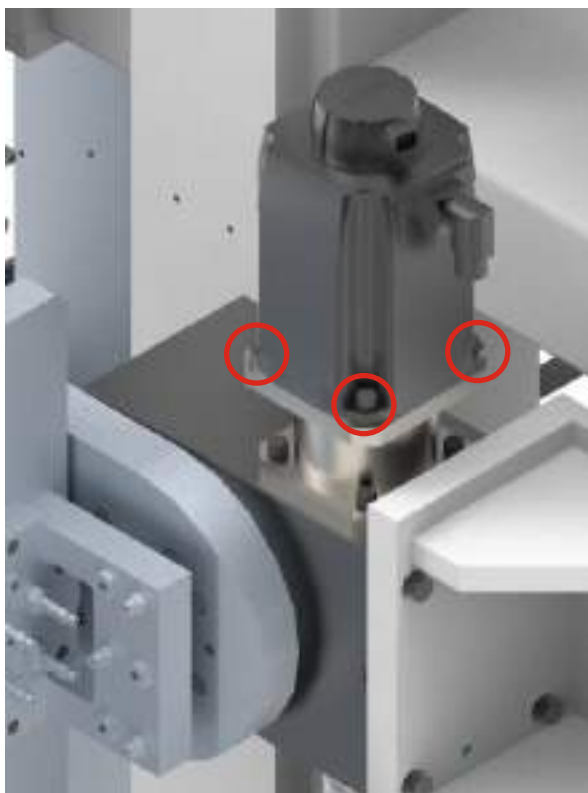


BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 9 Secure the servomotor with the crane and slings before proceeding to disassemble the servomotor.



- 10** Disassemble the 4 screws fixing the Servomotor and extract it.

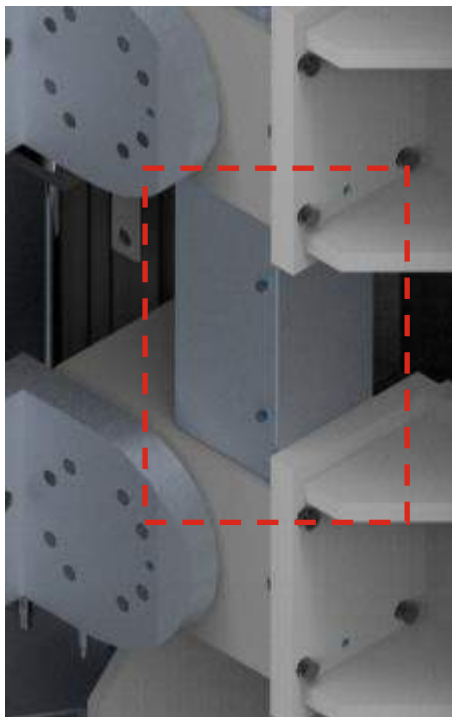


POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 11** Extract the Elastic Coupling of the servomotor.

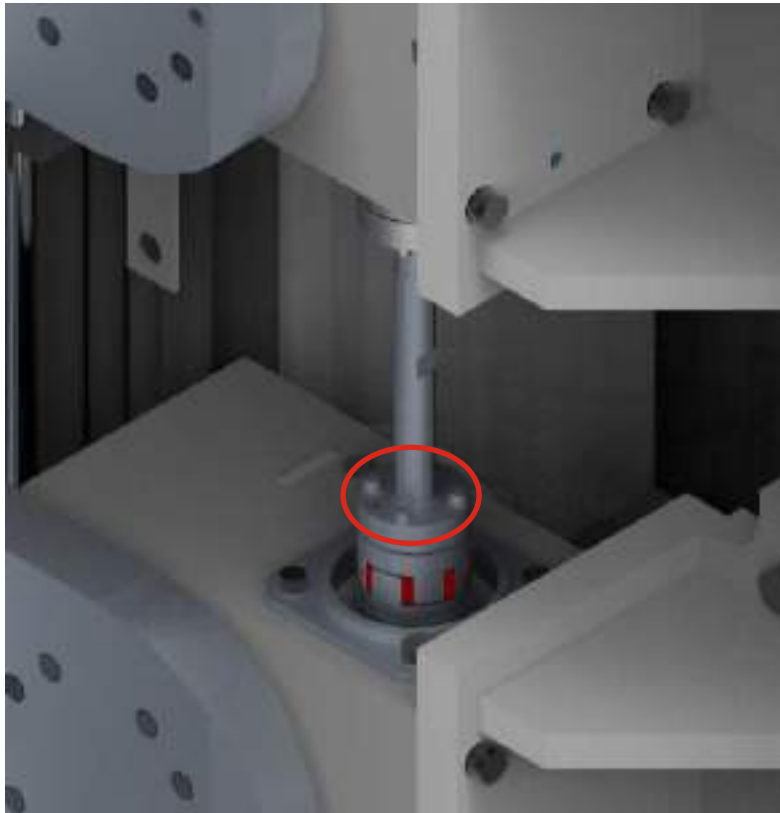


- 12 Disassemble plates covering the transmission system.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 13** Disassemble screws of the drive coupling on both sides of the transmission shaft and extract it.



- 14** Extract the Elastic Couplings of the transmission shaft.



**6. PROCEDURE DESCRIPTION: ELEMENT REPLACEMENT AND ASSEMBLY**

15	Replace the "A" Axis Elastic Coupling and the Servomotor for new ones.
16	To assemble the "A" Axis Elastic Coupling and Servomotor, follow the disassembly steps in reverse order.

**7. CONSIDERATIONS FOR ASSEMBLY**

ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm



FOR MORE INFORMATION ABOUT THE SERVOMOTOR COUPLING, REFER TO THE KTR MANUAL

### 4.1 Components of the coupling

Components of ROTEX® GS clamping hubs, hub type 2.0, 2.1, 2.5 or 2.6

Component	Quantity	Description
1	2	Clamping hub
2	1	Spider
3	2	Cap screw DIN EN ISO 4762

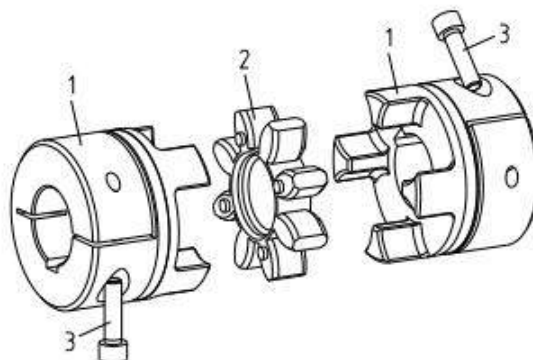


Illustration 14: ROTEX® GS clamping hub

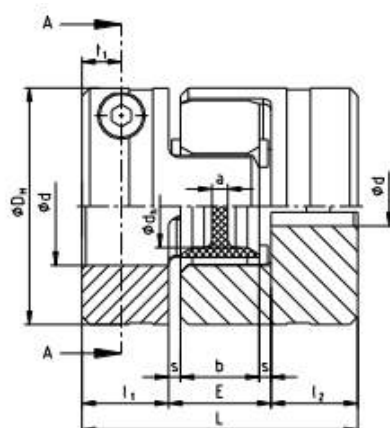


Illustration 4: ROTEX® GS hub type 2.0 (from size 5 - 14)

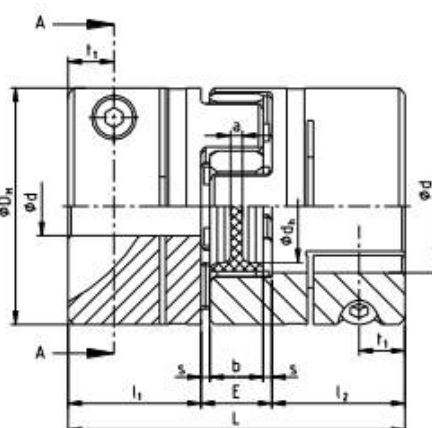


Illustration 5: ROTEX® GS hub type 2.5 (from size 19 - 90)

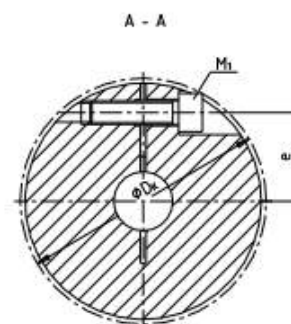


Table 4: Dimensions - clamping hubs

Size	Dimensions <sup>1)</sup> [mm]										Clamping screw DIN EN ISO 4029 (ROTEX® GS 5 - DIN EN ISO 1207)					
	D	D <sub>n</sub>	d <sub>n</sub>	L	l <sub>1</sub>	l <sub>2</sub>	M, N	E	b	s	a	M <sub>1</sub>	l <sub>1</sub>	a	D <sub>2</sub>	T <sub>A</sub> [Nm]
Hub material - aluminium																
5	-	10	-	15	5	-	5	4	0.5	4.0	M1.2	2.5	3.5	11.4	- <sup>1)</sup>	
7	-	14	-	22	7	-	8	6	1.0	6.0	M2	3.5	5.0	16.5	0.37	
9	-	20	7.2	30	10	-	10	8	1.0	1.5	M2.5	5.0	7.5	23.4	0.78	
12	-	25	8.5	34	11	-	12	10	1.0	3.5	M3	5.0	9.0	27.5	1.34	
14	-	30	10.5	35	11	-	13	10	1.5	2.0	M3	5.0	11.5	32.2	1.34	
19	-	40	18	68	25	-	18	12	2.0	3.0	M6 <sup>2)</sup>	11.0	14.5 <sup>2)</sup>	46.0	10.5 <sup>2)</sup>	
24	-	55	27	78	30	-	18	14	2.0	3.0	M6	10.5	20.0	57.5	10.5	
28	-	65	30	90	35	-	20	15	2.5	4.0	M6	11.5	25.0	73.0	25	
38	-	80	38	114	45	-	24	18	3.0	4.0	M8	15.5	30.0	83.5	25	
Hub material - steel																
42	85	95	46	126	50	28	25	20	3.0	4.0	M10	18	32.0	93.5	60	
48	95	105	51	140	58	32	28	21	3.5	4.0	M12	21	36.0	105.0	120	
55	110	120	60	160	65	37	30	22	4.0	4.5	M12	26	42.5	119.5	120	
65	115	135	68	185	75	47	35	26	4.5	4.5	M12	33	45.0	124.0	120	
75	135	160	80	210	85	53	40	30	5.0	5.0	M16	36	51.0	147.5	206	
90	160	200	104	245	100	62	45	34	5.5	6.5	M20	40	60.0	176.0	580	

1) Slotted screw, tightening torque not defined

2) Size 19: Bore Ø22 - Ø24 with 2-off clamping screws M4, T<sub>A</sub> = 2.9 Nm and dimension e = 15.0

3) Transmittable friction torques of clamping hubs see table 6



**4.5 Assembly of the clamping hubs (hub types 2.0, 2.1, 2.5, 2.6, 2.8 and 2.9)**

The power transmission of ROTEX® GS clamping hubs (hub type 2.0, 2.5 and 2.8) is frictionally engaged. With hub type 2.1, 2.6 and 2.9 a feather key additionally provides for positive locking power transmission.



**If used in potentially explosive atmospheres all screw connections must be secured against working loose additionally, e. g. conglomerating with Loctite (average strength).**

- Clean and degrease the hub bore and the shaft.
- Lightly detach the clamping screws.
- Slip the hub onto the shaft. Please observe dimension  $l_1$  or  $l_2$ .
- Tighten the clamping screws at the tightening torques specified in table 4.  
With hub type 2.8 or 2.9 (with feather keyway) the screws have to be tightened alternately in equal steps at the tightening torques specified in table 6.



Illustration 20: Assembly of clamping hub

Please note: hub type 2.8 or 2.9 have 2 clamping screws



**The transmittable friction torques of the clamping hubs depend on the bore diameter.**



**Hubs, clamping hubs or similar types without feather keyway may be used in category 3 only and are marked with category 3 accordingly.**



**If the clamping screws are not tightened at the correct tightening torque, there is the risk of**  
 a) a fracture of the hub and plastic deformation with a too high tightening torque  $T_A$   
 b) early slipping, untightening of the screws with a too low tightening torque  $T_A$



### 4.1 Components of the coupling

Components of ROTEX® GS clamping ring hubs, hub type 6.0 light, 6.0 steel or 6.0

Component	Quantity	Description
1.1	2	Clamping ring
1.2	2	Clamping ring hub
2	1	Spider
3	see table 5, 6 and 7	Cap screw DIN EN ISO 4762

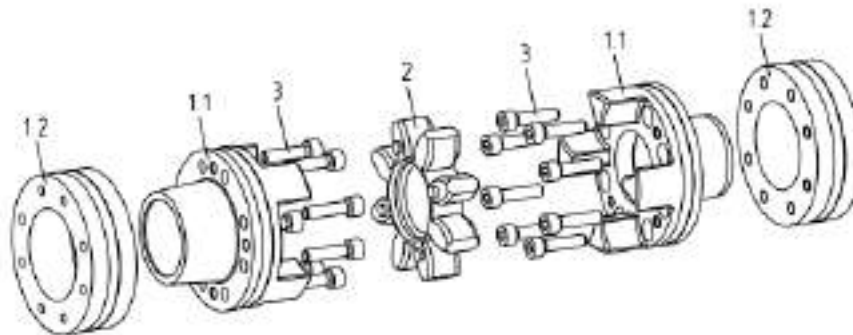


Illustration 17: ROTEX® GS clamping ring hub

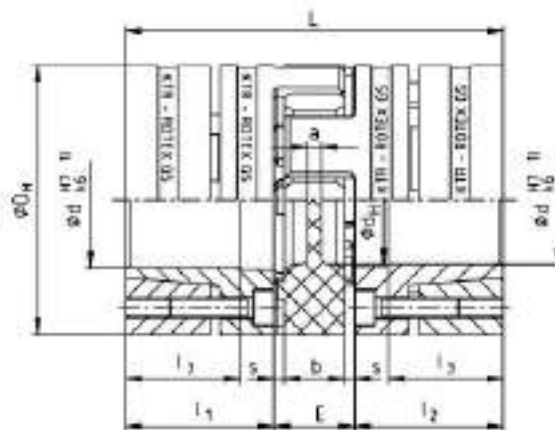


Illustration 9: ROTEX® GS, clamping ring hubs

Extraction thread M<sub>1</sub> between clamping screws.

Clamping ring hub 6.0 light with block mounting (hub and clamping ring mounted as a block)

t<sub>1</sub> From Ø55 tolerance G7/m6

Table 6: Dimensions - Clamping ring hubs 6.0 light, 6.0 steel and 6.0

Size	Dimensions <sup>2)</sup> (mm)									Clamping screws DIN EN ISO 4762			
	D <sub>h</sub> <sup>3)</sup>	d <sub>h</sub>	L	L <sub>1</sub> , L <sub>2</sub>	L <sub>3</sub>	E	b	s	a	M	z <sup>4)</sup>	T <sub>A</sub> [Nm]	M <sub>1</sub>
<b>6.0 light (size 14 - 48)</b>													
Material of hub/clamping ring - aluminium													
Hub material - aluminium/clamping ring material - steel													
14	30	10.5	50	18.5	13.5	13	10	1.5	2.0	M3	4	1.34	M3
19	40	18	65	25	18	16	12	2.0	3.0	M4	5	3	M4
24	55	27	78	30	22	18	14	2.0	3.0	M5	4	6	M5
28	65	30	90	35	27	20	15	2.5	4.0	M5	8	8	M5
38	80	38	114	45	35	24	18	3.0	4.0	M6	8	10	M6
42	95	48	128	50	38	26	20	3.0	4.0	M8	4	25	M8
48	105	51	140	56	41	28	21	3.5	4.0	M10	4	49	M10
<b>6.0 steel (size 19 - 90)</b>													
Material of hub and clamping ring - steel													
19	40	18	65	25	18	16	12	2.0	3.0	M4	5	4.1	M4
24	55	27	78	30	22	18	14	2.0	3.0	M5	4	8.5	M5
28	65	30	90	35	27	20	15	2.5	4.0	M5	8	8.5	M5
38	80	38	114	45	35	24	18	3.0	4.0	M6	8	14	M6
42	95	48	128	50	38	26	20	3.0	4.0	M8	4	41	M8
48	105	51	140	56	41	28	21	3.5	4.0	M10	4	69	M10
55	120	60	160	65	46	30	22	4.0	4.5	M10	4	69	M10
65	135	68	185	75	55	35	26	4.5	4.5	M12	4	120	M12
75	160	80	210	85	63	40	30	5.0	5.0	M12	5	120	M12
90	200	104	245	100	75	45	34	5.5	6.5	M18	5	295	M18

2) Ø D<sub>h</sub> + 2 mm with high speeds for expansion of spider

3) z = Number each clamping ring hub

4) Consider transmittable friction torques of the respective clamping ring hubs 6.0 light, 6.0 steel and 6.0 (see table 9 to 11)

#### 4.6 Assembly of clamping ring hubs (hub type 6.0 light, 6.0 steel and 6.0)

The power transmission of **ROTEX® GS** clamping hubs is frictionally engaged. The necessary surface pressure is transmitted via the clamping ring with internal taper to the taper hub and consequently to the shaft. The friction torques specified in table 5 to 7 consider a fit pair H7/k6, from Ø55 G7/m6. With a bigger fitting tolerance the friction torques specified in table 9 to 11 are reduced.

The strength and dimensions of the shafts (specifically hollow shafts) have to be dimensioned such that sufficient safety against plastic deformation is ensured. This may roughly be reviewed as per the following criterion.

For clamping connections with hollow shafts the required internal diameter of the hollow shaft  $d_{IW}$  is calculated based on the following formula:

$$d_{IW} \leq d \cdot \sqrt{\frac{R_{p0,2} - 2 \cdot p_w}{R_{p0,2}}} \quad [\text{mm}]$$

Shear stress on the internal shaft diameter for hollow shaft:

$$\sigma_{tIW} \approx - \frac{2 \cdot p_w}{1 - C_w^2} \quad [\text{N/mm}^2]$$

Shear stress for solid shaft:

$$\sigma_{tW} = - p_w \quad [\text{N/mm}^2]$$

$R_{p0,2}$  = yield strength of shaft material  $[\text{N/mm}^2]$   
 $p_w$  = surface pressure of hub/shaft  $[\text{N/mm}^2]$

$d_{IW}$  = internal diameter of hollow shaft  $[\text{mm}]$   
 $d$  = shaft diameter  $[\text{mm}]$   
 $C_w$  =  $d_{IW} / d$

The strength required is not provided if the hollow shaft bore exceeds the max. internal bore calculated or if the shear stress exceeds the yield strength of the material.  
 For a detailed calculation please contact KTR.



**If used in potentially explosive atmospheres all screw connections must be secured against working loose additionally, e. g. conglomerating with Loctite (average strength).**

- Clean the hub bore and shaft and review for dimensional accuracy, afterwards lubricate with a thin oil (e. g. Castrol 4 in 1, Klüber Quietsch-Ex or WD 40).



**Oils and greases containing molybdenum disulfide or other high-pressure additives as well as internal lubricants must not be used.**

- Lightly untighten the clamping screw and pull the clamping ring from the hub only marginally to make sure that the clamping ring is fitted loosely.
- Shift the clamping ring hub onto the shaft. Dimension  $l_3$  should at least be observed (see table 8).
- Tighten the clamping screws evenly crosswise gradually to the tightening torque specified in table 8. Repeat this process until all clamping screws have reached the tightening torque.

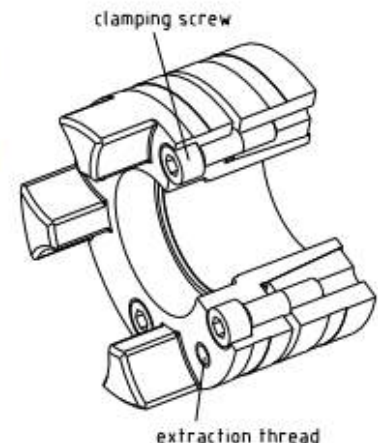


Illustration 21: Assembly of clamping ring hub with clamping ring



**If the clamping screws are not tightened at the correct tightening torque, there is the risk of**  
 a) a fracture of the hubs/cams and plastic deformation with a too high tightening torque  $T_A$   
 b) early slipping, untightening of the screws with a too low tightening torque  $T_A$

- **Applies with hub type 6.0 light only:**  
 Tighten the clamping screws evenly gradually and crosswise at 1/3 or 2/3 tightening torque  $T_A$ , respectively (see table 8) until the ring gets in contact. Afterwards tighten the screws at the tightening torque mentioned in table 8 one after another.



### 4.7 Disassembly of clamping ring hubs (hub type 6.0 light, 6.0 steel and 6.0)

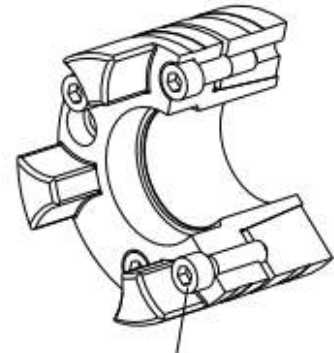
Unscrew the clamping screws evenly one after another. During every revolution every screw may only be unscrewed by half a turn. Unscrew all clamping screws by 3 - 4 pitches.

Remove the screws located next to the extraction threads and screw them into the respective extraction threads until they fit.

The clamping ring is released by tightening the screws in the extraction threads evenly gradually and crosswise.



**If these hints are not observed, the operation of the coupling may be affected.**



clamping screw in  
extraction thread

Illustration 22: Disassembly of clamping  
ring hub with clamping ring

If the assembly is repeated the bore of the hub and shaft have to be cleaned and afterwards lubricated with a thin oil (e. g. Castrol 4 in 1, Klüber Quietsch-Ex or WD 40). The same applies for the taper surfaces of clamping ring hub and clamping ring.



**Oils and greases containing molybdenum disulfide or other high-pressure additives as well as internal lubricants must not be used.**

#### Applies with hub type 6.0 light only:



**If the assembly is repeated the taper surfaces, bores of the hub and the shaft have to be cleaned. The bore of the hub and shaft have to be lubricated with thin oil (e. g. Castrol 4 in 1, Klüber Quietsch-Ex or WD 40). Lightly paint the taper surfaces of the clamping ring hub or clamping ring with the grease Gleitmo 800, afterwards twist the components against one another by one revolution in order to spread the grease evenly.**

**8. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES**

17	Switch on the machine (Refer to the Service Manual).
18	Close and lock the safety door to access the machine. (Refer to the Service Manual)
19	Carry out the alignment and "0" reference of the "A" Axis.



CHECK THE MACHINE AXIS ALIGNMENT PROCEDURES DESCRIBED IN THE SERVICE MANUAL

File N°	TW_CM_261_003	Reference Drawings	XXXX261 / XXXX262 XXXX263 / XXXX264 XXXX265 / XXXX266
Mechanical Personnel	1	Electrical Personnel	0
Duration	30'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

### 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Element Disassembly
3	Element Replacement and Assembly
4	Machine Connection

### 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHenever a maintenance task needs to be conducted, the operator or the maintenance personnel must ensure that only them can operate the machine in accordance to the safety standards and approved work procedures



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

## 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
3	Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES

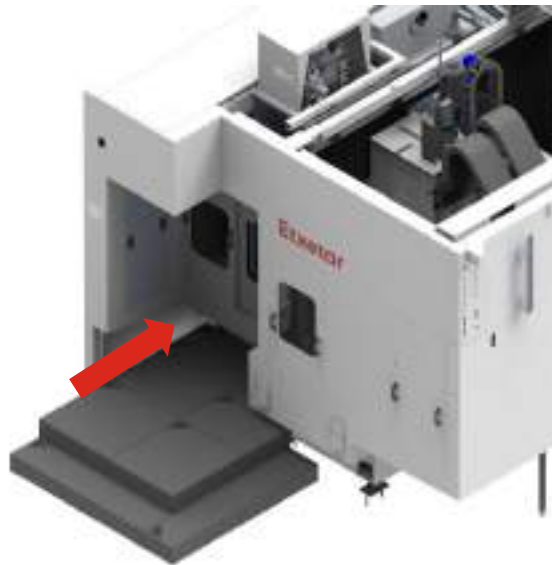


AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

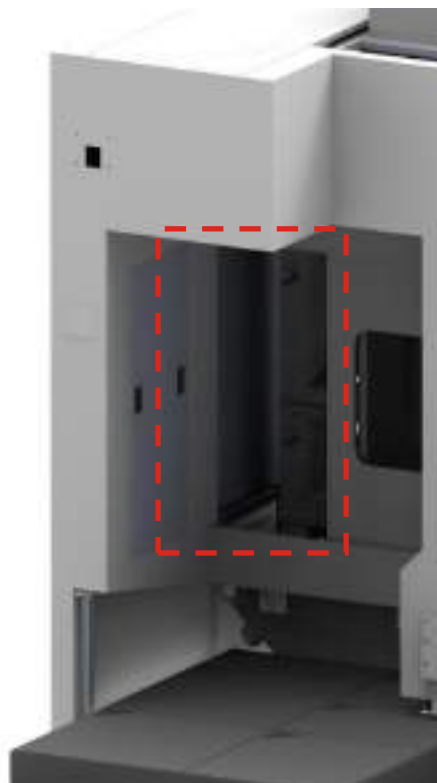


### 4. PROCEDURE DESCRIPTION: PART SEATING CONTROL DEVICE DISASSEMBLY

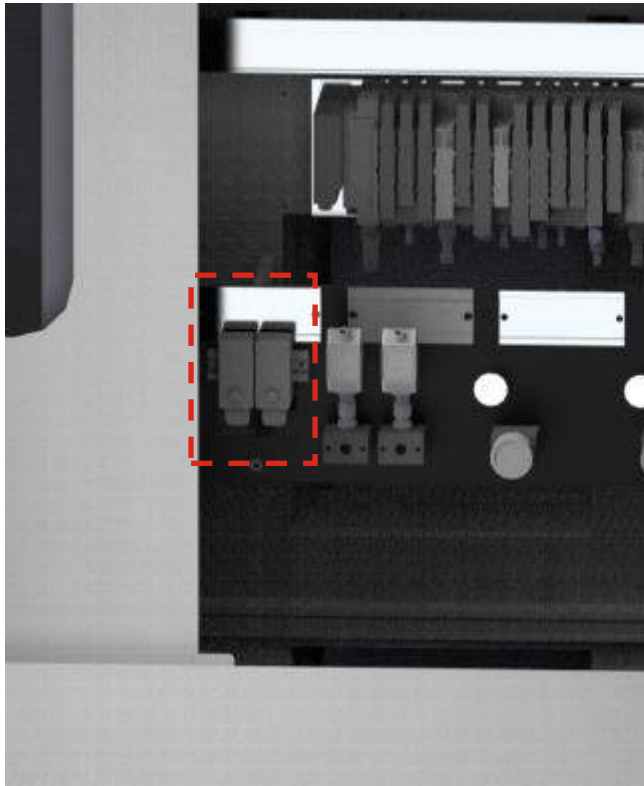
- 4 Access the Tool Magazine Safety Door area.



- 5 Disassemble the cover to access the Tool Magazine.



- 6** Disassemble the Part Seating Control Device from the Fluid Panel and extract it.



### 5. PROCEDURE DESCRIPTION: PART SEATING CONTROL DEVICE REPLACEMENT AND ASSEMBLY

7	Replace the Part Seating Control Device for new one.
8	To assemble the Part Seating Control Device, follow the disassembly steps in reverse order.

### 6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

9	Switch on the machine (Refer to the Service Manual).
10	Close and lock the safety door to access the machine. (Refer to the Service Manual)

File N°	TW_CM_261_004	Reference Drawings	XXXX261 / XXXX262 XXXX263 / XXXX264 XXXX265 / XXXX266
Mechanical Personnel	1	Electrical Personnel	0
Duration	30'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

### 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Clamping Fixture Clamping Elements Disassembly
3	Clamping Fixture Clamping Elements Replacement and Assembly
4	Machine Connection

### 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Using the Main Panel of the machine, open the Load / Unload Automatic Door.



- 3 Using the Robot, disassemble the Clamping Fixture from the machine.
- 4 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 5 Switch off the machine (Refer to the Service Manual).



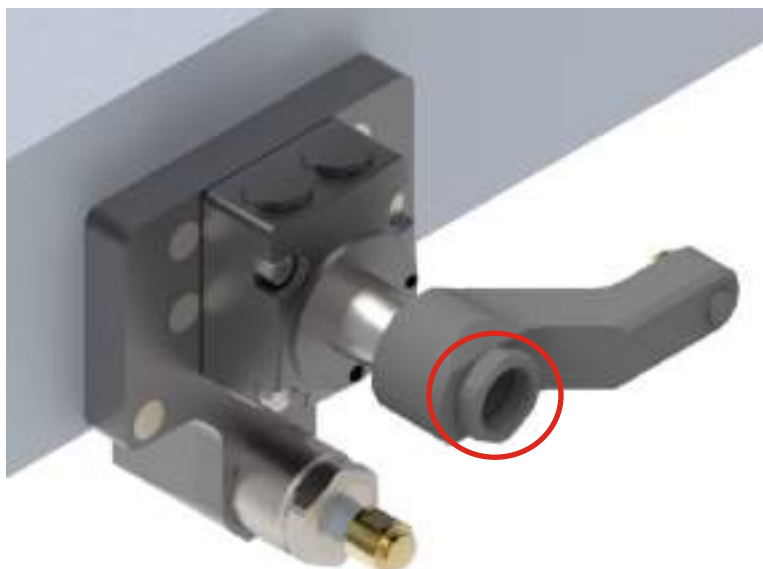
WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: CLAMPING FIXTURE CLAMPING ELEMENTS DISASSEMBLY

6	Access to the disassembled Clamping Fixture and locate the Clamping Cylinder to disassemble and replace.
7	Disassemble the nut fixing the Jaw to the Clamping Cylinder and extract the Jaw.



8	Disassemble the 4 screws fixing the Clamping Cylinder to the Clamping Fixture and extract it.
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BEAR IN MIND TO REPLACE THE O-RING SEALS ON THE CLAMPING FIXTURE FOR NEW ONES.



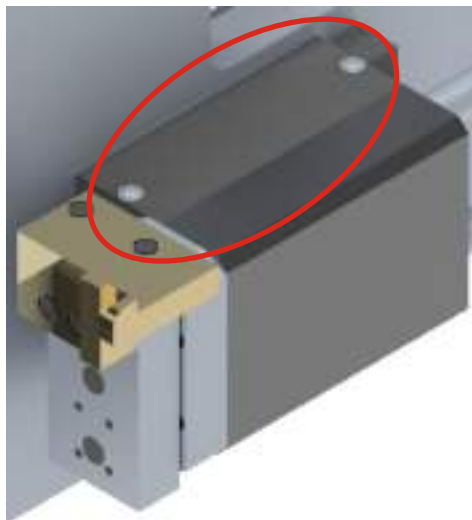
CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



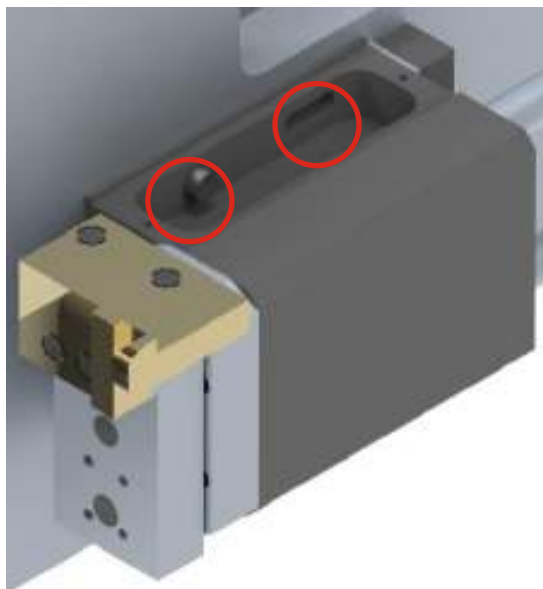
BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 5. PROCEDURE DESCRIPTION: CLAMPING FIXTURE CLAMPING ELEMENTS DISASSEMBLY

- |    |   |
|----|---|
| 9  | Access to the disassembled Clamping Fixture and locate the Axial Pusher to disassemble and replace. |
| 10 | Disassemble the Upper / Lower Guarding of the Axial Pusher.   |

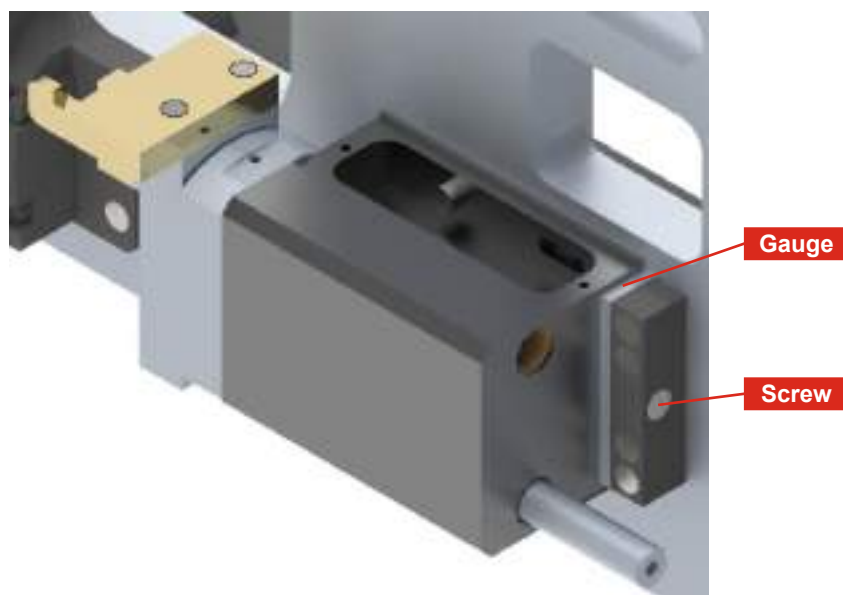


- |    |  |
|----|--|
| 11 | Untighten the 4 screws fixing the Axial Pusher against the Clamping Fixture. |
|----|--|

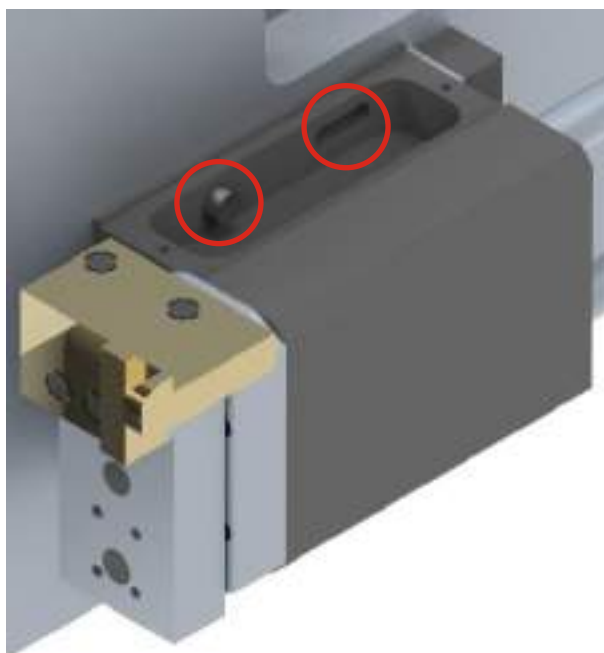


CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 12** Access the rear side of the Axial Pusher and disassemble the pusher screw and the gauge.



- 13** Disassemble the 4 screws fixing the Axial Pusher against the Clamping Fixture.





BEAR IN MIND TO REPLACE THE O-RING SEALS ON THE CLAMPING FIXTURE FOR NEW ONES.



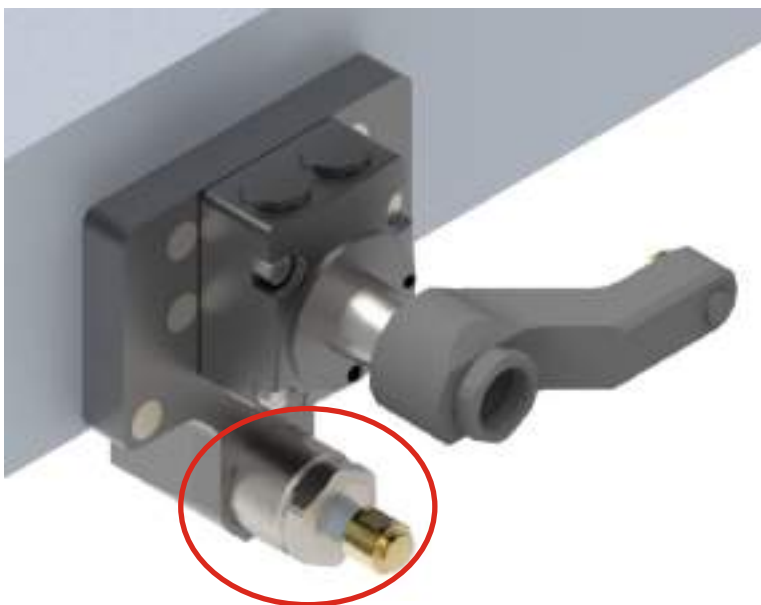
CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 6. PROCEDURE DESCRIPTION: CLAMPING FIXTURE CLAMPING ELEMENTS DISASSEMBLY

14	Access to the disassembled Clamping Fixture and locate the Vibration Dumper to disassemble and replace.
15	Disassemble the Vibration Dumper and extract it



BEAR IN MIND TO REPLACE THE O-RING SEALS ON THE CLAMPING FIXTURE FOR NEW ONES.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 7. PROCEDURE DESCRIPTION: ELEMENT REPLACEMENT AND ASSEMBLY

16	Replace the Clamping Fixture Elements for new ones.
17	To assemble the Clamping Fixture Elements, follow the disassembly steps in reverse order.

### 8. CONSIDERATIONS FOR ASSEMBLY



ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm

### 9. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

18	Switch on the machine (Refer to the Service Manual).
19	Close and lock the safety door to access the machine. (Refer to the Service Manual)
20	Carry out the alignment and "0" reference of the "X – Y –Z" Axis and replace the Tool Change Reference Position on the Machine Program (CN). (Refer to the Service Manual).
21	Check that the alignment and the "0" reference of the other Axis (X, Y, Z, etc.) and the Machine Reference Positions (Tool Change, Work piece Load – Unload, etc.) are correct.
22	Carry out the alignment and "0" reference of the other Axis and replace the Machine Reference Positions on the Machine Program (CN) if necessary. (Refer to the Service Manual).
23	Carry out a Dry Cycle, controlling that the machining, tool changes and load / unload of the work piece are properly carried out and there are no collisions.



FOR MORE INFORMATION ABOUT THE AXIS ALIGNMENT, CHECK THE MACHINE AXIS ALIGNMENT PROCEDURES DESCRIBED IN THE SERVICE MANUAL





File N°	TW_CM_320_002	Reference Drawings	XXXX320
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	Anually
Machine Status	ON	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

### 1. SUMMARY

Step	Description
1	Work Spindle Collet Chuck Disassembly
2	Work Spindle Collet Chuck Seal Disassembly and Replacement
3	Work Spindle Collet Chuck Lip Seal Disassembly and Replacement
4	Work Spindle Collet Chuck Lubrication
5	Work Spindle Collet Chuck Assembly
6	Work Spindle Collet Chuck Clamping Strength Control
7	Machine Connection

### 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. PROCEDURE DESCRIPTION: WORK SPINDLE COLLET CHUCK DISASSEMBLY

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Using the Main Panel of the machine, open the Load / Unload Automatic Door.

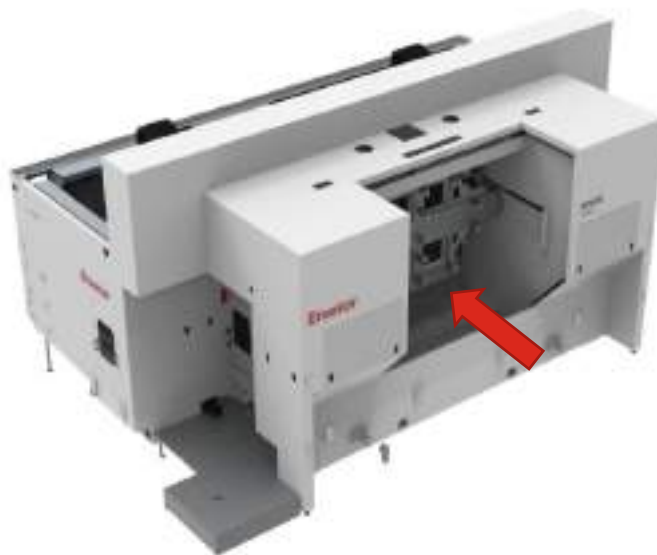


- 3 Unload to the Tool Magazine the tools located on the Work Spindle.
- 4 Unclamp the Work Spindle Collet Chuck.
- 5 Using the Robot, disassemble the Clamping Fixture from the machine.
- 6 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 7 Connect the Handheld Unit. (Refer to the Service Manual)



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES

- 8 Access the Clamping Fixture area.



- 9 Using a cleaning cloth, clean the Work Spindle and the Collet Chuck.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



IF THE WORK SPINDLE HAS AN INTERNAL COOLANT SPEAR, SPECIAL TOOLING WILL BE NEEDED TO CARRY THIS PROCEDURE. TO ACCESS THE INTERNAL NUT OF THE COLLET CHUCK, A SPECIAL ALLEN KEY WITH A TROUGH HOLE WILL BE NEEDED IN ORDER TO AVOID / NOT TOUCH THE INTERNAL COOLANT SPEAR.

10

When the Collet Chuck is in the unclamped position, use a M4/6/8 Allen Key (or special Allen Key in case of having coolant spear) to disassemble the Collet Chuck Cone.



Special Tool



11

Extract the Collet Chuck Cone



- 12** Using pliers, extract the Collet Chuck Grippers one by one.

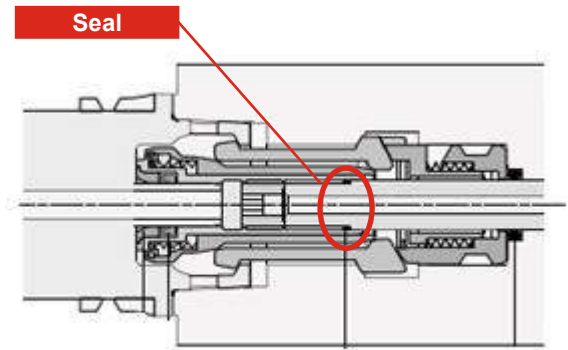


- 13** Using a cleaning cloth, clean the cavity where the Collet Chuck Grippers where.



**4. PROCEDURE DESCRIPTION: WORK SPINDLE COLLET CHUCK SEAL DISASSEMBLY AND REPLACEMENT**

- 14 Using twizzers, extract the Collet Chuck Seal.

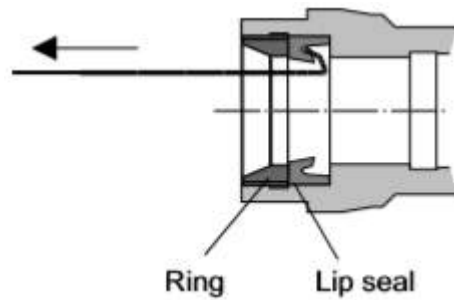


- 15 Replace the Collet Chuck Seal for a new one.



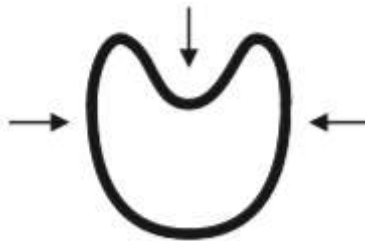
**5. PROCEDURE DESCRIPTION: WORK SPINDLE COLLET CHUCK LIP SEAL DISASSEMBLY AND REPLACEMENT**

- 16** Using a hook or pliers, extract the Collet Chuck Lip Seal.

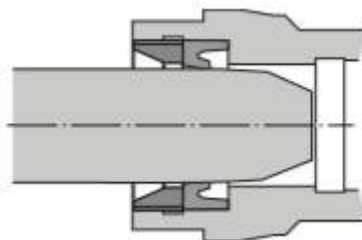


- 17** Replace the Collet Chuck Lip Seal for a new one.

- 18** Press the Lip Seal into a kidney shape and install it carefully observing the installation position.



- 19** Using a blunt object, press the seal against the walls and bring it into the final position using a mandrel.



### 6. PROCEDURE DESCRIPTION: WORK SPINDLE COLLET CHUCK LUBRICATION

20	Clean the Collet Chuck Grippers and the Collet Chuck Cone thoroughly before re-greasing them.
21	<p>The grease to be used for this procedures are the next ones:</p> <ul style="list-style-type: none"> <li>▪ METAFLUX-Paste Nr. 70-8508. Size: 400ml</li> <li>▪ KLÜBER-Paste ME 31-52. Size: 400ml</li> </ul>



ENSURE THAT THE COLLET CHUCK GRIPPERS AND THE COLLET CHUCK CONE ARE THOROUGHLY CLEANED BEFORE APPLYING THE NEW GREASE.



DO NOT MIXT THE DIFFERENT TYPES OF GREASE DURING THE GREASING PROCESS.

### 7. PROCEDURE DESCRIPTION: WORK SPINDLE COLLET CHUCK ASSEMBLY

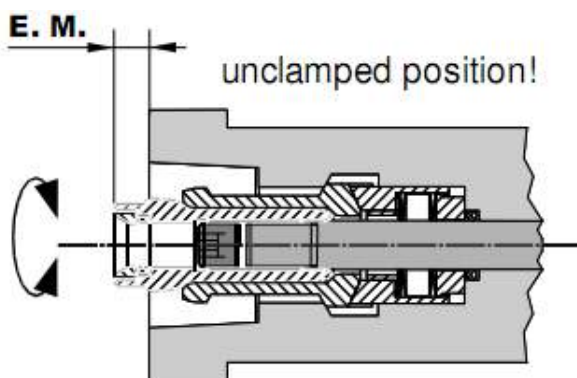
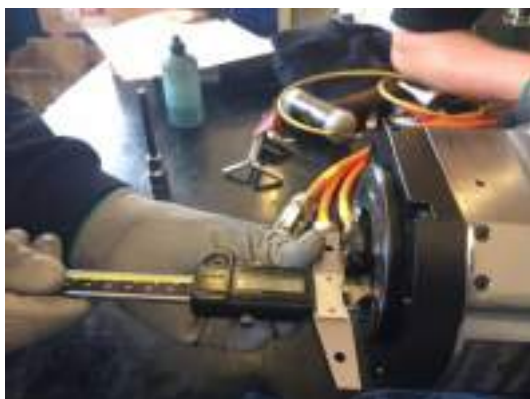
- 22** Using pliers, assemble the Collet Chuck Grippers one by one.



- 23** Assemble the Collet Chuck Cone



24	Adjust the depth of the Collet Chuck Cone until it meets the EM dimension advised by the supplier.
25	<p>The EM dimension to be used for this procedures are the next ones:</p> <ul style="list-style-type: none"> <li>▪ HSK63-&gt;10,5mm</li> <li>▪ HSK80-&gt;13mm</li> <li>▪ HSK100-&gt;13mm</li> </ul>



26	Use a M4/6/8 Allen Key (or special Allen Key in case of having coolant spear) to fix the Collet Chuck Cone in position using the advised torque.
27	<p>The torques to be used for this procedures are the next ones:</p> <ul style="list-style-type: none"> <li>▪ HSK63-&gt;30Nm</li> <li>▪ HSK80-&gt;30Nm</li> <li>▪ HSK100-&gt;50Nm</li> </ul>



Special Tool



## 8. PROCEDURE DESCRIPTION: WORK SPINDLE COLLET CHUCK CLAMPING STRENGTH CONTROL

28	Using the Handheld Unit, Clamp / Unclamp the Work Spindle Collet Chuck 100 time to spread the grease evenly.
29	While the Work Spindle Collet Chuck is unclamped, insert the clamping strength measuring unit.



30	Clamp the Work Spindle Collet Chuck and measure the clamping strength.
31	<p>The clamping strength to be displayed for this procedures are the next ones:</p> <ul style="list-style-type: none"> <li>■ HSK63-&gt;18kN</li> <li>■ HSK80-&gt;28kN</li> <li>■ HSK100-&gt;45kN</li> </ul>



IF THE DISPLAYED CLAMPING STRENGTH IS UNDER THE 50%, REPLACE THE WORK SPINDLE COLLET CHUCK FOR A NEW ONE.

## 9. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

- |    |   |
|----|---|
| 32 | Close and lock the safety door to access the machine. (Refer to the Service Manual) |
|----|---|





File N°	TW_CM_320_003	Reference Drawings	XXXX320
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	On Demand
Machine Status	ON	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Work Spindle Collet Chuck Disassembly and Replacement
2	Work Spindle Collet Chuck Lubrication
3	Work Spindle Collet Chuck Assembly
4	Work Spindle Collet Chuck Clamping Strength Control
5	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. PROCEDURE DESCRIPTION: WORK SPINDLE COLLET CHUCK DISASSEMBLY AND REPLACEMENT

1	Clean and prepare the area where the maintenance task is going to take place.
2	Using the Main Panel of the machine, open the Load / Unload Automatic Door.

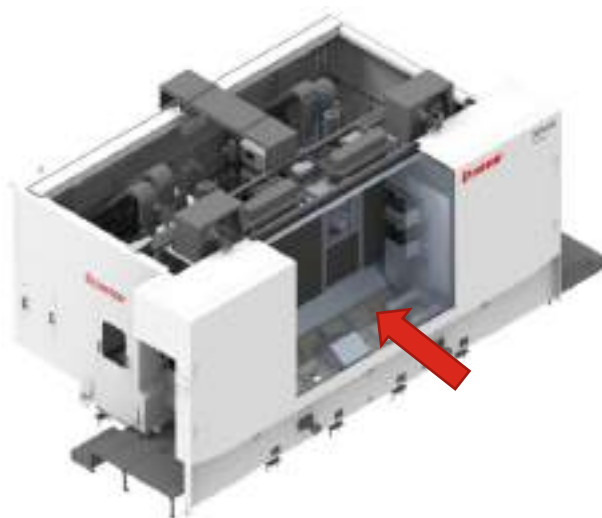


3	Unload to the Tool Magazine the tools located on the Work Spindle.
4	Unclamp the Work Spindle Collet Chuck.
5	Using the Robot, disassemble the Clamping Fixture from the machine.
6	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
7	Connect the Handheld Unit. (Refer to the Service Manual)

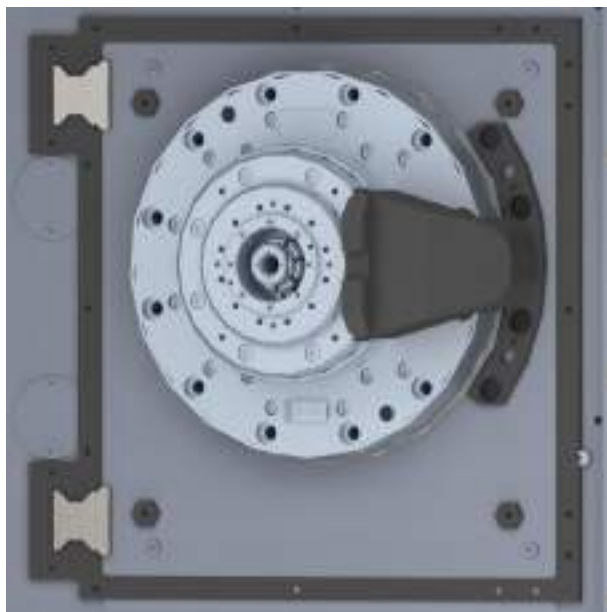


WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES

- 8 Access the Clamping Fixture area.



- 9 Using a cleaning cloth, clean the Work Spindle and the Collet Chuck.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



IF THE WORK SPINDLE HAS AN INTERNAL COOLANT SPEAR, SPECIAL TOOLING WILL BE NEEDED TO CARRY THIS PROCEDURE. TO ACCESS THE INTERNAL NUT OF THE COLLET CHUCK, A SPECIAL ALLEN KEY WITH A TROUGH HOLE WILL BE NEEDED IN ORDER TO AVOID / NOT TOUCH THE INTERNAL COOLANT SPEAR.

10

When the Collet Chuck is in the unclamped position, use a M4/6/8 Allen Key (or special Allen Key in case of having coolant spear) to disassemble the Collet Chuck Cone.



Special Tool



11

Extract the Collet Chuck Cone



- 12** Using pliers, extract the Collet Chuck Grippers one by one.



- 13** Using a cleaning cloth, clean the cavity where the Collet Chuck Grippers where.

- 14** Replace the Collet Chuck for a new one.



### 4. PROCEDURE DESCRIPTION: WORK SPINDLE COLLET CHUCK LUBRICATION

15	Clean the Collet Chuck Grippers and the Collet Chuck Cone thoroughly before greasing them.
16	<p>The grease to be used for this procedures are the next ones:</p> <ul style="list-style-type: none"> <li>▪ METAFLUX-Paste Nr. 70-8508. Size: 400ml</li> <li>▪ KLÜBER-Paste ME 31-52. Size: 400ml</li> </ul>



ENSURE THAT THE COLLET CHUCK GRIPPERS AND THE COLLET CHUCK CONE ARE THOROUGHLY CLEANED BEFORE APPLYING THE NEW GREASE.



DO NOT MIXT THE DIFFERENT TYPES OF GREASE DURING THE GREASING PROCESS.

### 5. PROCEDURE DESCRIPTION: WORK SPINDLE COLLET CHUCK ASSEMBLY

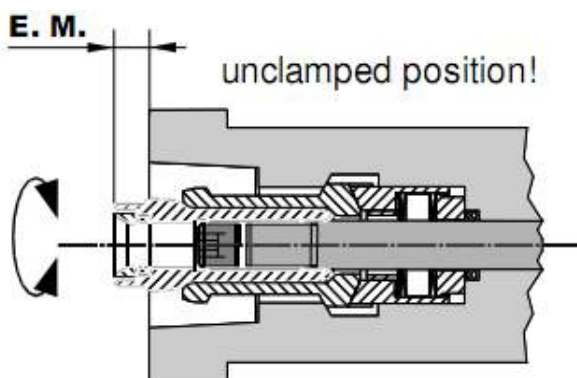
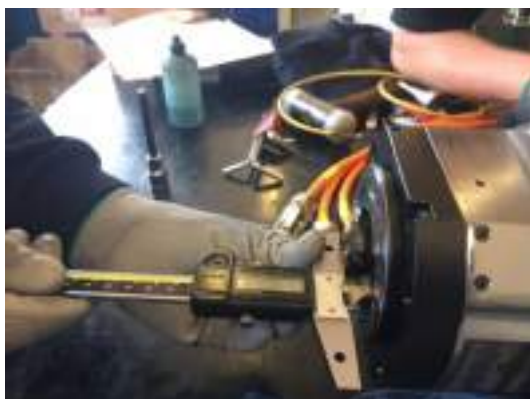
- 17** Using pliers, assemble the Collet Chuck Grippers one by one.



- 18** Assemble the Collet Chuck Cone



19	Adjust the depth of the Collet Chuck Cone until it meets the EM dimension advised by the supplier.
20	<p>The EM dimension to be used for this procedures are the next ones:</p> <ul style="list-style-type: none"> <li>▪ HSK63-&gt;10,5mm</li> <li>▪ HSK80-&gt;13mm</li> <li>▪ HSK100-&gt;13mm</li> </ul>



21	Use a M4/6/8 Allen Key (or special Allen Key in case of having coolant spear) to fix the Collet Chuck Cone in position using the advised torque.
22	<p>The torques to be used for this procedures are the next ones:</p> <ul style="list-style-type: none"> <li>▪ HSK63-&gt;30Nm</li> <li>▪ HSK80-&gt;30Nm</li> <li>▪ HSK100-&gt;50Nm</li> </ul>



Special Tool



## 6. PROCEDURE DESCRIPTION: WORK SPINDLE COLLET CHUCK CLAMPING STRENGTH CONTROL

23	Using the Handheld Unit, Clamp / Unclamp the Work Spindle Collet Chuck 100 time to spread the grease evenly.
24	While the Work Spindle Collet Chuck is unclamped, insert the clamping strength measuring unit.



25	Clamp the Work Spindle Collet Chuck and measure the clamping strength.
26	<p>The clamping strength to be displayed for this procedures are the next ones:</p> <ul style="list-style-type: none"> <li>■ HSK63-&gt;18kN</li> <li>■ HSK80-&gt;28kN</li> <li>■ HSK100-&gt;45kN</li> </ul>



## 7. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

- |    |   |
|----|---|
| 27 | Close and lock the safety door to access the machine. (Refer to the Service Manual) |
|----|---|



File N°	TW_CM_609_001	Reference Drawings	XXXX609
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Earmuffs



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Machine Interior Camera Disassembly
3	Machine Interior Camera Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION



### 3. MACHINE DISCONNECTION

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Using the Main Panel of the machine, open the Load / Unload Automatic Door.



- 3 Using the Robot, disassemble the Clamping Fixture from the machine.
- 4 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 5 Switch off the machine (Refer to the Service Manual).



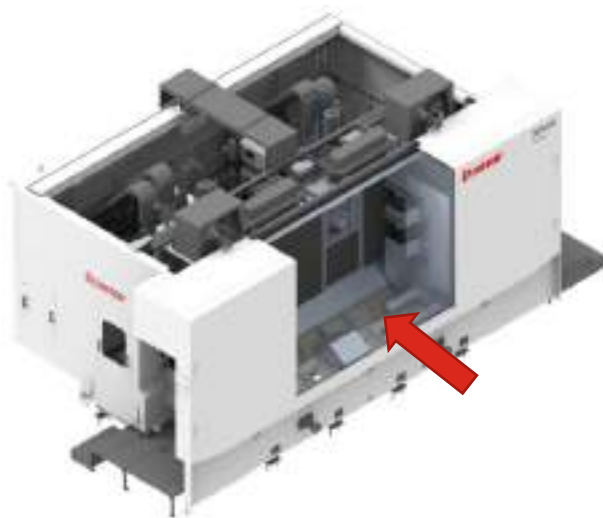
WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: MACHINE INTERIOR CAMERA DISASSEMBLY

- 6 Access the Clamping Fixture area of the machine.



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 7 Disassemble as many cleaning connections as needed to make the disassembly of the Interior Camera more comfortable.



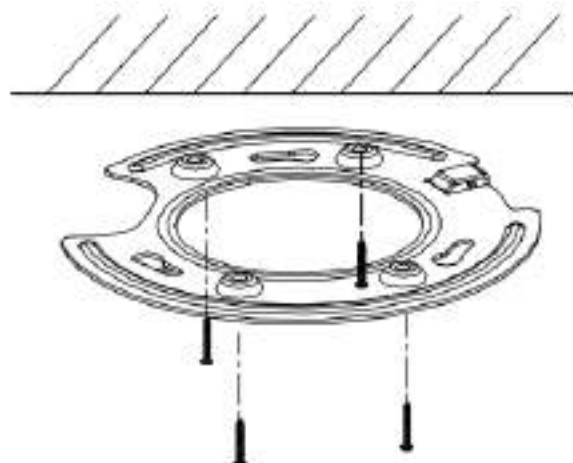
- 8** On the machine interior ceiling, disassemble the screw fixing the Camera to its base.



- 9** Disassemble the Camera from the base and disconnect the wires attached to it.



- 10** Disassemble the Base of the Camera from the Machine Ceiling.



### 5. PROCEDURE DESCRIPTION: MACHINE INTERIOR CAMERA REPLACEMENT AND ASSEMBLY

11	Replace the Machine Interior Camera for new one.
12	To assemble the Machine Interior Camera, follow the disassembly steps in reverse order.

### 6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

13	Switch on the machine (Refer to the Service Manual).
14	Close and lock the safety door to access the machine. (Refer to the Service Manual)

File N°	TW_CM_645_001	Reference Drawings	XXXX645 / XXXX646
Mechanical Personnel	1	Electrical Personnel	0
Duration	30'	Frequency	250.000 Cycles
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Tool Cleaning Device Disassembly
3	Tool Holder Gripper Disassembly
4	Tool Holder Gripper Replacement and Assembly
5	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Using the Main Panel or the Handheld Unit, move the Tool Holder Gripper that needs to be replaced into the manual tool change position.
3	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
4	Switch off the machine (Refer to the Service Manual).



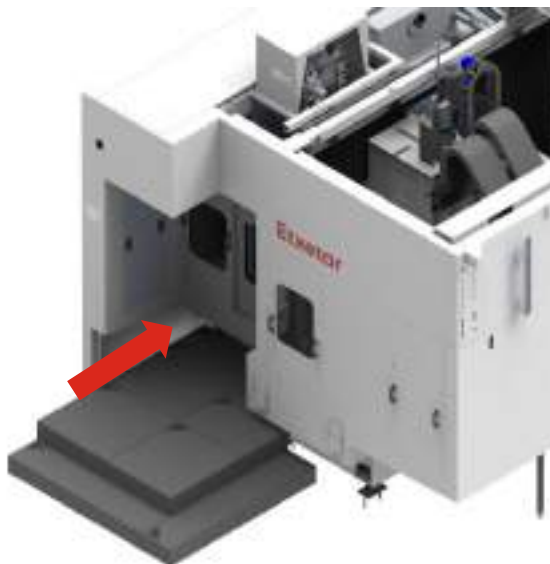
WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: TOOL CLEANING DEVICE DISASSEMBLY

- 5** Access the Tool Magazine Safety Door area.

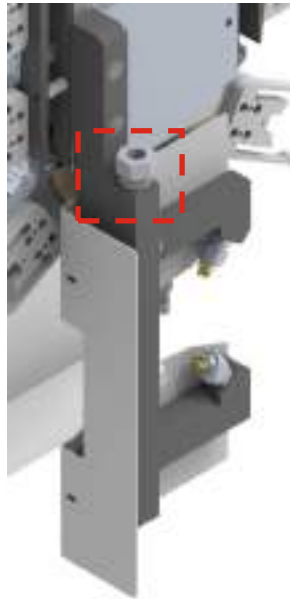


- 6** Disassemble the Tool Magazine frontal protection.

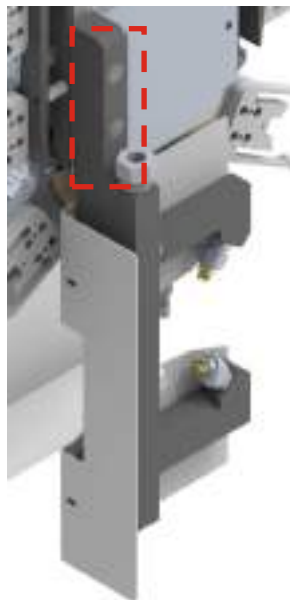




- 7** Disassemble the Tool Cleaning Device fluid connections.

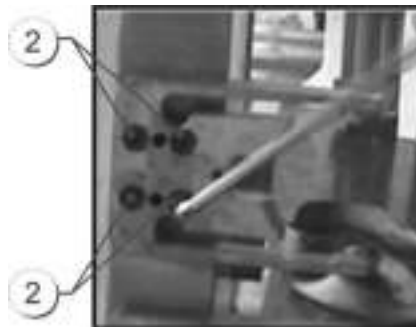


- 8** Disassemble the screws fixing the Tool Cleaning Device to the Tool Magazine and extract it.

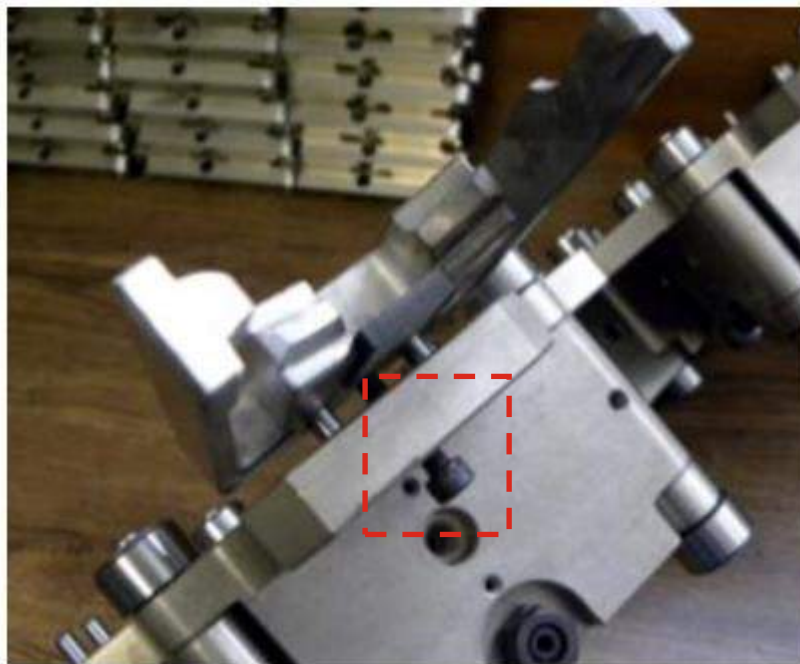


### 5. PROCEDURE DESCRIPTION: TOOL HOLDER GRIPPER DISASSEMBLY

- 9** Disassemble the 4 screws (Pos.2) fixing the Tool Holder Gripper against the Tool Magazine link.



- 10** Assemble a screw on the threaded hole in the center of the magazine link where the Gripper is located and extract the Gripper.



### 6. PROCEDURE DESCRIPTION: TOOL HOLDER GRIPPER REPLACEMENT AND ASSEMBLY

11	Replace the Tool Holder Gripper for new one.
12	If any of the pins positioning the Gripper to the magazine link has been extracted, coat the pin with LOCTITE 220 and assemble it in position.



13	To assemble the Tool Holder Gripper and the Tool Cleaning Device, follow the disassembly steps in reverse order.
----	--

## 7. CONSIDERATIONS FOR ASSEMBLY



ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm

## 8. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

- 14 Switch on the machine (Refer to the Service Manual).
- 15 Close and lock the safety door to access the machine. (Refer to the Service Manual)
- 16 Carry out the alignment and "0" reference of the "Q" Axis if needed.



CHECK THE MACHINE AXIS ALIGNMENT PROCEDURES DESCRIBED IN THE SERVICE MANUAL

File N°	TW_CM_645_002	Reference Drawings	XXXX645 / XXXX646
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	8 Years
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Tool Cleaning Device Disassembly
3	Wearable Parts Disassembly
4	Wearable Parts Replacement and Assembly
5	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL

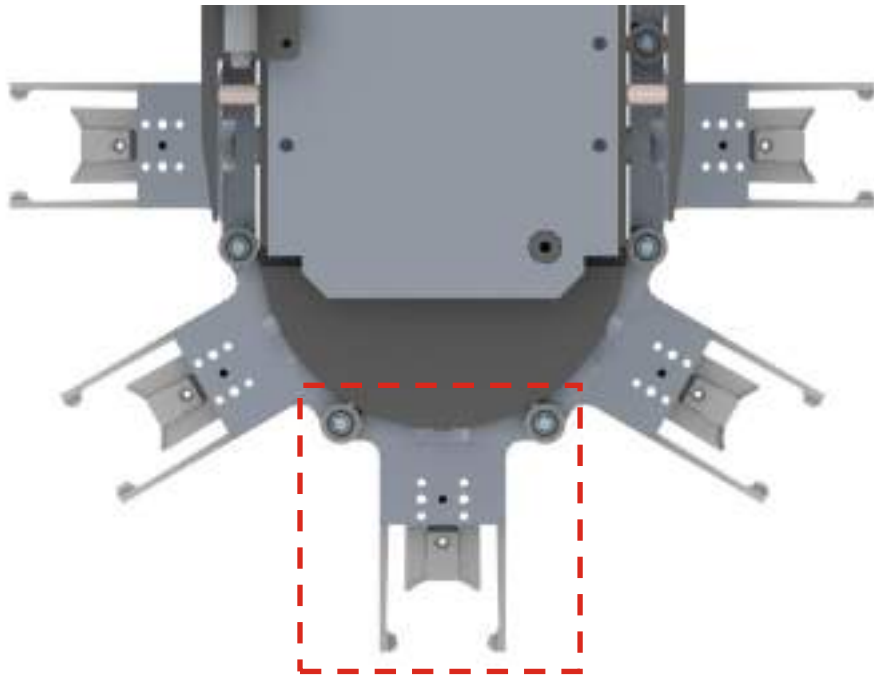


TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Extract all the Tools from the Tool Magazine.
3	Using the Main Panel or the Handheld Unit, move the Tool Holder Gripper that needs to be replaced into the position where the Tool Magazine Chain is least tensioned.



4	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
5	Switch off the machine (Refer to the Service Manual).



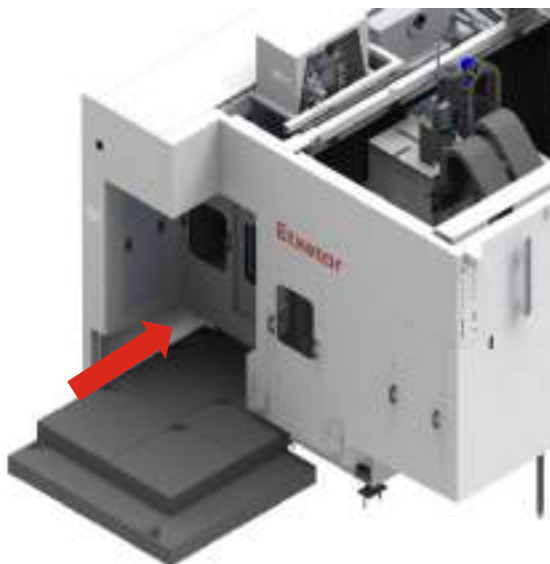
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AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: TOOL CLEANING DEVICE DISASSEMBLY

- 6** Access the Tool Magazine Safety Door area.

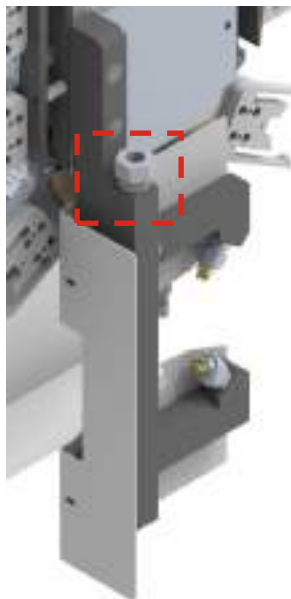


- 7** Disassemble the Tool Magazine frontal protection.





- 8** Disassemble the Tool Cleaning Device fluid connections.



- 9** Disassemble the screws fixing the Tool Cleaning Device to the Tool Magazine and extract it.



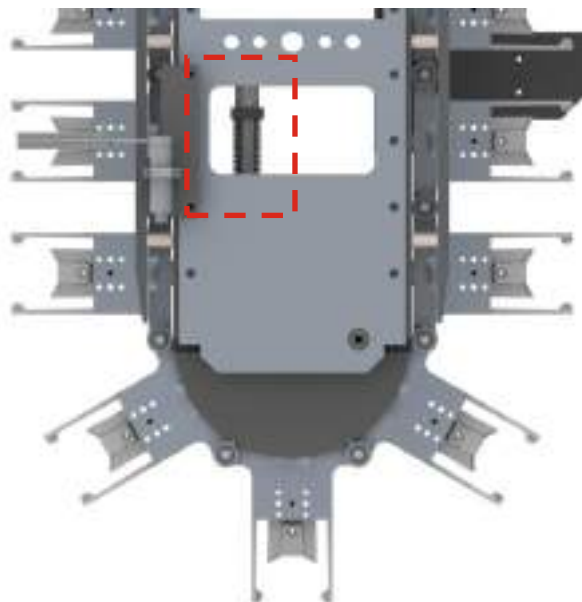
### 5. PROCEDURE DESCRIPTION: WEARABLE PARTS DISASSEMBLY

- 10** Disassemble the Tool Magazine guarding to access the chain tension system.

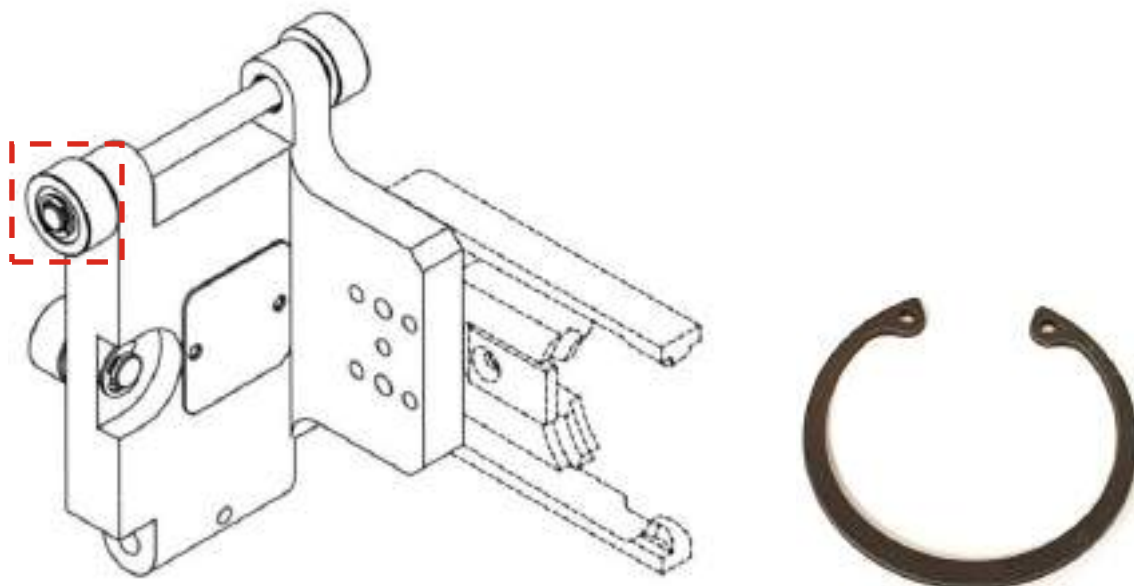


CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

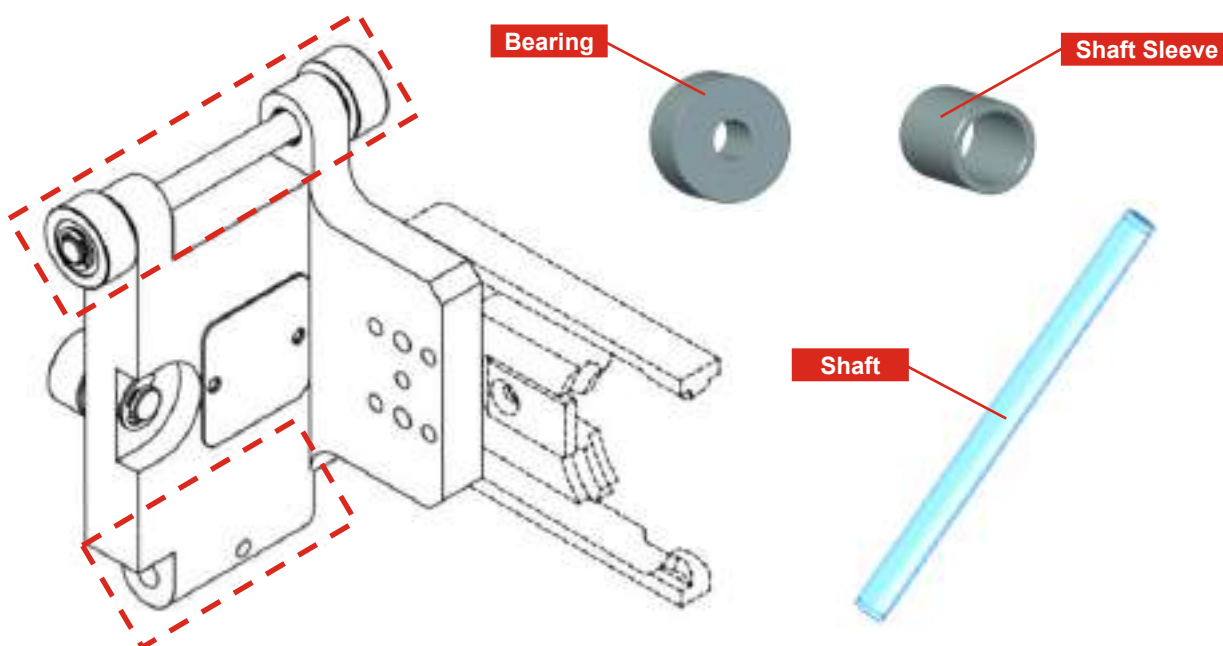
- 11 Set the chain of the Tool Magazine loose adjusting the tension of the nuts.
- 12 Once the chain is loose, disassemble the element that needs to be replaced following the next steps.



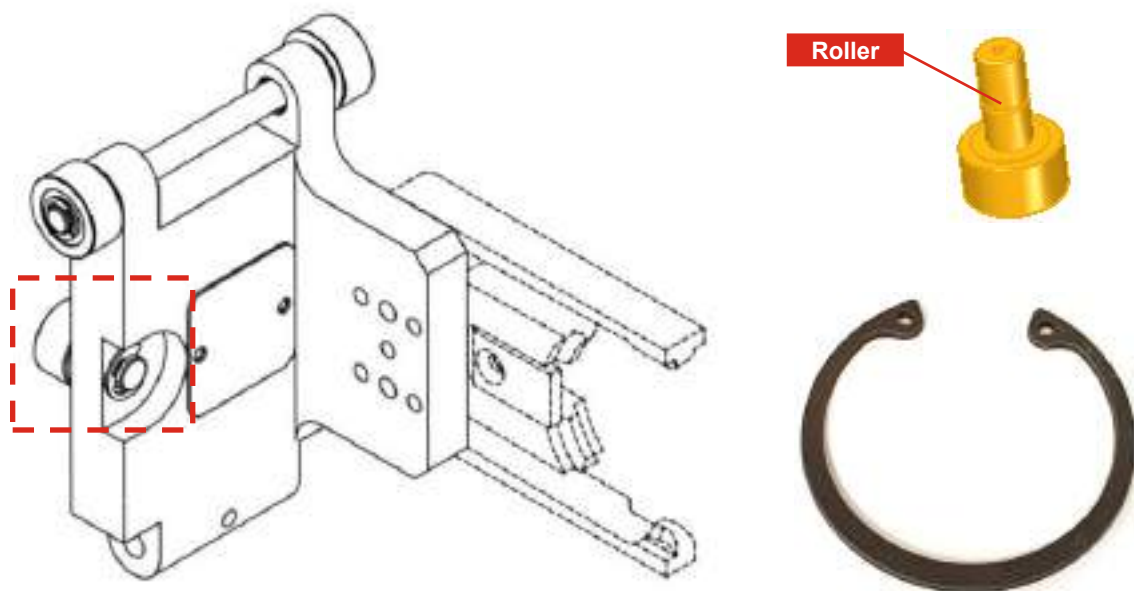
- 13 Disassemble the Retaining Ring holding the movement of the shaft and the bearings.



- 14 Disassemble the Bearings, the Shaft Sleeves and the Shaft.



- 15 Disassemble the Retaining Ring and the Axial Roller.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 6. PROCEDURE DESCRIPTION: ELEMENT REPLACEMENT AND ASSEMBLY

16	Replace the Tool Magazine Link for new one.
17	To assemble the Tool Magazine Link and the Tool Cleaning Device, follow the disassembly steps in reverse order.

### 7. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

18	Switch on the machine (Refer to the Service Manual).
19	Close and lock the safety door to access the machine. (Refer to the Service Manual)
20	Carry out the alignment and "0" reference of the "Q" Axis.



CHECK THE MACHINE AXIS ALIGNMENT PROCEDURES DESCRIBED IN THE SERVICE MANUAL



File N°	TW_CM_645_003	Reference Drawings	XXXX645 / XXXX646
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	10 Years
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Tension Elements Disassembly
3	Tension Elements Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



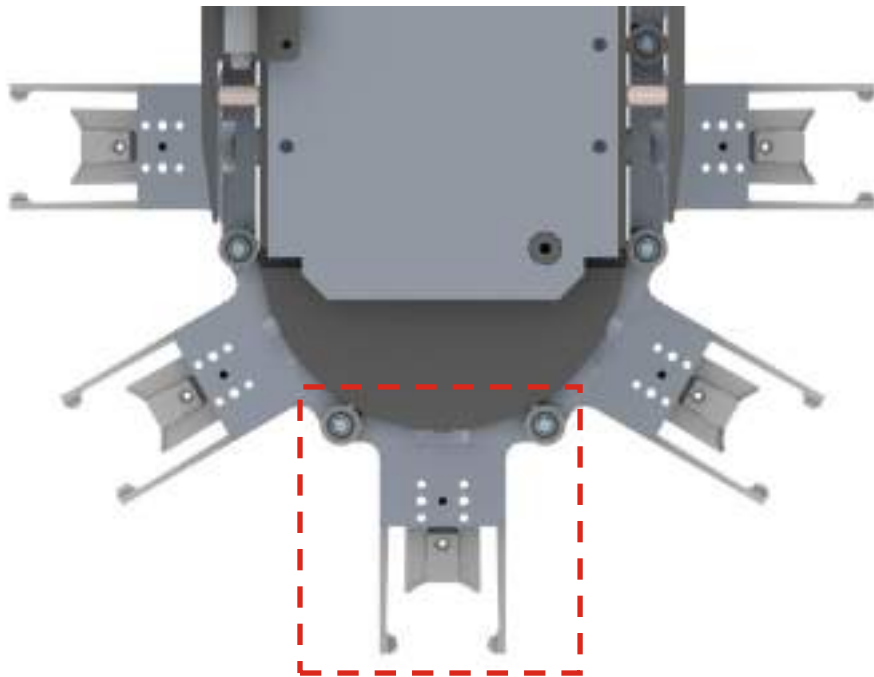
TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION



### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Extract all the Tools from the Tool Magazine.
3	Using the Main Panel or the Handheld Unit, move the Tool Holder Gripper into the position where the Tool Magazine Chain is least tensioned.



4	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
5	Switch off the machine (Refer to the Service Manual).



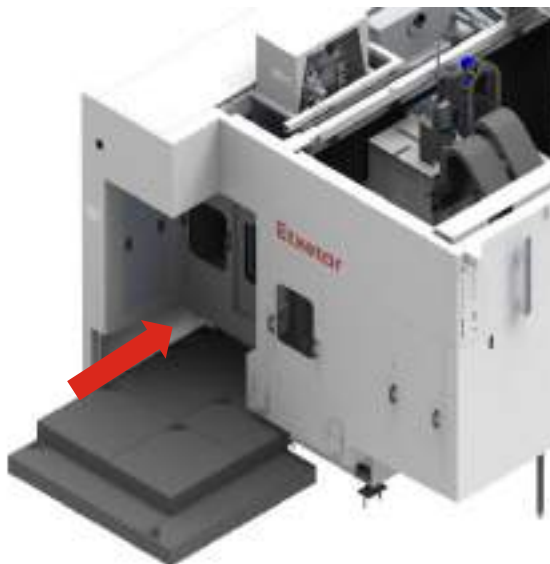
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AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: TENSION ELEMENTS DISASSEMBLY

- 6** Access the Tool Magazine Safety Door area.



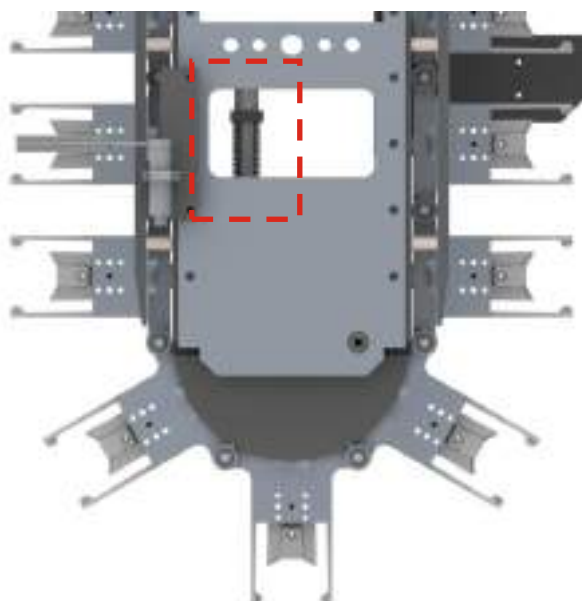
- 7** Disassemble the Tool Magazine guarding to access the chain tension system.





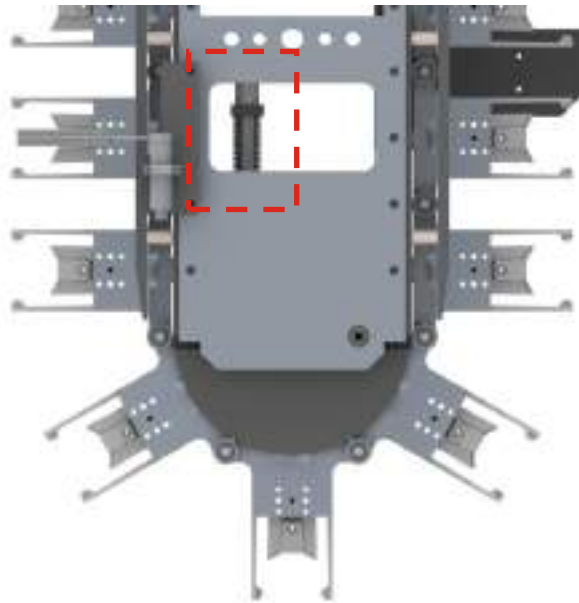
CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

8	Disassemble the nuts and the plate holding the tension elements in position.
9	Disassemble the Tension Elements.

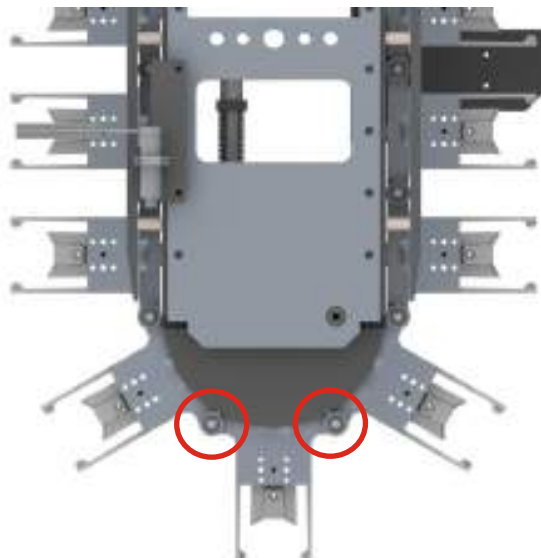


**5. PROCEDURE DESCRIPTION: TENSION ELEMENT REPLACEMENT AND ASSEMBLY**

10	Replace the Tension Elements for new ones.
11	Assemble the plate and the nuts holding the tension elements in position.
12	Using a dynamometric wrench, adjust the tension of the nuts providing the tension to the chain to 1,5Nm.



13	Once adjusted, ensure that the bearings on both ends of the Tool Magazine make contact with the track and they can't spin freely.
14	If this condition is not met, increase the tension of the chain little by little until the bearings make contact with the track.



- 15** Assemble the Tool Magazine guarding to access the chain tension system.
- 



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

**6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES**

<b>16</b>	Switch on the machine (Refer to the Service Manual).
<b>17</b>	Close and lock the safety door to access the machine. (Refer to the Service Manual)
<b>18</b>	Carry out the alignment and "0" reference of the "Q" Axis.



CHECK THE MACHINE AXIS ALIGNMENT PROCEDURES DESCRIBED IN THE SERVICE MANUAL

File N°	TW_CM_645_004	Reference Drawings	XXXX645 / XXXX646
Mechanical Personnel	2	Electrical Personnel	0
Duration	180'	Frequency	10 Years
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment, Crane, Slings		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Gloves



Safety Vest



Safety Helmet



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Tool Magazine Protections Disassembly
3	Tool Magazine Disassembly
4	Tool Magazine Replacement and Assembly
5	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION



### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Extract all the Tools from the Tool Magazine.
3	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
4	Switch off the machine (Refer to the Service Manual).



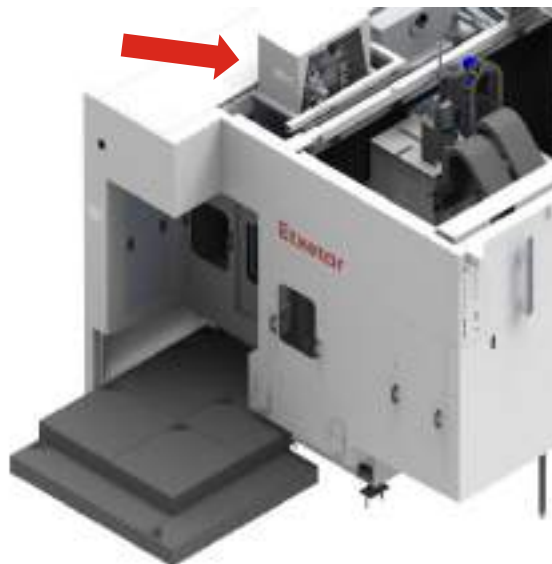
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AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

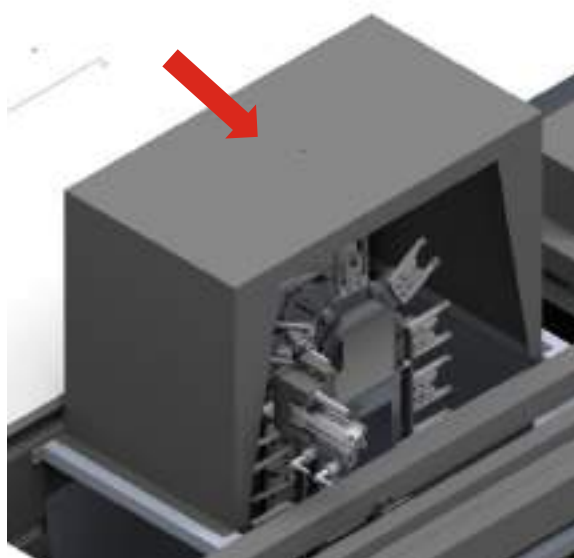
### 4. PROCEDURE DESCRIPTION: TOOL MAGAZINE PROTECTIONS DISASSEMBLY

- 5 Access the upper part of the machine.



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 6 Disassemble the Upper Protection of the Tool Magazine.





CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 7 Disassemble the "Q" Axis Servomotor electrical connections.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

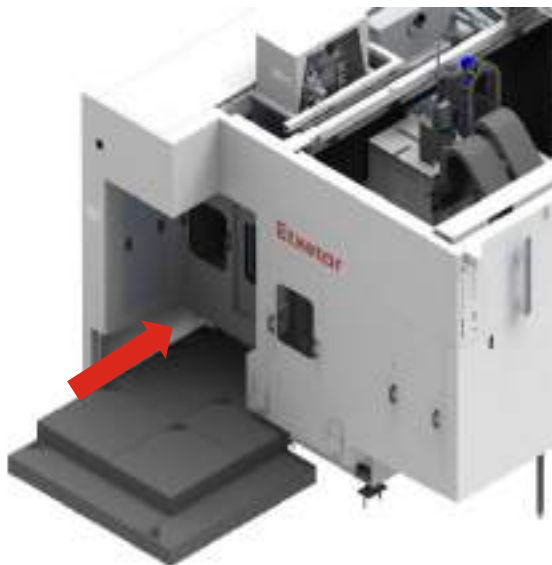
- 8 Secure the Tool Magazine using a crane and slings.



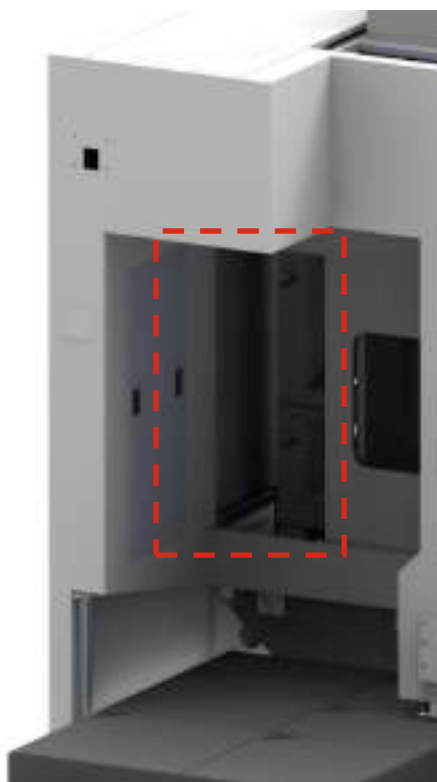


POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 9 Access the Tool Magazine Safety Door area.



- 10 Disassemble the cover to access the Tool Magazine.



- 11 Disassemble the Tool Magazine guarding.



- 12 Disassemble the Tool Magazine side protection to access the arms supporting the Tool Magazine.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 13** Disassemble the Tool Magazine side protection to access the arms supporting the Tool Magazine.



- 14** Disassemble the Tool Magazine side protection supports.



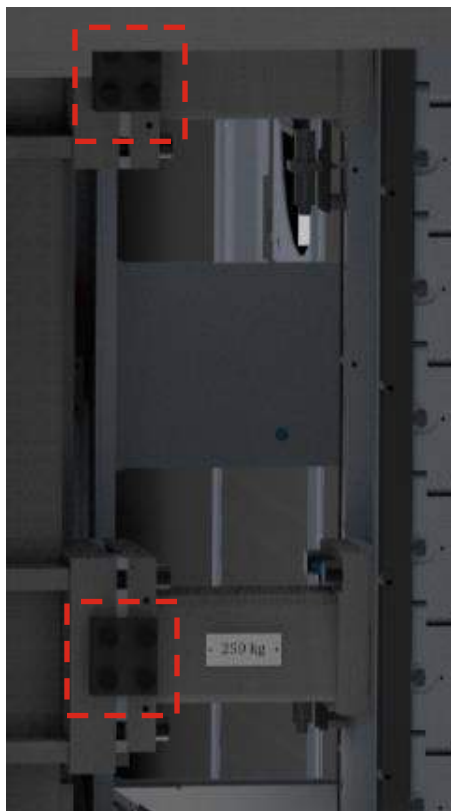
CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 5. PROCEDURE DESCRIPTION: TOOL MAGAZINE DISASSEMBLY

- 15** Disassemble all the electrical and fluids connections from the Tool Magazine, Tool Holder Identification and Tool Holder Cleaning Device.



- 16** Disassemble the 4 screws of each positioning blocks and extract them with their corresponding adjustment wedges.



17	Untighten the screws of the Tool Magazine arm supports and extract the adjustment wedges. To extract the wedges, assemble a screw on the threaded hole present on the wedges and pull them out.
18	To extract the wedges, assemble a screw on the threaded hole present on the wedges and pull them out.



19	Disassemble the screws of the Tool Magazine arm supports and extract the Tool Magazine.
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POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



### 6. PROCEDURE DESCRIPTION: TOOL MAGAZINE REPLACEMENT AND ASSEMBLY

20	Replace the Tool Magazine for new one.
21	To assemble the Tool Magazine, follow the disassembly steps in reverse order.

### 7. CONSIDERATIONS FOR ASSEMBLY



ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm

**8. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES**

<b>22</b>	Switch on the machine (Refer to the Service Manual).
<b>23</b>	Close and lock the safety door to access the machine. (Refer to the Service Manual)
<b>24</b>	Carry out the alignment and "0" reference of the "Q" Axis.



CHECK THE MACHINE AXIS ALIGNMENT PROCEDURES DESCRIBED IN THE SERVICE MANUAL

File N°	TW_CM_645_005	Reference Drawings	XXXX645 / XXXX646
Mechanical Personnel	1	Electrical Personnel	0
Duration	30'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Tool Breakage Detector Disassembly
3	Tool Breakage Detector Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

## 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Extract all the Tools from the Tool Magazine.
3	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
4	Switch off the machine (Refer to the Service Manual).



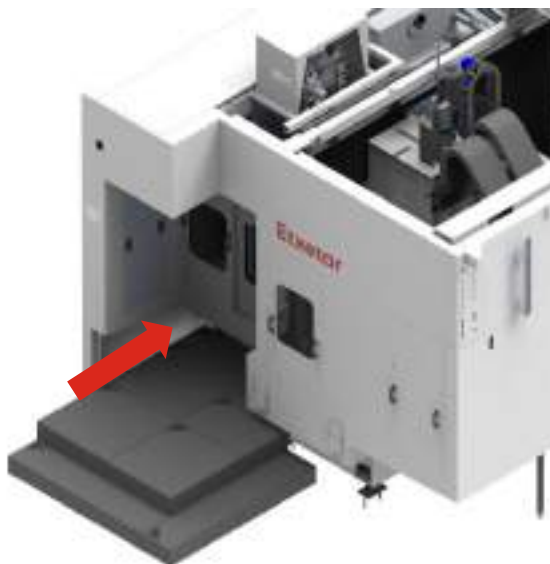
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AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: TOOL BREAKAGE DETECTOR DISASSEMBLY

- 5 Access the Tool Magazine Safety Door area.

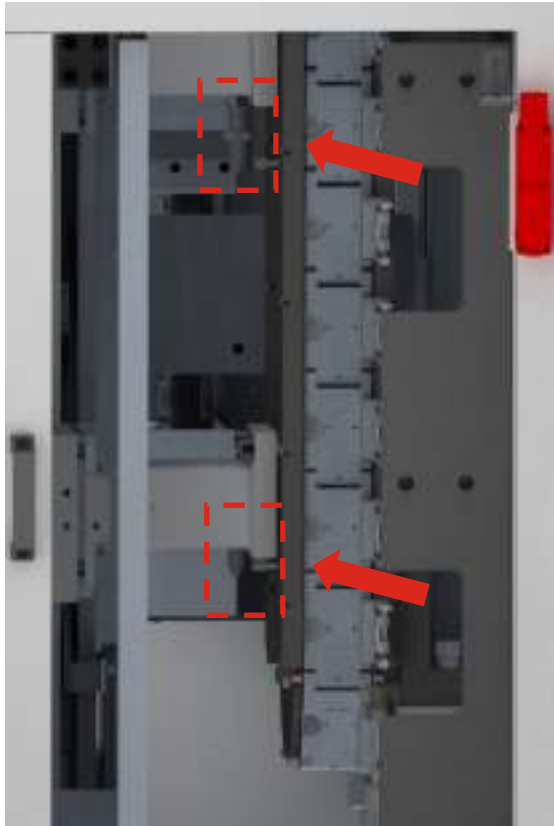


- 6 Disassemble the Tool Magazine guarding.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 7 Disassemble the screws fixing the sensor to the tool magazine and extract it.

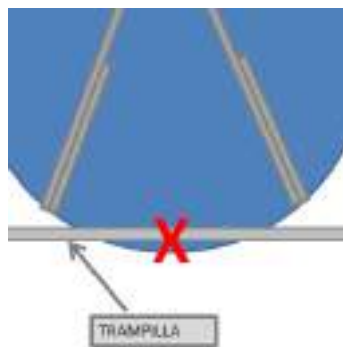


### 5. PROCEDURE DESCRIPTION: TOOL BREAKAGE DETECTOR REPLACEMENT AND ASSEMBLY

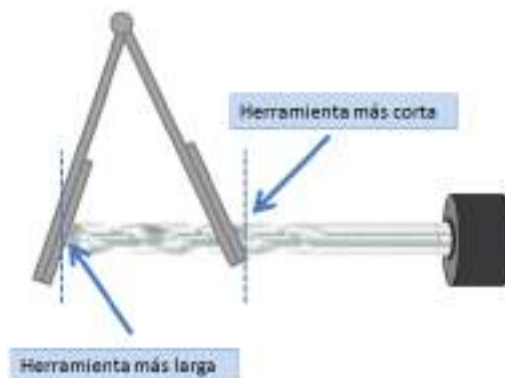
8	Replace the Tool Breakage Detector for new one.
9	To assemble the Tool Breakage Detector, follow the disassembly steps in reverse order.

### 6. CONSIDERATIONS FOR ASSEMBLY

10	Ensure that the module rod does not collide with any tool while staying in "HOME" position.
11	Ensure that the module rod does not collide with the tool magazine trap door all along the travel of the rod.



12	Ensure that the module rod makes contact with the shortest and the largest tools of the magazine tool set.
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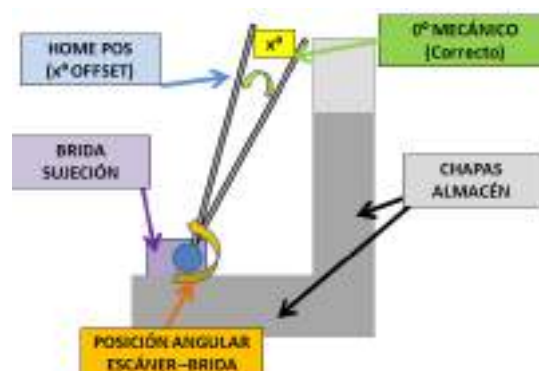
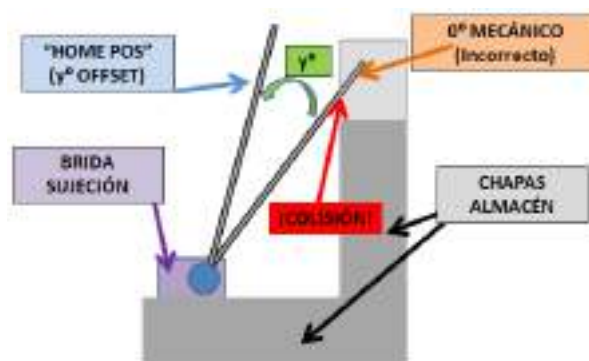


- 13 Ensure that the module rod makes contact with the tool perpendicularly.



- 14 To find the proper angular position, the mechanical stop of the module must be inside the range of movement of the module.

- 15 It is important to observe that there is no collision with any other object before reaching the mechanical stop.



- |    |   |
|----|---|
| 16 | After adjusting the sensor, the "HOME position" of the module must be the nearest position to the longest tool tip ensuring that there is no collision with any other tool. |
|----|---|

### 7. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

- |    |   |
|----|---|
| 17 | Switch on the machine (Refer to the Service Manual).                                |
| 18 | Close and lock the safety door to access the machine. (Refer to the Service Manual) |

File N°	TW_CM_645_006	Reference Drawings	XXXX645 / XXXX646
Mechanical Personnel	1	Electrical Personnel	0
Duration	120'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment, Crane, Slings		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Gloves



Safety Vest



Safety Helmet



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Tool Magazine Protections Disassembly
3	Tool Cleaning Device Disassembly
4	Tool Magazine Disassembly
5	Tool Magazine Servomotor Disassembly
6	Tool Magazine Servomotor Replacement and Assembly
7	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHenever a maintenance task needs to be conducted, the operator or the maintenance personnel must ensure that only them can operate the machine in accordance to the safety standards and approved work procedures



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Extract all the Tools from the Tool Magazine.
3	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
4	Switch off the machine (Refer to the Service Manual).



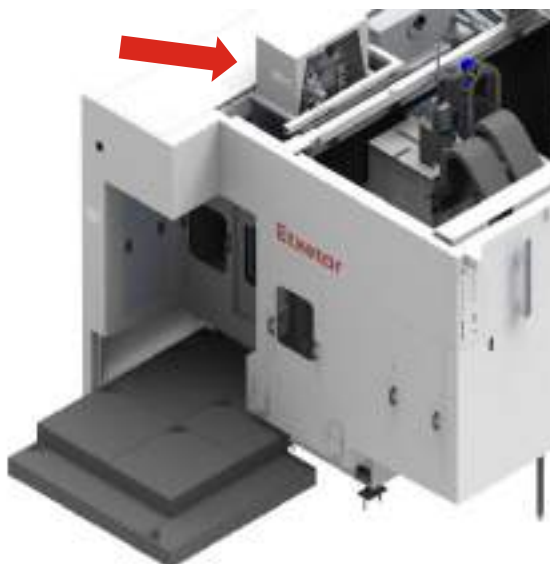
WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

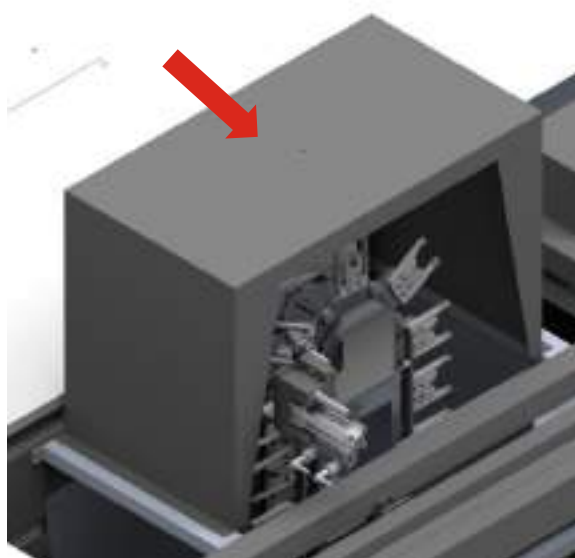
### 4. PROCEDURE DESCRIPTION: TOOL MAGAZINE PROTECTIONS DISASSEMBLY

- 5 Access the upper part of the machine.



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 6 Disassemble the Upper Protection of the Tool Magazine.





CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 7 Disassemble the "Q" Axis Servomotor electrical connections.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

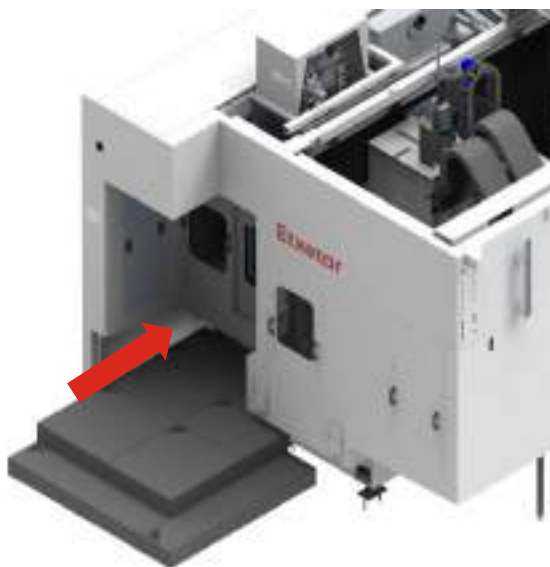
- 8 Secure the Tool Magazine using a crane and slings.



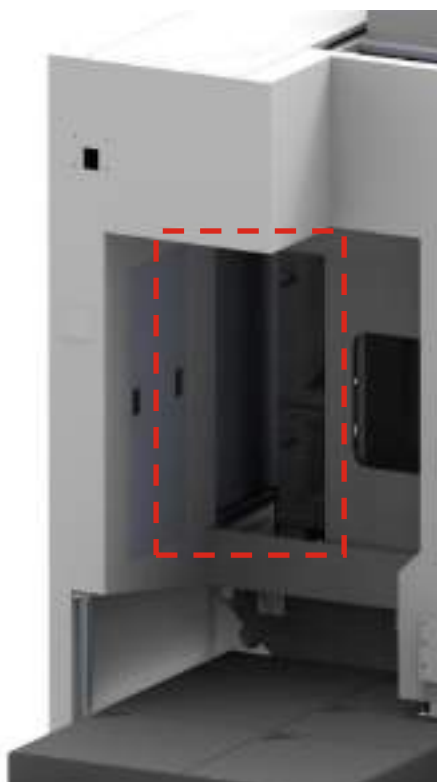


POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 9 Access the Tool Magazine Safety Door area.



- 10 Disassemble the cover to access the Tool Magazine.





- 11 Disassemble the Tool Magazine guarding.



- 12 Disassemble the Tool Magazine side protection to access the arms supporting the Tool Magazine.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 13** Disassemble the Tool Magazine side protection to access the arms supporting the Tool Magazine.



- 14** Disassemble the Tool Magazine side protection supports.



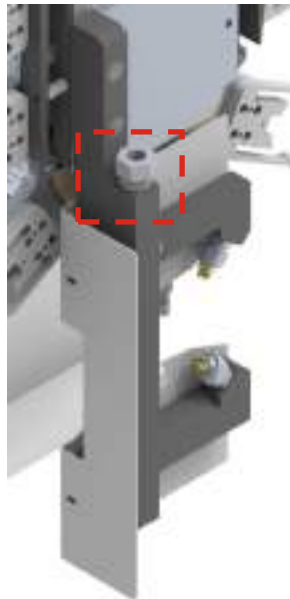
CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

**5. PROCEDURE DESCRIPTION: TOOL CLEANING DEVICE DISASSEMBLY**

- 15** Disassemble the Tool Magazine frontal protection.



- 16** Disassemble the Tool Cleaning Device fluid connections.



- |    |   |
|----|---|
| 17 | Disassemble the screws fixing the Tool Cleaning Device to the Tool Magazine and extract it. |
|----|---|

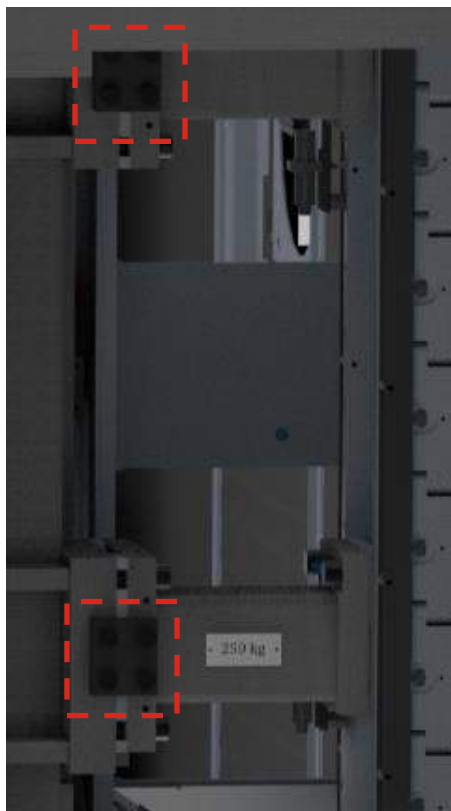


### 6. PROCEDURE DESCRIPTION: TOOL MAGAZINE DISASSEMBLY

- 18** Disassemble all the electrical and fluids connections from the Tool Magazine, Tool Holder Identification and Tool Holder Cleaning Device.



- 19** Disassemble the 4 screws of each positioning blocks and extract them with their corresponding adjustment wedges.



20	Untighten the screws of the Tool Magazine arm supports and extract the adjustment wedges.
21	To extract the wedges, assemble a screw on the threaded hole present on the wedges and pull them out.

Adjustment Wedge



22	Disassemble the screws of the Tool Magazine arm supports and extract the Tool Magazine.
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POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

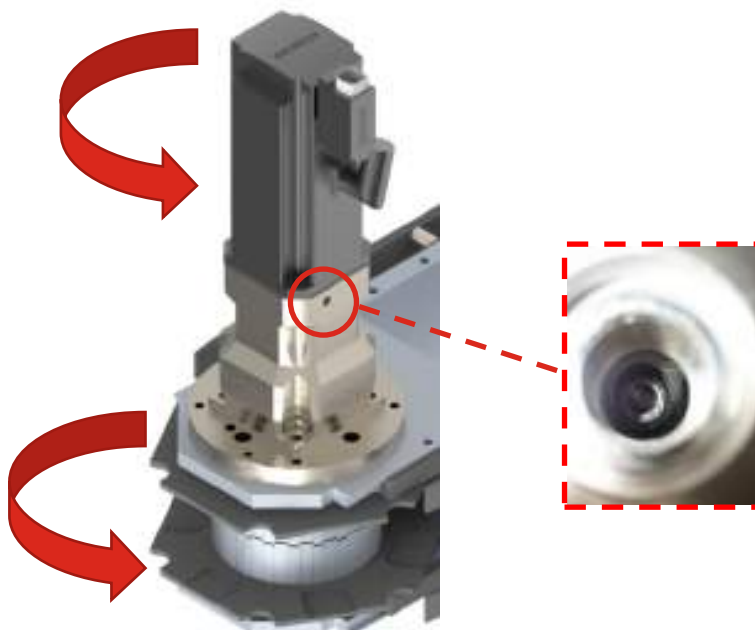
### 7. PROCEDURE DESCRIPTION: TOOL MAGAZINE SERVOMOTOR DISASSEMBLY

**23** Place the Tool Magazine on a flat surface with the Servomotor side looking up and secure it.

**24** Disassemble the 4 screws fixing the Servomotor to the Gearbox.



**25** Rotate the Servomotor along with the Tool Magazine Drum until the screw coupling the Servomotor and the Gearbox is aligned with the hole on the Gearbox side.



- 26** Untighten the Servomotor and Gearbox coupling screw and extract the Servomotor.





### 8. PROCEDURE DESCRIPTION: TOOL MAGAZINE SERVOMOTOR REPLACEMENT AND ASSEMBLY

27	Replace the Tool Magazine “Q” Axis Servomotor for new one.
28	To assemble the Tool Magazine “Q” Axis Servomotor, follow the disassembly steps in reverse order.

### 9. CONSIDERATIONS FOR ASSEMBLY



ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm

**10. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES**

<b>29</b>	Switch on the machine (Refer to the Service Manual).
<b>30</b>	Close and lock the safety door to access the machine. (Refer to the Service Manual)
<b>31</b>	Carry out the alignment and “0” reference of the “Q” Axis.



CHECK THE MACHINE AXIS ALIGNMENT PROCEDURES DESCRIBED IN THE SERVICE MANUAL

File N°	TW_CM_645_007	Reference Drawings	XXXX645 / XXXX646
Mechanical Personnel	1	Electrical Personnel	0
Duration	120'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment, Crane, Slings		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Gloves



Safety Vest



Safety Helmet



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Tool Magazine Protections Disassembly
3	Tool Cleaning Device Disassembly
4	Tool Magazine Disassembly
5	Tool Magazine Chain Disassembly
6	Tool Magazine Servomotor Disassembly
7	Tool Magazine Gearbox Disassembly
8	Tool Magazine Gearbox Replacement and Assembly
9	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL** AND THE **ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



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- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Extract all the Tools from the Tool Magazine.
3	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
4	Switch off the machine (Refer to the Service Manual).



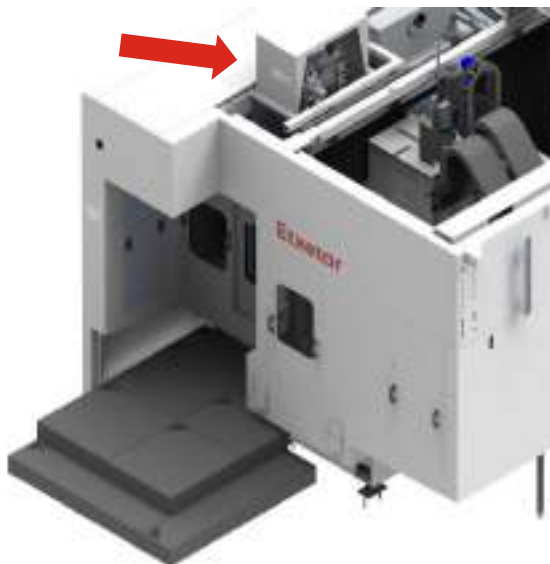
WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



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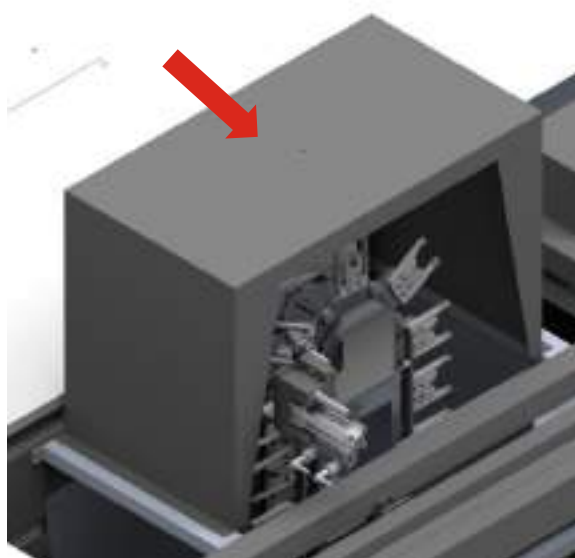
### 4. PROCEDURE DESCRIPTION: TOOL MAGAZINE PROTECTIONS DISASSEMBLY

- 5 Access the upper part of the machine.



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 6 Disassemble the Upper Protection of the Tool Magazine.





CUTS PRODUCED BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 7 Disassemble the "Q" Axis Servomotor electrical connections.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

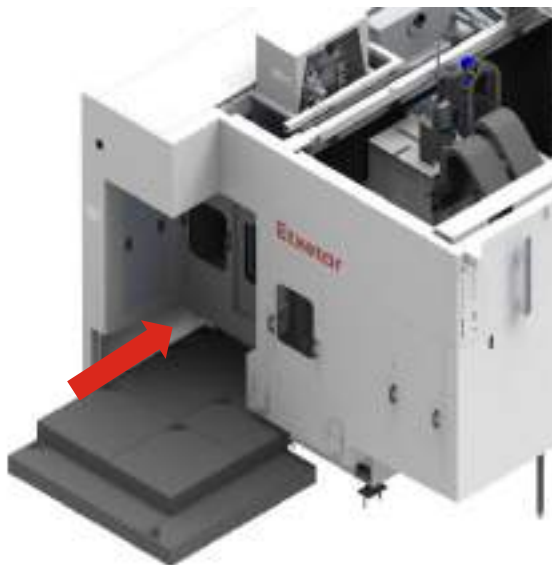
- 8 Secure the Tool Magazine using a crane and slings.



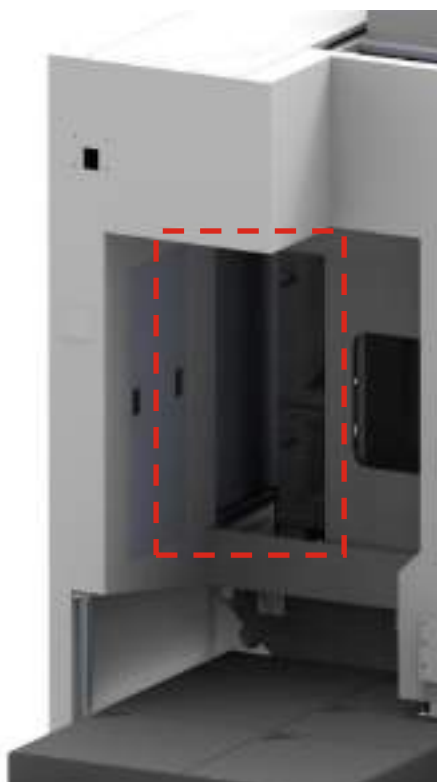


POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 9 Access the Tool Magazine Safety Door area.



- 10 Disassemble the cover to access the Tool Magazine.





- 11 Disassemble the Tool Magazine guarding.



- 12 Disassemble the Tool Magazine side protection to access the arms supporting the Tool Magazine.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 13** Disassemble the Tool Magazine side protection to access the arms supporting the Tool Magazine.



- 14** Disassemble the Tool Magazine side protection supports.



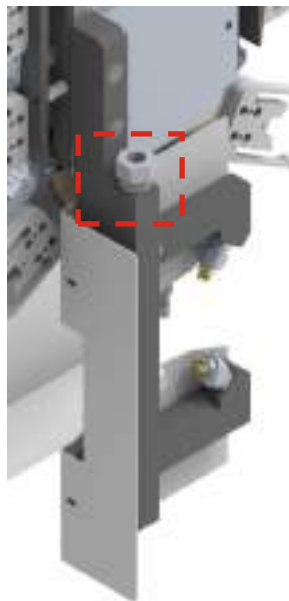
CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 5. PROCEDURE DESCRIPTION: TOOL CLEANING DEVICE DISASSEMBLY

- 15 Disassemble the Tool Magazine frontal protection.



- 16 Disassemble the Tool Cleaning Device fluid connections.



- |    |   |
|----|---|
| 17 | Disassemble the screws fixing the Tool Cleaning Device to the Tool Magazine and extract it. |
|----|---|

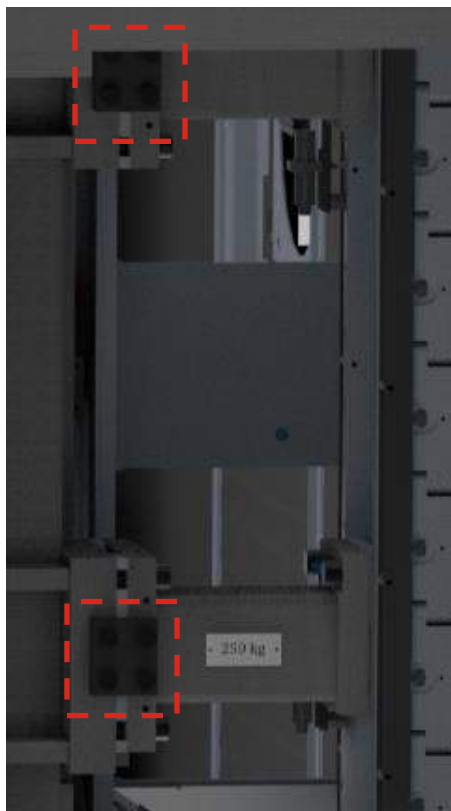


### 6. PROCEDURE DESCRIPTION: TOOL MAGAZINE DISASSEMBLY

- 18** Disassemble all the electrical and fluids connections from the Tool Magazine, Tool Holder Identification and Tool Holder Cleaning Device.



- 19** Disassemble the 4 screws of each positioning blocks and extract them with their corresponding adjustment wedges.



20	Untighten the screws of the Tool Magazine arm supports and extract the adjustment wedges.
21	To extract the wedges, assemble a screw on the threaded hole present on the wedges and pull them out.

Adjustment Wedge



22	Disassemble the screws of the Tool Magazine arm supports and extract the Tool Magazine.
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POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

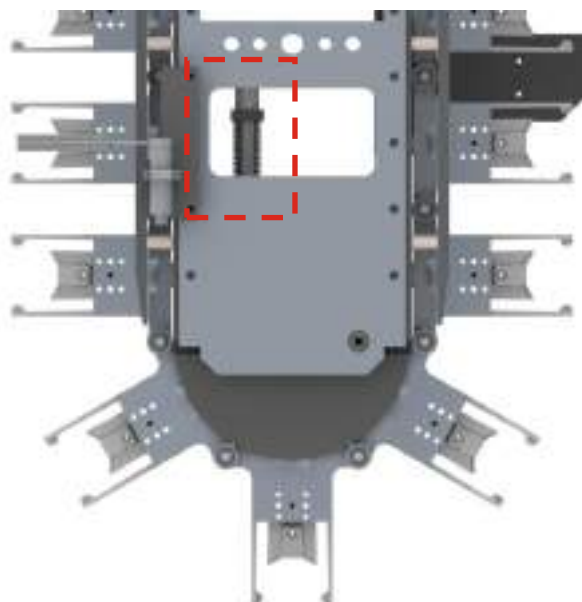
### 7. PROCEDURE DESCRIPTION: TOOL MAGAZINE CHAIN DISASSEMBLY

- 23** Place the Tool Magazine on a flat surface with the Gearbox looking up and secure it.

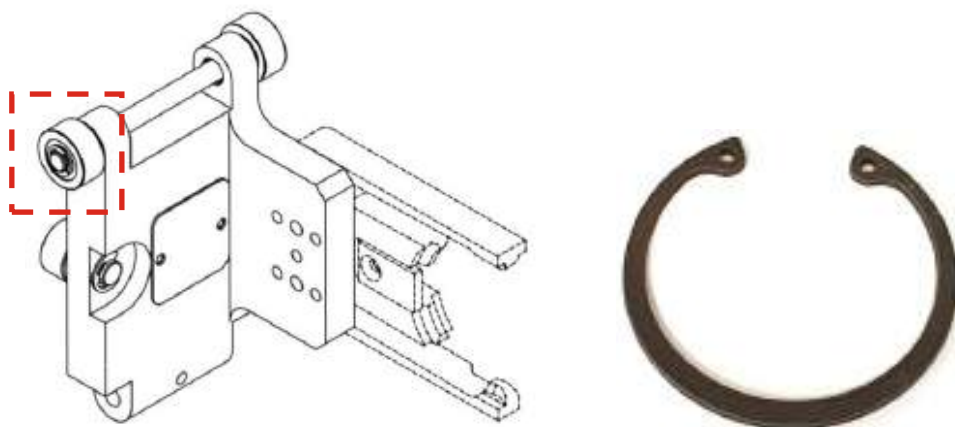


POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

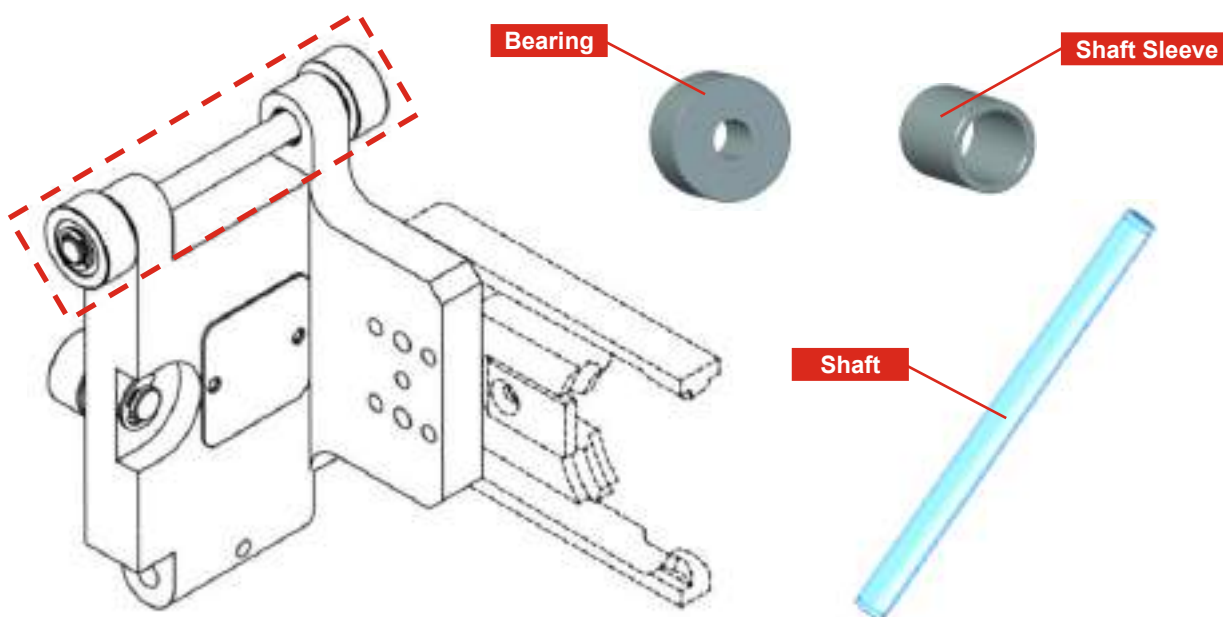
- 24** Set the chain of the Tool Magazine loose adjusting the tension of the nuts.



- 25** Disassemble the Retaining Ring holding the movement of the shaft and the bearings.



- 26** Disassemble the Bearings, the Shaft Sleeves and the Shaft.

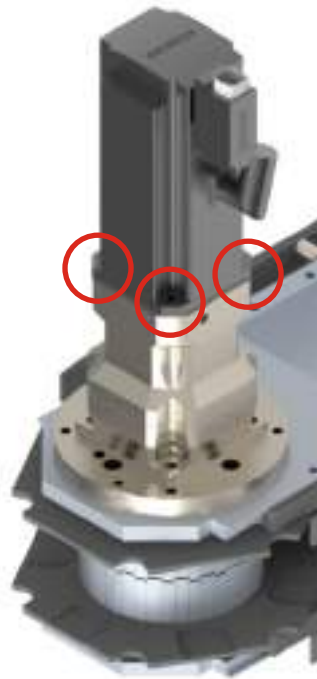


- 27** Extract the Tool Magazine Chain completely.

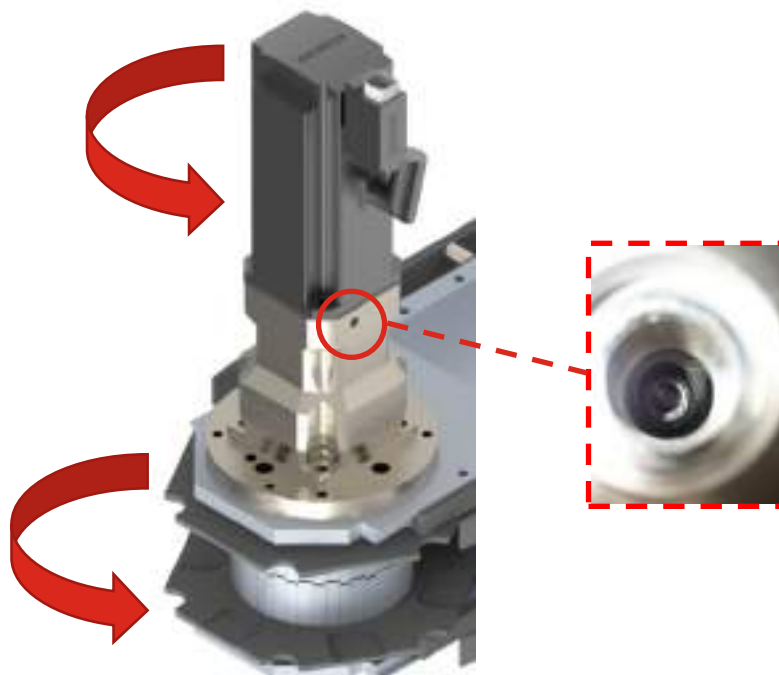


### 8. PROCEDURE DESCRIPTION: TOOL MAGAZINE SERVOMOTOR DISASSEMBLY

- 28** Disassemble the 4 screws fixing the Servomotor to the Gearbox.



- 29** Rotate the Servomotor along with the Tool Magazine Drum until the screw coupling the Servomotor and the Gearbox is aligned with the hole on the Gearbox side.

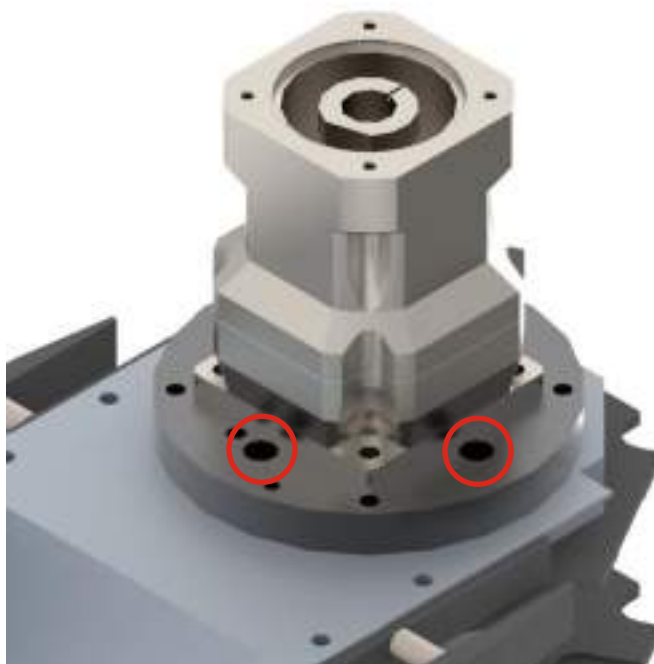


- 30** Untighten the Servomotor and Gearbox coupling screw and extract the Servomotor.

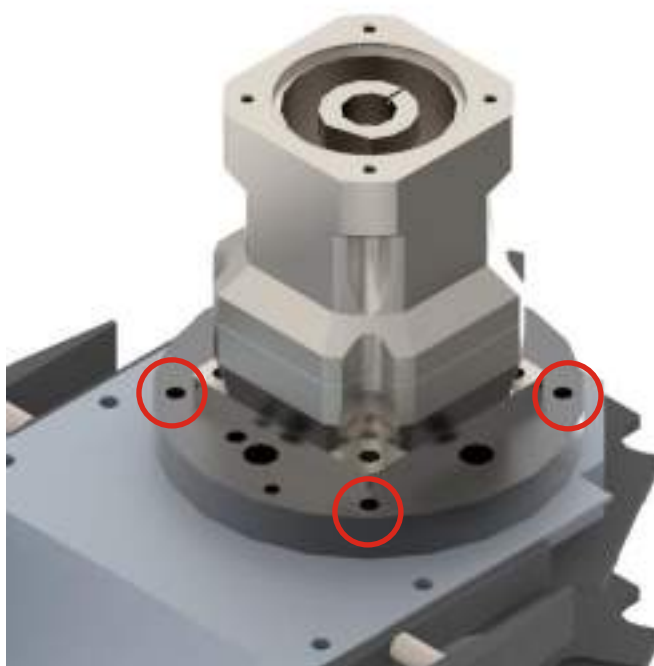


**9. PROCEDURE DESCRIPTION: TOOL MAGAZINE GEARBOX DISASSEMBLY**

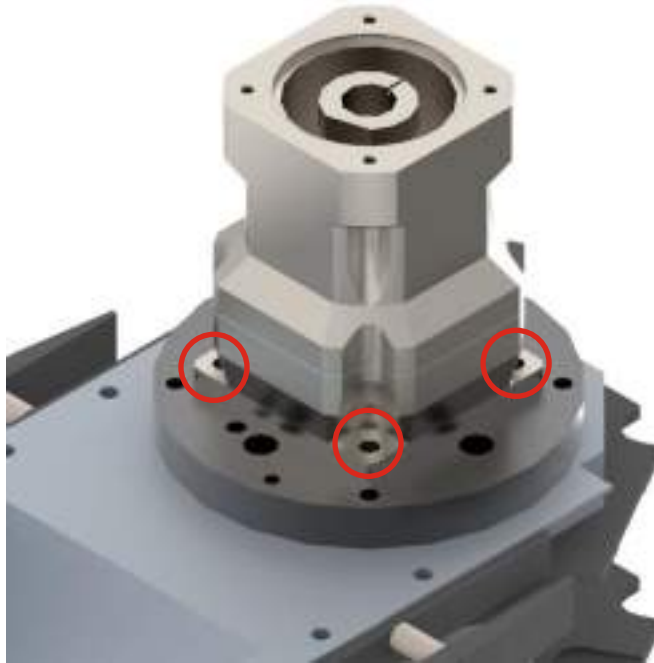
- 31** Disassemble the 4 screws fixing the Magazine Drum to the Gearbox.



- 32** Disassemble the 4 screws coupling the Gearbox Fixing Plate to the Tool Magazine.



- 33** Disassemble the 4 screw fixing the Gearbox to the Gearbox Fixing Plate.



- 34** Assemble 2 screws on the Magazine Drum threaded holes and extract the Gearbox and the Fixing Plate.



- 35** Disassemble the screws and extract the Gearbox.
- 



## 10. PROCEDURE DESCRIPTION: TOOL MAGAZINE GEARBOX REPLACEMENT AND ASSEMBLY

36	Replace the Tool Magazine Gearbox for new one.
37	To assemble the Tool Magazine Gearbox, follow the disassembly steps in reverse order.

## 11. CONSIDERATIONS FOR ASSEMBLY



ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm

### 12. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

38	Switch on the machine (Refer to the Service Manual).
39	Close and lock the safety door to access the machine. (Refer to the Service Manual)
40	Carry out the alignment and "0" reference of the "Q" Axis.



CHECK THE MACHINE AXIS ALIGNMENT PROCEDURES DESCRIBED IN THE SERVICE MANUAL





File N°	TW_CM_649_001	Reference Drawings	XXXX649 / XXXX650
Mechanical Personnel	1	Electrical Personnel	0
Duration	XX'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Tool Cleaning Device Disassembly
2	Tool Cleaning Device Nozzle Disassembly
3	Tool Cleaning Device Nozzle Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



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TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
3	Switch off the machine (Refer to the Service Manual).



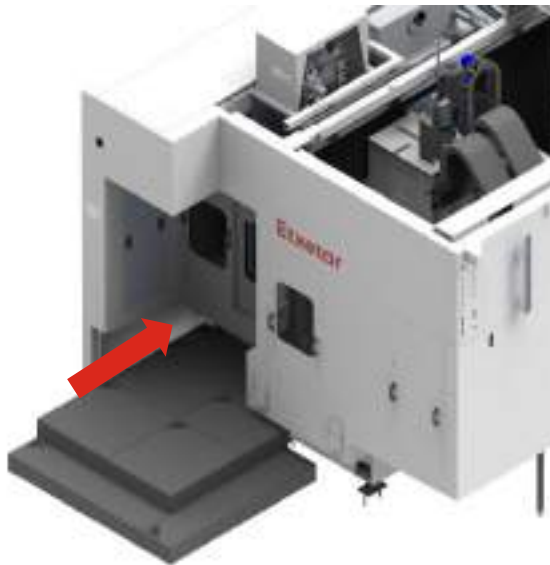
WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: TOOL CLEANING DEVICE DISASSEMBLY

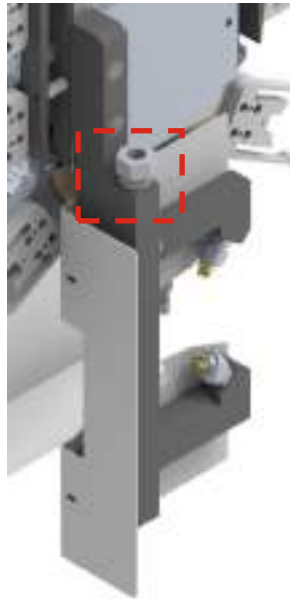
- 4 Access the Tool Magazine Safety Door area.



- 5 Disassemble the Tool Magazine frontal protection.



- 6** Disassemble the Tool Cleaning Device fluid connections.

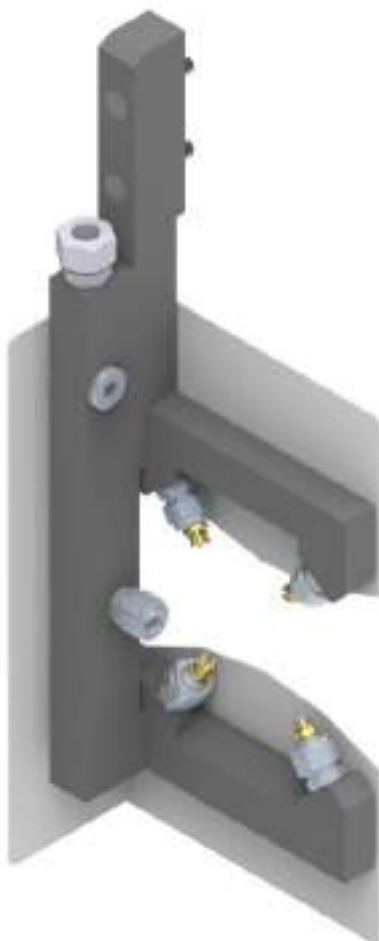


- 7** Disassemble the screws fixing the Tool Cleaning Device to the Tool Magazine and extract it.



### 5. PROCEDURE DESCRIPTION: TOOL CLEANING DEVICE NOZZLE DISASSEMBLY

- 8 Disassemble the Nozzles from the Tool Cleaning Device and extract them.



### 6. PROCEDURE DESCRIPTION: TOOL CLEANING DEVICE NOZZLE REPLACEMENT AND ASSEMBLY

9	Replace the Tool Cleaning Device Nozzles for new ones.
10	To assemble the Tool Cleaning Device, follow the disassembly steps in reverse order.

### 7. CONSIDERATIONS FOR ASSEMBLY



ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm

### 8. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

11	Switch on the machine (Refer to the Service Manual).
12	Close and lock the safety door to access the machine. (Refer to the Service Manual)





File Number	TW_CM_999_008	Reference Drawings	-
Mechanical Manpower	1	Electrical Manpower	0
Duration	20'	Frequency	-
Machine Status	ON	Task Interruptible	NO
Special Tools	Alignment Briefcase, Magnetic Base, Dial Gauge, Handheld Unit		

### ISO Safety Symbols



Safety  
Padlock



Safety  
Shoes



Safety  
Glasses



Safety  
Gloves



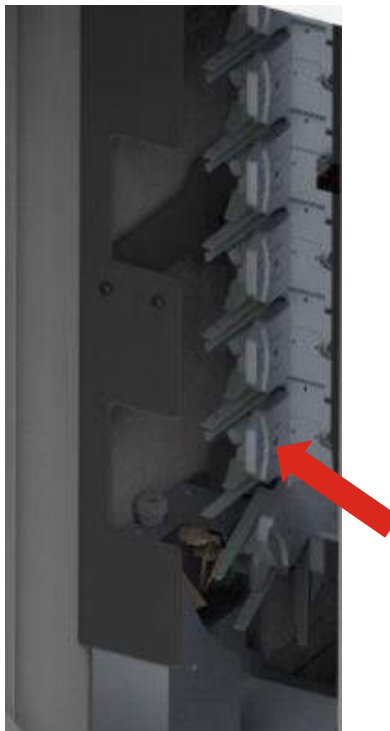
Safety  
Vest



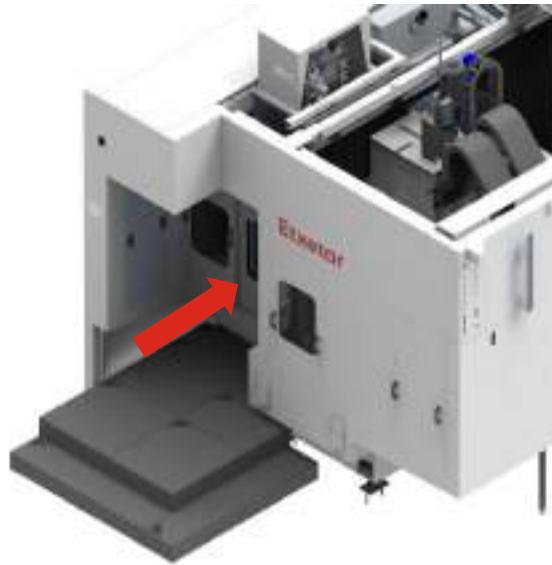
Safety  
Clothes

### 1. PROCEDURE DESCRIPTION

1	Remove the tools from the Work Spindle.
2	Move the "Q" Axis until the Gripper #1 is located on the Tool Extraction Position.



- |   |   |
|---|---|
| 3 | Unlock and open safety doors and access the Tool Magazine Area. |
|---|---|

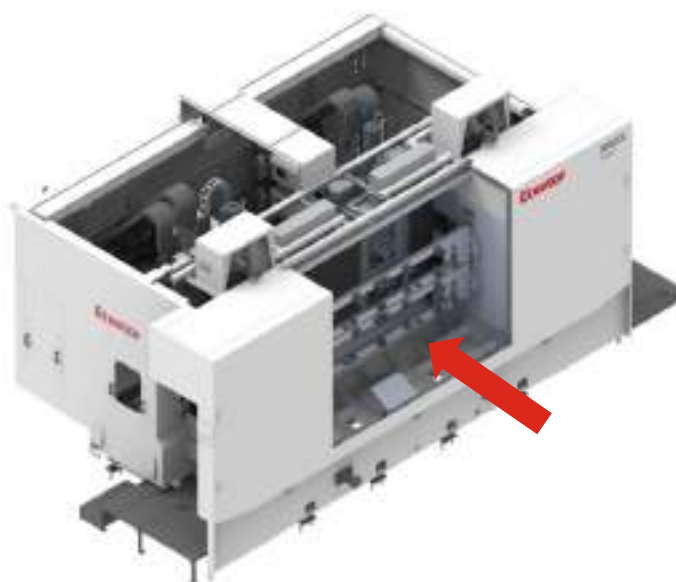


- |   |                               |
|---|-------------------------------|
| 4 | Clean the Tool Magazine Area. |
|---|-------------------------------|

- |   |  |
|---|--|
| 5 | Disassemble the Gripper #1 and assemble the Adjustment Gripper on the Tool Magazine. |
|---|--|

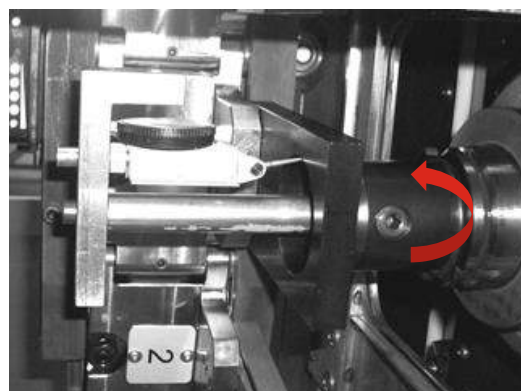
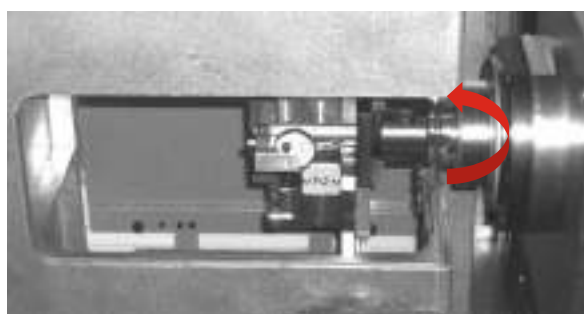


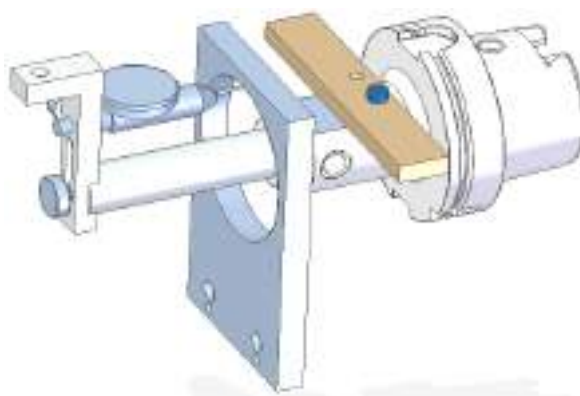
6	Connect the Handheld Unit.
7	Open the Load / Unload Automatic Door and access Working Area.



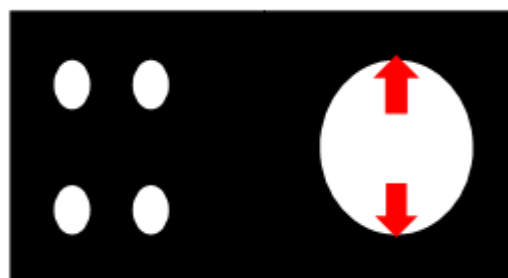
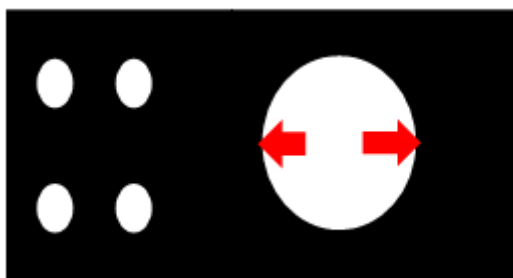
FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

8	Place Adaptor and the Square with Dial Gauge on the Work Spindle.
9	Move the "Z" Axis until the tip of the Dial Gauge comes into contact with the Adjustment Gripper inner hole.
10	Set the Dial Gauge to "0".





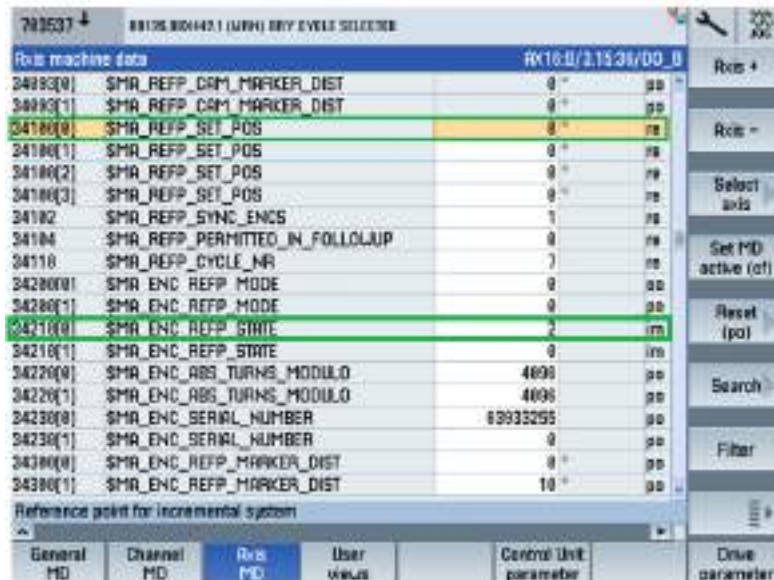
11	Moving just the “Q” Axis, align the “Q” Axis in the “Y” Axis direction rotating the dial test indicator respect to the Adjustment Gripper inner hole.
12	Moving just the “X” Axis, align the “Q” Axis in the “X” Axis direction rotating the dial test indicator respect to the Adjustment Gripper inner hole.



13	Check that the oscillation does not exceed the tolerance of 0.02 mm when finished with the adjustment of both Axis.
14	When the indicated tolerance has been reached, declare the "0" of the “Q” Axis.
15	Access the Axis Parameters Menu and select the Parameters of the “Q” Axis.



- 16 Select the **Parameter 34100[0]** and set the value for the Reference Position. (Refer to the Machine Drawings to set the Position Value)
- 17 Select the **Parameter 34210[0]** and change its value to **34210[0]=1** in order to Reference the position of the Axis.



- 18 Access the CN Manual Menu.
- 19 Select the “Q” Axis. And press the **Reference** Soft Key
- 20 Press the **Jog +** Soft Key in order to reference the Axis in the Position Value specified before on the Axis Parameters Menu.



- 21 When the procedure is finished, remove all the calibration elements used for this procedure from the machine.



File Number	TW_CM_999_011	Reference Drawings	-
Mechanical Manpower	1	Electrical Manpower	0
Duration	20'	Frequency	-
Machine Status	ON	Task Interruptible	NO
Special Tools	Alignment Briefcase, Magnetic Base, Dial Gauge, Handheld Unit		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



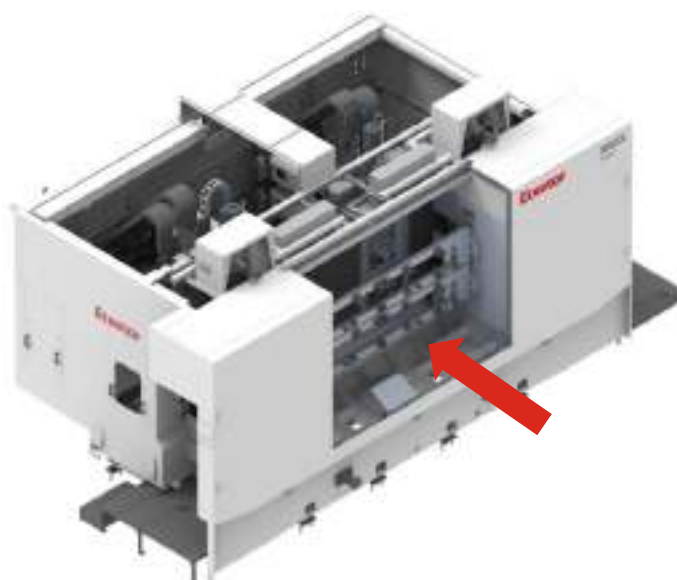
Safety Vest



Safety Clothes

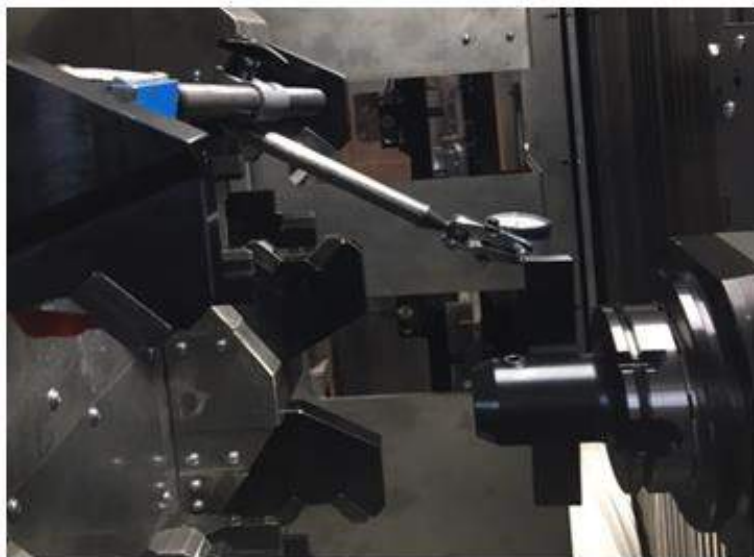
### 1. PROCEDURE DESCRIPTION

1	<p>Before proceeding with alignment of the "SP" Axis, turn the work spindle along with the tool so that the encoder starts to count the rotations.</p> <p>To do this, the "JOG" and "MDA" settings in the control panel can be adjusted.</p> <ul style="list-style-type: none"> <li>▪ S1 = 100 M1 = 3 G04 F3</li> <li>▪ S2 = 100 M2 = 3 G04 F3</li> <li>▪ S3 = 100 M3 = 3 G04 F3</li> </ul>
2	Connect the Handheld Unit.
3	Open the Load / Unload Automatic Door and access Working Area.



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

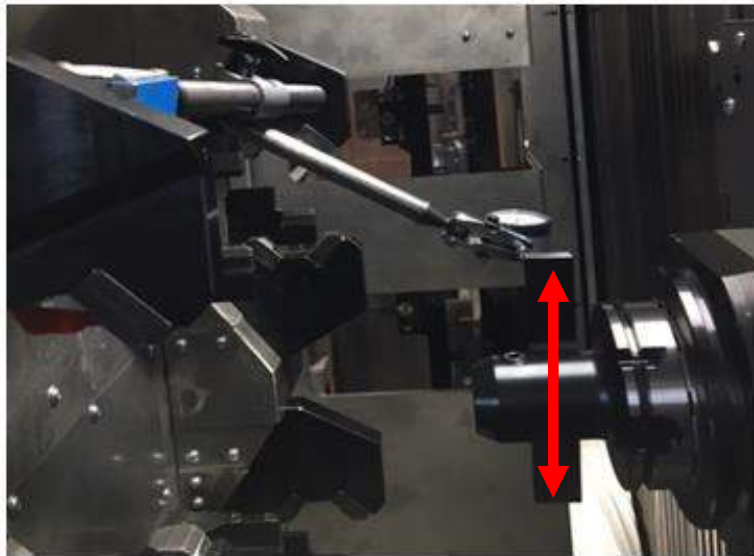
4	Clean the Clamping Fixture, the Works Spindle and its surroundings.
5	Remove the tools from the Work Spindle and place the Tool Holder with the Adjustment Adaptor.
6	Place the Magnetic Base with the Dial Gauge on top of the Clamping Fixture.
7	Move the “Z” Axis until the tip of Dial Gauge makes contact with the Adjustment Adaptor on the Work Spindle.
8	Manually set the Dial Gauge to “0”.
9	Depending on the orientation of the Adjustment Adaptor plate, the displacement takes place along the "X" axis or along the "Y" axis.
10	Horizontal position for the adaptor. Movement along the "X" Axis.
11	Vertical position for the adaptor. Movement along the “Y” axis





12

Moving the "X" - "Y" Axis, move the Dial Gauge across the Adjustment Adaptor and check that the oscillation is within the tolerance of 0.02 mm.



13

If it is not within the specified tolerance, adjust the position of the "SP" axis by rotating it manually until the specified tolerance is reached.

14

After reaching the specified tolerance, look for the value of the Spindle Position ("SP" Axis) on the screen and take note of it.

15

Access the "XX\_MCH\_POS.SPF" part program and change the value of the Tool Change Position in the appropriate location of the program.

16

When the procedure is finished, remove all the calibration elements used for this procedure from the machine.

17

Perform a tool change at reduced speed and verify the correct operation.



File Number	TW_CM_999_015	Reference Drawings	-
Mechanical Manpower	1	Electrical Manpower	0
Duration	20'	Frequency	-
Machine Status	ON	Task Interruptible	NO
Special Tools	Alignment Briefcase, Magnetic Base, Dial Gauge, Handheld Unit		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



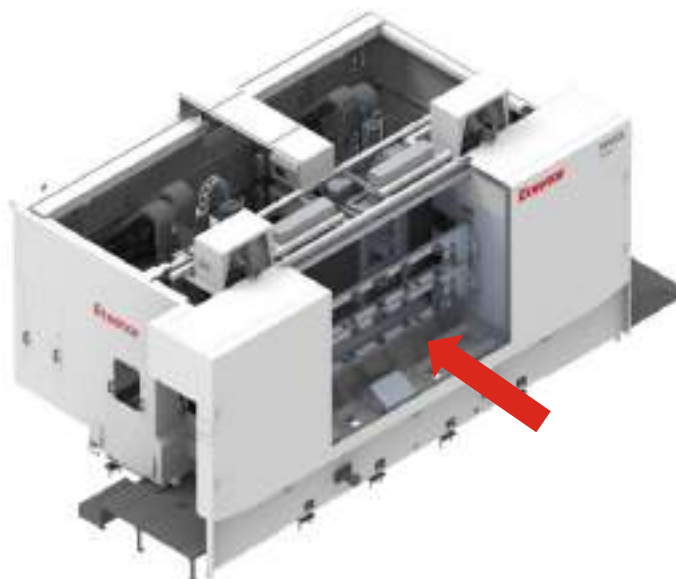
Safety Vest



Safety Clothes

### 1. PROCEDURE DESCRIPTION

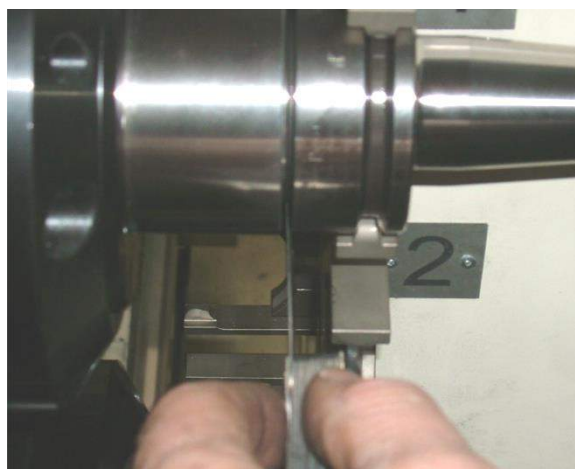
- 1 Connect the Handheld Unit.
- 2 Open the Load / Unload Automatic Door and access Working Area.



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 3 Clean the area where the alignment is going to take place.
- 4 Remove the tools from the Work Spindle.

- 5 Place the Tool Holder on the Tool Magazine Gripper #1.



- 6 Displace "X" - "Y" - "Z" Axis to the tool change position.
- 7 Place 0.35 mm Adjustment Gauge between flat face of the Tool Holder and the Work Spindle face.
- 8 Move the "Z" Axis until the shim remains clamped between the flat face of the Tool Holder and the Work Spindle.
- 9 Check the Position Value of the "Z" Axis on the screen and take note of it.
- 1 Access the "XX\_MCH\_POS.SPF" part program and change the value of the "Z" Tool Change Position ("Z" Axis Position Value -0.05mm) in the appropriate location of the program.
- 10 When the procedure is finished, remove all the calibration elements used for this procedure from the machine.

File N°	CM_000_001	Reference Drawings	-
Mechanical Personnel	1	Electrical Personnel	0
Duration	5'	Frequency	On Demand
Machine Status	ON	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Tool Change Procedure
2	Tool Change Procedure using the Tool Loading Assistant

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL

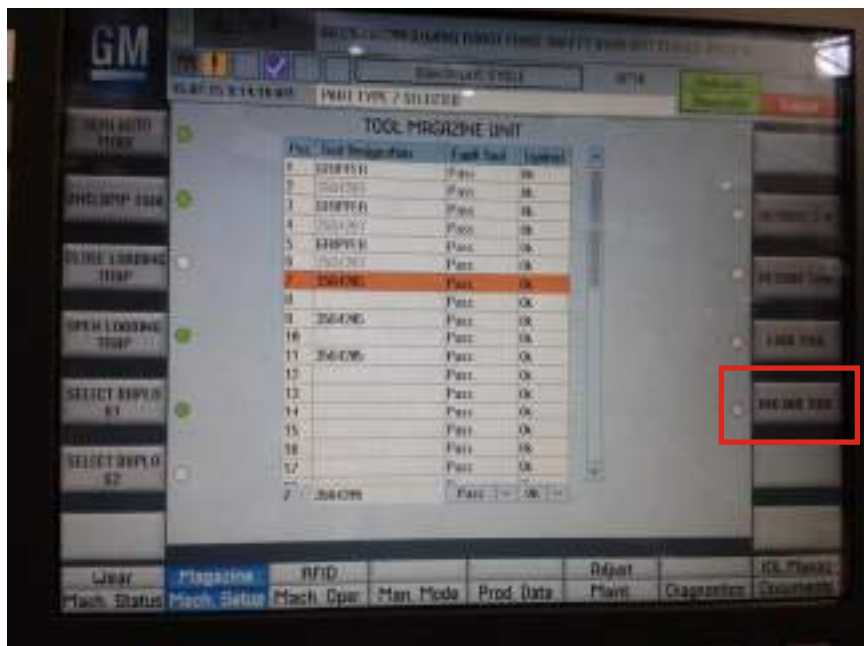


TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. PROCEDURE DESCRIPTION: TOOL CHANGE PROCEDURE

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Select the Automatic or Semi-automatic Cycle mode. (Refer to the Service Manual)
- 3 On the TOOL MANAGEMENT screen, select the tool that needs to be changed from the list displayed.
- 4 Push on the UNLOAD TOOL button to unload the tool automatically.



ON THE TOOL MANAGEMENT SCREEN OF THE HMI, THE TOOLS THAT ARE CURRENTLY AVAILABLE ON THE MAGAZINE CAN BE SEEN

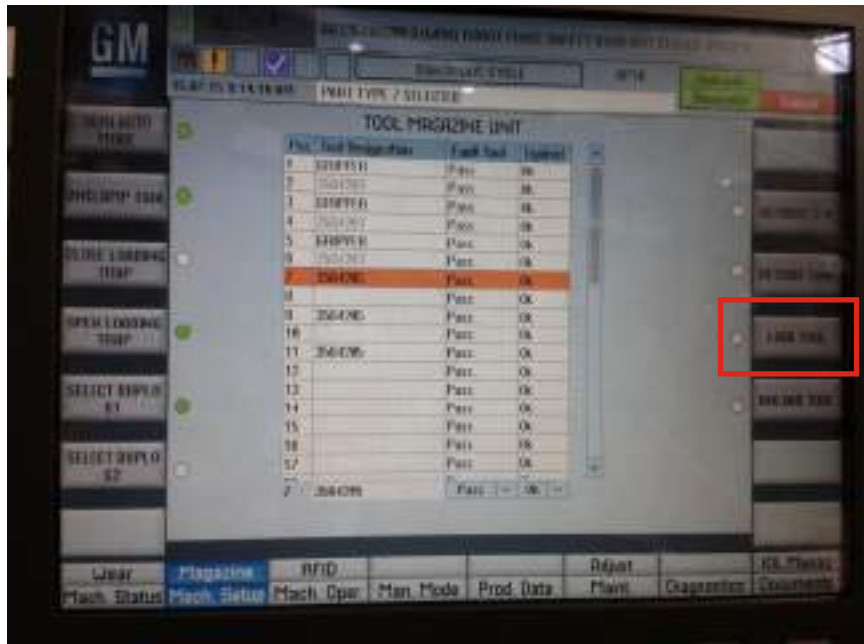
5	If the selection of the tool has been correctly made, the tool magazine will automatically pick up the tool and return to the tool unloading position.
6	When the tool magazine is on the unloading position, the access door is automatically unlocked.
7	Open the safety door to access the machine.
8	Remove the tool from the gripper and replace it for a new one.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

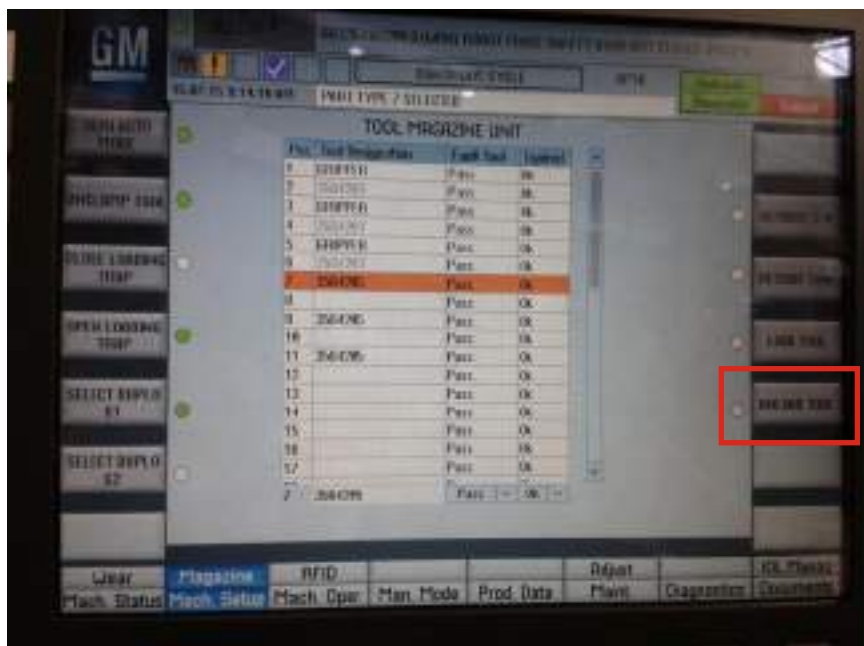


- 9 Close and lock the safety door to access the machine. (Refer to the Service Manual)
- 10 On the TOOL MANAGEMENT screen, select the tool that needs to be loaded from the list displayed.
- 11 Push on the LOAD TOOL button to load the tool automatically.



4. PROCEDURE DESCRIPTION: TOOL CHANGE PROCEDURE USING THE TOOL LOADING ASSISTANT

- 12 Clean and prepare the area where the maintenance task is going to take place.
- 13 Select the Automatic or Semi-automatic Cycle mode. (Refer to the Service Manual)
- 14 On the TOOL MANAGEMENT screen, select the tool that needs to be changed from the list displayed.
- 15 Push on the UNLOAD TOOL button to unload the tool automatically.



ON THE TOOL MANAGEMENT SCREEN OF THE HMI, THE TOOLS THAT ARE CURRENTLY AVAILABLE ON THE MAGAZINE CAN BE SEEN

16	If the selection of the tool has been correctly made, the tool magazine will automatically pick up the tool and return to the tool unloading position.
17	When the tool magazine is on the unloading position, the access door is automatically unlocked.
18	Open the safety door to access the machine.
19	Take the Tool Loading Assistant in one hand and secure the tool on the magazine with the other hand.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 20** Pull back the trigger and fit the Tool Loading Assistant into the tool. Once fitted, release the trigger and lock the tool.



POSSIBLE FALLS OF HEAVY LOADS MAY OCCUR IF THE TOOL IS NOT PROPERLY LOCKED ON THE TOOL LOADING ASSISTANT. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 21** With a small strike back, pull the tool slightly to unlock it from the tool magazine. After, apply force on the Tool Loading Assistant to get the tool out of the tool magazine.



- 22** While the tool is still on the gripper, take a comfortable position as near of the tool magazine grippers as you can.



- 23** Hold the Tool Loading Assistant and the tool on it with both hands and keep it near your body while transporting it.



- |    |  |
|----|--|
| 24 | Place the Tool Change Assistant with the tool on the table.                              |
| 25 | Pull the trigger back and unlock the tool to be unloaded from the Tool Change Assistant. |



- |    |   |
|----|---|
| 26 | Pick up the tool that needs to be changed and place it outside the Tool Change Assistant. |
|----|---|



- 27 Pick up the new tool and place it inside the Tool Change Assistant.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 28 Pull the trigger back and lock the tool to be loaded on the Tool Change Assistant.





- 29** Make sure that the tool is properly locked on the Tool Change Assistant.



POSSIBLE FALLS OF HEAVY LOADS MAY OCCUR IF THE TOOL IS NOT PROPERLY LOCKED ON THE TOOL LOADING ASSISTANT. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 30** Hold the Tool Loading Assistant with both hands and keep it near your body while transporting it.





- 31** Get to the tool magazine and take a comfortable position as near of the tool magazine grippers as you can.



- 32** Place the tool on the gripper.



THE WEIGHT OF THE TOOL MUST BE SUPPORTED BY THE GRIPPER, TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

33

Once the tool is positioned on the gripper, use the length of the Tool Loading Assistant to apply enough force to fit the tool into the gripper.

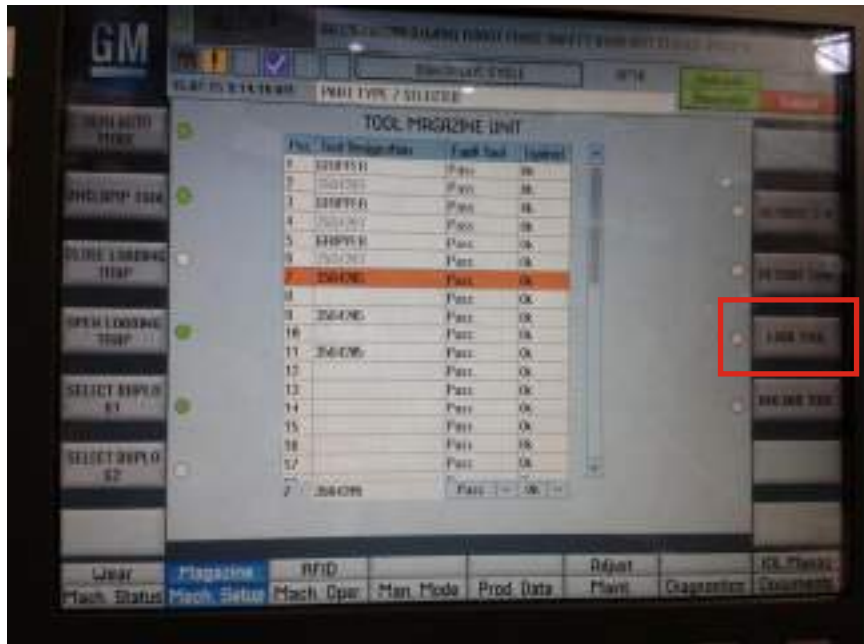


34

After fitting the tool inside the tool magazine, pull back the trigger and release the tool from the Tool Loading Assistant.



- 35 Close and lock the safety door to access the machine. (Refer to the Service Manual)
- 36 On the TOOL MANAGEMENT screen, select the tool that needs to be loaded from the list displayed.
- 37 Push on the LOAD TOOL button to load the tool automatically.





File N°	CM_000_002	Reference Drawings	-
Mechanical Personnel	1	Electrical Personnel	0
Duration	30'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Level / Temperature Sensor Disassembly
3	Pressure Switch Disassembly
4	Flow Sensor Disassembly
5	Sensor Replacement and Assembly
6	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHenever a maintenance task needs to be conducted, the operator or the maintenance personnel must ensure that only them can operate the machine in accordance to the safety standards and approved work procedures



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 3 Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY LEVELS AND WORK PROCEDURES APPROVED (BA).



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: LEVEL / TEMPERATURE SENSOR DISASSEMBLY

4	Disassemble all the Electrical Connections of the Level Sensor.
5	Disassemble the Nut fixing the Level Sensor to the Tank.
6	Extract the Level Sensor.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



### 5. PROCEDURE DESCRIPTION: PRESSURE SWITCH DISASSEMBLY

7	Disassemble all the Electrical Connections of the Pressure Switch.
8	Disassemble the Pressure Switch Fluid Connection..
9	Extract the Pressure Switch.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 6. PROCEDURE DESCRIPTION: FLOW SENSOR DISASSEMBLY

10	Disassemble all the Electrical Connections of the Flow Sensor.
11	Disassemble the Nuts on both sides fixing the Flow Sensor.
12	Extract the Flow Sensor.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

## 7. PROCEDURE DESCRIPTION: SENSOR REPLACEMENT AND ASSEMBLY

13	Replace the Sensor for a new one.
14	To assemble the Sensor, follow the disassembly steps in reverse order.

## 8. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

15	Switch on the machine (Refer to the Service Manual).
16	Close and lock the safety door to access the machine. (Refer to the Service Manual)
17	Parameterize the replaced Sensor. (Refer to the Fluid / Electric Diagrams)



File N°	CM_000_003	Reference Drawings	XXXX880 / XXXX950
Mechanical Personnel	1	Electrical Personnel	0
Duration	15'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Hydraulic Solenoid / Modular Sandwich Valve Disassembly
3	Pneumatic Solenoid / Modular Sandwich Valve Disassembly
4	Solenoid / Modular Sandwich Valve Replacement and Assembly
5	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
3	Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY LEVELS AND WORK PROCEDURES APPROVED (BA).



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: HYDRAULIC SOLENOID / MODULAR SANDWICH VALVE DISASSEMBLY

4	Disassemble the Electrical Connections of the Hydraulic Valve.
5	Disassemble the Screws fixing the Hydraulic Valve against the Hydraulic Block.
6	Extract the Valve from the Hydraulic Block.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



### 5. PROCEDURE DESCRIPTION: HYDRAULIC SOLENOID / MODULAR SANDWICH VALVE DISASSEMBLY

7	Disassemble the Electrical Connections of the Pneumatic Valve.
8	Disassemble the Screws fixing the Pneumatic Valve against the Pneumatic Block.
9	Extract the Valve from the Pneumatic Block.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 6. PROCEDURE DESCRIPTION: SOLENOID / MODULAR SANDWICH VALVE REPLACEMENT AND ASSEMBLY

10	Replace the Valve for a new one.
11	To assemble the Valve, follow the disassembly steps in reverse order.

### 7. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

12	Switch on the machine (Refer to the Service Manual).
13	Close and lock the safety door to access the machine. (Refer to the Service Manual)

File N°	CM_000_009	Reference Drawings	-
Mechanical Personnel	1	Electrical Personnel	0
Duration	10'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

### 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Solenoid Valve Adapter Disassembly
3	Solenoid Valve Adapter Replacement and Assembly
4	Machine Connection

### 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
3	Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: SOLENOID VALVE ADAPTER DISASSEMBLY

4	Locate the faulty Solenoid Valve on the Machine.
5	Disassemble the Adapter from the Solenoid Valve and extract it.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 5. PROCEDURE DESCRIPTION: SOLENOID VALVE ADAPTER REPLACEMENT AND ASSEMBLY

6	Replace the Solenoid Valve Adapter for a new one.
7	To assemble the Solenoid Valve Adapter, follow the disassembly steps in reverse order.

### 6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

8	Switch on the machine (Refer to the Service Manual).
9	Close and lock the safety door to access the machine. (Refer to the Service Manual)





File N°	CM_000_010	Reference Drawings	-
Mechanical Personnel	-	Electrical Personnel	-
Duration	-	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Considerations For Screw Assembly

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. CONSIDERATIONS FOR SCREW ASSEMBLY



ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE USING A SUITABLE DYNAMOMETRIC WRENCH



TO PREVENT THE LOOSING UP OF THE BOLTS, ALWAYS USE THREAD LOCKING PRODUCTS (LOCTITE 243) TO SEAL THE THREADS.



AFTER THE BOLT IS SECURED ON PLACE, MARK THE BOLT AND THE SURFACE WHERE ITS RESTING USING A PERMANENT MARKER TO DETECT THE LOOSENED BOLTS WITH A QUICK VISUAL INSPECTION

DIN ISO 272	Paso Rosca	Llave e/c	Calidad 12.9
	mm	mm	Par apriete M [N·m]
M3	0,5	5,5	2,2
M4	0,7	7	5,1
M5	0,8	8	10
M6	1	10	18
M8	1,25	13	42
M10	1,5	16	85
M12	1,75	18	147
M14	2	21	235
M16	2	24	358
M18	2,5	27	490
M20	2,5	30	696
M22	2,5	34	941
M24	3	36	1196
M30	2,5	46	2403
M33	3,5	50	3266
M36	4	55	4197
M39	4	60	5443
M42	4,5	65	6727



File N°	CM_000_011	Reference Drawings	-
Mechanical Personnel	1	Electrical Personnel	-
Duration	15'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

### 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Coolant Nozzle Disassembly
3	Coolant Nozzle Replacement and Assembly
4	Machine Connection

### 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
3	Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY LEVELS AND WORK PROCEDURES APPROVED (BA).



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

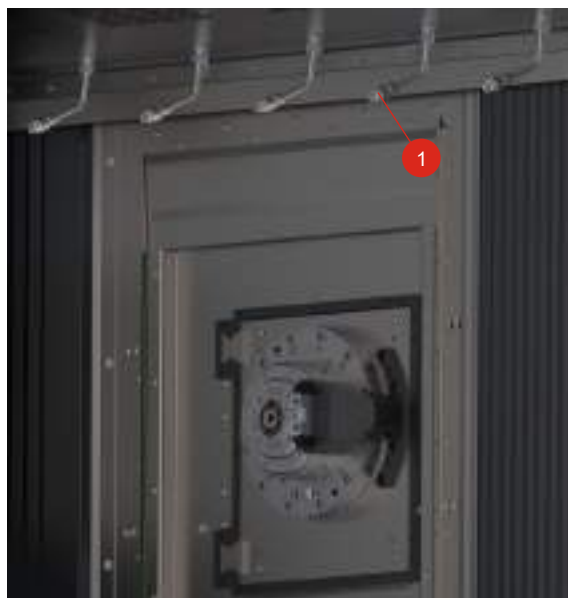
### 4. PROCEDURE DESCRIPTION: COOLANT NOZZLE DISASSEMBLY

- 4 Access the Machining Area.



FALLS AT THE SAME / DIFFERENT LEVEL MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

- 5 Disassemble the Coolant Nozzle (Pos.1).



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



## 5. PROCEDURE DESCRIPTION: COOLANT NOZZLE REPLACEMENT AND ASSEMBLY

6	Replace the Coolant Nozzle for a new one.
7	To assemble the Coolant Nozzle, follow the disassembly steps in reverse order.

## 6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

8	Switch on the machine (Refer to the Service Manual).
9	Close and lock the safety door to access the machine. (Refer to the Service Manual)



File N°	CM_785_001	Reference Drawings	XXXX785
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	3 Years
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment, Crane, Slings		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Helmet



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Cooling System Pump Disassembly
3	Cooling System Pump Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 3 Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: COOLING SYSTEM PUMP DISASSEMBLY

- 4 Check the Cooling Central Supplier Manual for the pump disassembly instructions.



### 5. PROCEDURE DESCRIPTION: COOLING SYSTEM PUMP REPLACEMENT AND ASSEMBLY

5	Replace the Cooling System Pump for new one.
6	To assemble the Cooling System Pump, follow the disassembly steps in reverse order.

### 6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

7	Switch on the machine (Refer to the Service Manual).
8	Close and lock the safety door to access the machine. (Refer to the Service Manual)



FOR MORE INFORMATION ABOUT OIL AND GREASE REFERENCES TO BE USED IN THE MACHINE, TOGETHER WITH DIFFERENT MANUFACTURERS AND EQUIVALENCES BETWEEN THEM, REFER TO THE ATTACHMENT FOLDER





File N°	CM_785_002	Reference Drawings	XXXX785
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	10 Years
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Cooling Unit Disassembly
3	Cooling Unit Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



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TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
3	Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: COOLING UNIT DISASSEMBLY

4	Disassemble all the Electrical Connections.
5	Place a container under the Emptying Plug to collect the cooling fluid.
6	Disassemble the Emptying Plug and empty the Cooling Tank.
7	Assemble the Emptying Plug into place.
8	Place a container under the Cooling Pipes to collect the cooling fluid spilling.
9	Disassemble the Cooling Unit Pipes.
10	Disassemble the Cooling Unit.



### 5. PROCEDURE DESCRIPTION: COOLING UNIT REPLACEMENT AND ASSEMBLY

11	Replace the Cooling Unit for new one.
12	To assemble the Cooling Unit, follow the disassembly steps in reverse order.

### 6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

13	Switch on the machine (Refer to the Service Manual).
14	Close and lock the safety door to access the machine. (Refer to the Service Manual)
15	Fill the Cooling Tank with clean and new chilling water through the filling plug.



FOR MORE INFORMATION ABOUT OIL AND GREASE REFERENCES TO BE USED IN THE MACHINE, TOGETHER WITH DIFFERENT MANUFACTURERS AND EQUIVALENCES BETWEEN THEM, REFER TO THE ATTACHMENT FOLDER



File N°	CM_785_003	Reference Drawings	XXXX785
Mechanical Personnel	1	Electrical Personnel	0
Duration	15'	Frequency	Yearly
Machine Status	OFF	Interruptible Task	NO
Specific Tools	-		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

### 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Cooling System “Y” Type Filter Disassembly
3	Cooling System “Y” Type Filter Replacement and Assembly
4	Machine Connection

### 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



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- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION



### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
3	Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

## 4. PROCEDURE DESCRIPTION: COOLING SYSTEM “Y” TYPE FILTER DISASSEMBLY

- 4 Disassemble the Cooling System “Y” Type filter.



CUTS PRODUCES BY SHARP EDGES OR CHIPS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

## 5. PROCEDURE DESCRIPTION: COOLING SYSTEM “Y” TYPE FILTER REPLACEMENT AND ASSEMBLY

- 5 Replace the Cooling System “Y” Type Filter for new one.
- 6 To assemble the Cooling System “Y” Type Filter, follow the disassembly steps in reverse order.

### 6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

7	Switch on the machine (Refer to the Service Manual).
8	Close and lock the safety door to access the machine. (Refer to the Service Manual)



File N°	CM_785_004	Reference Drawings	XXXX785
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	10 Years
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Heat Exchanger Disassembly
3	Heat Exchanger Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



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TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

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- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
3	Switch off the machine (Refer to the Service Manual).



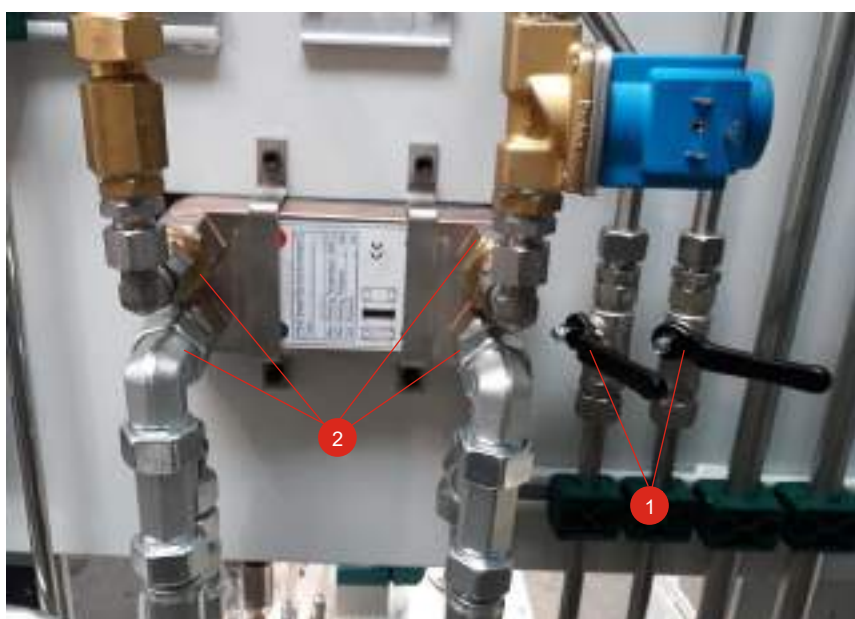
WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: HEAT EXCHANGER DISASSEMBLY

4	Isolate the Heat Exchanger from the main cooling circuit (Pos. 1).
5	Place a Container under the Heat Exchanger to collect the spillage of the Cooling Fluid.
6	Disassemble the pipes from the Heat Exchanger (Pos. 2)





**5. PROCEDURE DESCRIPTION: ASSEMBLY**

<b>7</b>	Replace the Heat Exchanger for new one.
<b>8</b>	To assemble the Heat Exchanger, follow the disassembly steps in reverse order.

**6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES**

<b>9</b>	Switch on the machine (Refer to the Service Manual).
<b>10</b>	Close and lock the safety door to access the machine. (Refer to the Service Manual)



File N°	CM_880_001	Reference Drawings	XXXX880
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	7 Years
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment, Wearable part list and Operator Manual		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

### 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Hydraulic Pressure Accumulator Disassembly
3	Hydraulic Pressure Accumulator Replacement and Assembly
4	Machine Connection

### 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



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- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

## 3. MACHINE DISCONNECTION

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Switch off the machine (Refer to the Service Manual).



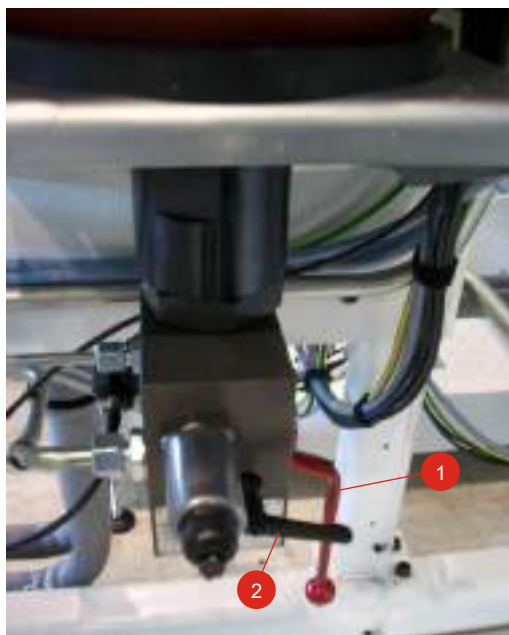
WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

**4. PROCEDURE DESCRIPTION: HYDRAULIC PRESSURE ACCUMULATOR DISASSEMBLY**

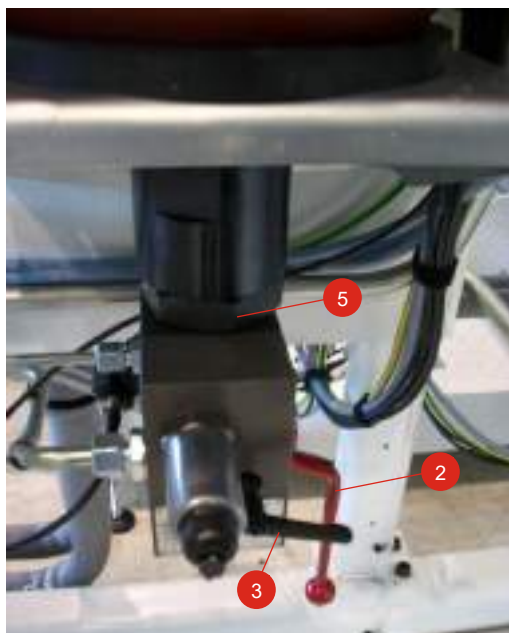
3	Isolate the Hydraulic Accumulator driving the Isolation Lever (Pos. 1).
4	Discharge the Hydraulic Accumulator driving the Discharge Lever (Pos. 2).



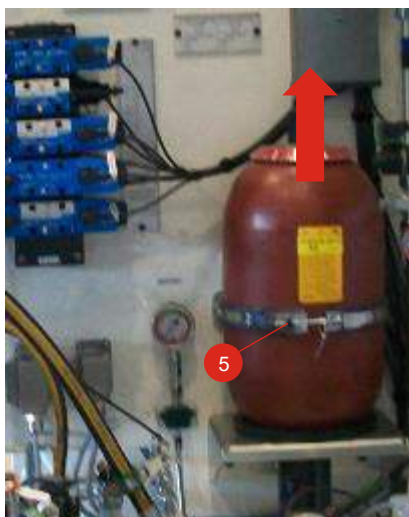
5	Check the Pressure Gauge (Pos. 3) and ensure that there is no pressure.
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- 6** Disassemble the Safety Block from the Hydraulic Accumulator using a wrench to release the Nut (Pos.4).



- 7** Loosen the clamp (Pos.5) and disassemble the Hydraulic Accumulator.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

**5. PROCEDURE DESCRIPTION: HYDRAULIC PRESSURE ACCUMULATOR REPLACEMENT AND ASSEMBLY**

<b>8</b>	Replace the Hydraulic Accumulator for new one.
<b>9</b>	To assemble the Hydraulic Accumulator, follow the disassembly steps in reverse order.

**6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES**

<b>10</b>	Switch on the machine (Refer to the Service Manual).
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File N°	CM_880_002	Reference Drawings	XXXX880
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	10 Years
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

### 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Hydraulic Tank Level Gauge Disassembly
3	Hydraulic Tank Level Gauge Replacement and Assembly
4	Machine Connection

### 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHenever a maintenance task needs to be conducted, the operator or the maintenance personnel must ensure that only them can operate the machine in accordance to the safety standards and approved work procedures



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



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- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
- 3 Switch off the machine (Refer to the Service Manual).



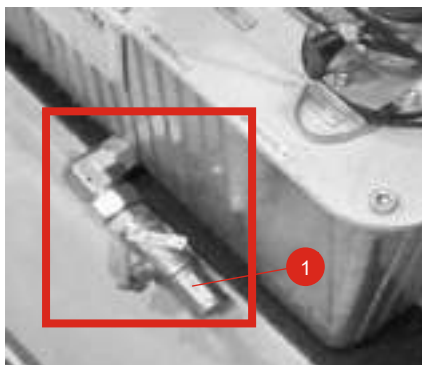
WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: HYDRAULIC TANK LEVEL GAUGE DISASSEMBLY

- 4 Empty the hydraulic tank through the Drain Coupling (Pos.1)



- 5 Disassemble the screws (Pos.2) and extract the Level Gauge (Pos.3).



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 5. PROCEDURE DESCRIPTION: HYDRAULIC TANK LEVEL GAUGE REPLACEMENT AND ASSEMBLY

6	Replace the Level Gauge for new one.
7	To assemble the Level Gauge, follow the disassembly steps in reverse order.

### 6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

8	Fill the hydraulic tank with new oil. (Do not go over the maximum level).
9	Switch on the machine (Refer to the Service Manual).



File N°	CM_880_003	Reference Drawings	XXXX880
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	5 Years
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment, Crane and Slings		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Helmet



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Hydraulic Tank Electric Motor and Elastic Coupling Disassembly
3	Hydraulic Tank Electric Motor and Elastic Coupling Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION



## 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Switch off the machine (Refer to the Service Manual).



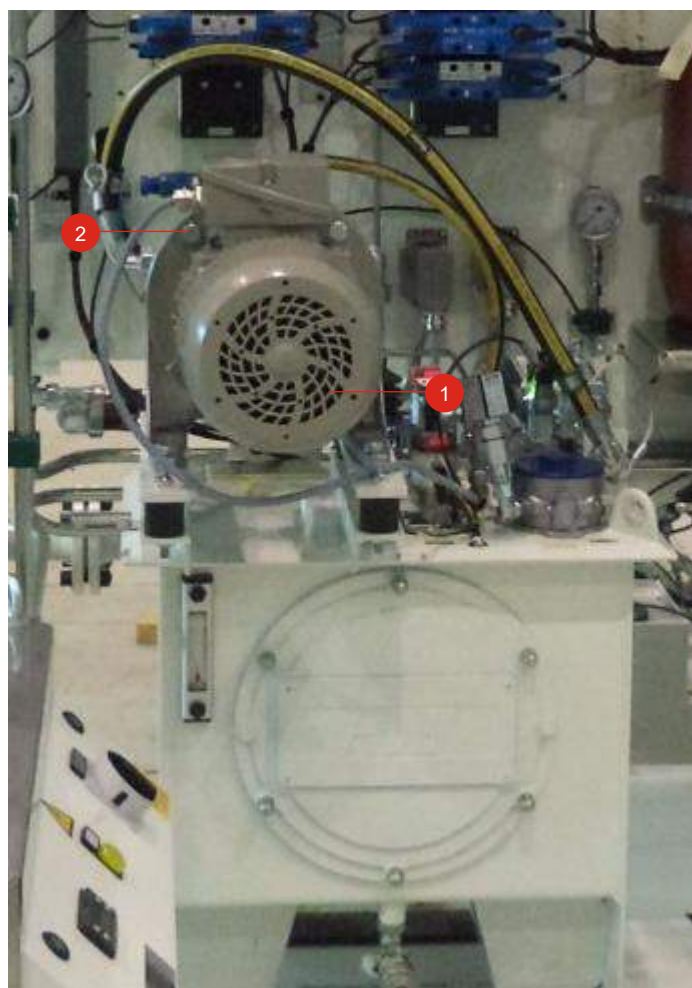
WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: HYDRAULIC TANK ELECTRIC MOTOR AND ELASTIC COUPLING DISASSEMBLY

3	Before starting the disassembly, secure the Motor with a crane and slings.
4	Disassemble all the Motor Electric Connections.
5	Disassemble the Screws (Pos.2) fixing the Motor (Pos.1) and extract it with the Elastic Coupling.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

## 5. PROCEDURE DESCRIPTION: HYDRAULIC TANK ELECTRIC MOTOR AND ELASTIC COUPLING REPLACEMENT AND ASSEMBLY

6	Replace the Electric Motor and the Elastic Coupling for new ones.
7	To assemble the Electric Motor and the Elastic Coupling, follow the disassembly steps in reverse order.

## 6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

8	Switch on the machine (Refer to the Service Manual).
---	--



File N°	CM_880_004	Reference Drawings	XXXX880
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	3 Years
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment, Crane, Slings		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Helmet



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Hydraulic Pump Disassembly
3	Hydraulic Pump Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

- 1 Clean and prepare the area where the maintenance task is going to take place.
- 2 Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

## 4. PROCEDURE DESCRIPTION: HYDRAULIC PUMP DISASSEMBLY

3	Before starting the disassembly of the Pump, secure the motor with a crane and slings.
4	Disassemble the Motor Electrical Connections.
5	Disassemble the Pump Hydraulic Connections. (If needed)
6	Disassemble Screws (Pos.2) Fixing the Pump to the Hydraulic Tank and extract it.



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS



### 5. PROCEDURE DESCRIPTION: HYDRAULIC PUMP REPLACEMENT AND ASSEMBLY

7	Replace the Hydraulic Pump for new one.
8	To assemble the Hydraulic Pump, follow the disassembly steps in reverse order.

### 6. CONSIDERATIONS FOR ASSEMBLY



ALWAYS USE 12.9 QUALITY BOLTS AND APPLY THE ADVISED TORQUE ATTACHED ON THE FOLLOWING TABLE.

SCREW TORQUE VALUES		
METRIC	STEEL	ALUMINUM
M4	3,9 Nm	3 Nm
M5	7,8 Nm	6 Nm
M6	13 Nm	10 Nm
M8	32 Nm	25 Nm
M10	63 Nm	49 Nm
M12	105 Nm	73,5 Nm
M14	167 Nm	117 Nm
M16	260 Nm	182 Nm
M18	365 Nm	255 Nm
M20	518 Nm	362 Nm

### 7. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

9	Switch on the machine (Refer to the Service Manual).
---	--



File N°	CM_880_005	Reference Drawings	XXXX880
Mechanical Personnel	1	Electrical Personnel	0
Duration	60'	Frequency	10 Years
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

### 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Hydraulic Accumulator Safety Block Disassembly
3	Hydraulic Accumulator Safety Block Replacement and Assembly
4	Machine Connection

### 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



STRICTLY OBSERVE THE ENVIRONMENTAL PROTECTION RULES AND STANDARDS ESTABLISHED BY THE LAW BEFORE ELIMINATING USED OR SPILLED OIL



TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS SUCH AS:

- CUTS PRODUCES BY SHARP EDGES OR CHIPS
- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
3	Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: HYDRAULIC ACCUMULATOR SAFETY BLOCK DISASSEMBLY

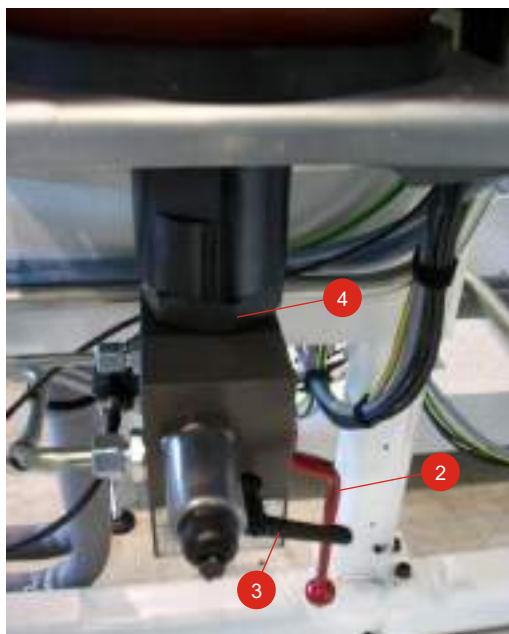
4	Disassemble the Electrical Connections of the Hydraulic Pump.
5	Isolate the Hydraulic Accumulator driving the Isolation Lever (Pos. 1).
6	Discharge the Hydraulic Accumulator driving the Discharge Lever (Pos. 2).



7	Check the Pressure Gauge (Pos. 3) and ensure that there is no pressure.
---	---



8	Disassemble the Hydraulic Connections of the Hydraulic Accumulator Safety Block.
9	Disassemble the Safety Block from the Hydraulic Accumulator using a wrench to release the Nut (Pos.4).



BURNS FROM HOT COMPONENTS MAY OCCUR. TAKE THE NECESSARY PRECAUTIONS TO AVOID RISKS

### 5. PROCEDURE DESCRIPTION: HYDRAULIC ACCUMULATOR SAFETY BLOCK REPLACEMENT AND ASSEMBLY

10	Replace the Hydraulic Accumulator Safety Block for new one.
11	To assemble the Hydraulic Accumulator Safety Block, follow the disassembly steps in reverse order.

### 6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

12	Switch on the machine (Refer to the Service Manual).
----	--



File N°	CM_950_001	Reference Drawings	XXXX950
Mechanical Personnel	1	Electrical Personnel	0
Duration	30'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Pneumatic Connection Components Disassembly
3	Pneumatic Connection Components Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



ENSURE THAT ALL THE MATERIALS AND SPARE PARTS ARE THROWN AWAY WITH SAFETY AND RESPECTFULLY WITH THE ENVIRONMENT



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- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION

### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
3	Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: PNEUMATIC CONNECTION COMPONENTS DISASSEMBLY

4 Check on the Pressure Gauge that there is no pressure.

5 Disassemble all the Electric and Fluid Connections.



6 Disassemble the Screws fixing the Connection Components together and extract the faulty one.



## 5. PROCEDURE DESCRIPTION: PNEUMATIC CONNECTION COMPONENTS REPLACEMENT AND ASSEMBLY

7	Replace the Pneumatic Connection Component for a new one.
8	To assemble the Pneumatic Connection Component, follow the disassembly steps in reverse order.

## 6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

9	Switch on the machine (Refer to the Service Manual).
10	Close and lock the safety door to access the machine. (Refer to the Service Manual)



File N°	CM_950_003	Reference Drawings	XXXX950
Mechanical Personnel	1	Electrical Personnel	0
Duration	30'	Frequency	On Demand
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Earmuffs



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Part Seating Control Unit Disassembly
3	Part Seating Control Unit Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



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- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION



### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
3	Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



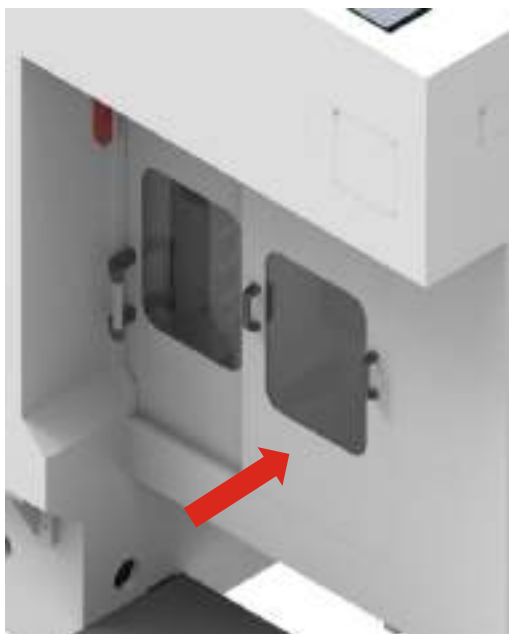
AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: PART SEATING CONTROL UNIT DISASSEMBLY

- 4 Access the Tool Magazine Safety Door area.



- 5 Disassemble the cover to access the Tool Magazine.



<b>6</b>	Locate the Part Seating Control Unit on the Fluid Panel.
<b>7</b>	Disassemble all the Electrical and Fluid Connections.
<b>8</b>	Disassemble the Screws fixing the Part Seating Control Unit to the Fluid Panel and extract it..



## 5. PROCEDURE DESCRIPTION: PART SEATING CONTROL UNIT REPLACEMENT AND ASSEMBLY

9	Replace the Part Seating Control Unit for a new one.
10	To assemble the Part Seating Control Unit, follow the disassembly steps in reverse order.

## 6. CONSIDERATIONS FOR ASSEMBLY



FOR MORE INFORMATION ABOUT THE PART SEATING CONTROL UNIT, REFER TO THE FESTO MANUAL

## 8.3 Setting the switching characteristics of the binary signals (EDIT mode)

- The distance monitoring function can be set for the binary signals OutA and OutB.
- The supply pressure monitoring function can be set for binary signal OutC  
→ 5.2.2.1 Switching signals.

## Setting distance monitoring for OutA



The procedure for setting the distance monitoring for OutA and OutB is basically identical. The procedure is described below based on the binary signal OutA.

Requirement: EDIT mode is active.

1. Select [OutA] with the A or B pushbutton.
2. Press the Edit button to confirm the selection.  
↳ [SP] flashes.
3. Set switching point with the A or B pushbutton.
4. Press the Edit button to confirm the set value.  
↳ [HY] flashes.
5. Set value for hysteresis with A or B pushbutton.
6. Press the Edit button to confirm the set value.  
↳ [NO] or [NC] flashes.
7. Select the switching element function with the A or B pushbutton.
8. Press the Edit button to confirm the selection.  
↳ RUN mode is active.
9. Use a test run to check that the sensor switches as desired (switching point and hysteresis).

## **8.6 Teaching the switching points (TEACH mode)**

### **i**

The process for teaching the switching outputs OutA (A pushbutton) and OutB (B pushbutton) is basically identical. The procedure is described below based on the binary signal OutA.

---

1. Establish the desired switching distance between the object and the measuring nozzle.
2. Press and hold the A pushbutton.
3. Also press the Edit button.
  - 🔊 – [OutA] and [TeachIn] flash. The value is adopted as the switching point.
  - [Lock] flashes: security lock active. The value is buffered.
4. Enter the set security code using the A or B pushbutton.
5. Press the Edit button.
  - 🔊 – [OutA] and [TeachIn] flash. The cached value is accepted as the switching point.
  - RUN mode is active.

### 7. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

11	Switch on the machine (Refer to the Service Manual).
12	Set the Part Seating Control Unit according to the Fluid Diagrams. (Refer to the Element Manual for more information)
13	Close and lock the safety door to access the machine. (Refer to the Service Manual)

File N°	CM_980_001	Reference Drawings	XXXX980
Mechanical Personnel	1	Electrical Personnel	0
Duration	30'	Frequency	5 Years
Machine Status	OFF	Interruptible Task	NO
Specific Tools	Maintenance Equipment		

### ISO Safety Symbols



Safety Padlock



Safety Shoes



Safety Glasses



Safety Gloves



Safety Vest



Safety Clothes

## 1. SUMMARY

Step	Description
1	Machine Disconnection
2	Centralized Lubrication Piston Distributor Disassembly
3	Centralized Lubrication Piston Distributor Replacement and Assembly
4	Machine Connection

## 2. PRECAUTIONS



BEFORE STARTING ANY MAINTENANCE OPERATION ON THE MACHINE, BEAR IN MIND ALL THE SAFETY INDICATIONS DESCRIBED ON THE **SERVICE MANUAL AND THE ECPL PLACARD**



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- PROJECTION OF PARTICLES
- BURNS FROM HOT COMPONENTS
- FALLS AT THE SAME / DIFFERENT LEVEL
- POSSIBLE FALLS OF HEAVY LOADS IN SUSPENSION



### 3. MACHINE DISCONNECTION

1	Clean and prepare the area where the maintenance task is going to take place.
2	Unlock and open the safety door to Access the machine. (Refer to the Service Manual)
3	Switch off the machine (Refer to the Service Manual).



WHENEVER A MAINTENANCE TASK NEEDS TO BE CONDUCTED, THE OPERATOR OR THE MAINTENANCE PERSONNEL MUST ENSURE THAT ONLY THEM CAN OPERATE THE MACHINE IN ACCORDANCE TO THE SAFETY STANDARDS AND APPROVED WORK PROCEDURES



AFTER DISCONNECTING THE MAIN POWER SWITCH, WAIT AT LEAST 5 MINUTES BEFORE CARRYING ANY MAINTENANCE WORK ON THE ELECTRICAL SYSTEM AND CHECK THAT THERE IS NO RESIDUAL PRESSURE ON THE FLUID LINES CHECKING THE PRESSURE GAUGES AND PRESSURE SWITCHES.

### 4. PROCEDURE DESCRIPTION: CENTRALIZED LUBRICATION PISTON DISTRIBUTOR DISASSEMBLY

4	Disassemble the Piston Distributor Connection (Pos.1).
5	Disassemble the Piston Distributor Hoses (Pos.2).



6	Extract the Piston Distributor.
---	---------------------------------

### 5. PROCEDURE DESCRIPTION: CENTRALIZED LUBRICATION PISTON DISTRIBUTOR REPLACEMENT AND ASSEMBLY

7	Replace the Piston Distributor for new one.
8	To assemble the Piston Distributor, follow the disassembly steps in reverse order.

### 6. MACHINE CONNECTION / AXIS REFERENCE PROCEDURES

9	Switch on the machine (Refer to the Service Manual).
10	Close and lock the safety door to access the machine. (Refer to the Service Manual)
11	Purge the Centralized Lubrication Line.
12	Carry out greasing cycles.



FOR MORE INFORMATION ABOUT OIL AND GREASE REFERENCES TO BE USED IN THE MACHINE, TOGETHER WITH DIFFERENT MANUFACTURERS AND EQUIVALENCES BETWEEN THEM, REFER TO THE ATTACHMENT FOLDER

