

MatcorMatsu

Die Standards

A detailed 3D CAD model of a multi-pin connector assembly, shown in an exploded view. The assembly consists of a base housing (yellow) and a top housing (green). The base housing features a red internal component and several blue labels that read "NO FORK". The top housing has a green internal component and a blue label that reads "NO FORK". The assembly is designed for high-density pin connections.

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1. SIMULATION REPORT

The Simulation report must include the following information:

- Thinning, wrinkles, and spring back analysis,
- FLD diagrams.
- Die action sections
- Total tonnage per station.
- Blank size used on simulation report.
- Steel spec of the part.
- Engineering level of the part.
- If the part has thinning or wrinkles problems, write down proposal to Improve.
- Sim native File.

Formability (Non Linear)



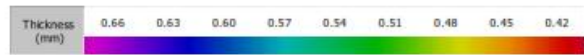
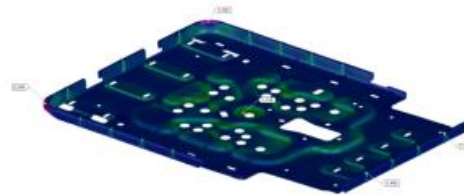
2710_run_10a.afd

Operation Step:	M-70 Springback
Distance To Bottom:	0.00 mm
Print Comment:	

01-02-2019, 11:27:04



Thickness / Hotforming: Total Thickness



2710_run_10a.afd

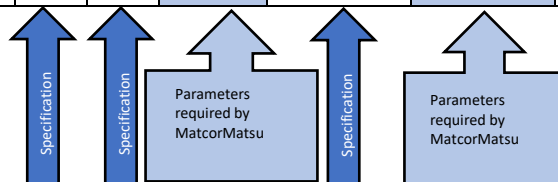
Operation Step:	M-70 Springback
Distance To Bottom:	0.00 mm
Print Comment:	

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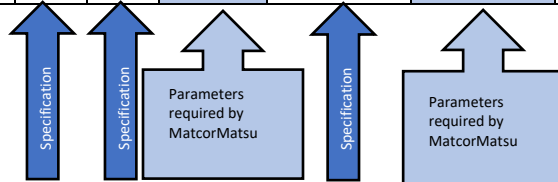


- Use Yield & Tensile Strength values indicated in the Table showed below.

TABLE WITH REQUIREMENTS FOR SIMULATION										
Sheet Steel										
Hot and C old Rolled High Strength Steel - Yield Strength Based										
GMW6409M Cold Rolled Steel										
GMW-3032-M-STS Designation	Yield Strength		Yield Strength MIN +75%	Tensile Strength (MPa) MIN	Tensile Strength MIN +75%	Total Elong in 50 mm % MIN	Total Elong in 80 mm % MIN	Total Elong in 50 mm (JIS No5) % MIN	Rm ⁵⁶⁷ MIN	n value ⁵
CR 1	140									
CR 2	140	260	230	270	360	34				0.18
CR 3	140	210	193	270	323	38			1.7	0.20
CR 4	140	185	174	270	304	40			1.8	0.22
CR 5	110	180	163	260	313	42			1.9	0.24
GMW6409M Hot Rolled Steel										
HR 1	180	290	263	270	353					
HR 2	180	290	263	270	353	34				0.18
HR 3	180	290	263	270	353	38				0.20
GMW3032M Hot Rolled and Cold Rolled Steel										
180 P	180	240	225	300	345	35	33	39	1.41	0.22
180 B2	180	240	225	300	345	35	33	39	1.41	0.21
180 B0	180	240	225	300	345	35	33	39	1.41	0.19
210 P	210	270	255	320	365	33	31	37	1.41	0.21
210 B2	210	270	255	320	365	33	31	37	1.21	0.19
210 B0	210	270	255	320	365	33	31	37	1.21	0.18
240 B2	240	300	285	340	385	30	28	34	1.21	0.19
240 B0	240	300	285	340	385	30	28	34	1.21	0.18
270 B2	270	330	315	365	410	28	26	32	1.11	0.17
270 B0	270	330	315	365	410	28	26	32	1.11	0.17
300 B2	300	360	345	390	435	26	24	30	1.01	0.16
300 B0	300	360	345	390	435	26	24	30	1.01	0.16
GMW3032M Cold Rolled High Strength Low Alloy - Mechanical Properties										
CR270	270	350	330	330	390	26	24	30		0.17
CR300	300	380	360	370	430	24	22	28		0.16
CR340	340	420	400	410	470	22	20	26		0.15
CR380	380	460	440	450	510	20	18	24		0.14
CR420	420	520	495	480	555	18	16	22		0.13 ⁴
CR500	500	600	575	560	635	16	14	20		0.11 ⁴
CR550	550	650	625	610	685	14	12	18		0.10 ⁴



GMW3032M Hot Rolled High Strength Low Alloy - Mechanical Properties										
HR270	270	350	330	330	390	29	27			0.17
HR300	300	380	360	370	430	27	25			0.16
HR340	340	420	400	410	470	25	23			0.15
HR380	380	460	440	450	510	23	22			0.14
HR420	420	520	495	480	555	22	20			0.13
HR500	500	600	575	560	635	20	18			0.11
HR550	550	650	625	610	685	18	16			0.10
GMW3399M Hot Rolled Dual Phase - Mechanical Properties										
HR 490T / XXXY DP	To Be Determined									
HR 580T / 320Y DP	300	450	412.5	580	692.5	21	22	19		0.20
HR 780T / 380Y DP	380	610	552.5	780	952.5	15	16	14		0.18
GMW3032M Hot Rolled High Strength Low Alloy - Mechanical Properties										
HR 450T / 310Y HE	310	380	362.5	450	502.5		25			TBD
HR 590T / 440Y HE	440	620	575	590	725		14	17		0.10
HR 780T / 600Y HE	600	800	750	780	930		12	15		0.09
HR 980T / XXXY HE	To Be Determined									
GMW3399M Cold Rolled Dual Phase- Mechanical Properties										
CR 450T / 250Y DP	250	330	310	450	510		27	30		0.18
CR 490T / 290Y DP	290	390	365	490	565		24	27		0.17
CR 590T / 340Y DP	340	440	415	590	665		20	22		0.16
CR 780T / 420Y DP	420	550	517.5	780	877.5		15	17		0.11
CR 980T / 550Y DP	550	730	685	980	1115		8	10		N/A
CR 1180T / 820Y DP	820	1130	1052.5	1180	1412.5		3	4		N/A
GMW3399M Cold Rolled TRIP - Mechanical Properties										
CR 590T / 380Y TR	380	480	455	590	665		26	29		0.21
CR 690T / 400Y TR	400	510	482.5	690	772.5		24	27		0.21
CR 780T / 420Y TR	440	560	530	780	870		20	20		0.19



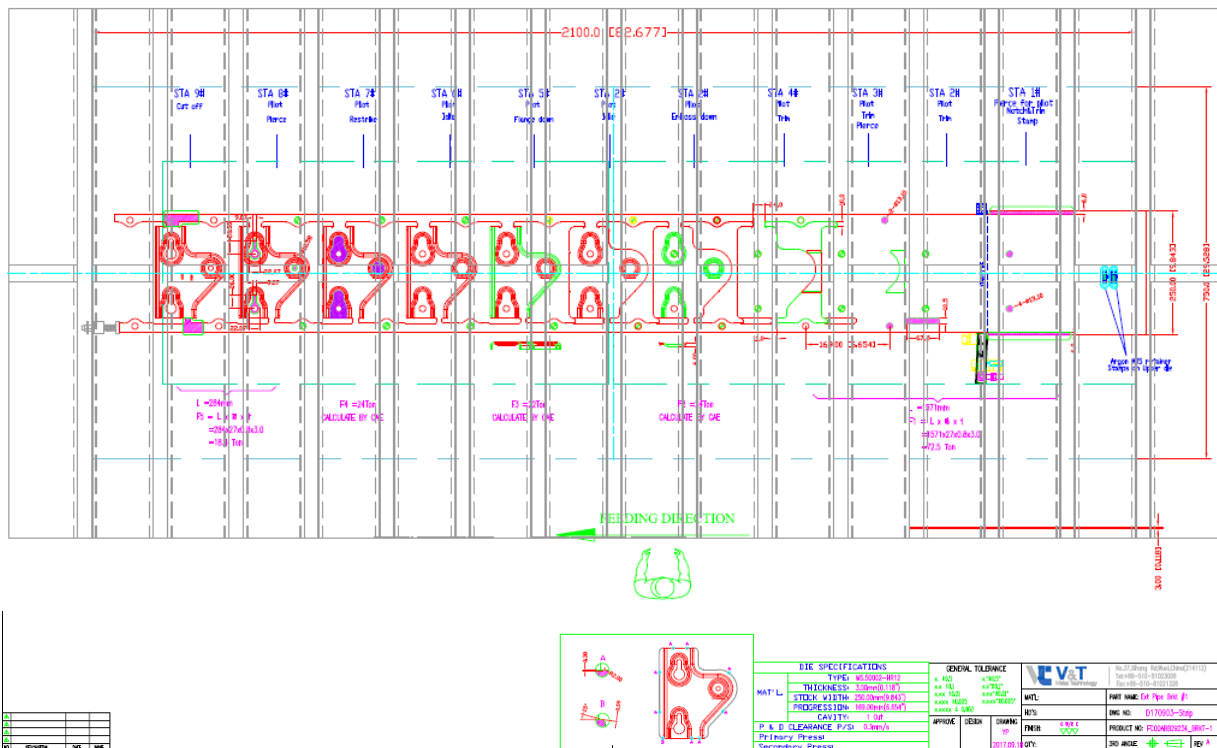
2. LAYOUT PROCESS

Strip layout or transfer process must be in 2D DWG, PDF and 3D STEP file.

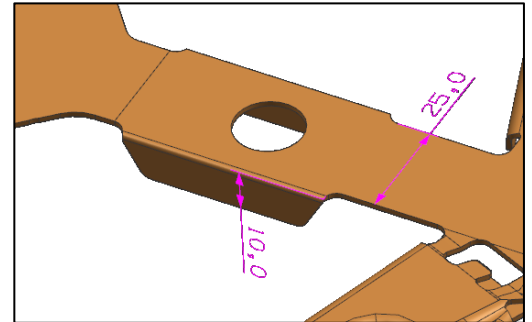
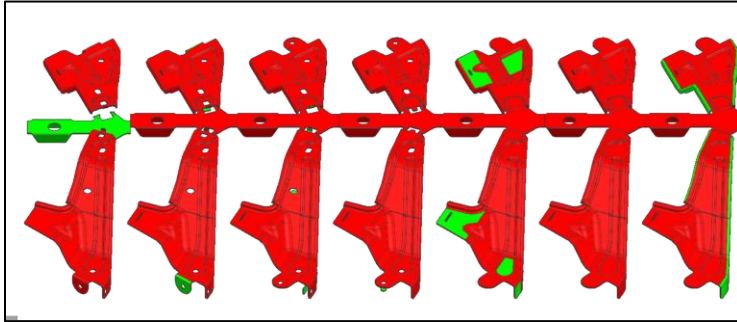
Layout must show:

1. All the Dimensions in METRIC SYSTEM.
2. Total tonnage and Tonnage by each single station. **Total tonnage needs to be under 80% of press capacity.**
3. Feed direction.
4. Date stamp location.
5. Sensors for pitch and cut-off.
6. Shut Height, feed height, Transfer pass line, width, pitch, material thickness, lifting, pilot hole $\varnothing$ and critical dimensions as show.
7. Part Mismatch layout.
8. Forming, trim and pierce indicated with different colors.
9. Show Bolster of selected press.

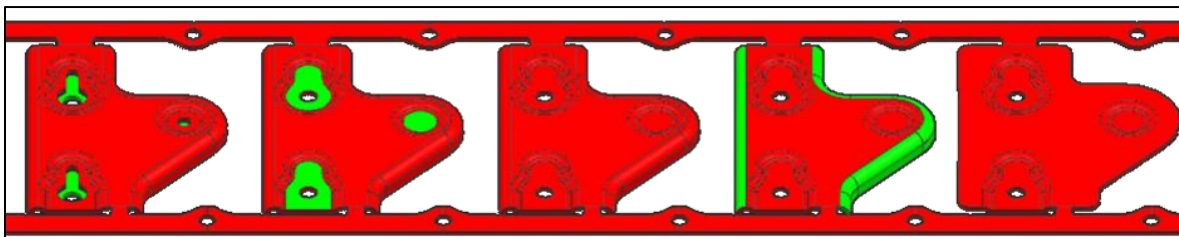
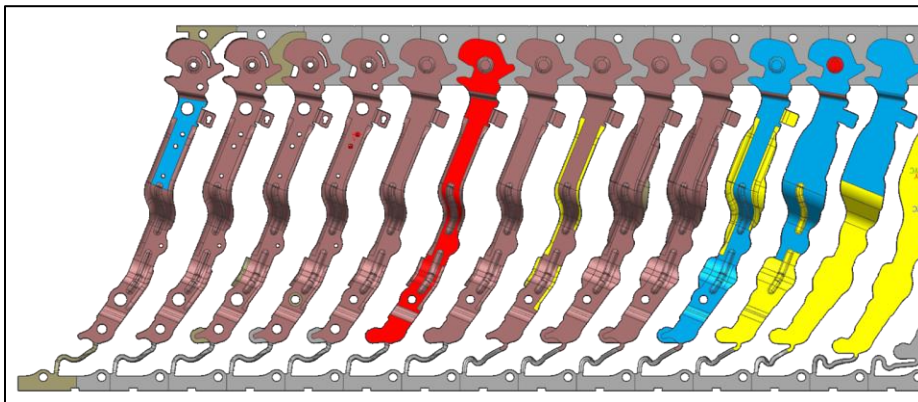
The estimated press force is 160.9 Ton.



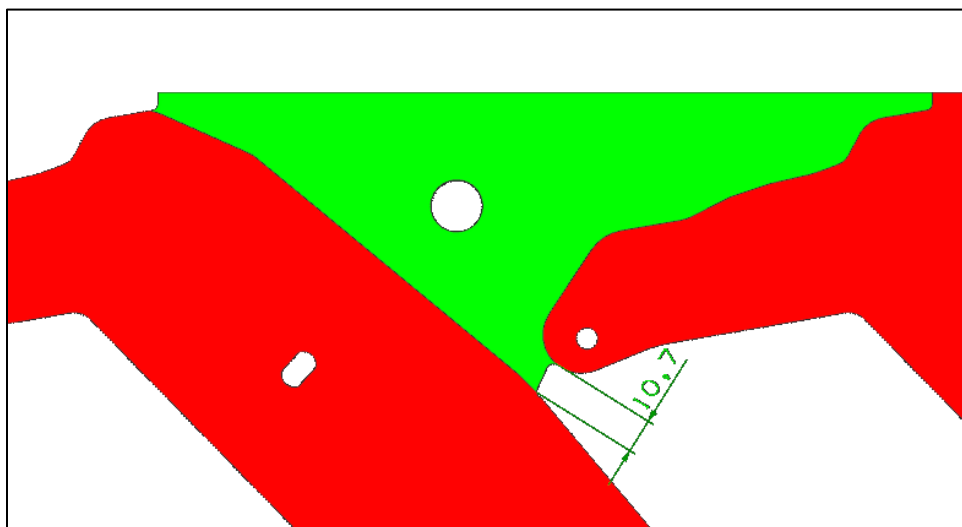
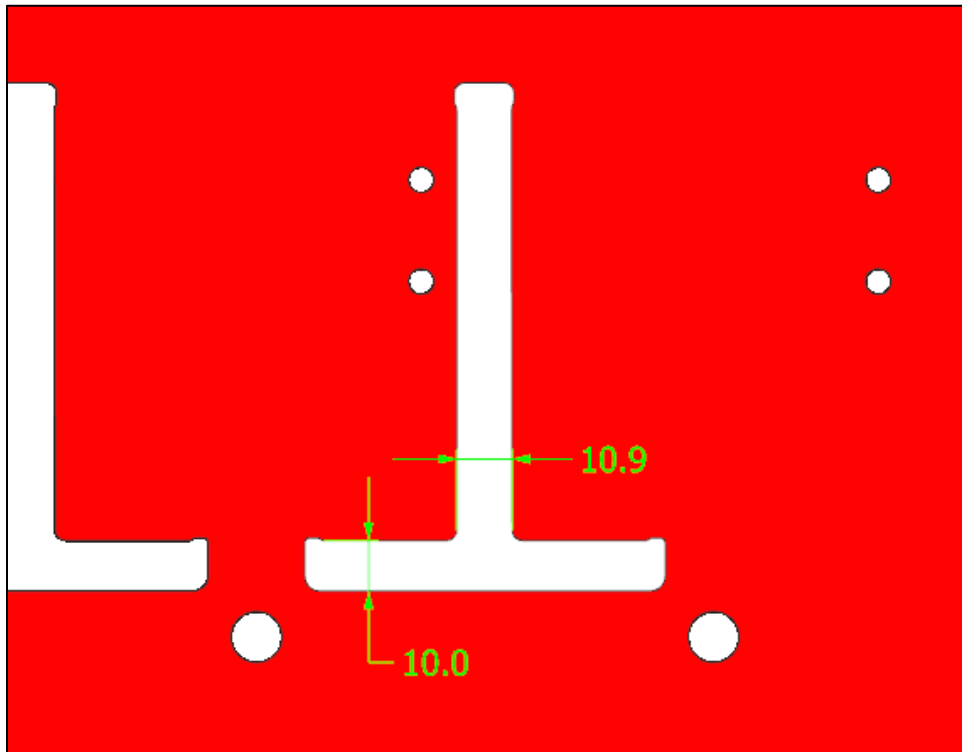
- Center Carrier must be strong adding a U flange 10mm height for stability when possible.



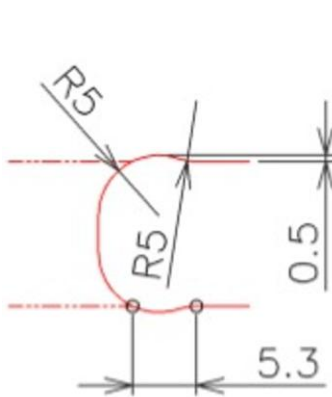
- Lat carrier must be strong and wide enough for stability.



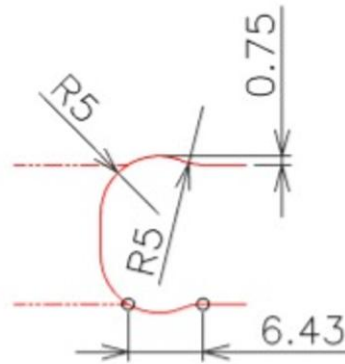
- Width of Trim punches need to be 10mm or 3 times material thickness whichever is greater. (need MatcorMatsu Tooling Engineer approval if cannot meet this standard)



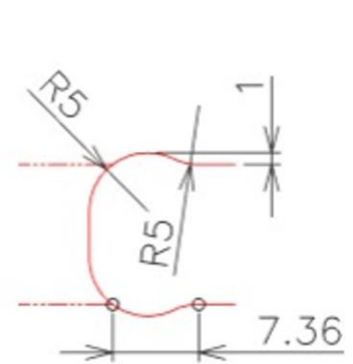
- By-pass notches to be designed to avoid double cutting condition. Follow below standard when trim tolerance is allowed.



Detailed notch
0.5mm-2.5mm material thickness

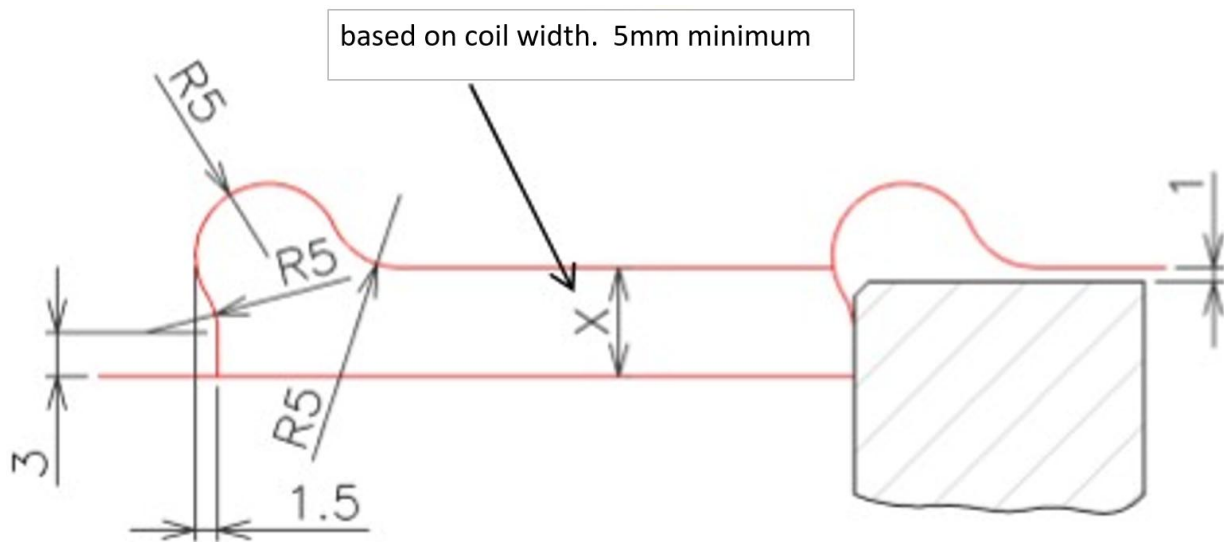


Detailed notch
2.6mm-4mm material thickness



Detailed notch
> 4.1mm material T.

- Coil edge cut to follow below standard.

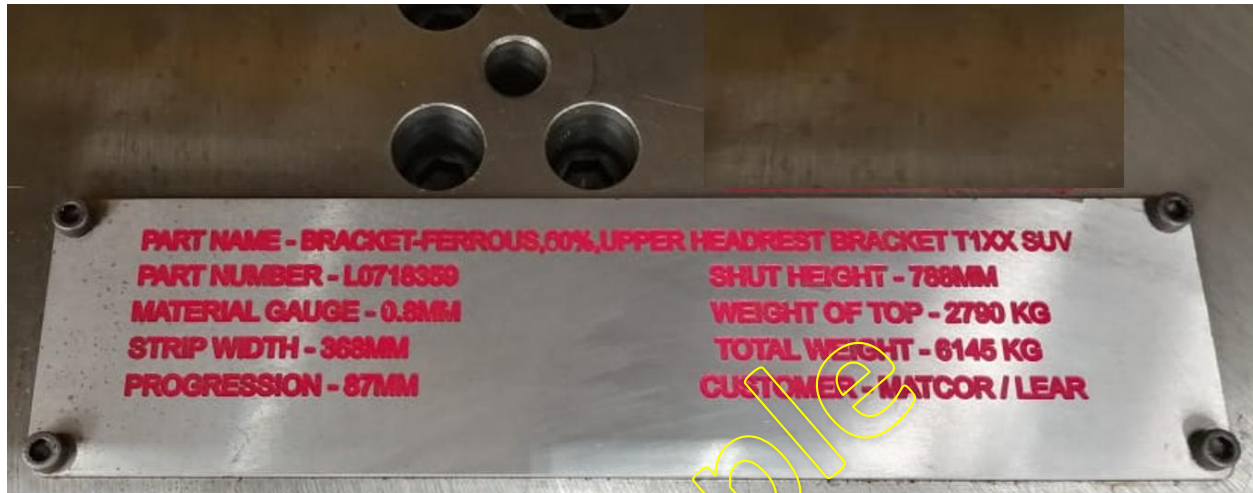


3. GENERAL DIE DESIGN

- Process layout, simulation and Die design need to be reviewed and approved by the Tooling Engineer before die build.
- Below are listed the materials to be use in **MatcorMatsu** dies:
 - Lower & Upper Shoes SAE 1018 / SAE 1020
 - Risers / Parallels / Keys SAE 1018 / SAE 1020
 - Lifters/Stock Guides/ Stripper AISI 4140
 - Special Punch-Retainer AISI 9840 / AISI 4140
 - Backing Plates 4140 Pre hard.
 - Trim Punches, blades & buttons AISI D2 or DC53 if need to stamp high strength material (58-62° HRC)
 - Forming Inserts AISI D2 or DC53 if need to stamp high strength material (58-62° HRC).
- All Designs must be in 3D and **Metric System**.
- Designs shared with MatcorMatsu should be in STEP and Native Format.
- **Progressive Dies: should be made of steel plate (no casting).**
- **Transfer Dies: for parts 1.5mm or thicker should be made of steel plate, cast die is acceptable for parts that less than 1.5mm thick.**
- **Pierce punches** 90.0mm length and ball lock heavy duty (M2 steel), use headed type when material thickness is thicker than 3mm or for high strength material 550MP or higher (DAYTON PS4 steel)
- Extruding punches use DAYTON PS4 coating by DAYTON XNP type.
- **Button die** 25.0mm height Dayton brand, made of highspeed Steel (M2).
- Nitrogen Gas Spring, DADCO brand:
Small MICRO series/ Medium L series/ Large 90.10-90.8 series.

HYSON or KALLER brand can also be used as long as exchangeable with DADCO and agreed by Tooling Engineer.

- Nitro cylinders should be charged to a max of 80% .
- Wear plates, guide blocks, keepers, Danly/Lamina brand, or equivalent according NAAMS Standards (Do not use special Sizes)
- For stripper pads and lifters: Standard Lifters, Guide pin / bushing, wear plates can be used.
- All progressive & blanking dies must be run off in a press with coil feeder, no strip feeding.
- Transfer Dies must be run off under one RAM (all sets at same time).
- All the Blanks Shape Must have Poka-yoke to avoid any mistake orientation when is loaded in the Blank Destaker and feed the blank to the Forming/Draw Station.
- Include this information marked in lower plate (progressive and blanking dies):
 1. Part Name
 2. Part Number
 3. Shut Height
 4. Pitch
 5. Strip Width
 6. Material thickness
 7. Weight of Top half of die
 8. Weight of Bottom half of die
 9. Total Die Weight.
 10. Property of (to be based on OEM requirement)



- For Sensors and connector, MatcorMatsu will share information at die design stage.

Example:

Sensors NPN M12 X 1

Balluf brand

Code: BES 516-329-G-E5-C-S4

Connector pin

PHOENIX CONTACT Brand

Code: HC-B 24-ESTS-1771749

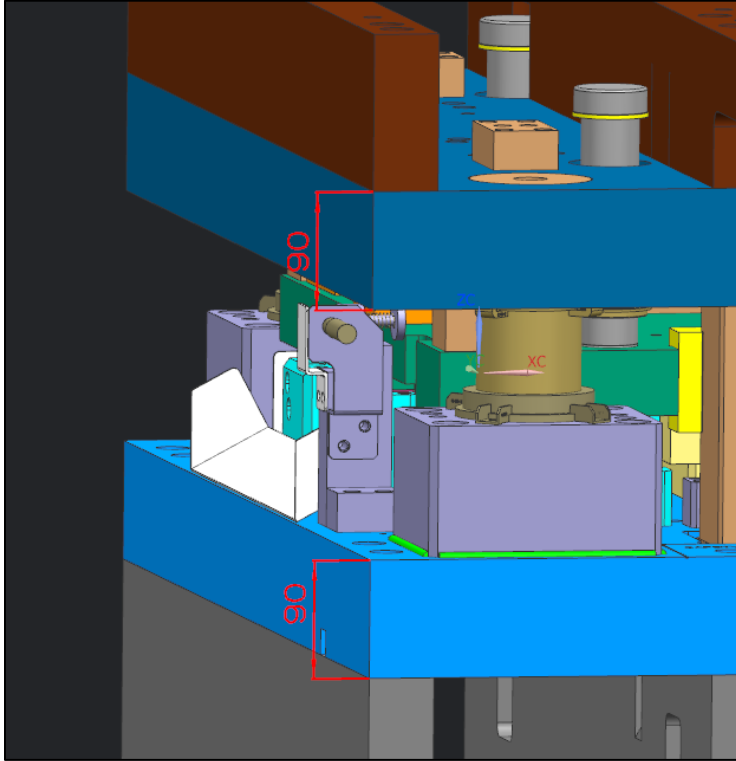
Mounting Box

PHOENIX CONTACT Brand

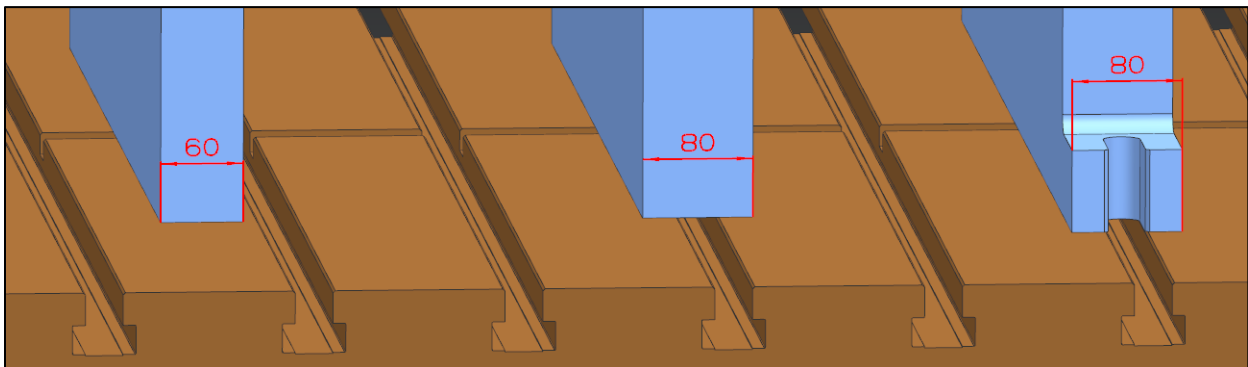
Code: HC-B 24-SMQ-67/M1M25-1586976

Progressive dies require one mechanical stop at the rear side of the Die (to avoid over-progression), **sensor** for coil present (stop for pitch), and other at the end of die, in order to detect miss feed.

- Die shoe thickness must be 90mm (80mm can be used for small dies).

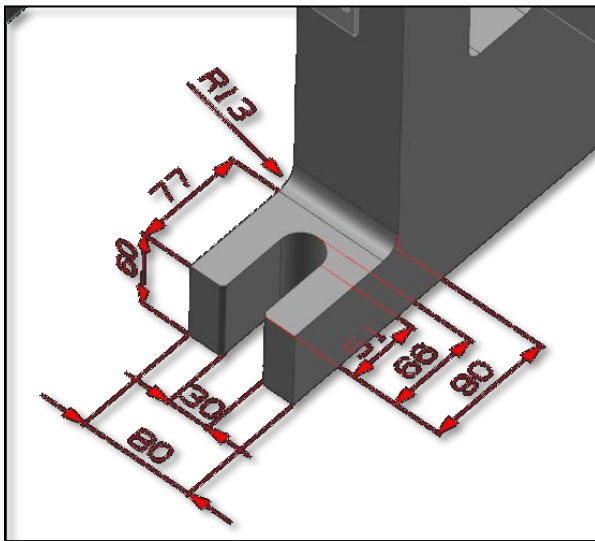


- Parallels:
 - Clamping parallel thickness must be 80mm,
 - for no clamping parallels 60mm to 80mm can be used (80mm wide must be if the parallel is over T-slot)

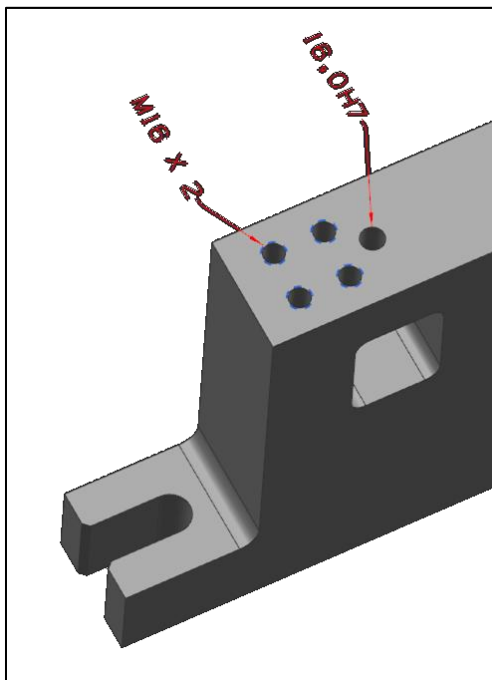


- Clamping feet dimensions will be provided by MatcorMatsu according to the presses and clamps.

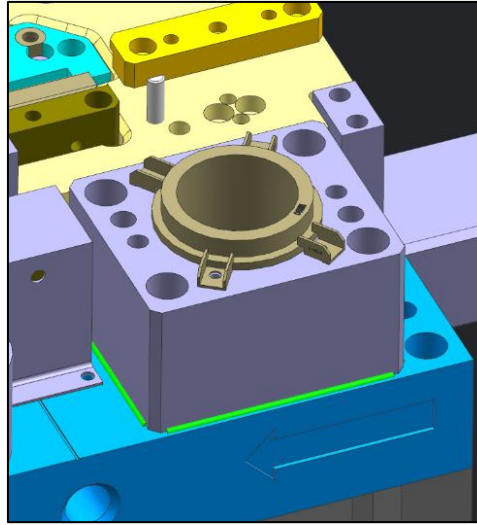
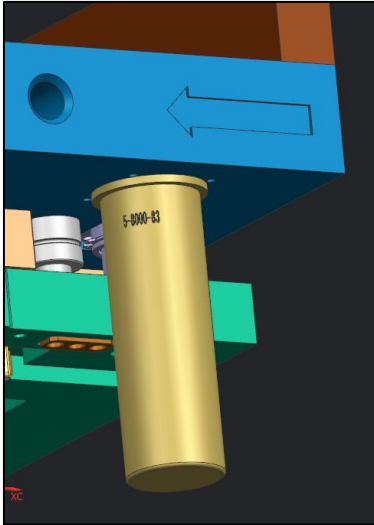
Example below:



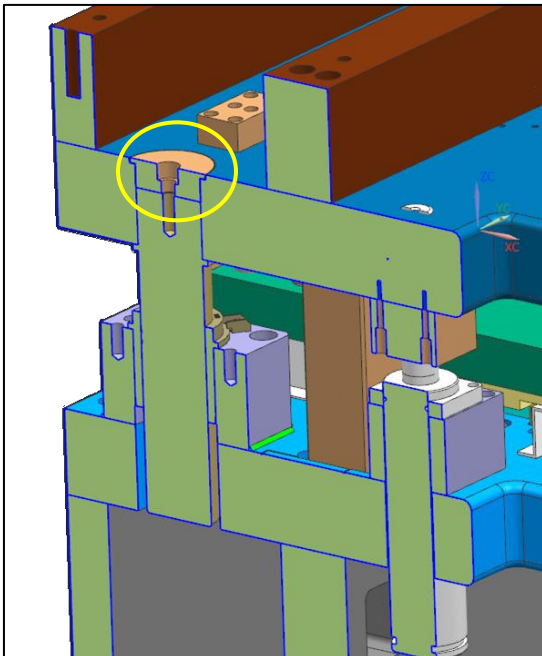
- Clamping parallel must be hold by 4 M16 screws and one Dowell pin each side.



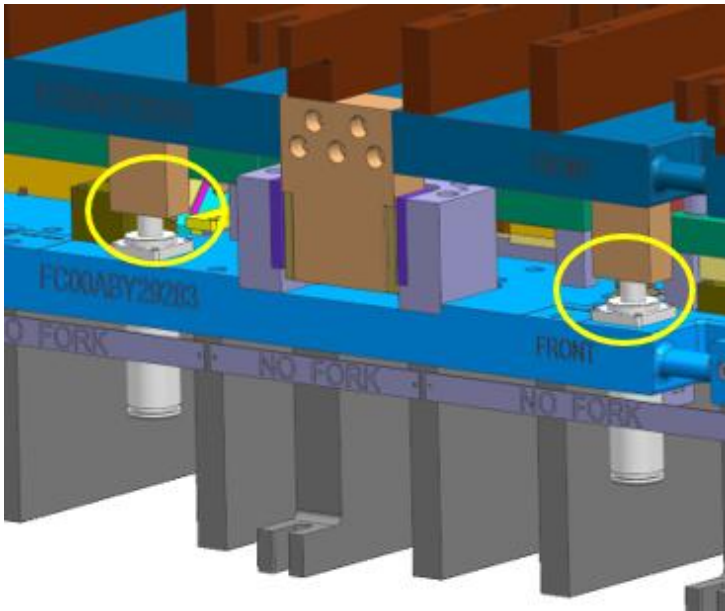
- Use bronze bushings and guide posts $\varnothing 80\text{mm}$ for mid and large size dies, $\varnothing 63\text{mm}$ for small dies: **(some Matcor plant requires ball guide pins, to be confirmed at design review)**



- Use safety keeper for guide post.



- Add storage cylinders.

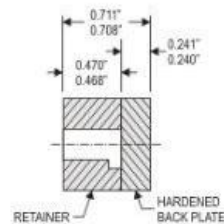
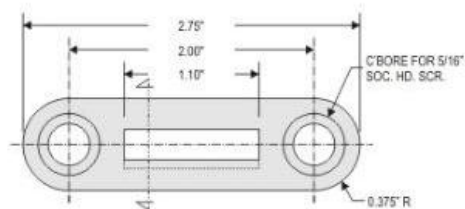


- Retainer for date stamp, Argon (brand) Spec RN1/8
(Size depend of Customer requirement)

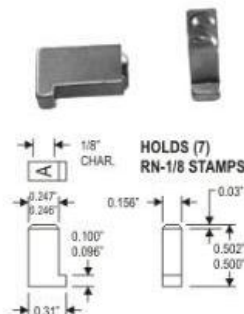
http://www.argontool.com/standard_stamps1.htm

92-845-1516 RETAINER SET

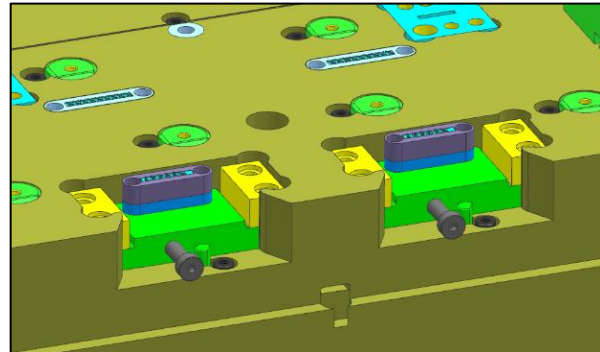
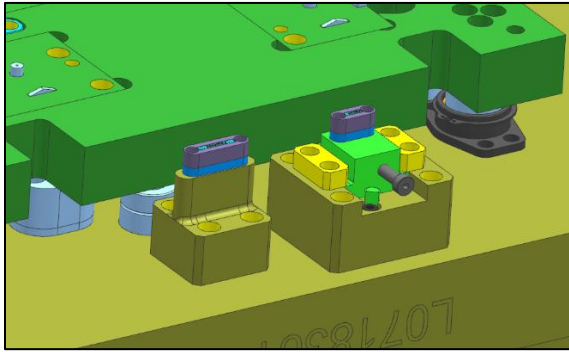
ARGON TOOL & MFG.



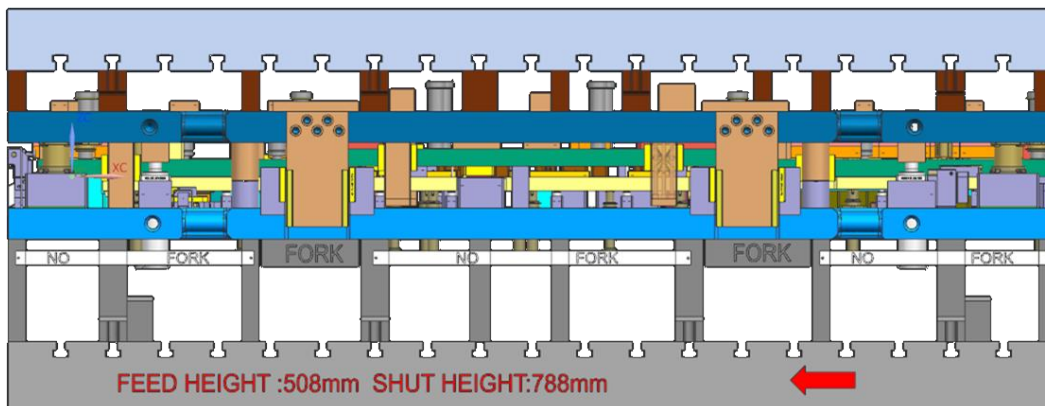
www.argontool.com (248)583-1605



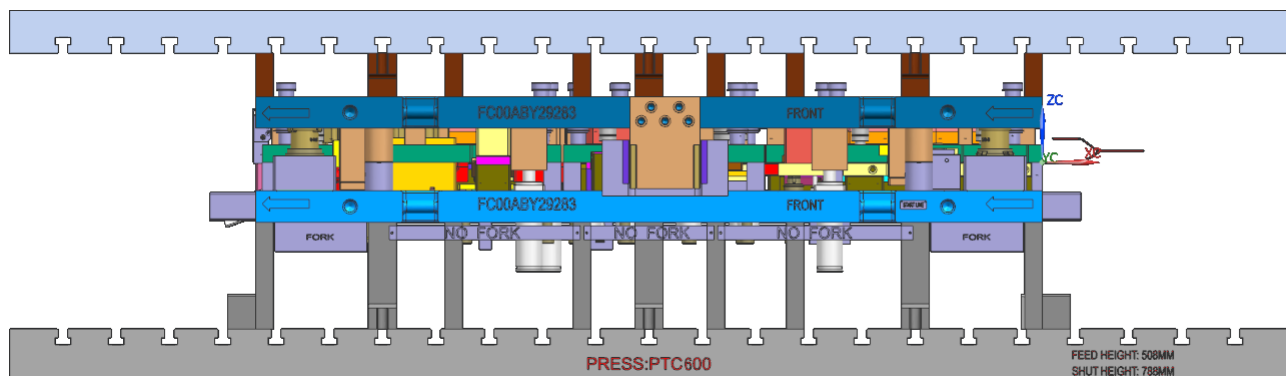
- Use quick change style holder for date stamp, and fixed stamp holder for part number (It can be in upper or lower die depending on customer requirements).



- Use 4 heel blocks for large dies.



- Use 2 heel blocks for medium and small dies.

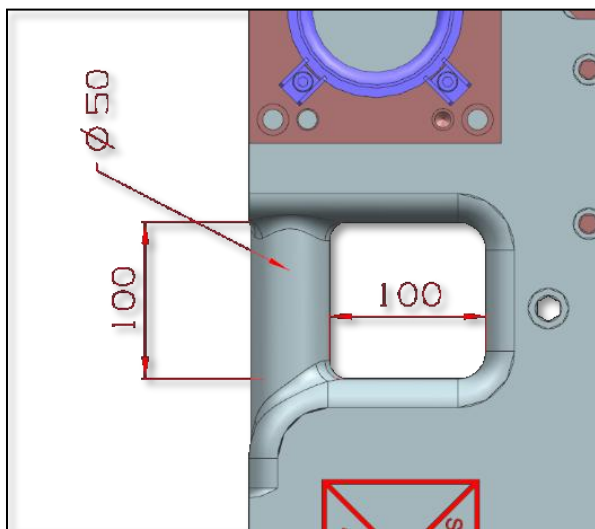


- All the Bolts used in MatcorMatsu DIES need to be GRADE 9.8 ~ 12.9
Example HOLO-KROME, UNBRAKO, BRIGHTON BEST, MISUMI.

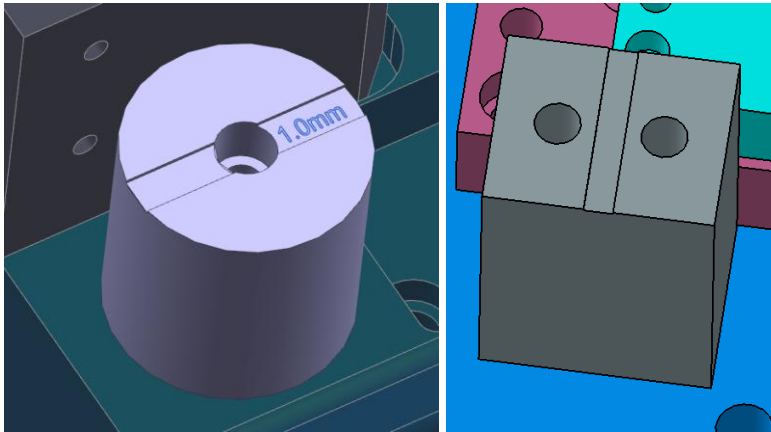


(No flat or low head allowed under any circumstances)

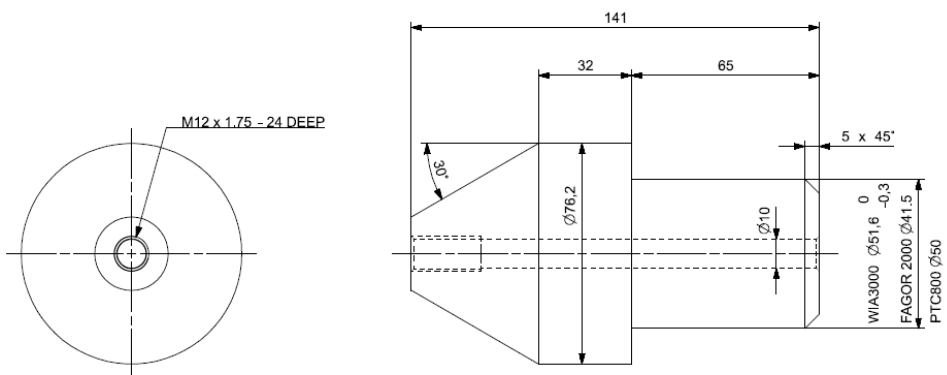
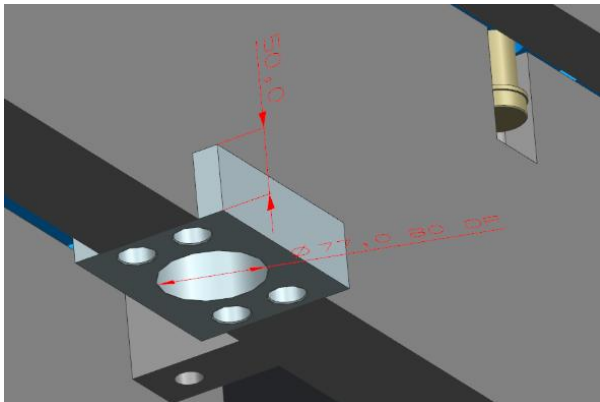
- Upper/Lower Parallel Bars must be Bolted using M16 Minimum.
- All inserts need to have enough lifting holes.
- All inserts have to be Identifying with Material Type, Detail Number, die number.
- All pocketed steels or doweled steels must have lifting holes.
- If lifting bars are required, they must be machined on die shoe.



- Limit blocks must have **1mm lead check** for adjust and **bolted with M12**, and have to be placed over parallels.

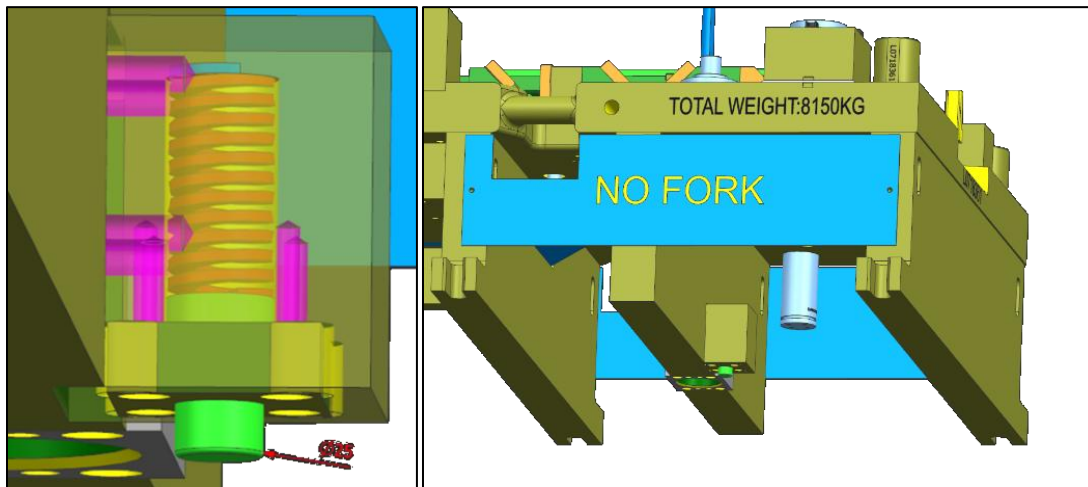


- For die location on the Bolster, MatcorMatsu will provide location system information according to the press.
Example for moving bolster with pin locators below:



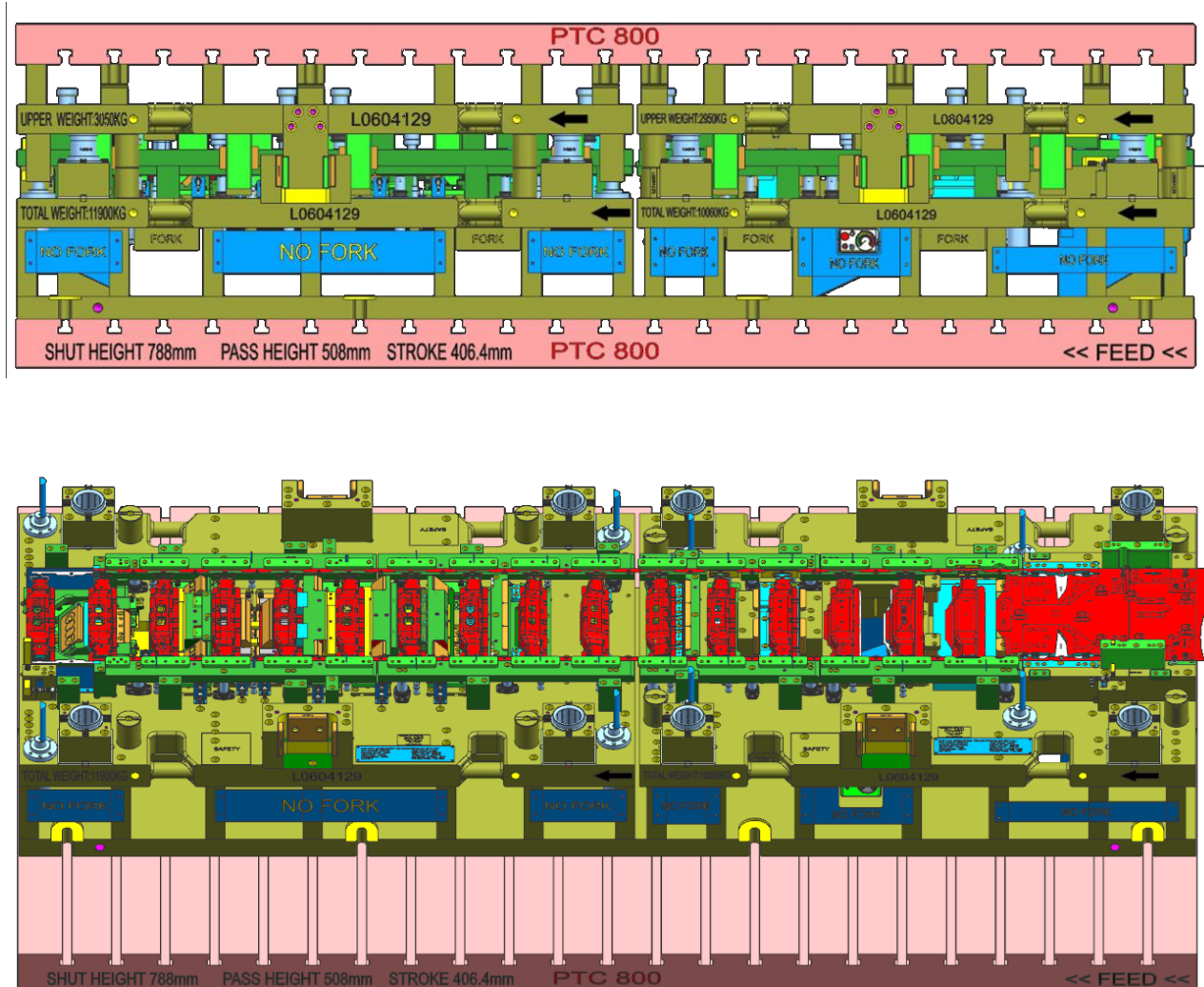
MATERIAL 4140

Example for fixed bolster below:



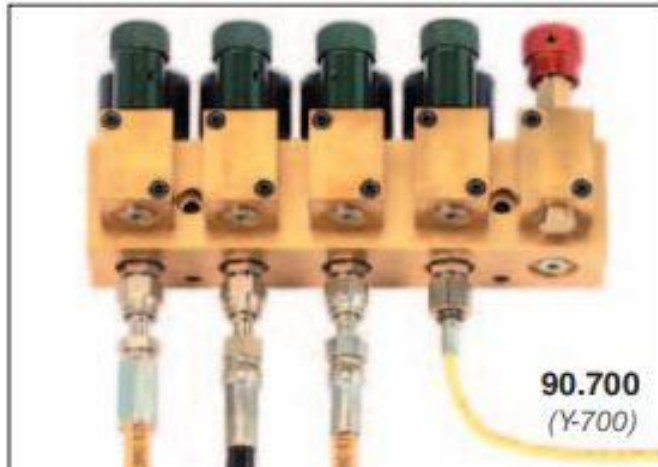
- Any insert over 250 x 250 mm or exceeding 15 kg weight must be split.
- **Heat treatment** certified is requested for each insert.
For Critical Forming areas use **coating DUPLEX VARIANTIC**, any alternative coating process must be approved by Project Tooling Engineer.
- All components and inserts have to be free of welding, shims are allowed but only one shim by component and fixed by a screw.
- **All Die Guide**, as well as Symmetrical pads must have an Error Proof.
- Include Reference holes with coordinates in x-y-z on each Die Set.
- Never use Manifolds plates with Nitro Gas Spring integrated.
- Draw station where **Nitrogen gas springs** are used must have linked system with control panel, also when forming steels are mounted on stripper pad linked system and control panel must be used.

- **Die size:** dies longer than 3000mm, need to be separated, unless agreed by MatcorMatsu Tooling Engineer.



- **Die Weight:** dies weigh more than 15 Metric ton need to be separated, unless agreed by MatcorMatsu Tooling Engineer.

- Use control panel with 6.0 mm quick disconnect fitting. Place it in front and back of tool and use Y-700 Hose only.

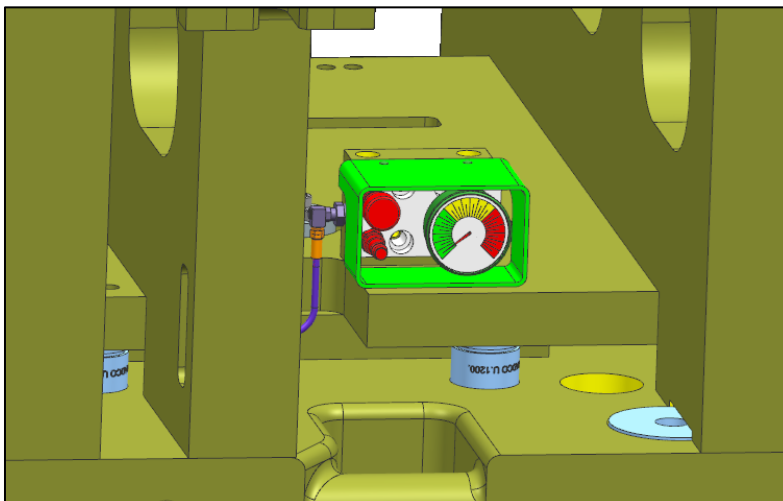


MINIFLEX®

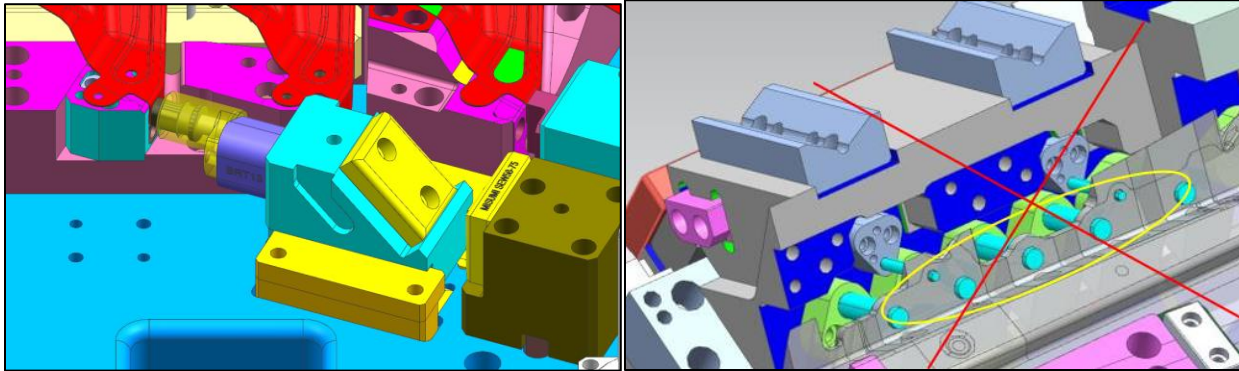
90.700 (Y-700) Hose

- + Offers the smallest possible bend radius available for flexible hose
- + Compatible with mini-fittings for the *MINILink*® System and DADCO Zip-fittings.
- Only permanent crimped adapters available
- Cannot be linked with a surge tank

- **For transfer dies** All Shut Heights tolerances of die sets have to be common +/- 0.5 mm. (T)
For **Die Set Location** 2 pin locators **per station are needed;** 1 to the front &, 1 more to the rear of die.
- The Control Panel Must Be Protected between parallels and add a safety guard.



- Use true strip MOELLER or DAYTON brand strippers for cam piercing



- For material thicker than 2.5mm Nitro Strip can be used according to tooling engineer requirement.



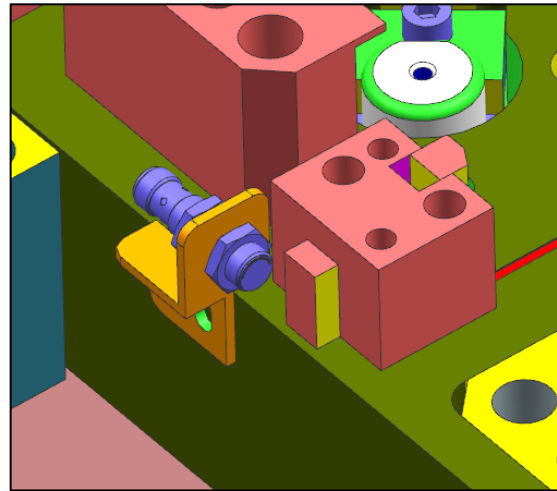
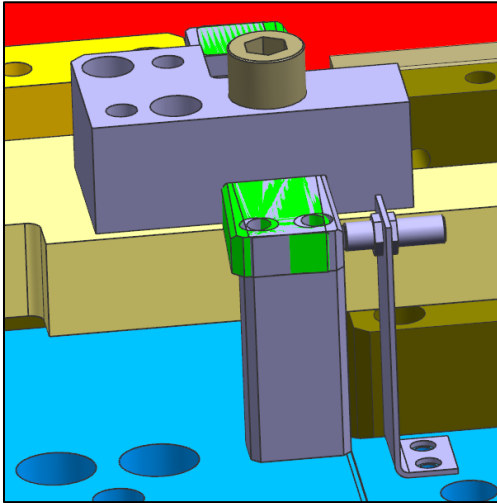
Heavy duty - adjustable force nitrogen gas spring stripper

Direct mounting to standard retainers for ball-lock and ISO headed punches

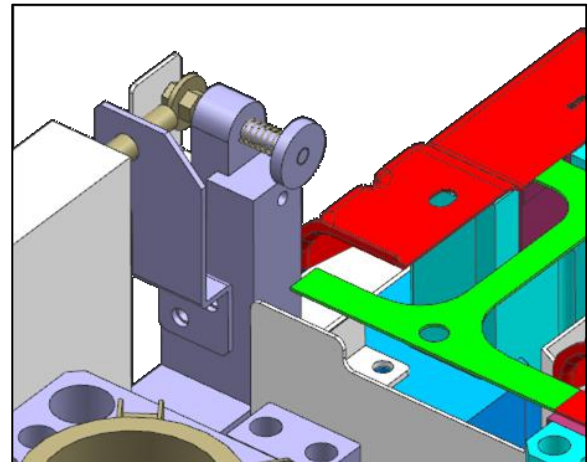
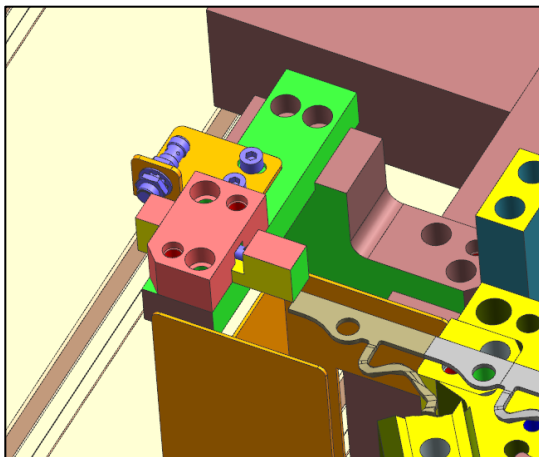


LOWER DIE

- Add sensor and finger according to the process.

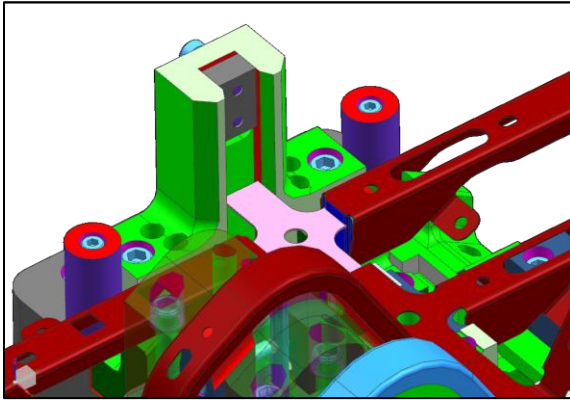


- For lateral carrier use this type of sensor fingers.



- Add sensor covers and pipes to protect the sensor cables

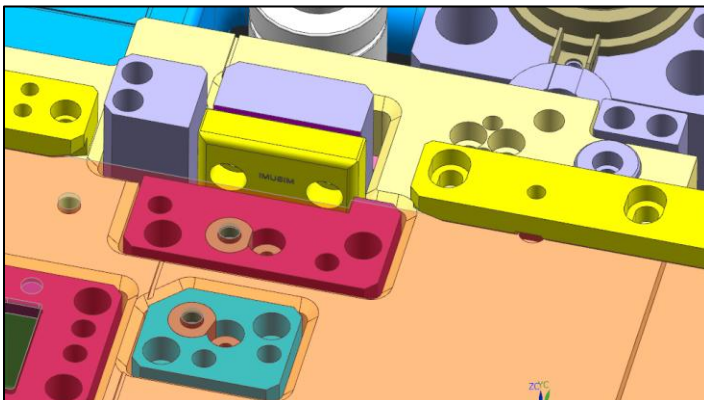
- For center carrier use this type of sensor finger with “V” guide block.



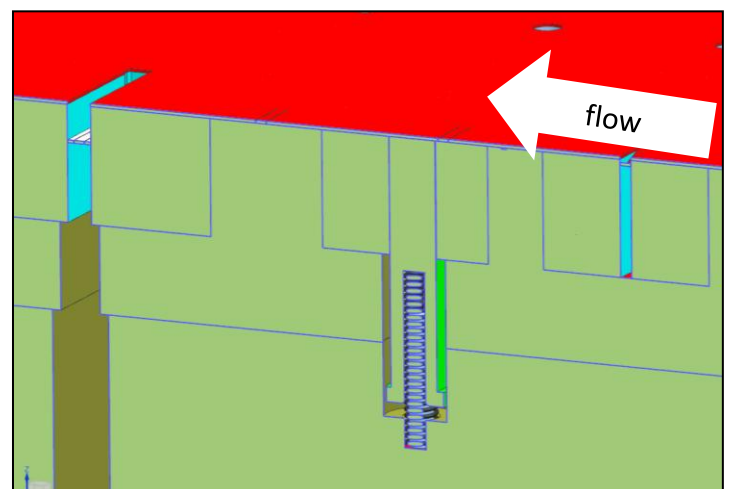
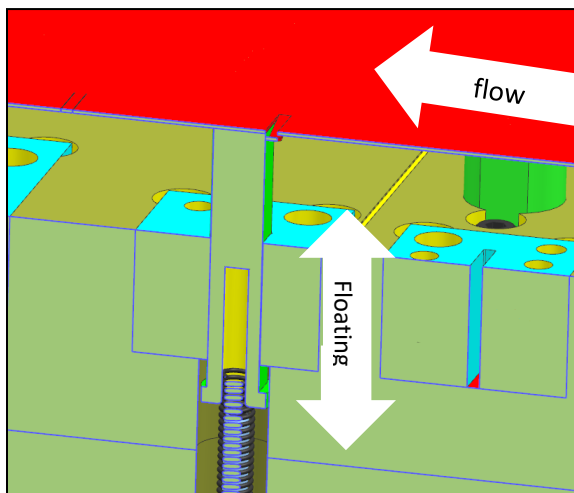
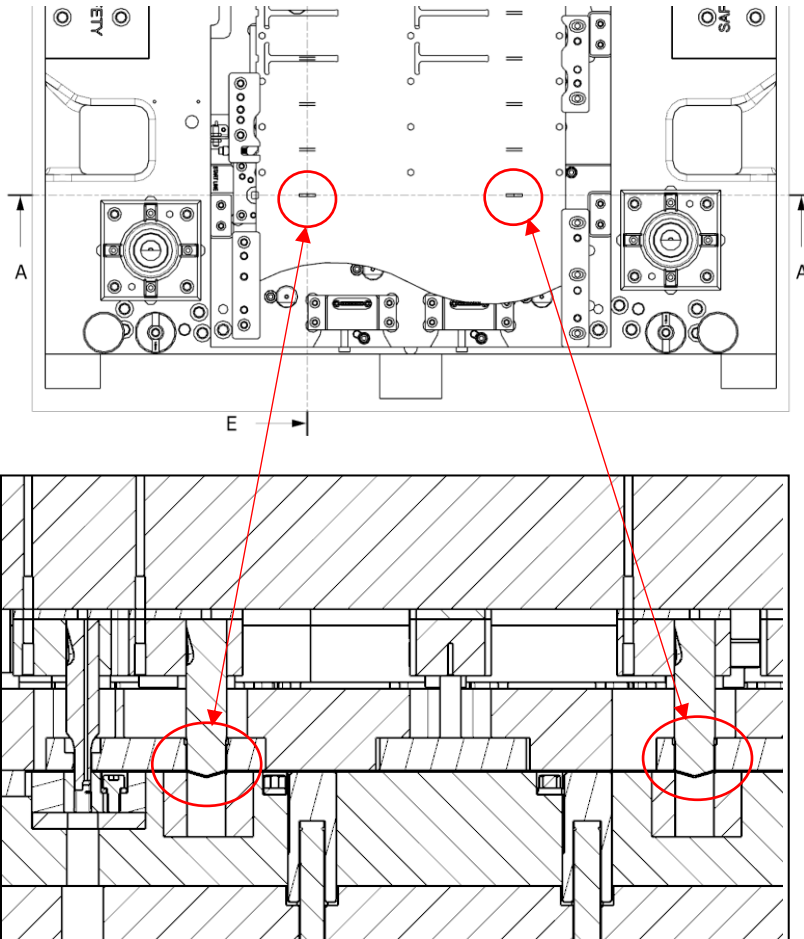
- Progressive dies require at least one solid stop block at the rear of the Die (to avoid over-progression).



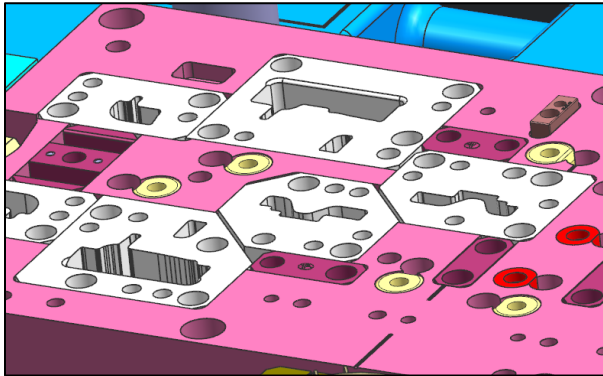
- If a single plate is used as lifter, stop block must be pocketed in die shoe never on the lifter.



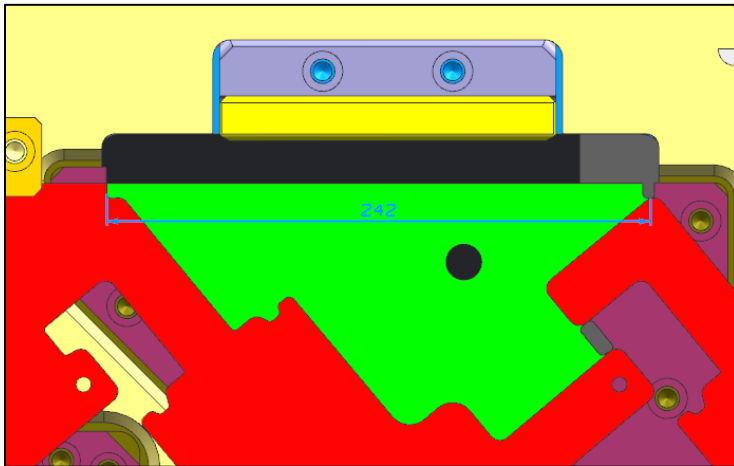
- Use FADE AWAY STOP when French stop is not feasible, as shown below.



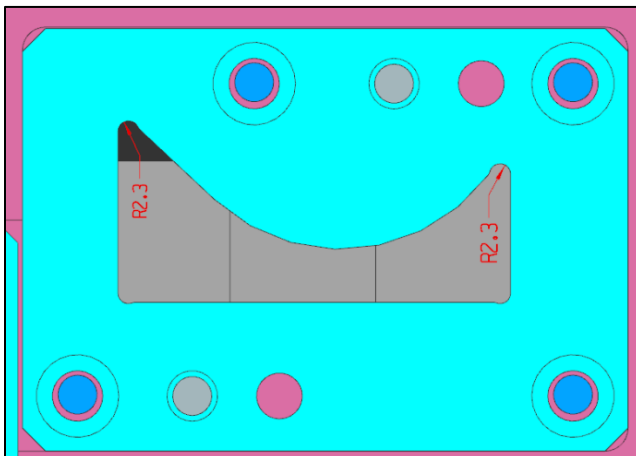
- Lower trim steels must be inserted in pocket.



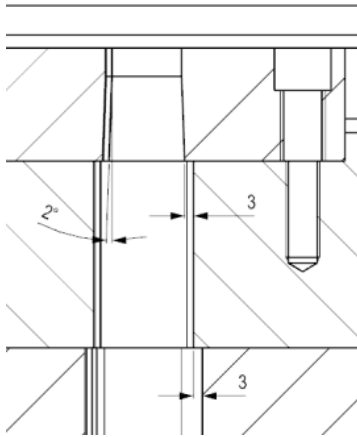
- Maximum Scrap length must be 300.0 mm.(T)



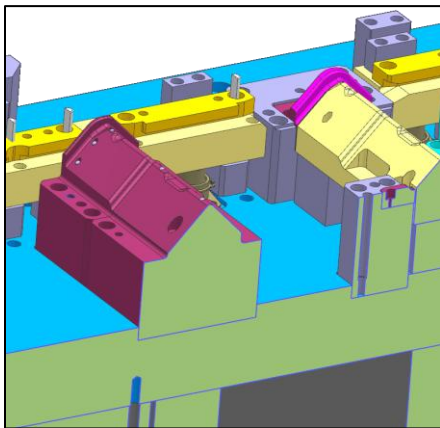
- For blades “Inner Sharp Corners are not allowed” use at least 2.0mm Radius.



- The Scrap falls for blades and button dies must be machined 2 Degrees and open 3mm gap to avoid Scrap Jam.



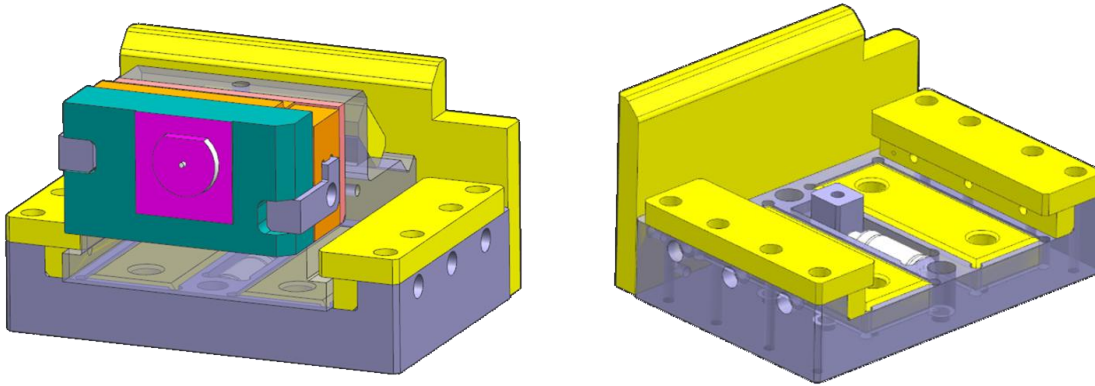
- Forming steels must be pocketed.



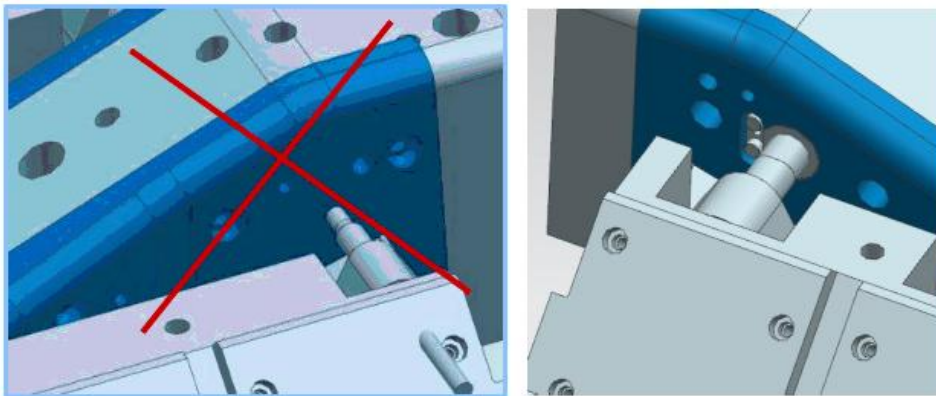
- Bottoming Marks to be installed in all draw & restrike section (argon brand) (Transfer Dies Only).



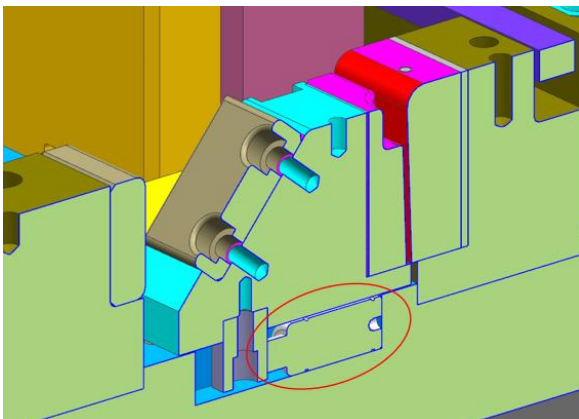
- All cam slide design must be adjustable for easy maintenance.



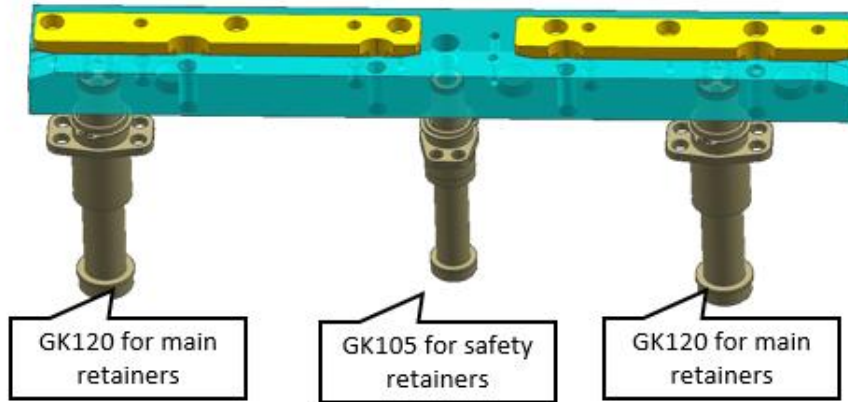
- If cam trim and piercing are made together, use standard button dies whenever is possible for easy maintenance.



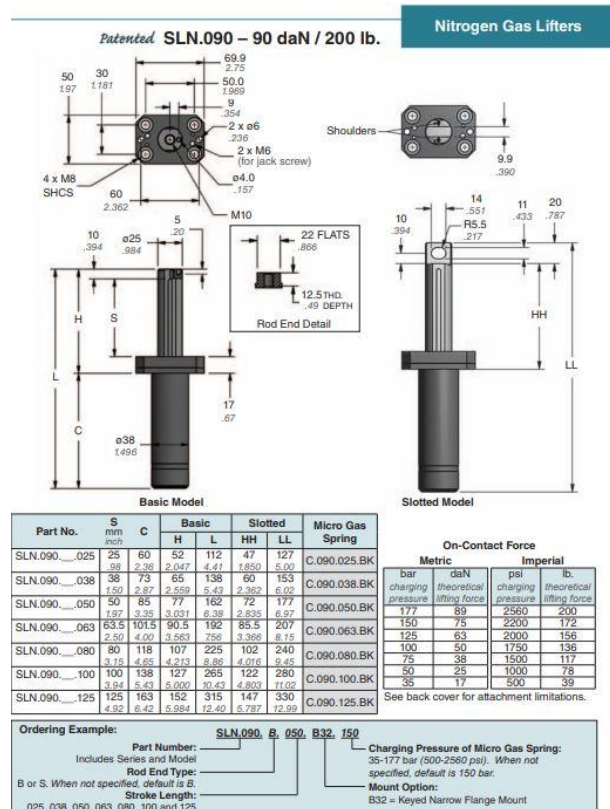
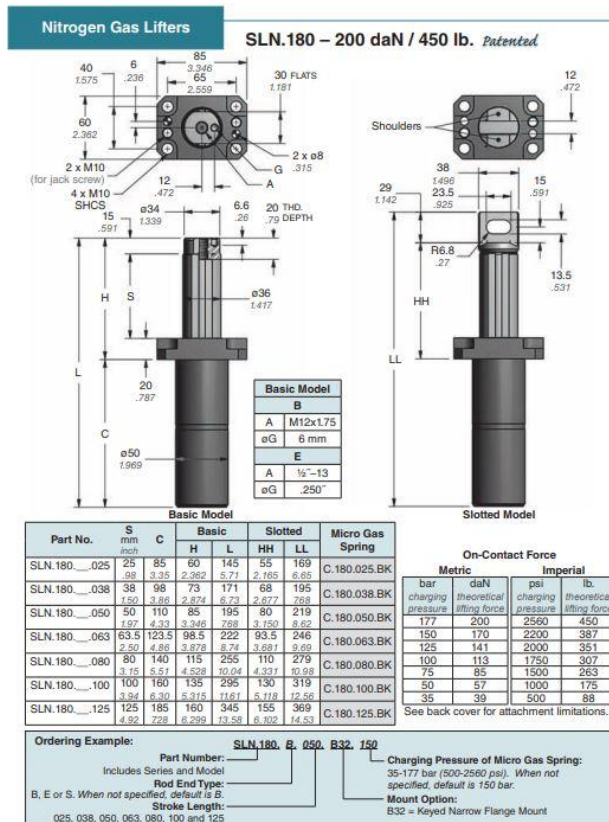
- Coil springs are not acceptable in any CAMs, nitro gas springs must be used.



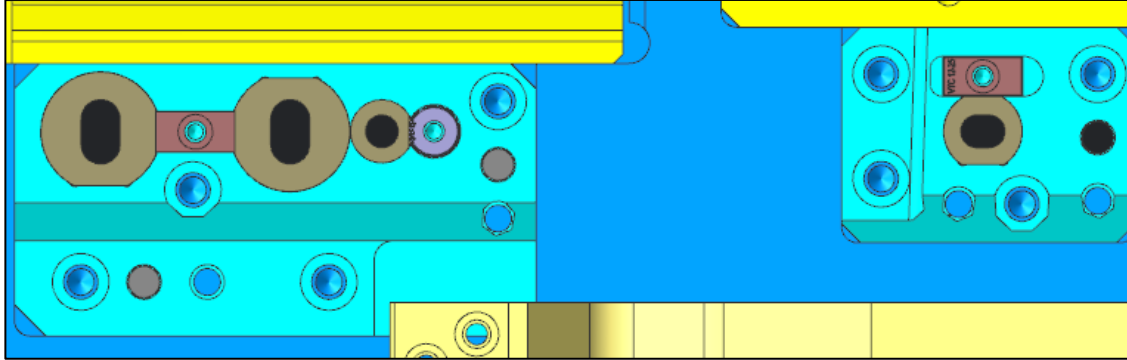
- For lifter bars use standard lifter as shown below. Guide bushing and pin can also be used.



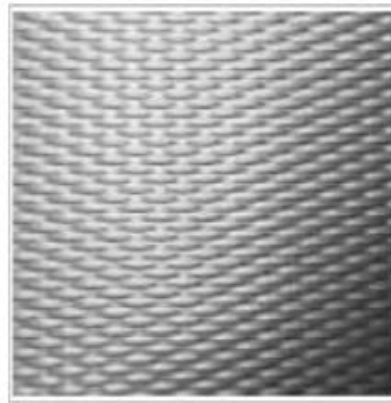
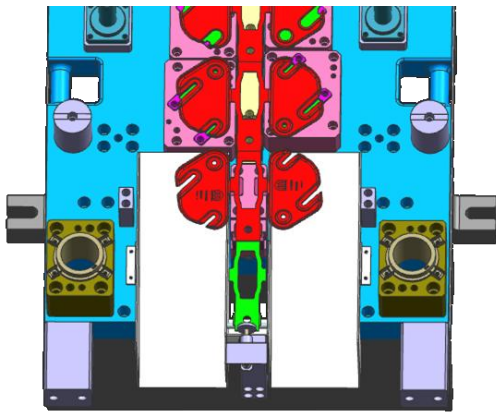
- DADCO brand can also be used for lifter bars.



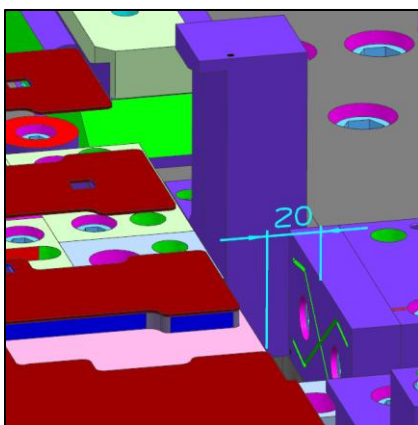
- For non-round holes (slot holes, square holes, etc..) use a flat face as error proof as show below.



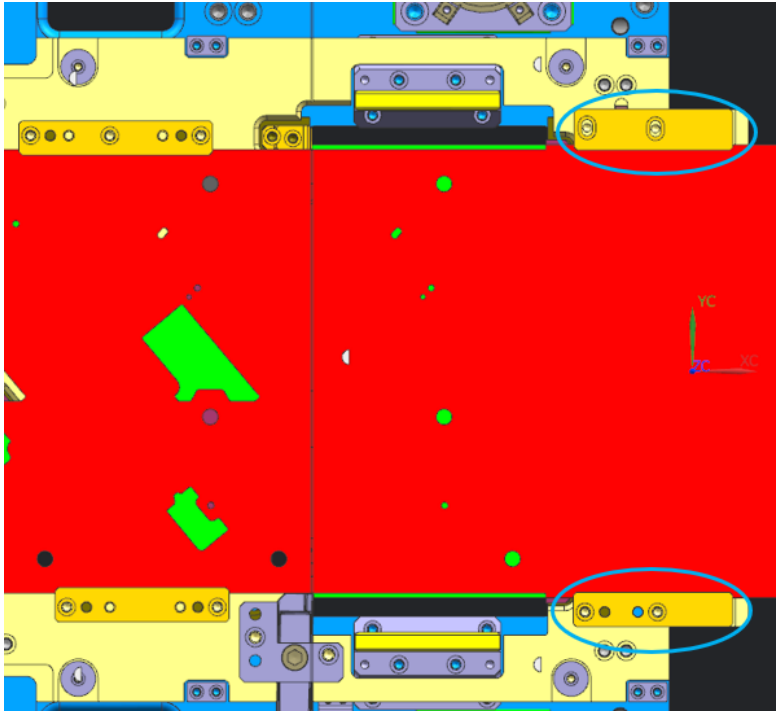
- Part chute thickness must be 3.0mm, also bubble sheet is required.



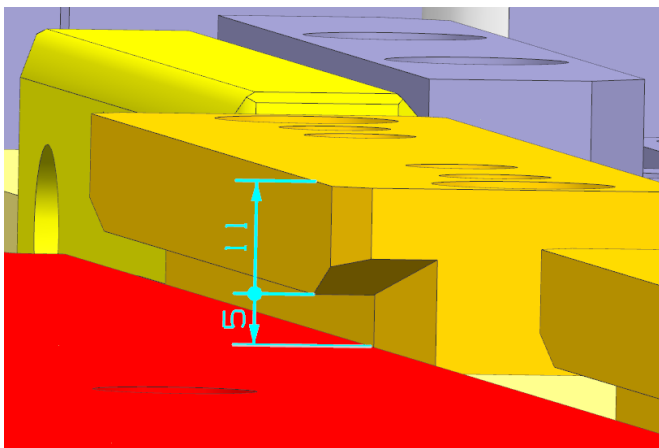
- Progressive and blank dies must be ready to run when coils arrived wider, consider (on trim just before French or solid stop) 20mm between original coil width edge and backing plate as show below.



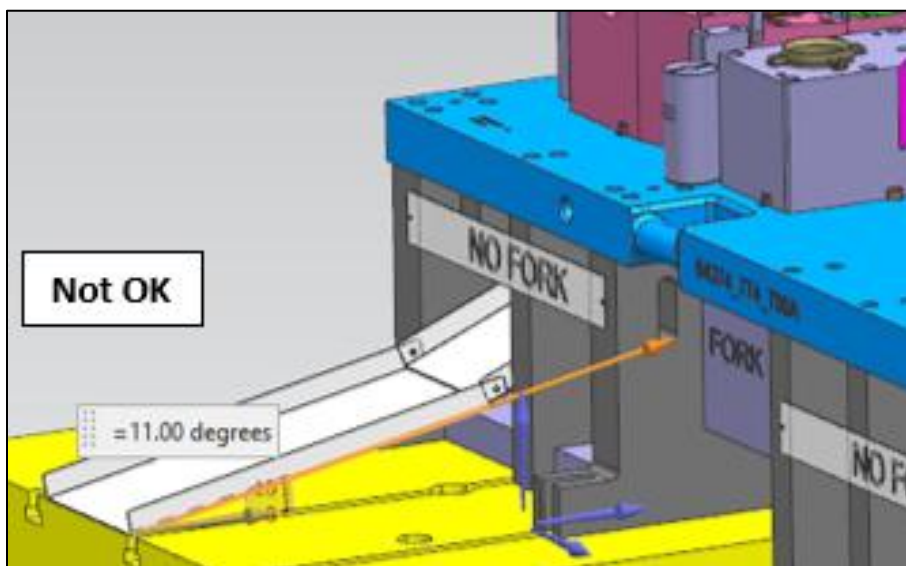
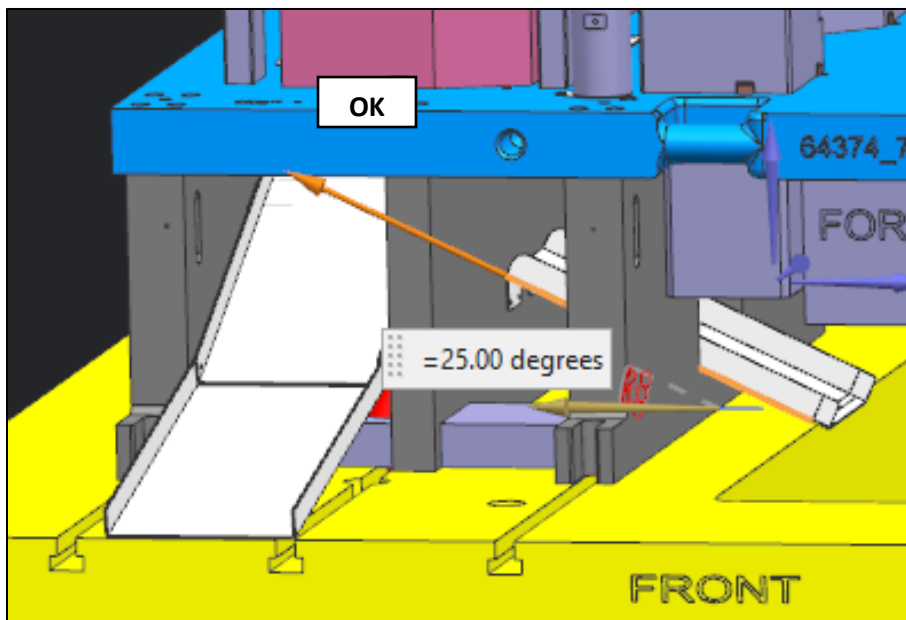
- **Stock guides**
 - Adjustable guides ($\pm 8.0\text{mm}$ of nominal coil width) must be placed on rear side of the die, and fixed guides on front side of die.



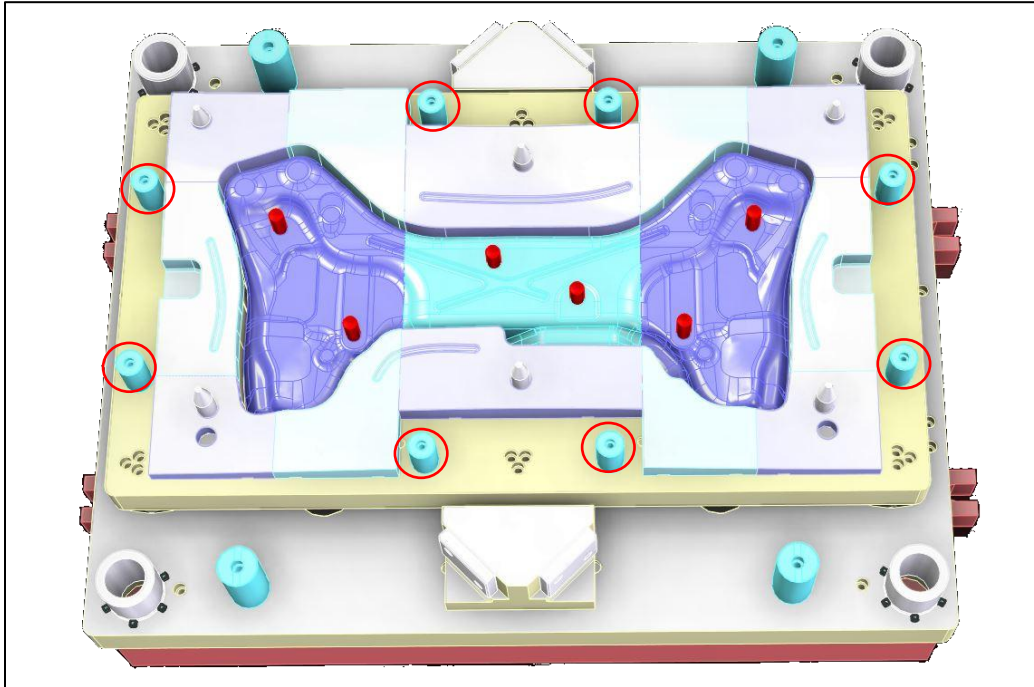
- Dimensions to be use for coil guides.



- **All the Scrap Chutes** must be strong enough 3.0mm thickness and need to be Bolted to the Parallel Bars
- Scrap to be directed to center bolster holes when available.
- Minimum angle accepted in scrap chutes is 25°.
- If 25° is not possible to achieve, tooling engineer needs to approve it.



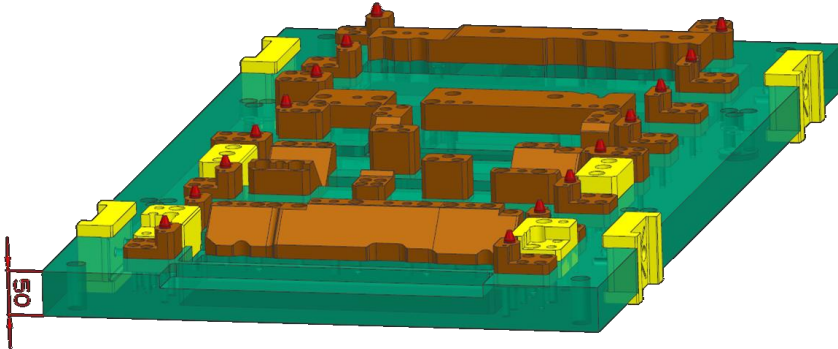
- All the Blank Holder must have equalizer Blocks.



- In Transfer Die, Blank Holder must be Coated with **DUPLEX VARIANTIC**, any alternative coating must be approved by Project Tooling Engineer

UPPER DIE

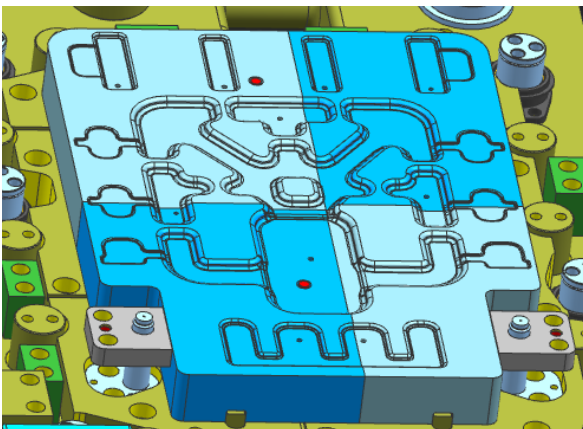
- Use at least 50mm thickness for stripper pads.



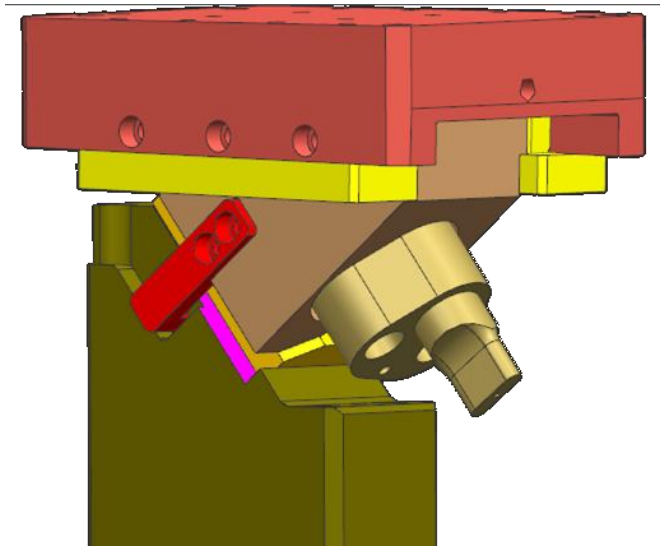
- Stripper pad windows plates must be pocketed with jack screws.



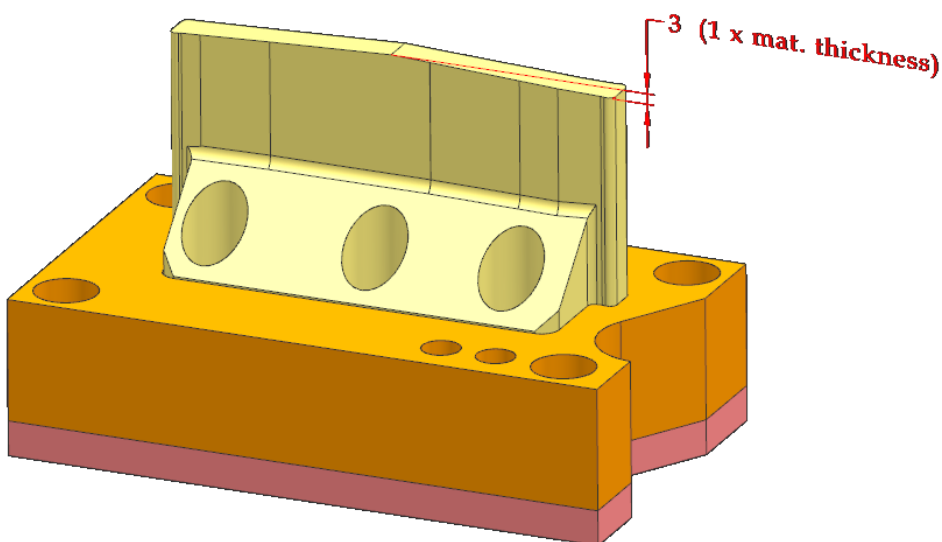
- All the Forming steels bigger than 300mm Should be split in parts for easy maintenance.



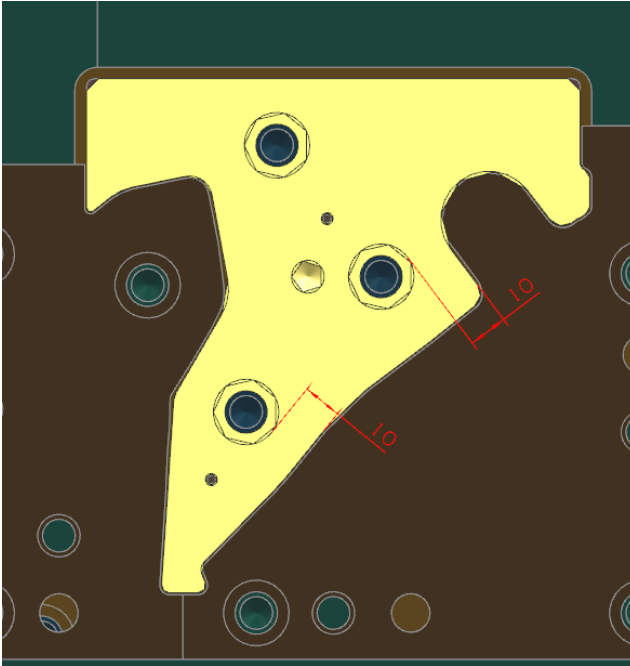
- **Lifting holes** for stripper pads and big components must be no smaller than M16.
- Cam slides must have 2 positive pullbacks or Return Guides. Two bolts required for each one.



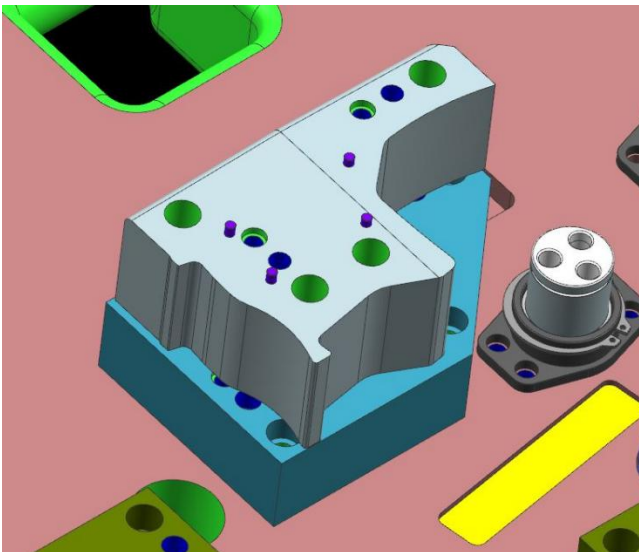
- Trim punches must be sharpened with scissors angle 1 material thickness height.



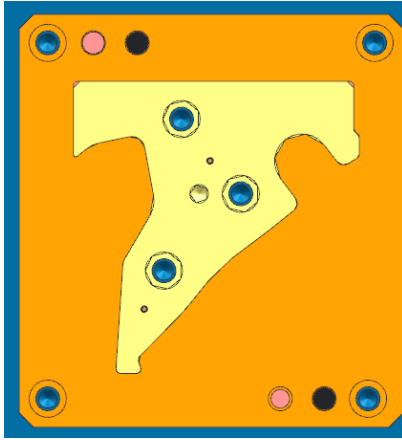
- Minimum distance allowed from trim edge to holes must be 10mm



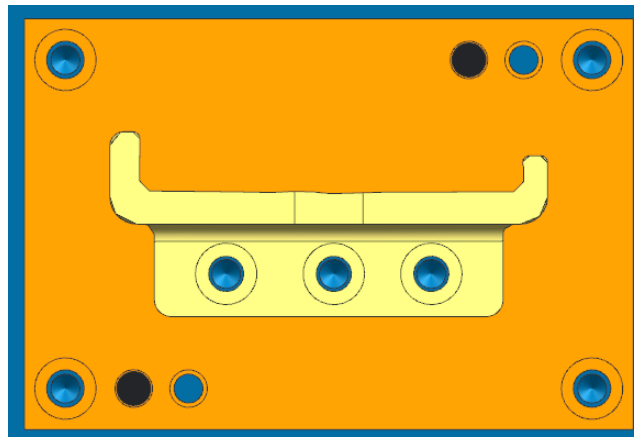
- All the Big and tall punches must be mounted on a base plate.



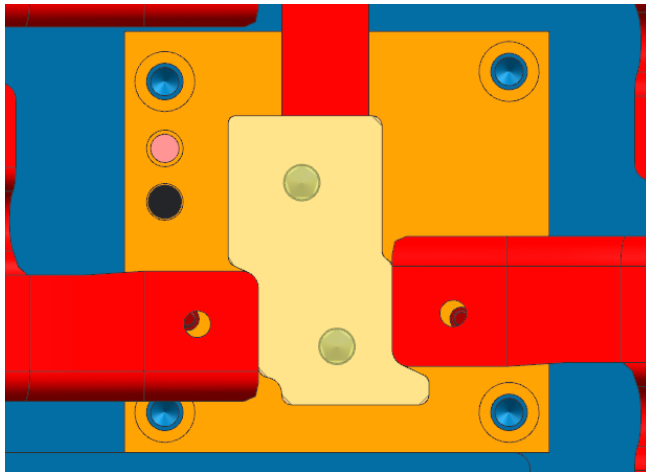
- Type of trim punches allowed.



Screw from top



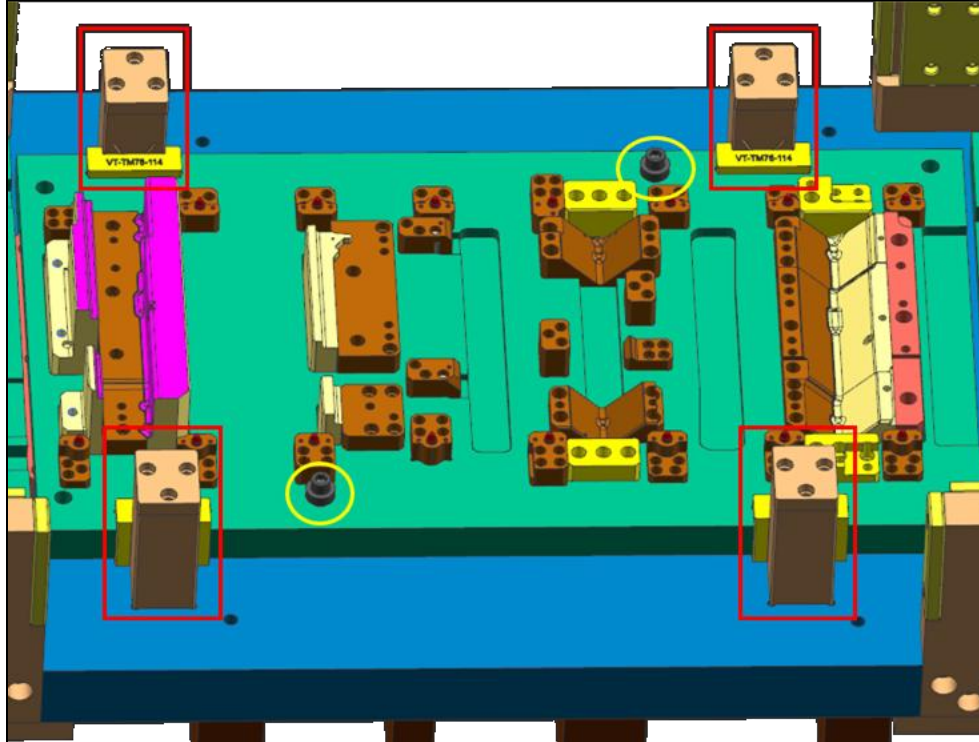
Screw from shank



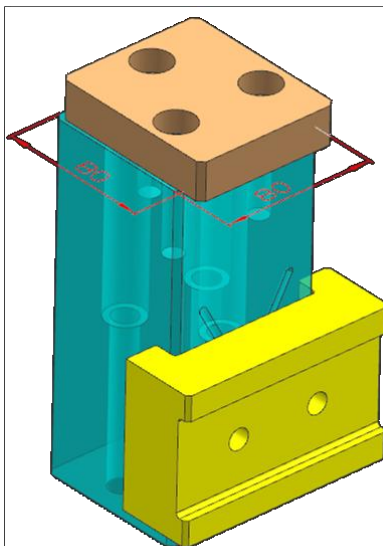
Screw from bottom

Allowed Only when screw from top or shank is not feasible.

- Use guide blocks on stripper pads and 2 safety spool retainers when forming with pad.



SPOOL RETAINERS



Part 10

CSR

	L
Ls100	Ls613
Ls110	Ls655

① SCM435
Strength class 12.9

② S45C
③ 38~43HRC
④ Black oxide (Fe/D)

D _{out}	d _h	d _r	d _s	MXP	h	T	ℓ
10	±0.007	10	15	6.3	6X1.0	6	5
13	±0.032	13	18	8.4	8X1.25	8	5
16	±0.075	16	24	10.6	10X1.5	10	8
20	±0.040	18	28	12.6	12X1.75	12	10
25	±0.092	24	36	16.8	16X2.0	16	13
32	±0.150	30	45	20.8	20X2.5	20	16

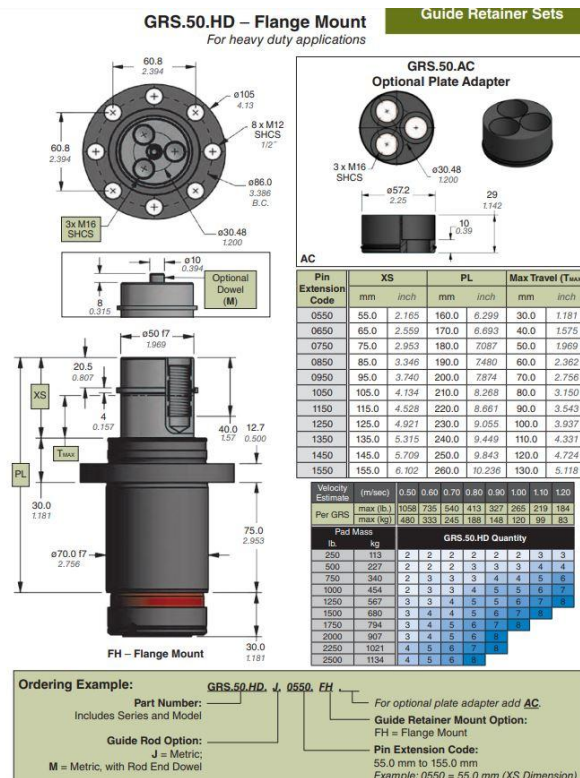
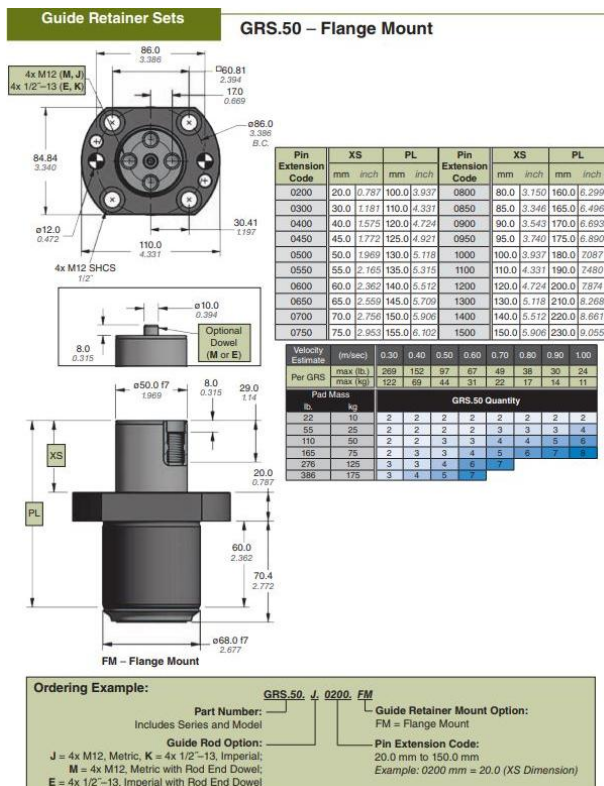
Catalog No.	L												Base unit price 1~15 pieces
Type													
CSR	10	10	15	20	25	30	35	40	45	50	55	60	Quotation
CSR	13	15	20	25	30	35	40	45	50	55	60	65	Quotation
CSR	16	20	25	30	35	40	45	50	55	60	65	70	Quotation
CSR	20	30	35	40	45	50	55	60	65	70	75	80	Quotation
CSR	25	40	45	50	55	60	65	70	75	80	85	90	Quotation
CSR	32	60	70	80	90	100	110	120	130	140	150	160	Quotation

- Retainers.

- Standard lifters GK180 or bigger can be use. Guide pin and bushing can also be used.

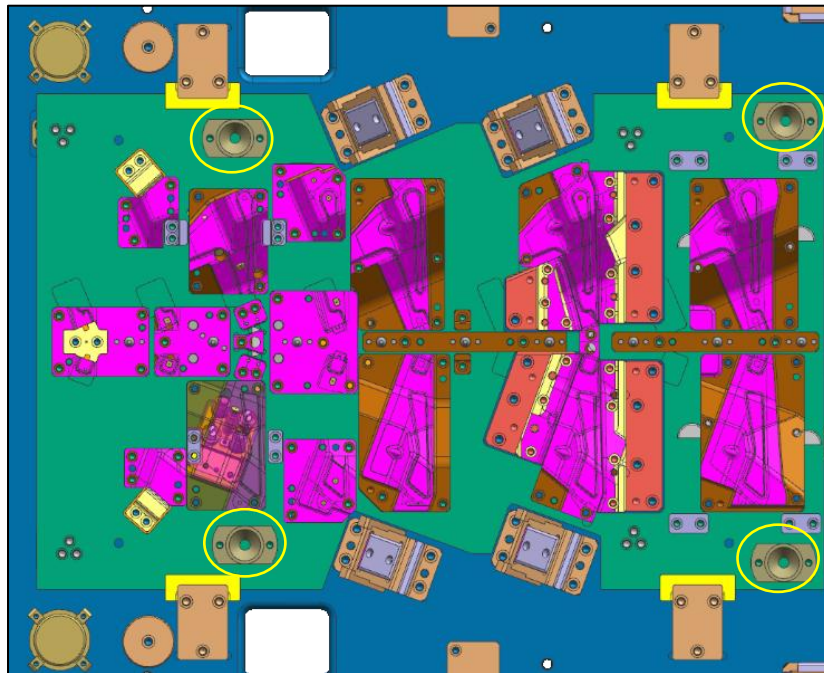
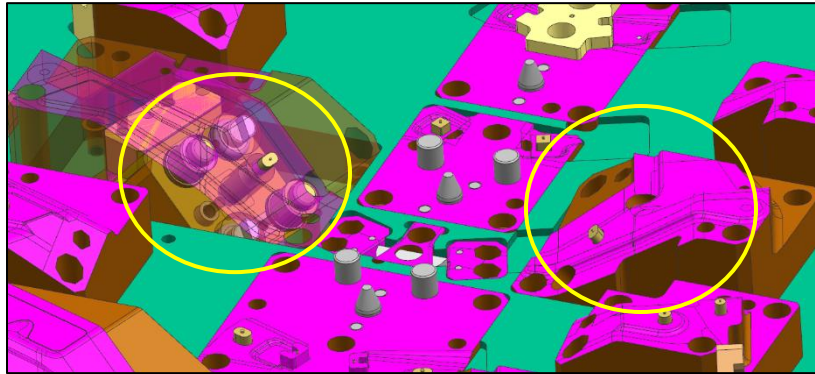


- For DADCO brand GRS.50 (light duty) and GRS.50HD (heavy duty) can be used.

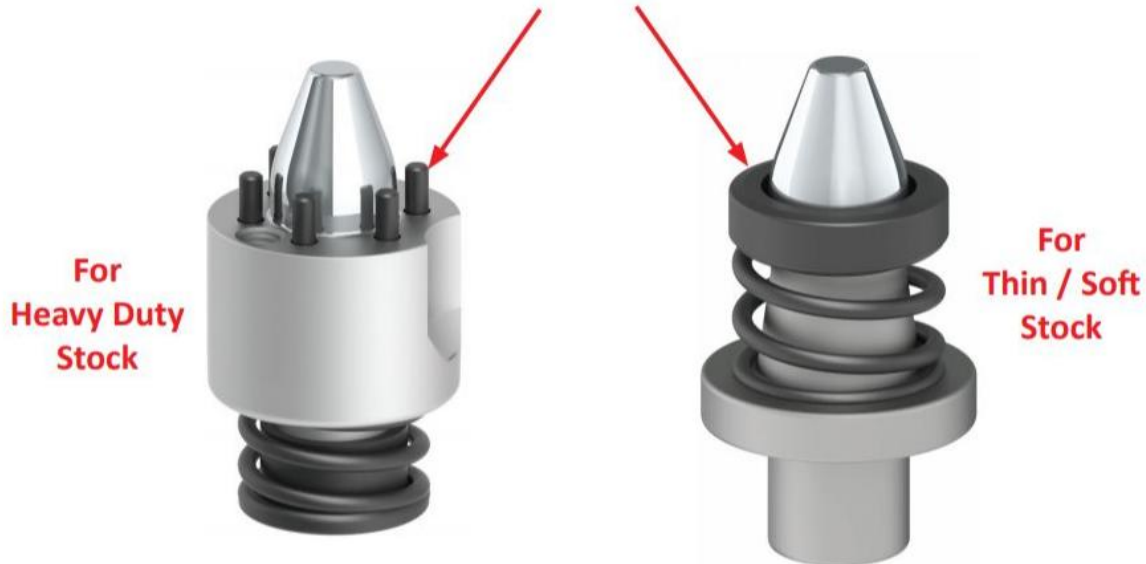


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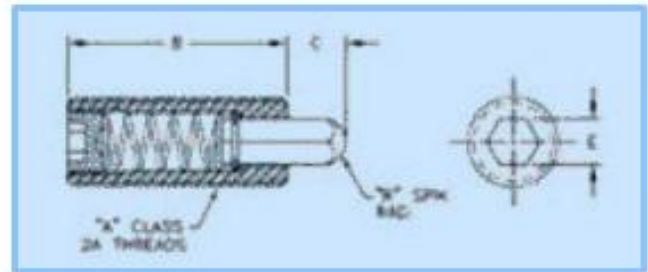
- If aerial cam mounted on stripper pad is needed, centering cones must be used.



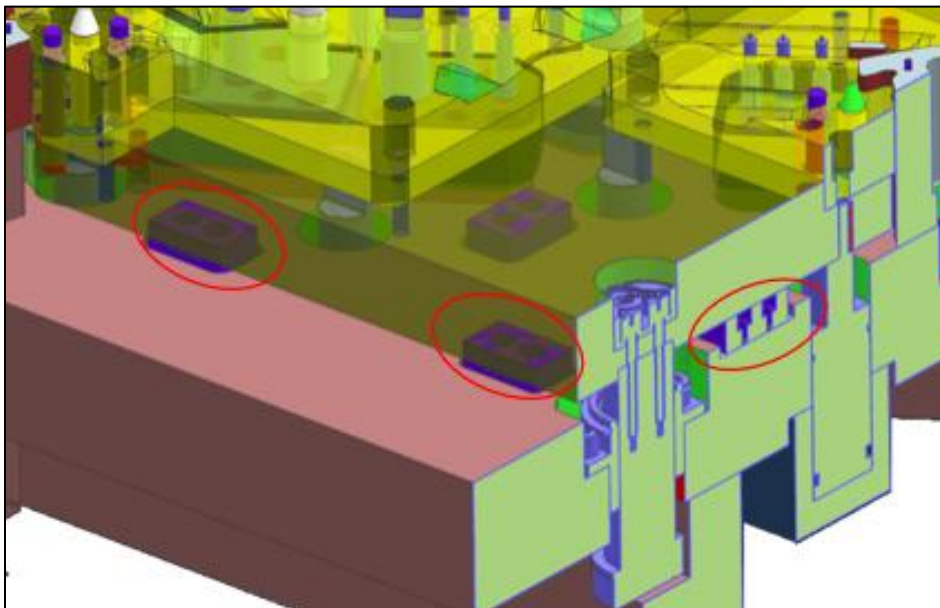
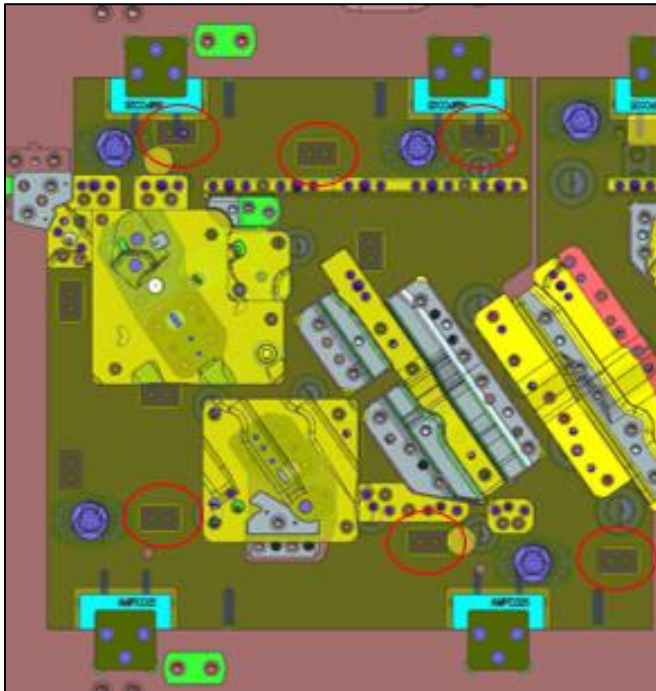
- Ejectors are required for pilot pins. Standard lifter pilot is preferred when there is enough space.



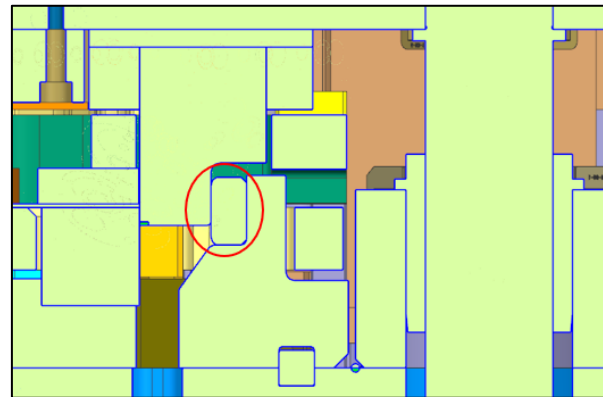
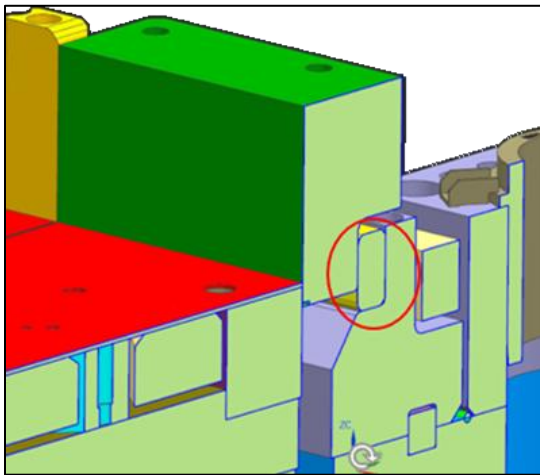
- If Spring plunger is needed (Must be hexagon Tip M10 minimum) Misumi brand.



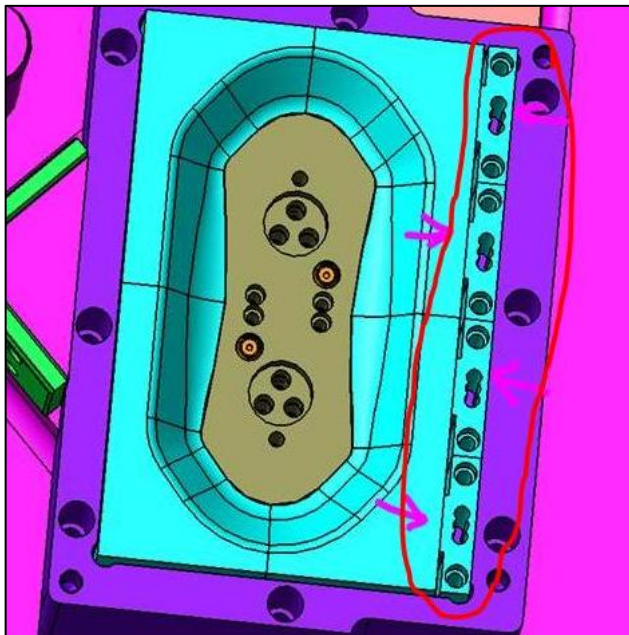
- Stripper pads must be backed up with limit blocks when forming with pad.



- All the trim Punch must have a Bronze Backing Plate 20mm size, and need to back up 10mm prior to cut.



- All the Forming Inserts Must Have a **“Fuse”** to avoid damages in case of double blank.
(due to the slots on the keys if double blank is processed the forming steel doesn't break because the key is going to be compressed).

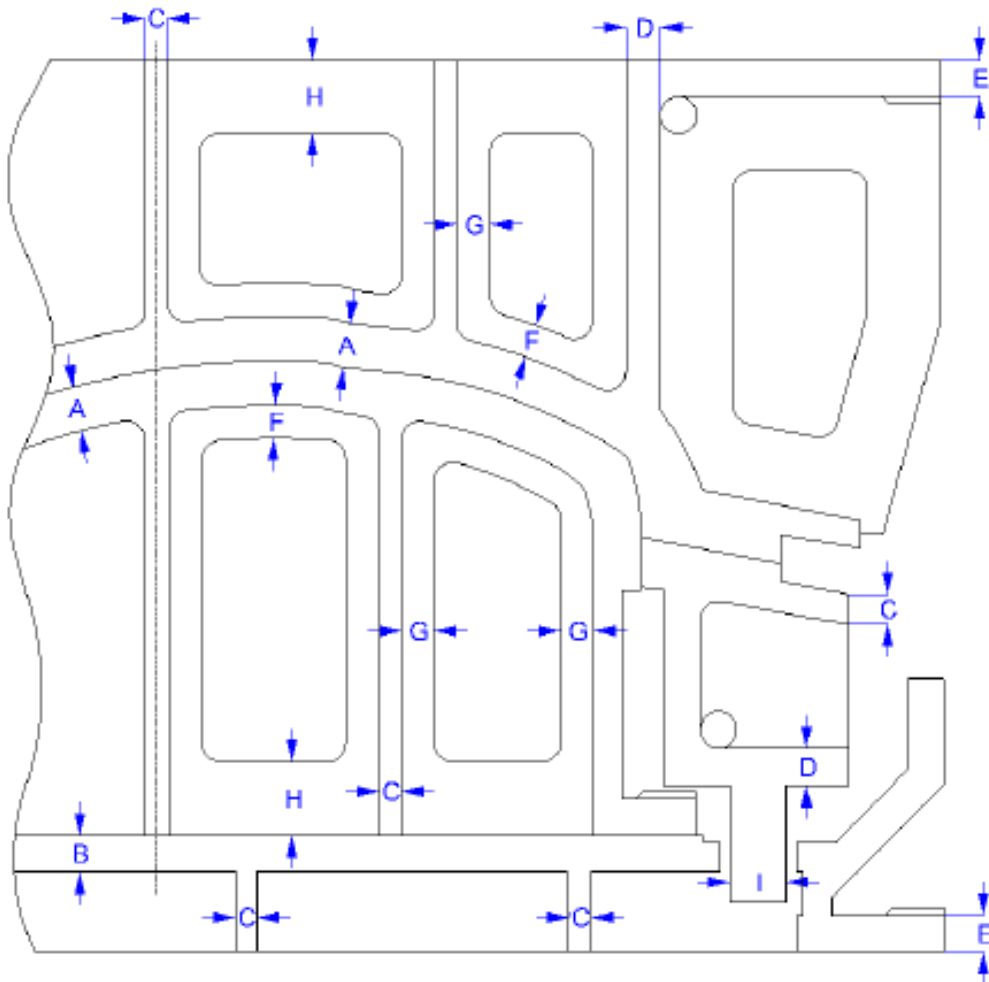


- All pockets for lifters or pilot holes on the base plate, must have a drainage hole.
- All the Forming & Restrike Operations must have a Lube Holes 8mm Diameter prepared and machined inside to use using Hose 6.35mm (1/4") and Quick connection in Upper Shoe.
- Once the Die is ready and Buy Off is Complete, the Tool Shop Supplier **MUST** Scan and update die design all trim and forming steels.
- The Cost of Coating **MUST** BE considered into the Supplier Quotation.
- Early sample parts must be stamped by Forming Die Complete, trim and holes by Laser Cut, expected 80% Minimum vs. Checking Fixture or Dimensional Report.
- Buy Off Sample Parts **MUST** BE at 100% vs. Checking Fixture and sit in all nets at Free State Method, before shipping.
- 300 pcs buy off sample parts need to be shipped with die; Cost should be included in die cost at time of quotation, unless otherwise instructed by MatcorMatsu.

4. CASTING DIE DESIGN.

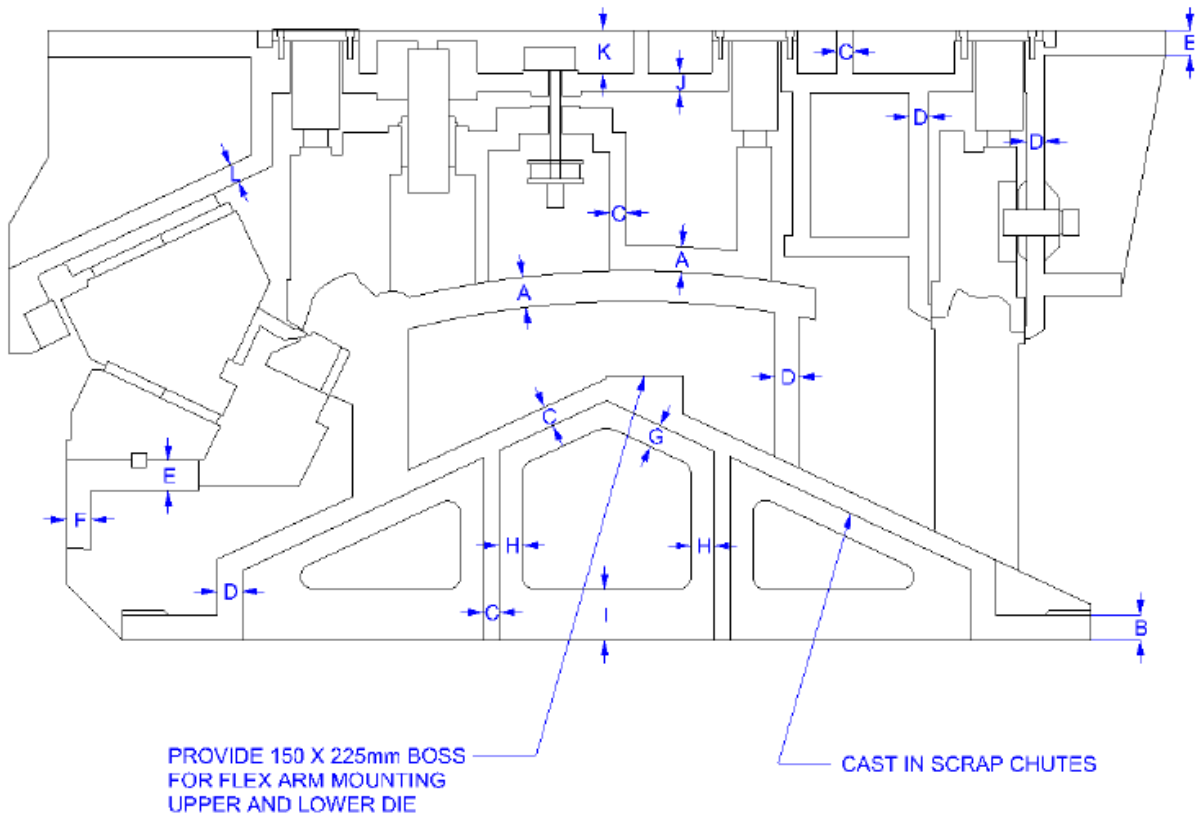
DIE SHOES / RISERS	GM-238
DRAW DIE PUNCHES	GM-190-M,GGG-70L,GM-338
BINDERS	GM-241-M / GM-246-M
FORM AND FLANGE	GM-190-M,GGG-70L,GM-338
PADS-FORM AND FLANGE	GM-238-M, GM-241-M, GM-246-M
PIERCE PUNCHES	M2
BUTTONS	A2
TRIM STEELS	D2
CAM DRIVER	GM-238-M
CAM SILIDE INSERTED	GM-238-M, GM-245-M
CAM SLIDE NON- INSERTED	GM-241-M

- DRAW DIE CASTING CONSTRUCTION**



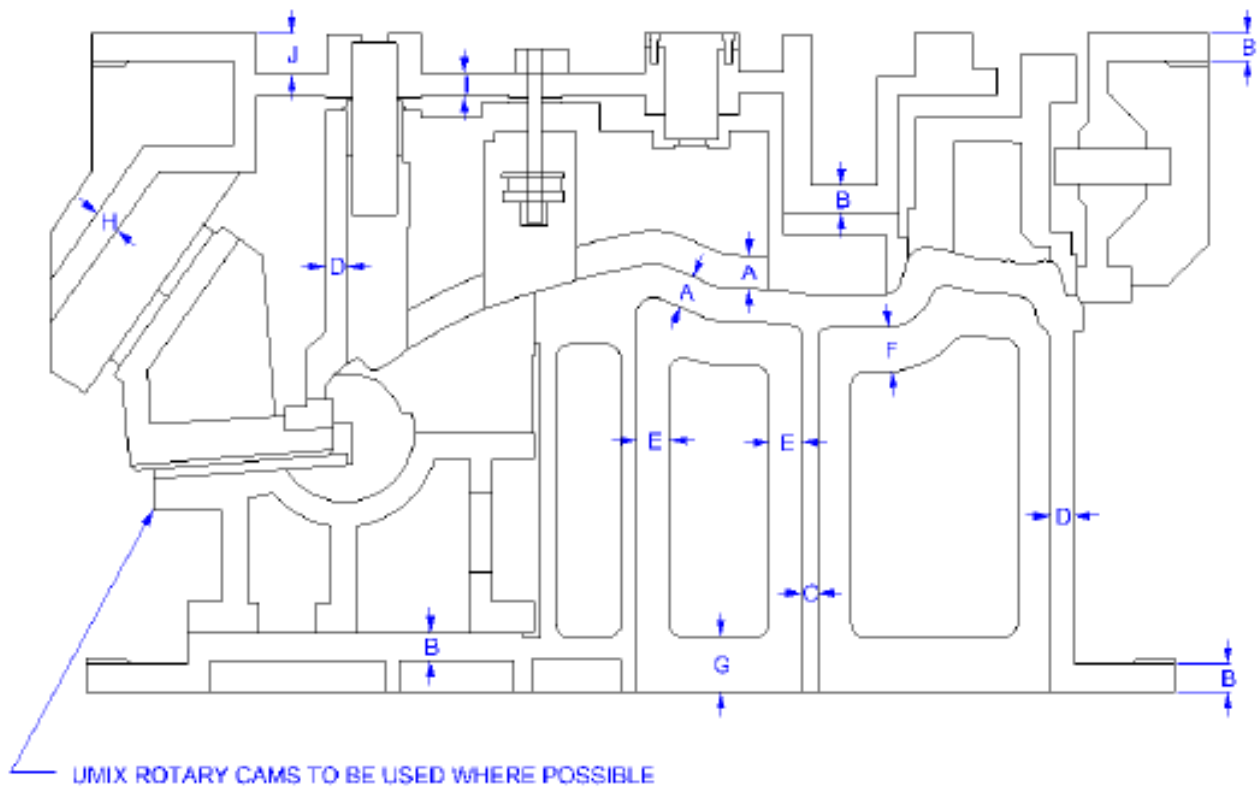
	A	B	C	D	E	F	G	H	I
mm	60	50	30	40	50	80	60	100	80

• TRIM DIE CAST CONSTRUCTION



A	B	C	D	E	F	G	H	I	J	K	L
60	50	30	40	60	50	80	60	100	40	20	40

- FLANGE AND RE-STRIKE DIE CASTING CONSTRUCTION**

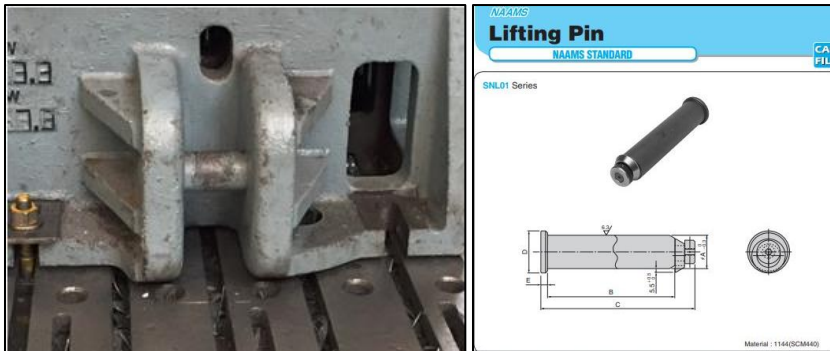


A	B	C	D	E	F	G	H	I	J
60	50	30	40	60	80	100	40	40	20

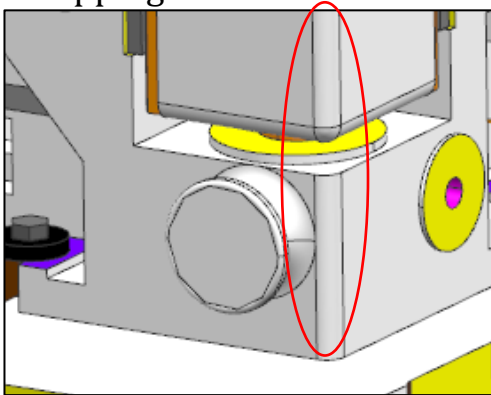
- **Lifting**

Tooling engineer will advise if the die use lift lugs with pin or lifting knobs.

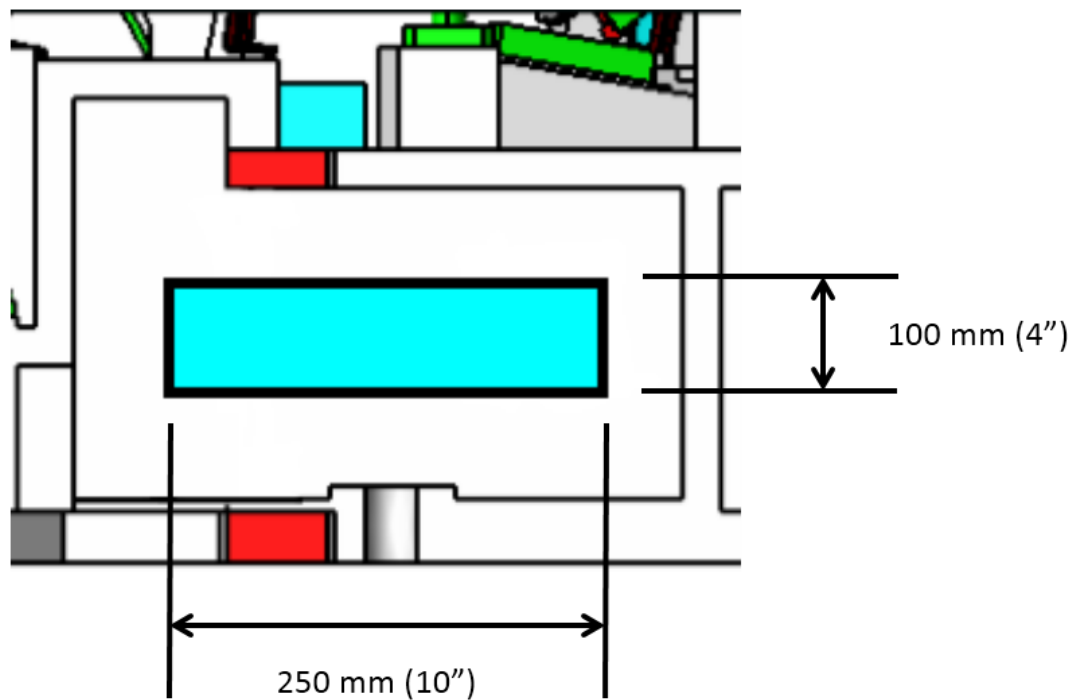
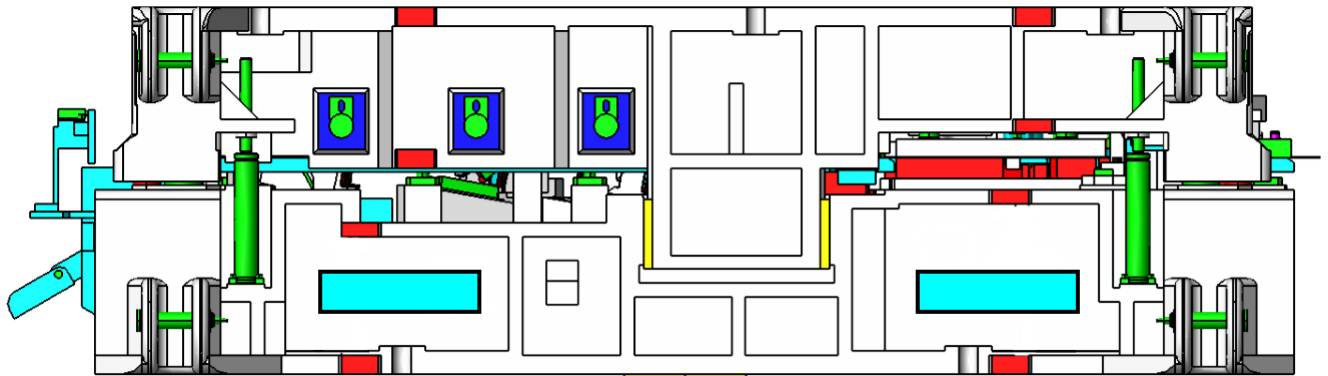
- **Use Lifting Pin according NAAMS standard and keep 85.0 mm free all-around the pin for crane hook access.**



- **Add a radius at edge where the Chain or cable is in contact when lifting or flipping.**



- All the Casting Dies Must Have Access to use Shakers to recover all the Scrap generated in all the Trim and Pierce stations, with the minimum dimension shown in the drawing below.



5. AUTOMATION

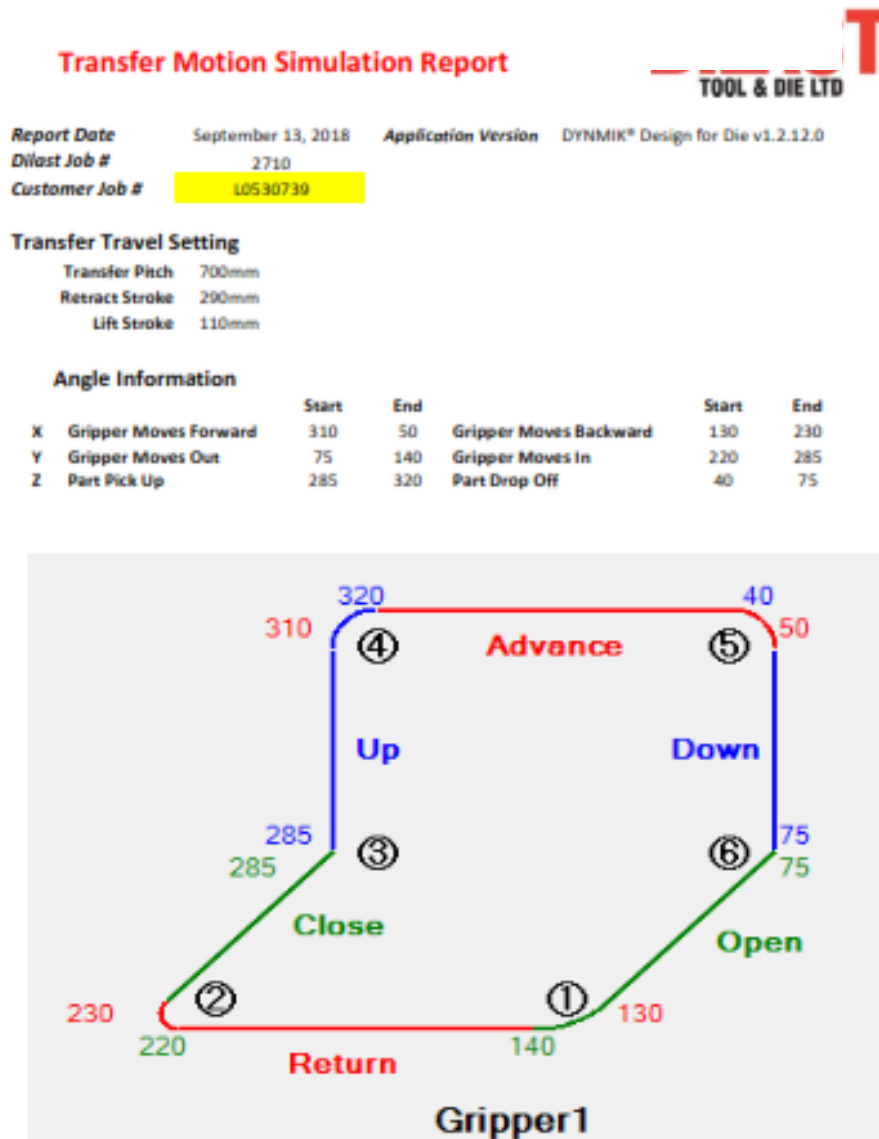
1. Fingers or clamps Should be 65mm wide x 65 mm deep x 65mm Height of clearance all around, when die is closed, however during Design Review is necessary define the Cavity depending on the Part design.

PHD brand grippers to be used to check clearance.

2. Restrictions to transfer dies:

- a) Different shut height, pass height & distance pitch, between stations is not acceptable.
- b) Fingers entrance area should be considered (65mm minimum under the part).
- c) Each station must have a fast positioning for the part (Guides, Pilots & Locators).
- d) Eliminate any flip over during transference of the part and/or part angle changes between stations (any question ask the tooling engineer).
- e) Keep the part always stable after being processed (without movement).
- f) Heel blocks or guide post must not have interference with the part when is in transference to the next station?
- g) Part out must be only over the conveyor, not possible to the front or back of press.
- h) Do not use pneumatic lifters.
- i) Die designer must Focus in Avoid lifters, in order to keep stable part and increase the SPM.

- **KINEMATICS SIMULATION must be Developed during the Design**
 - **Kinematics simulation report must be prepared as show below.**



- If there are interferences or any issue, proposals must be given by SIM supplier as show below.





Timing Chart: No violation chart has been saved or imported.

Crank Angle: 180

Press Stroke: 0

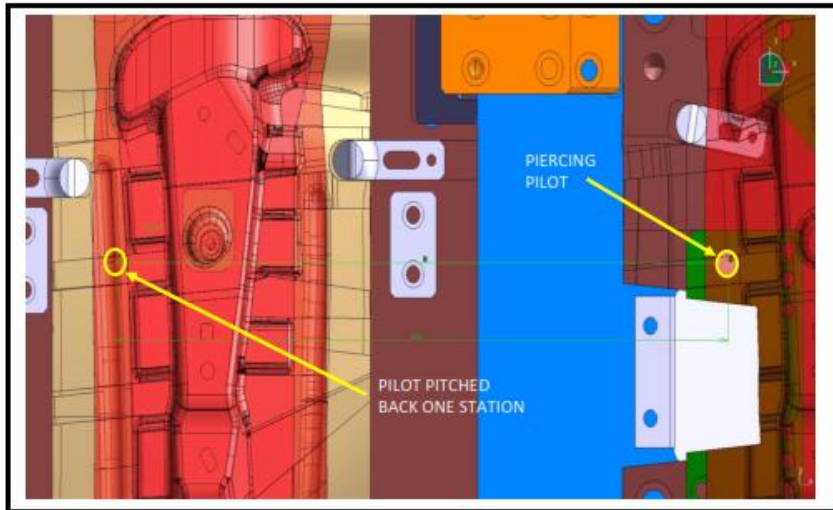
Lift: 0

Clamp: 175

Pitch: 151.506

Violation Type:

Items Affected:



Comment(s):

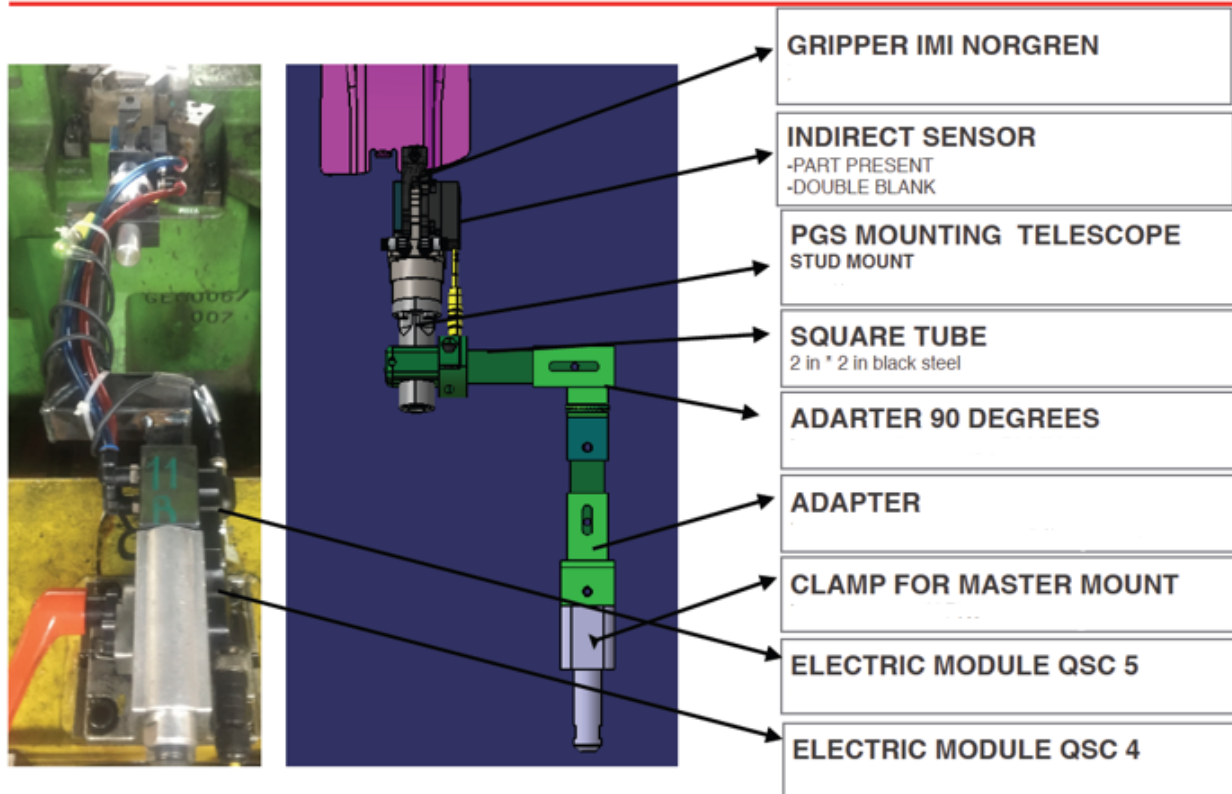
The draw beads are not included in part variations. The pilot is going to end up in the draw bead. Piercing and piloting in the middle of a draw bead can be problematic and create poor die conditions. Also there isn't clearance in lower die for draw beads in the two trim stations. Please review.

- **GRIPPERS SYSTEM:**

Complete gripper information and CAD 3D will be provided by MatcorMatsu for die design and 3D motion simulation.

GRIPPERS SYSTEM

Automatización



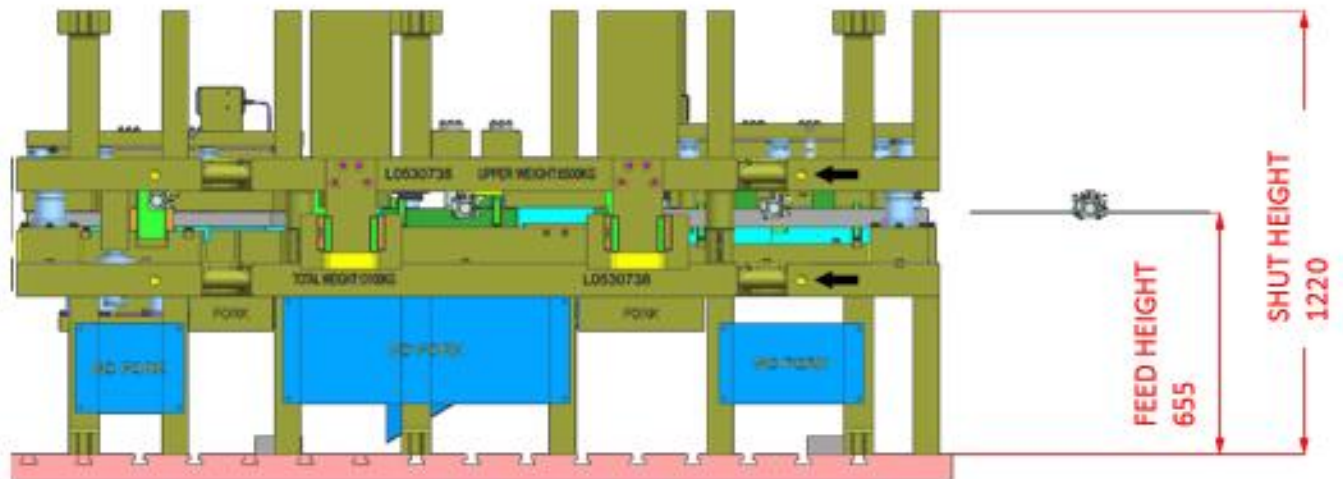
6. PRESS SPECIFICATION

MatcorMatsu will provide press information (3D file and all information needed for die design) as example below.

WIA 3000 TON.

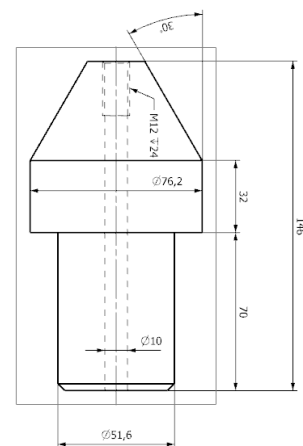
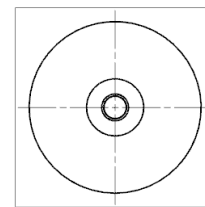
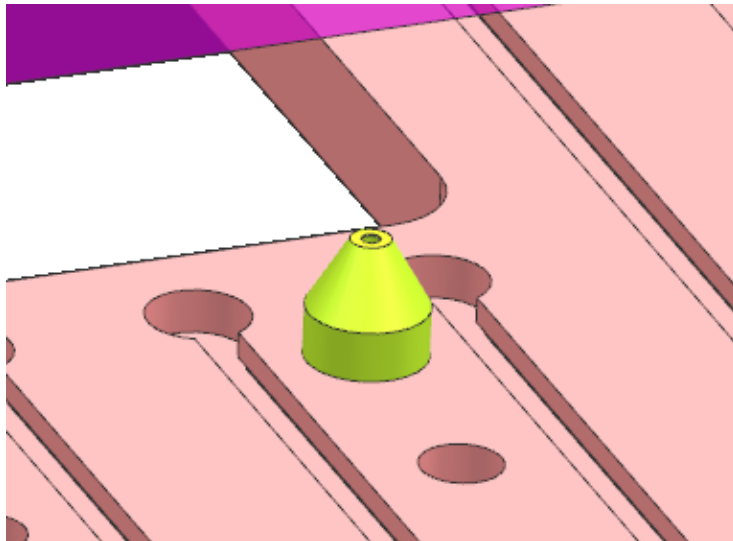
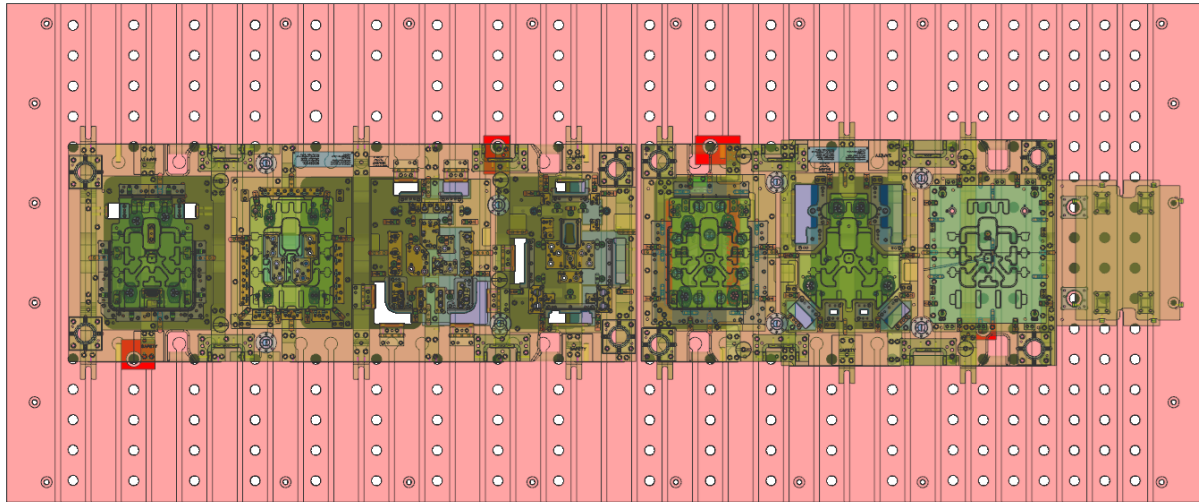
Press height information

SHUT HEIGHT	1220
FEED HEIGHT	655
STROKE	762
SLIDE ADJUSTMENT	350



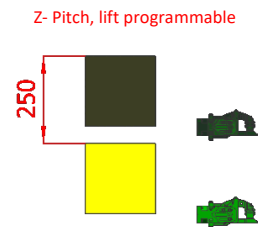
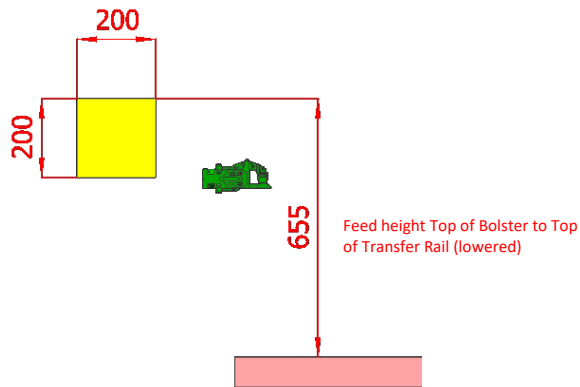
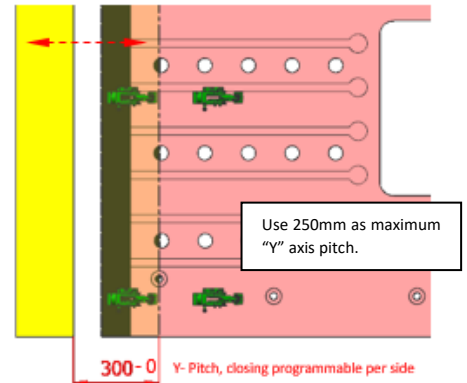
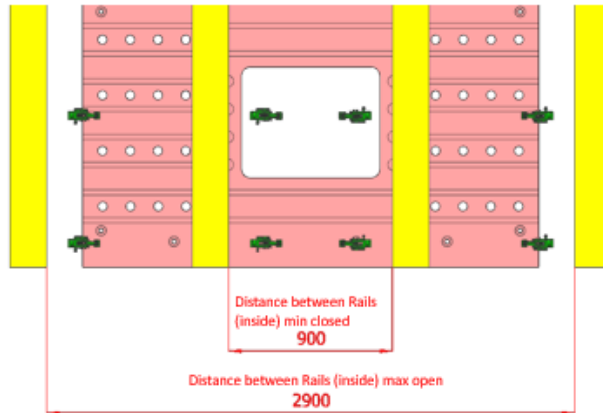
WIA 3000 TON.

Die location information.



WIA 3000 TON.

Transfer bar information.

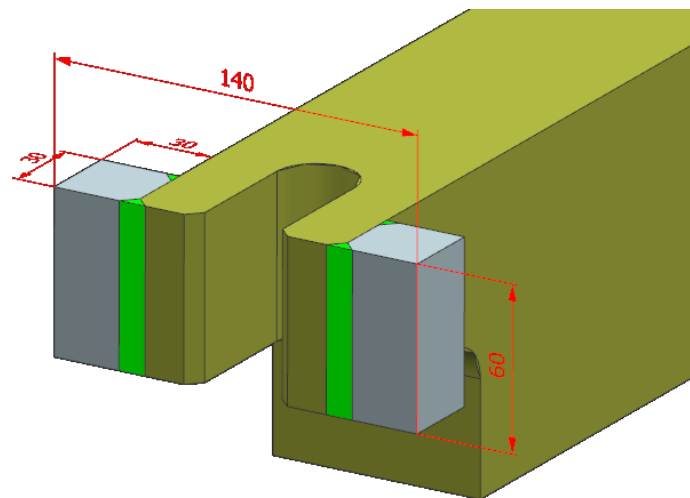
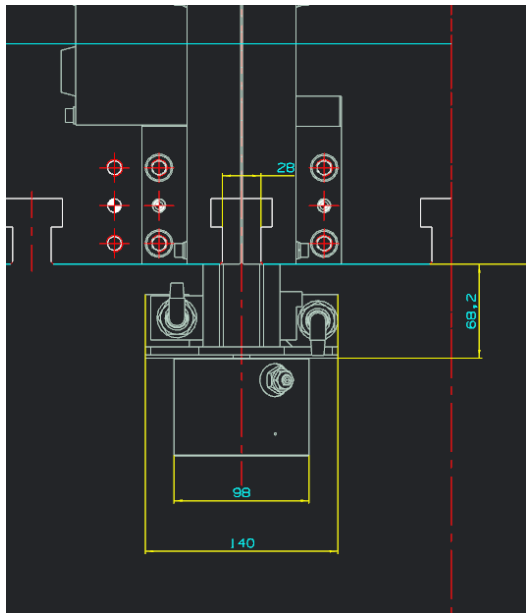


WIA 3000 TON.

Automatic Clamp information.

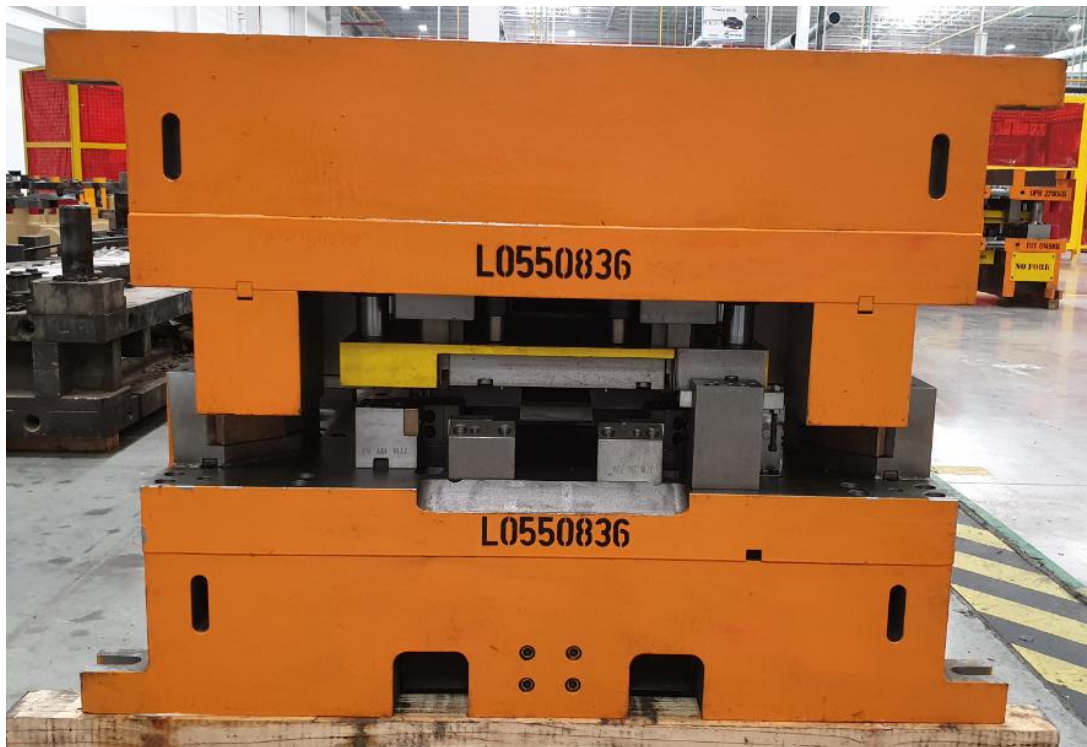


4	Die Clamp Specification		
1	Automatic Upper Die travelling Clamps		Included
1	Type	Type	Automatic
2	Brand		Pascal
2	Qty. of Die Clamps	SET	36 (18 per each side)
3	Capacity	Ton	10
4	Clamping Circuits	SET	2 Hydraulic circuits
5	Clamping Stroke	mm	8mm (4+4)
6	Travelling	Type	Electromechanic
7	Clamping Height for Upper Die	mm	60
2	Manual hydraulic Upper Die Clamps		N/A
1	Q'ty.	Ton	
2	Capacity	Ton	
3	Maker		
3	Manual hydraulic Lower Die Clamps		N/A



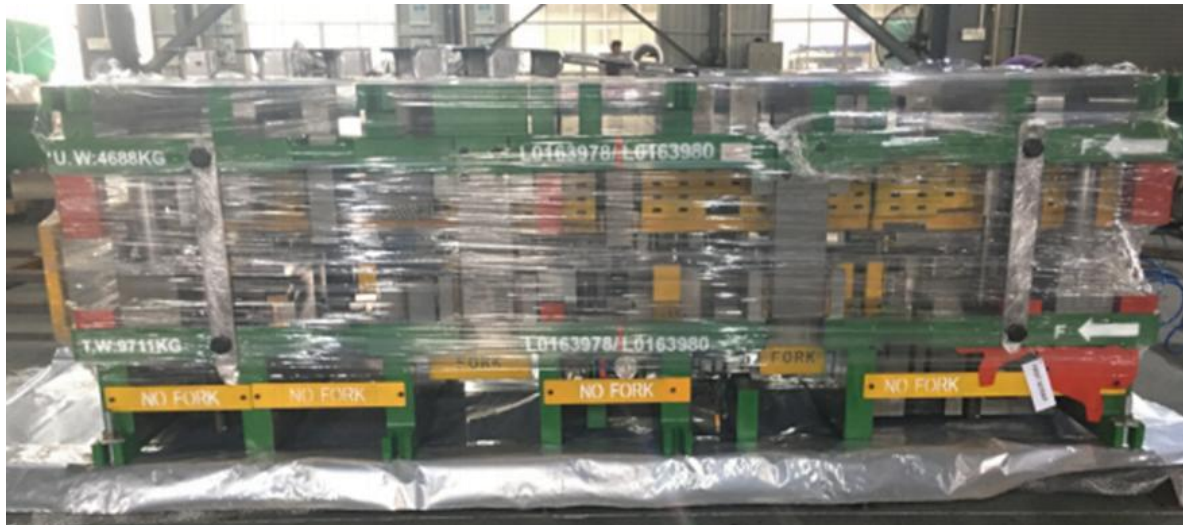
7. DIE PAINT & IDENTIFICATION

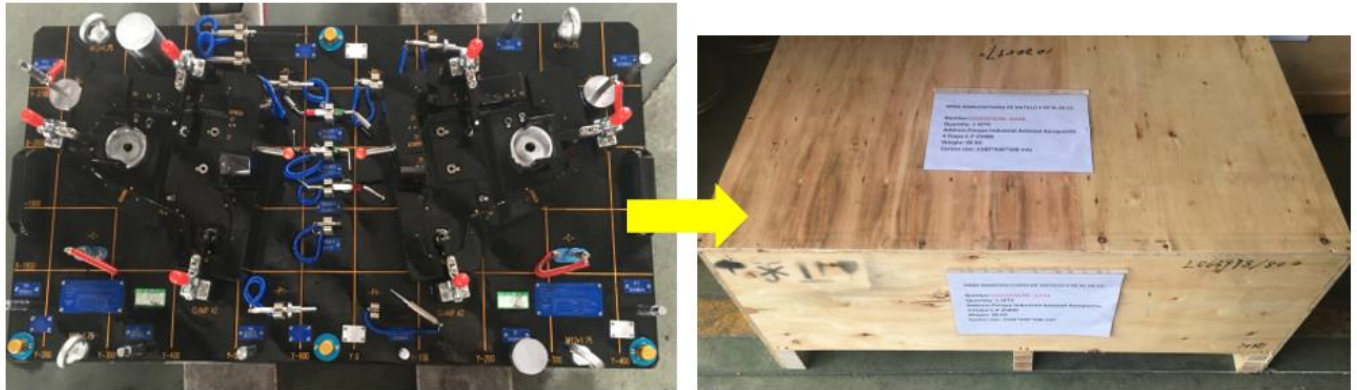
Color code will be provided by MatcorMatsu. PART NUMBER to be painted on 4 sides of die and Upper & Lower .



8. PACKAGING INFORMATION

All the Dies Must be packed according to the pictures below.





Opened container is needed for easy die and checking fixtures discharge.



9. BUY OFF REQUIREMENTS

- Supplier Must provide all information required listed below.

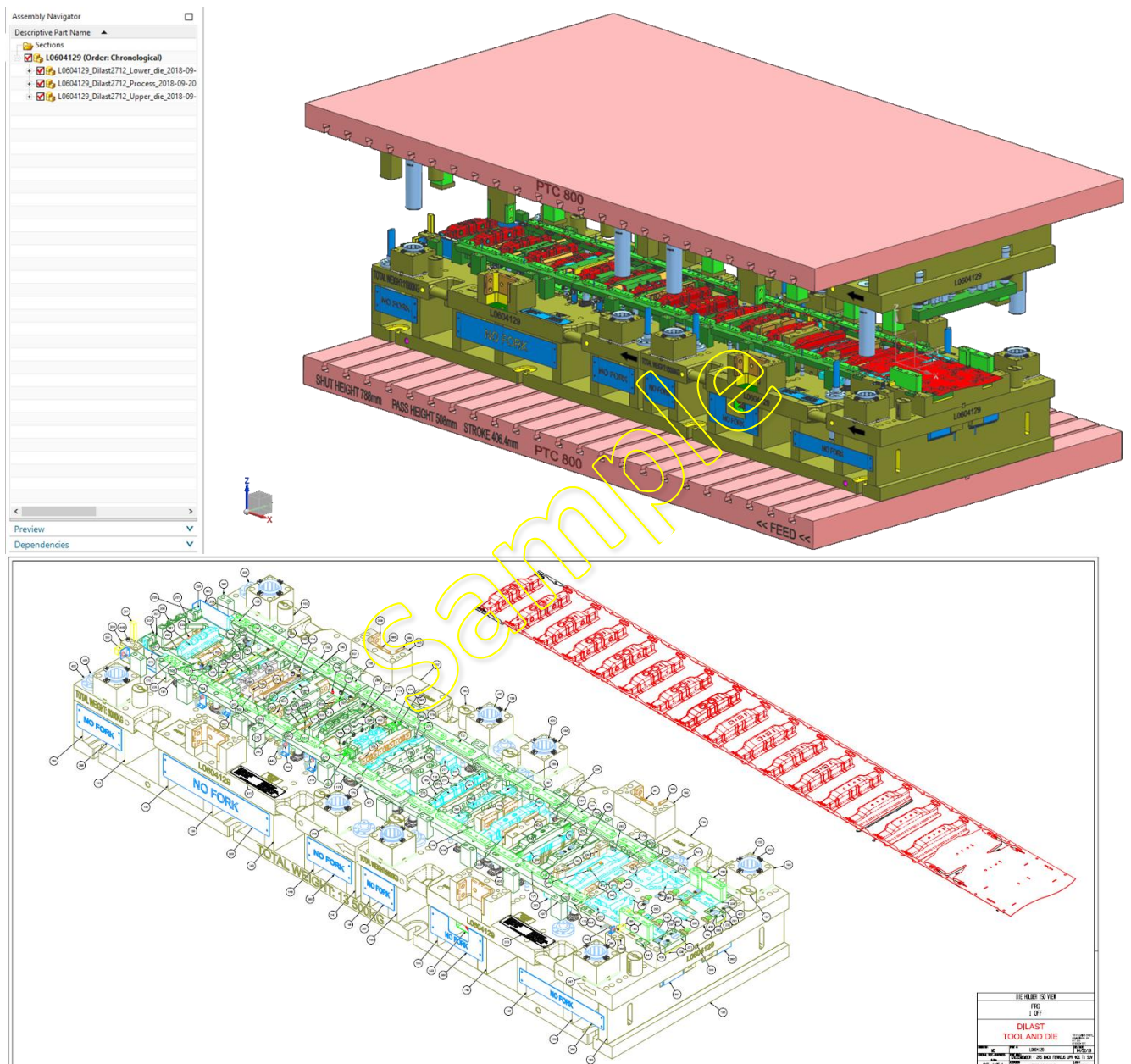
-  1. GD&T
-  2. FORMABILITY SIMULATION
-  3. STRIP LAYOUT
-  4. DIE DESIGN
-  5. DIE DESIGN CHECKLIST
-  6. BOM
-  7. BLUE PANEL 80%
-  8. HARDNESS ROAD MAP
-  9. KINEMATICS SIMULATION
-  10. CAPABILITY STUDIO
-  11. 5 PARTS FULL LAYOUT SCAN AND CMM REPORT
-  12. DIE BUY OFF CHECKLIST
-  13. CHECKING FIXTURE DESIGN
-  14. RUN OFF IN PRESS VIDEO
-  15. TIS (TOOL INFORMATION SHEET)

- **GD&T:** Include files containing information relating to GD&T's and all the information with engineering level updated.

[illegible]

- DIE DESIGN:

1. Contains the die design updated after Buy-off, supply die design in both STEP and native format.
2. 2D PDF with dimensions, sections and balloons should be provided for quick reference.
3. All the components must be called by groups (Upper Die, Lower Die, Strip Lay Out, bolster, Ram Press, Gripper, etc..) in 3D and metric system.

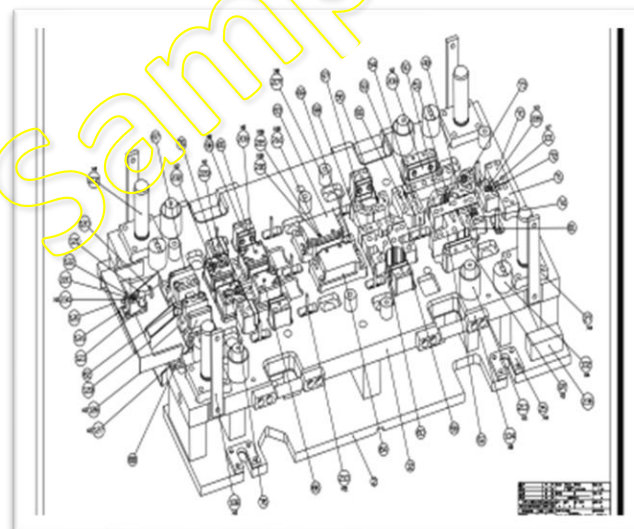


- DIE DESIGN CHECK LIST:

include the die design check list that was made by the tooling engineer responsible for the die, save the updated die design check list, with the originals notes in case they were added in the last check list, in PDF format.

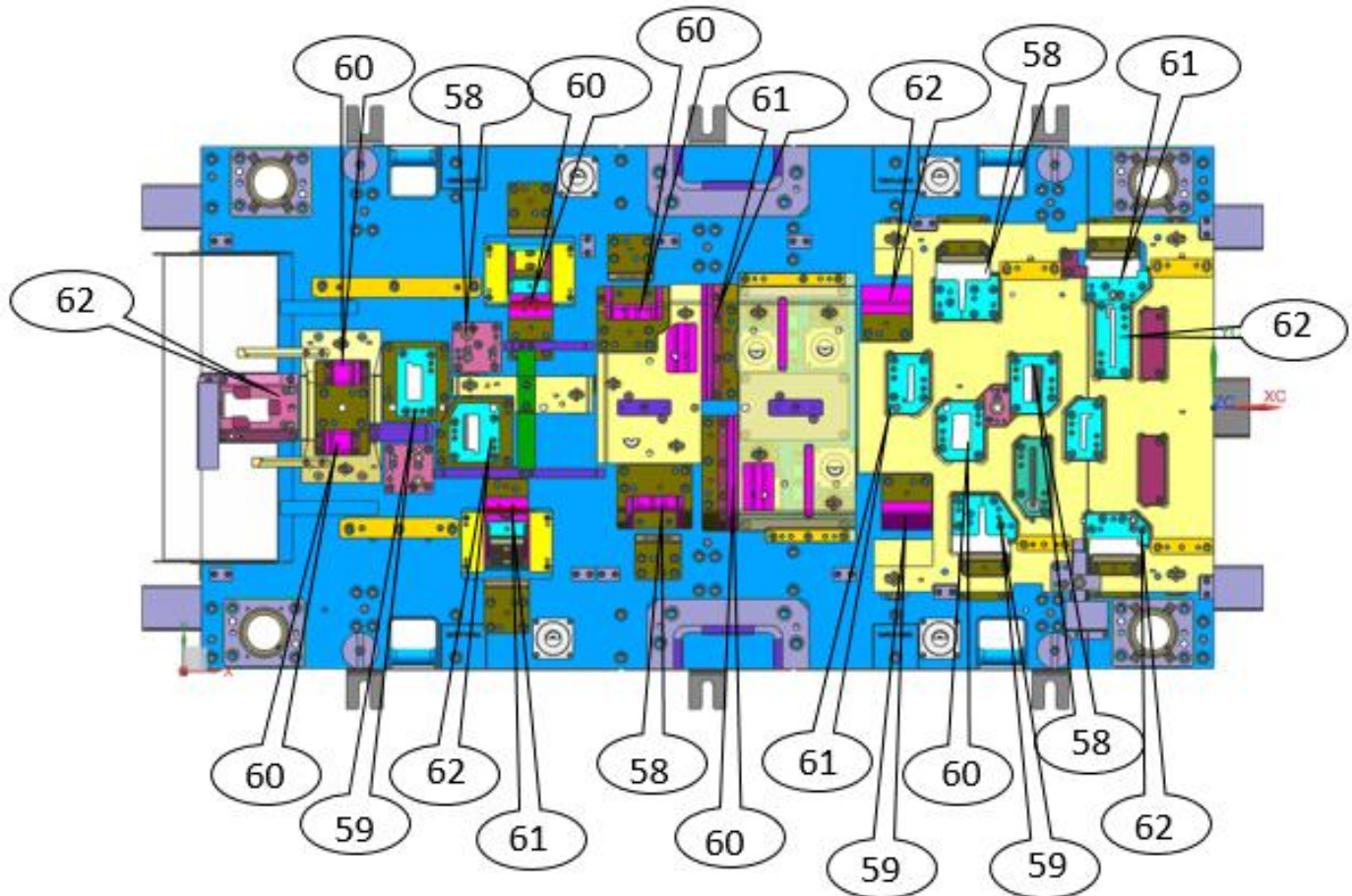
BOM: Must be included the bill of material authorized and updated die design, following this **EXCEL FORMAT**, with an explosion drawing with details number as a visual aid. (Include manufactured and standard parts).

	A	B	C	D	E	F	G	H	I	J	K	L
73	70	467	Cr12	95	196	10	1	Punch backing				STEEL
74	71	468	1050	79	163	24	1	Punch backing				STEEL
75	72	501	Cr12	47.8	15.8	12.2	4	Stamp retainer				STEEL
76	73	502	Cr12	142	115	35	1	Punch holder				STEEL
77	74	503	Cr12	136	95	35	1	Punch holder				STEEL
78	75	504	Cr12	90	120	35	1	Punch holder				STEEL
79	76	505	P20	89	84	136	1	Punch holder				STEEL
80	77	506	Cr12	100	95	35	1	Punch holder				STEEL
81	78	507	Cr12	95	196	35	1	Punch holder				STEEL
82	79	508	1050	79	113	58.7	1	Punch holder				STEEL
83	80	601	DC53	-	-	-	40	Stamps				STEEL
84	81	605	D2	40	35	70	1	Form punch				STEEL
85	82	712	1050	140	78	223	2	Heel blocok				STEEL
86	83	713	1050	Φ50.00	93	-	4	Upper stopper				STEEL
87	84	714	1050	Φ50.00	68	-	4	Upper other				STEEL
88	85	715	1050	59	40	48	4	Upper other				STEEL
89	86	717	1050	10	89	25	1	Upper other				STEEL
90	87	718	1050	Φ19	28	-	1	Upper other				STEEL
91	88	720	1050	50	61	12	4	Keeper				STEEL
92	89	721	CR12	50	50	130	4	Keeper				STEEL
93	90	722	1050	Φ76.00	24	-	4	Upper other				STEEL
94	91	723	Cr12	20	100	100	2	Inner other				STEEL



– HARDNESS ROAD MAPS FOR DIE OPERATIONS:

Example: Hardness road map. (Units Hardness Rockwell C)

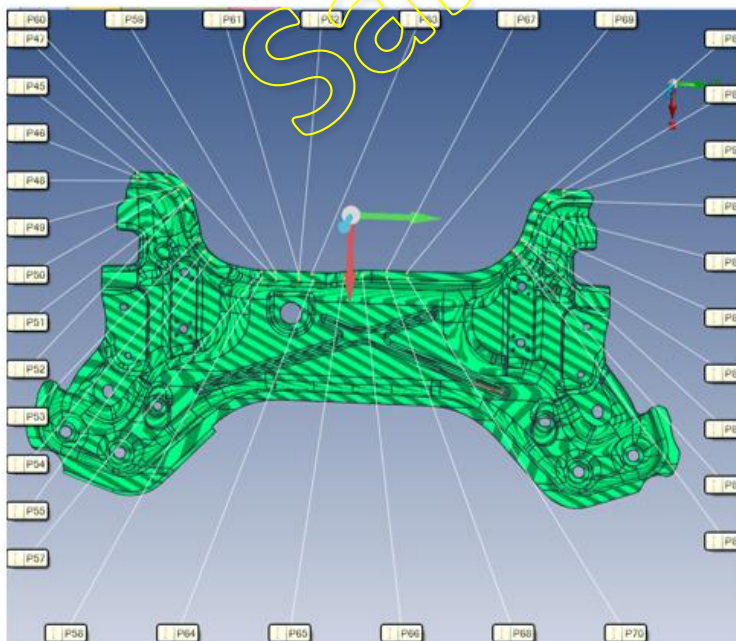


– CAPABILITY STUDY (SUPPLIER):

Part quality must be achieved 100% in the checking fixture, supplier must include the necessary documentation to prove the 30 pieces capability study obtaining at least a CP and CPK of 1.67, this result must be the same at final buyoff.

CAPABILITY REPORT								
Part number:	111173				Date:	18-Oct-13		
Part Name:	SILL-U/B #5 CR				Eng. Level:	AA		
Program:	GAMMA							
Characteristic:	PARTE							
Piece No.	Circle:CR4				Circle:CR6			
	X-axis	Y-axis	Z-axis	Diameter	X-axis	Y-axis	Z-axis	Diameter
1	-0.09	-0.20	0.305	0.151	-0.063	-0.316	0.226	0.133
20	0.09	-0.19	0.294	0.157	0.094	-0.267	0.352	0.140
21	0.05	-0.18	0.294	0.157	0.037	-0.220	0.163	0.175
22	-0.03	-0.26	0.203	0.135	-0.006	-0.349	0.222	0.157
23	-0.02	-0.25	0.254	0.157	-0.016	-0.369	0.189	0.165
24	0.08	-0.19	0.281	0.190	0.070	-0.311	0.131	0.173
25	0.05	-0.21	0.255	0.171	0.041	-0.292	0.233	0.176
26	0.06	-0.19	0.246	0.140	0.075	-0.260	0.253	0.141
27	0.07	-0.17	0.257	0.122	0.012	-0.235	0.175	0.145
28	0.06	-0.22	0.242	0.131	0.032	-0.274	0.161	0.117
29	0.01	-0.19	0.283	0.128	0.009	-0.278	0.190	0.126
30	0.00	-0.10	0.201	0.127	-0.023	-0.175	0.141	0.170
Descriptive Statistics								
Upper Spec	0.50	0.50	0.50	0.25	0.50	0.50	0.50	0.25
Nominal								
Lower Spec	-0.50	-0.50	-0.50	-0.25	-0.50	-0.50	-0.50	-0.25
average	-0.01	-0.21	0.25	0.15	-0.01	-0.29	0.21	0.16
X-DoubleBar	-0.01	-0.21	0.25	0.15	-0.01	-0.23	0.21	0.16
Range	0.21	0.18	0.19	0.07	0.21	0.19	0.22	0.07
Est. Sigma	0.05	0.04	0.05	0.01	0.05	0.05	0.05	0.02
Arith. Sigma	0.06	0.04	0.04	0.02	0.05	0.05	0.05	0.02
Cp	3.38	3.94	3.58	6.32	3.65	3.52	3.46	4.91
Cpk	3.33	2.26	1.78	2.54	3.50	1.44	1.99	1.83
Pp	2.67	3.94	3.80	5.00	3.23	3.28	3.47	4.57
Ppk	2.64	2.26	1.89	2.04	3.18	1.35	2.00	1.71

Road Map 50712050.



- DIE BUY OFF CHECK LIST:

(can be downloaded from MatcorMatsu supplier portal)

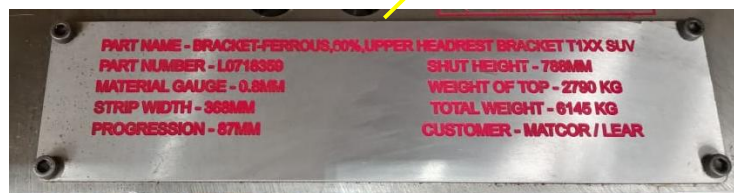
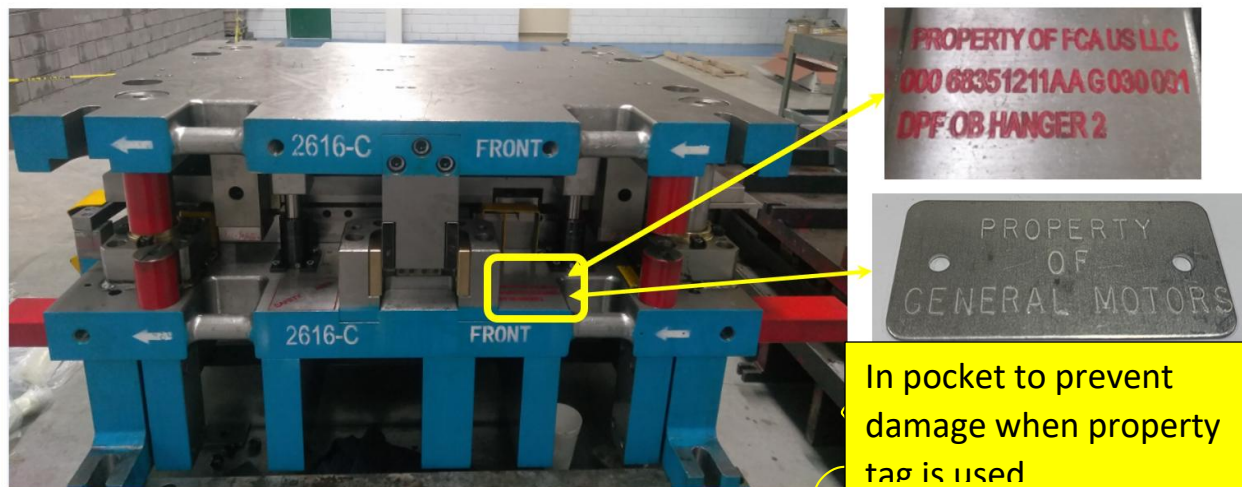
Must be included in PDF with signatures.

DIE BUY OFF CHECK LIST				 MatcorMatsu	
PART NUMBER:		PROJECT:		SPM:	
PART NAME:		DIE PROCESS:		TONNAGE:	
PITCH:		WIDTH:		THICKNESS:	
1 DYNAMIC		YES	NO	NOTES	
1.- HAS THE DIE PILOTS AND / OR LOCATORS IN EACH STATION ?					
2.- HAS THE DIE FRENCH STOP (OR SIMILAR), SENSOR FINGERS AND FINAL SENSORS?					
3.- ARE THE TRIM AND PIERCE HOLES FREE OF SCRAP ACCUMULATION?					
4.- DOES THE DIE HAVE ENOUGH PLUNGERS AND EJECTORS TO AVOID PART BE PULLED UP BY STRIPPER PAD?					
5.- IS THE DIE SPEED (SPM) THE APPROPRIATE ? IS THE PRESS SPM APPROPRIATE? WRITE IT					
6.- IS THE PROCESS STABLE ?					
7.- IS THE SENSNORS SYSTEM WORKING PROPERLY?					
8.- ARE ALL THE DIE COMPONENTS FUNCTIONAL AND WITHOUT INTERFERENCES ?					
9.- IS THE PART DISCHARGED CORRECTLY TO THE CONVEYOR ?					
10.- IS THE DIE IN THE APPROPRIATE PRESS ACCORDING THE TONNAGE REQUIRED BY THE PART ?					
11.- DOES THE PART REQUIRES LUBRICATION ?					
12.- ARE EACH PUNCH AND BUTTON DIE ALIGNED CORRECTLY? CHECK ALL HOLES AND TRIMS IN THE PART.					
2 QUALITY		YES	NO	COMMENTS / NOTES	
1.- PART QUALITY APPEARANCE IS ACCEPTABLE RESPECT TO:					
A) FREE OF WRINKLES					
B) FREE OF BURRS					
C) PART EDGES WITHOUT DAMAGE					
D) FREE OF SPLITS					
E) FREE OF DRAGGING					
F) FREE OF MARKS OR HITS					
2.- IS THE PART QUALITY DIMENSIONAL, ACCEPTABLE ACCORDING TO THE CHECKING FIXTURE ?					
3.- THE PART COMPLIANCE WITH A 1.66 CP AND 1.33 CPK, ACCORDING TO CMM MEASURES ?					
4.- IS THE PART AT THE LATEST ENGINEERING LEVEL ?					
5.- IS THE MATERIAL SPECIFICATION ACCORDING TO THE APL ?					
6.- VERIFY(CHECK WITH MICROMETER) DRAWS &/OR FORMINGS WITH RISK OF THINING, SPLITS OR CRACKS USING LIQUIDS OR SECTION CUTS FOR BETTER INSPECTION.					
3 STATIC					
UPPER DIE.		YES	NO	COMMENTS / NOTES	
1 HAS THE DIE LIFTING HOOKS (THREAD HOLES FOR EYE BOLTS IF IS NESCESARY)?					
2 IS THERE AN INTERFERENCE WHEN OPENING THE DIE.					
3 IS THERE A DAMAGED COMPONENT ON THE DIE					
4 ARE STRIPPERS ARE PROPERLY ATTACHED, BALANCED, AND LEVELED?					
5 WHEN STRIPPERS ARE BEING DISASSEMBLED, IS THERE ANY INTERFERENCE?					
6 ARE THE STRIPPER PADS GUIDED WITH AMPCO GUIDES AND STANDARD LIFTER OR DADCO RETAINER?					
7 WEAR PLATES : STEEL OVER BRONZE WITH GRAPHITE PLUGS					
8 ARE THE NYTRO CONTROL PANEL PLACED IN A SAFETY PLACE AND					
WITH STANDARD CONEXIÓN, AND ALL NYTRO CILINDERS COMPONENTS ARE DADCO BRAND ?					
9 DOES EXIST A PLATE WITH NYTRO FILL INFORMATION EACH DIE STATION (CAN BE ENGRAVED ON DIE SHOE)?					
10 ARE NYTRO CYLINDERS PROPERLY ATTACHED WITH SCREWS OR MOUNTING FLANGES ?					

- INFO PLATE:

Include Pictures showing the die and information plate or information engraved according customer requirement.

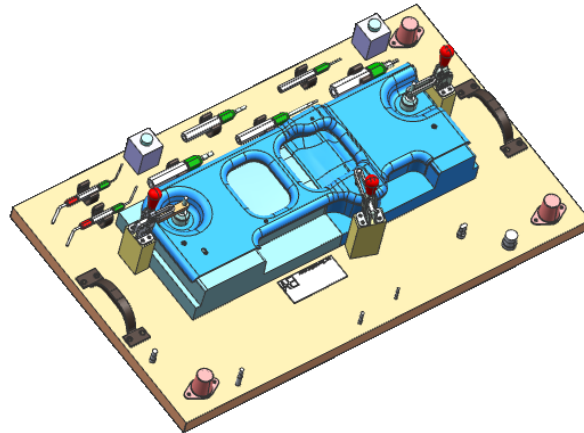
When Property of Tag is used, pocket is needed to prevent tag from damage.





– CHECKING FIXTURE:

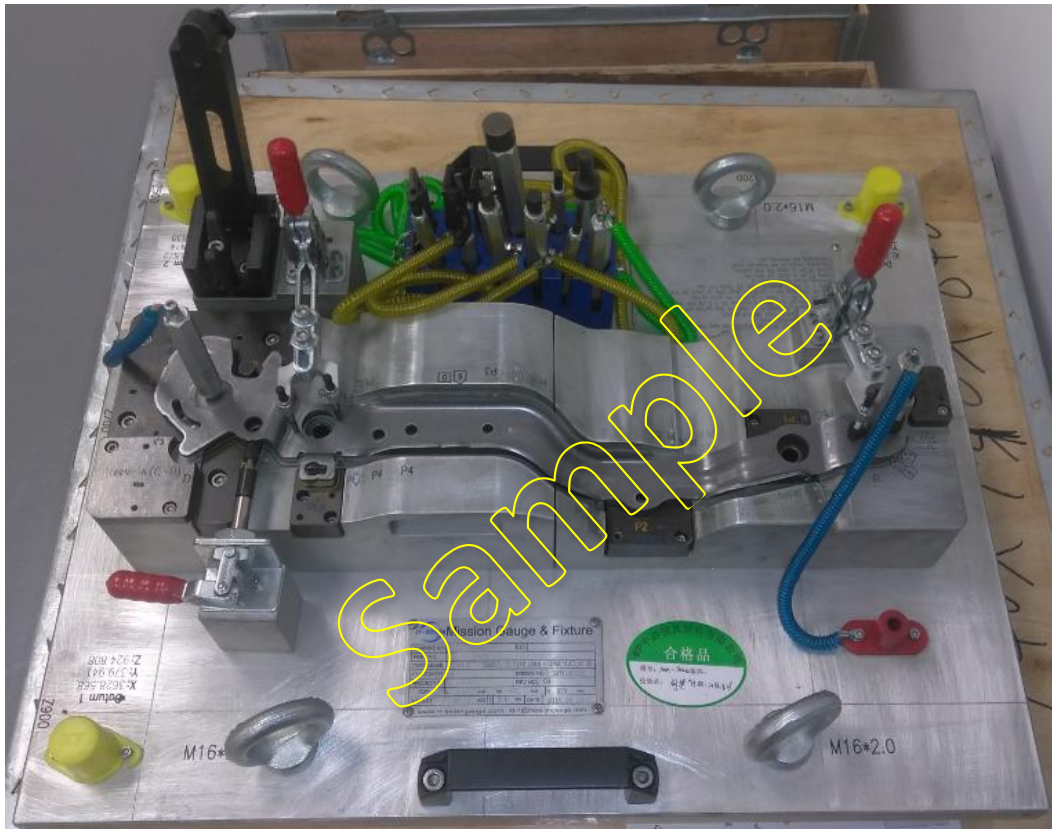
Include the checking fixture design in STEP and native format, in 3D and metric system, including certification, operation manual, R&R report and all information relating to the checking fixture.



Checking Fixture's Certification MUST BE by 3rd. Party.

CERTIFICATE OF MEASUREMENTS <u>FIXTURE CERTIFICATION</u>	
CUSTOMER:	Matcor
PART NAME:	
PART NUMBER:	FC00AAY27005_008_BRKT-3
DATE CERTIFIED:	7-2-18
E/C LEVEL:	
FIXTURE NUMBER:	F171207
TEMPERATURE AT TIME OF TEST:	18.2°C
TESTED ITEMS CONDITION:	NEW FIXTURE
All units are in metric unless otherwise specified. The results relate only to the items tested. For the results refer to the report attached with this certificate ☒ Roadmap ☒ CMM Printout Report ☐ Other	
The equipment used is traceable to National Standards as follows: COORDINATE MEASURING MACHINE: SERIAL#:I010836 SOFTWARE: PC-DMIS 2010 MR1 CAD++ CALIBRATED : 3:00 PM TRACEABILITY #: NO.1508005	
SIGNED:	DATE: 7-2-18
Fangyuan Measurement(Quality Manager)	

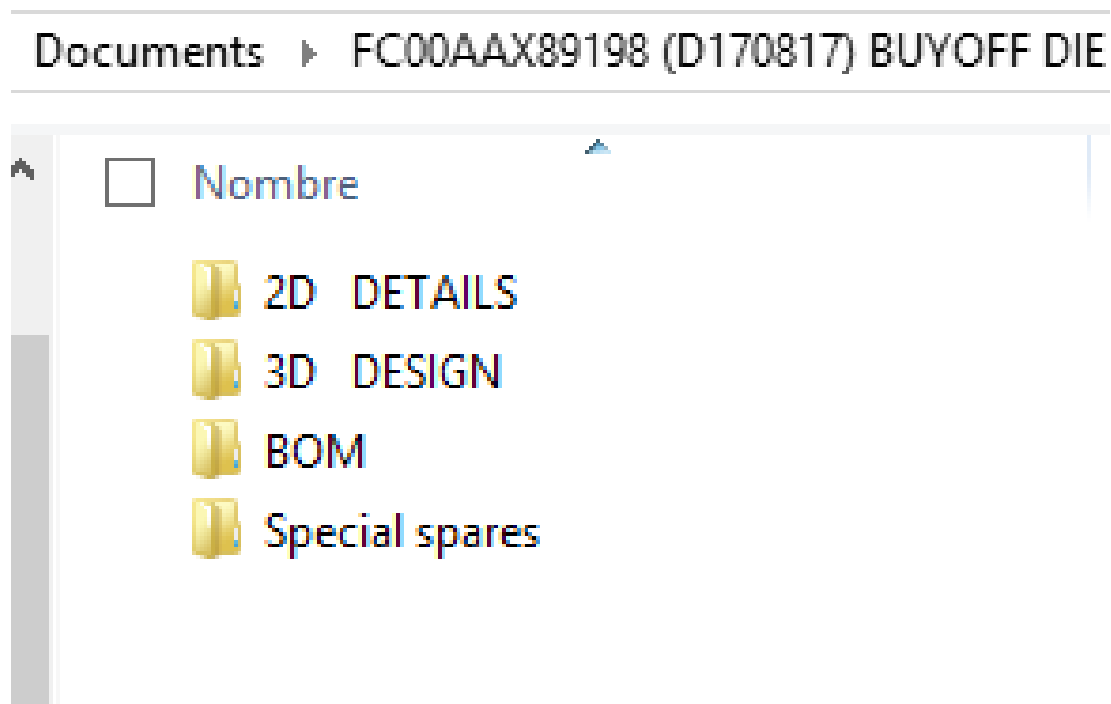
Checking fixture.



X.Y.Z.		Gauge & Fixture	
DRAWING NO.	ECL		
PART NO.	L0554250AA		
PART NAME	BRACKET - FERROUS, T1 FLOOR LATCH - COVER		
CUSTOMER	Matcor	MISSION NO.	
PROJECTS	T1XX	REV NO.	04
SIZE	L 600 mm	W 480 mm	H 75 mm
WEIGHT	43 KG	T 3.0 mm	DATE 2016.10.20

10. DIE DESIGN INFORMATION

MatcorMatsu Require Die Design Updated after Buy Off and Engineering Changes implemented, in STEP and Native Format, the Folders should be in order based in the next list:





- **Die design Checklist**
(can be downloaded from MatcorMatsu supplier portal)

DIE DESIGN CHECK LIST				MatcorMatsu			
PART NUMBER:		PROJECT:		ASSIGNED PRESS:		QUOTED PRESS:	
PART NAME:		DIE PROCESS:		SHUT HEIGHT:		FEED HEIGHT:	
FINAL BLANK SIZE:		QUOTED BLANK SIZE:		PRESS BED SIZE:			
1 SIMULATION REVIEW				YES	NO	NOTES	
1 Did supplier use Yield and Tensile strength values given by MatcorMatsu?							
2 Does the FLD graphic show all point in safety zone?							
3 Does the tonnage calculation ensure the die can work on assigned press?							
4 Is the blank size equal or less than the quoted ?							
5 Can the part be made with the quoted material spec without danger of splitting or are there needed design modifications to the part geometry needed							
6 Is the part at the latest engineering level ?							
7 Do critical zones are in the range less than 20% of thinning?							
8 If formability simulation shows splits, wrinkles, thinning, or another issue, does supplier have an action plan?							
2 DIE PROCESS / LAY OUT				YES	NO	COMMENTS / NOTES	
9 Are all dimensions and components in metric system?							
10 Has supplier confirmed that received the latest die standards?							
11 Are the shut height and feed height the correct for the assigned press?							
12 Is the bolster printed behind the strip layout?							
13 Does the Process ensure projected production volume ?							
14 Are the french stop and sensor fingers (cut-off and initial sensor) showed?							
15 Is the start line indicated?							
16 Isn't coil width wider than max coil feeder opening?							
17 Do pilot holes are made before start line?							
18 Are mating trims, datum and tight tolerance holes made after re-strike station?							
19 Are the datum holes pierced perpendicular to cad date surface ?							
20 Are estimated tonnage showed station by station and total tonnage?							
21 Is date stamp showed at the beginning of the process and each station?							
22 Does process layout shows:							
a) Material spec.							
b) Material thickness							
c) Coil width							
d) Pitch							
e) Primary press							
f) Auxiliary press							
g) Feed direction							
h) Lifting height							
23 Are Forming, trim and pierce indicated with different colors?							
24 If process has a center carrier, is it wide enough and guided with U flange 10mm height?							
25 Is de process developed to achieve tolerances and requirements according the GD&T?							
3 DIE DESIGN REVIEW				YES	NO	COMMENTS / NOTES	
GENERAL REVIEW							

11.SPARE PARTS

- Cost of one set of standard punches, Buttons and Trim Steels ,Trim Punches, need to be quoted at the time of sourcing and ship with die after buy off.
- Cost of one set of extrusion sections, if applicable, need to be quoted at the time of sourcing and ship with die after buy off.
- Cost of other Critical spares (forming sections, additional copies of trim section. etc.) need to be quoted upon request by MatcorMatsu Tooling Engineer at the time of final design review, and ship with die after buy off.
- All spare parts need to be clearly indicated in BOM with visual aid.

