



Schlumberger New Product Development Cell (NPD)

– Equipment Selection

07 May 2012

Agenda

- The NPD Parts We Will Be Making
- The Standard Guidelines For Buying Equipment
 - At least 3 quotations from different suppliers
 - Providing the preferences information for verification and justification
 - Our preferred terms & conditions
- The NPD Parts We Will Be Making
- The NPD New Equipment List
- Why The Equipment Was Preferred
 - The Available Choices
 - The Key Points We Have Focused On
- The Communications Among The Team Members
- The Timeline
- The Appendices (Illustration)
 - The Parts
 - The Equipment
 - The Processes

The Standard Guidelines For Buying Equipment

□ Guidelines of Buying Equipment

- Capability Required Study for the Cell
- Research/Survey for the Equipment Preferred in related industry
- Equipment Shortlisted
 - ✓ At least 3 brands leading in the markets
- RFQ Review/Approval
 - ✓ At least 3 quotations from different suppliers
 - ✓ Review meetings required among the team members
 - ✓ Contract Review (e.g. Technical, Commercial, Risk etc.)
- PO Issuing
- Machine Making at Manufacturer Site
- Buyoff (either at equipment builder's site or on-site in MMI)
- Shipment
- Installation and Commissioning
- Training/Handover

The Parts We Will Be Making

- ✓ The range of products specified for the NPD Cell
 - **Size:** Max. 2.5metres
 - **Max. Weight:** 1.5 metric ton
 - **Product Family:**
 - ✓ Block
 - ✓ Housing
 - ✓ Chassis
 - ✓ Flow Diverter
 - **Complexity:**
 - ✓ Tier I

The Product Illustration

The NPD New Equipment List



MMI NPD Equipment Price List

S/N	Type	No. of Axis	Brand	Model	Qty Req'	Unit Price USD	Total Amt. USD	Supplier	Remarks
1	Turn-Mill	4	Mori seiki	NL3000/3000	1	\$759,000	\$ 759,000.00	DMG MORI SEIKI South East Asia Pte. Ltd.	Includes all required accessories
2	Mill	5	Deckel Maho	DMF 360 (Y1100)	2	\$902,000	\$ 1,804,000.00	DMG MORI SEIKI South East Asia Pte. Ltd.	
3	EDM	3	Makino	EDNC 157 w/extended Tank	1	\$936,934	\$ 936,933.80	Makino Asia Pte. Ltd.	
4	Gundrill	3	Unisig	USK25-2000	1	\$1,045,000	\$ 1,045,000.00	Henko Machine Tools Pte. Ltd.	
5	CMM	3	Hexagon	Global Silver Advantage 12.40.14	2	\$249,706	\$ 499,412.00	Hexagon Metrology Asia Pacific Pte. Ltd.	
6	Renovation+Facilitization+Machinery Relocation						\$ 500,000.00		
Total :							\$ 5,544,345.80		

GRANT TOTAL B/F GST : \$ 5,544,345.80

GRANT TOTAL A/F GST (7%) : \$ 5,932,450.01

The Machine(s)

✓ In total, there are 7 new machines

- Large Mill (2x), 3m
- Large Turn-Mill Lathe, 3m
- Large Gun-Drill, 2.5m
- Large CMM (2x), 3m
- Large EDM, 3m

The Equipment Pictures

Large Mill

- Options :-
 - Vertical CNC with Tilting Head & B-Axis
 - Horizontal CNC with C-Axis
 - Horizontal Borer with C-Axis
 - Mill-Turn
- Shortlisted Vendors :-
 - DMG-Mori Seiki
 - Makino
 - Doosan Puma
 - Mazak

Brand & Model

		# of Axes	DMG – Mori Seiki	Makino	Doosan	Mazak
Mill	Vertical Machining Center with A-axis Indexer	4			VM1260	
	Double Column Vertical Mill with A-axis Indexer	4				FJV 60/120
	Vertical Mill with <u>Tilting Head(B-Axis)</u> & A-axis Indexer	5	DMF360			
	Horizontal Borer with W- & C-axis	5			DBC130P	
Turn	Turn-Mill	4	NL3000/3000Y (300mm chuck)		PUMA 600LY	Slant Turn Nexus 500/3000U
	Turn-Mill	6	NZX4000 / NZX6000			
Mill-Turn	Multi-Tasking Machine (Integrex)	5				E500H(3000U) or E670H(4m)
EDM				EDNC106 / EDNC157		

Shortlisted Milling & Turning combinations

		# of Axes	DMG – Mori Seiki	DMG – Mori Seiki	Doosan	Mazak	Mazak	Mazak
Mill	Vertical Machining Center with A-axis	4			VM1260	V815/120	V815/120	
	Vertical Mill with <u>Tilting Head</u> & A-axis	5	DMF360	DMF360				
	# of Tool Magazine		120	120	40	60	60	
Turn	Turn-Mill	4	NL3000 /3000Y		PUMA 600LY			
Mill-Turn	Multi-Tasking Machine (Integrex)	6				Integrex E500H (3000U)	Integrex E670H (4000U)	Integrex E670H (4000U)
	Inclined Drilling / Tapping or Milling		ONLY ON DMF360	ONLY ON DMF360	NO	ONLY ON E500H	ONLY ON E670H	YES
	Gun-Drilling with High Pressure Thru-Spindle Coolant		DMF360 @80 MPa (option)	DMF360 @80 MPa (option)	VM1260 @70 MPa (option)	E500H @70 MPa (option)	E670H @70 MPa (option)	E670H @70 MPa (option)
	Drill/Tap/Mill or Turn diameters at end of the shaft (for 2300mm part length)		POSSIBLE ON BOTH M/C's	POSSIBLE ON BOTH M/C's	ONLY ON PUMA 600LY	NO, E500H is too short	ONLY ON E670H (4000mm)	YES
	Orbital machining (Option with <u>Siemens</u> Controller)		OPTION ON DMF360	NO	NO	NO	NO	NO
			1 st Choice				2 nd Choice	3 rd Choice

Milling & Turning Equipment - Price & Leadtime

- 1st Choice
 - DMG Mori Seiki :-
 - 1x DMF 360 with Linear drive & B-axis Tilting Head
 - with A-axis Indexer
 - 120-Tool Magazine
 - 1x NL 3000 (3000U)
 - 10-station Turret
 - With Spline Hobbing function
 - Leadtime
 - 1x DMF360, 5.5 mths ex-works, GERMANY
 - 1x DMF360, 8.5 mths ex-works, GERMANY
 - 1x NL3000 / (3000U), 6 mths ex-works, JAPAN
 - Price US\$2,310,000

- 2nd Choice

- Yamazaki Mazak :-

- 2x Vertical Machining Center Mazatech V-815/120
 - with A-axis Tsudakoma Indexer
 - 60-Tool Magazine only
 - 1x Horizontal CNC lathe, integrex E-670H2 4000U
 - 120-Tool Magazine
 - Leadtime
 - 6 mths ex-works, JAPAN
 - Price US\$2,227,000

Why Was The 1st Choice Preferred For Turn-Mill & Mill

- These are current equipment that we use in Woodlands Plant and they are reliable machines, have a good installed base in Singapore with established after-sales-service organization
- The High Torque Options have been adopted to cater to our product (e.g. tough material etc.)
- Standardization of the tool holder/magazine system
- To facilitate the (legacy) machinery imbalance on the production side
- In line with our production in nature

Brand & Model – Gun-Drilling

Machine Maker	Auerbach	Unisig	Tibo	Miroku
Local Agent	Intec Precision	Henko Machine Tools	Wematec	CW Advanced Technologies
Model	AX 5.1 TLF	USK25	E40-3000 SO	MBDC-2200-NC
Drill Depth (mm)	2100 + 400	2000 - 3100	3000	2500
Counter-Rotation for on-center holes	Option	Included	Included	Included
Counter-Rotation for Off-Center holes (up to Ø 6" max)	No	Yes	No	No
Minimum Hole Diameter (mm)	2	2	3	4
Maximum Hole Diameter (mm)	65	25.4	30	25
Ex-Works	9 mths	6 mths	6 mths	6 mths
Landed MMI	12 mths	7.5 mths	7.5 mths	7 mths
Price, Yen				¥66,500,000
Price, Euro	€ 1,300,000		€565,000	
Price, USD	US\$1,725,000	US\$950,000	US\$750,000	US\$791,350
		1 st Choice Has many machines in Houston area with longer travel. Has similar machine installed at Halliburton (S'pore)	2 nd Choice No m/c in region. After-Sales-Service support ??	3 rd Choice Has not made a machine longer than 2000mm travel

EDM Equipment - Price & Leadtime

- Makino EDNC 106 with extended Tub
 - Similar to existing machine in WLDS Plant
 - Machine has an extended tub to accommodate 2500mm long parts
 - Will be re-designed to accommodate 3000mm long parts
 - Leadtime
 - 4 mths ex-works, JAPAN
 - Price US\$591,415 (was US\$456,000)

NPD Cell – timing expectations

2012



Phase 1

- DFM sessions with SLB design teams
- RFQ of parts up to 2m length with gundrill up to 1m
- Producing parts using existing equipment

Phase 2 (RFQ)

- RFQ of parts up to 2.5m length & gundrill up to 1m length

Phase 2 (Machining)

- Production of actual parts longer than 2m to start in Oct/Nov

Phase 3 (RFQ)

- RFQ of parts up to 2.5m length & gundrill up to 2.5m length

Phase 3 (Machining)

- Production of parts on the gundrill to start in Dec



TIMELINE PROJECT PLANNING

10 Months

Trigger Points

Mar

- Planning

May

- People in place

Jul

- Machines Movement

Sep

- CMM & EDM In Place

Nov

- TM In Place

Apr

- RFQ

Jun

- Floor Layout

Aug

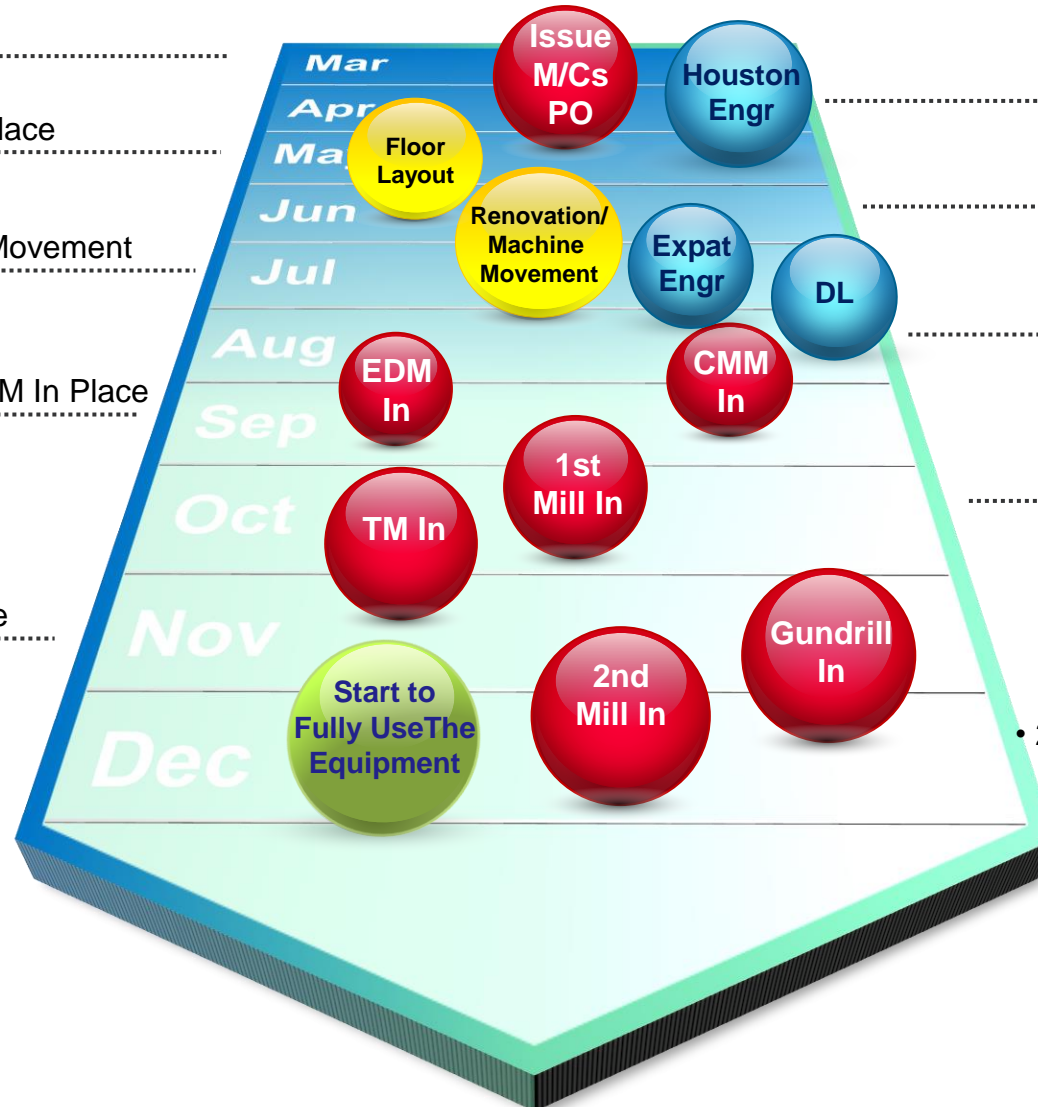
- Renovation

Oct

- 1st Mill In Place

Dec

- 2nd Mill & Gundrill



The Communications Among The Team Members

✓ Customer

- Recommended one Turn-Mill + 2 Mills

✓ Peter Ruler & Russ (MPP)

- Will review Turn-Mill when Peter is on board
- The rest machines would be ok with them

✓ WLDS Team

- Dave Rogers
- Christopher Wee (Engineering)
- Matthias (Production & Sales)
- Leoh (QA)

Thank You

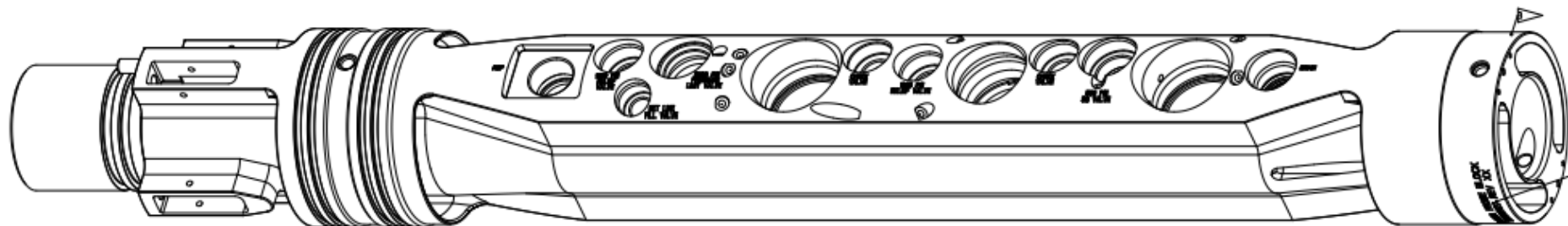
THE END

MMi

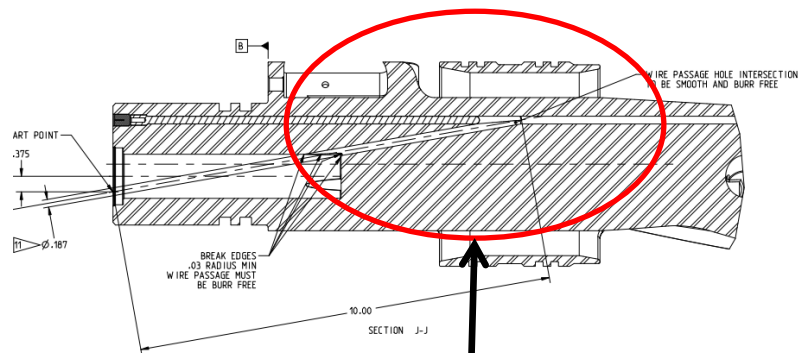
MMI HOLDINGS LIMITED

The Illustration of Products & Equipment

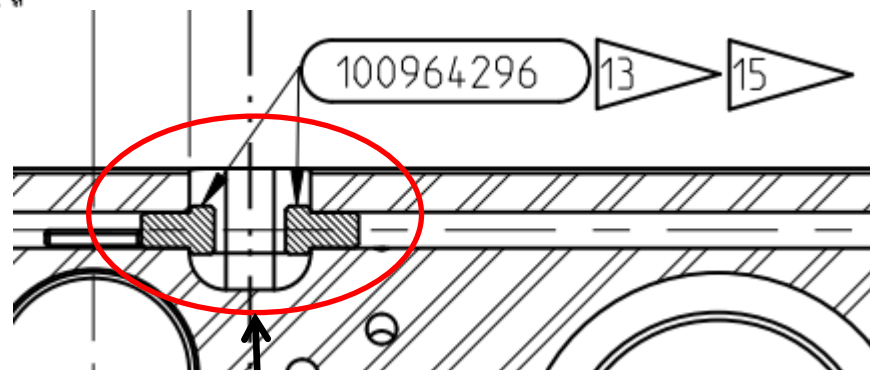
PIN AND THAT IT IS STRAIGHT AND TRUE



SCALE 1:1



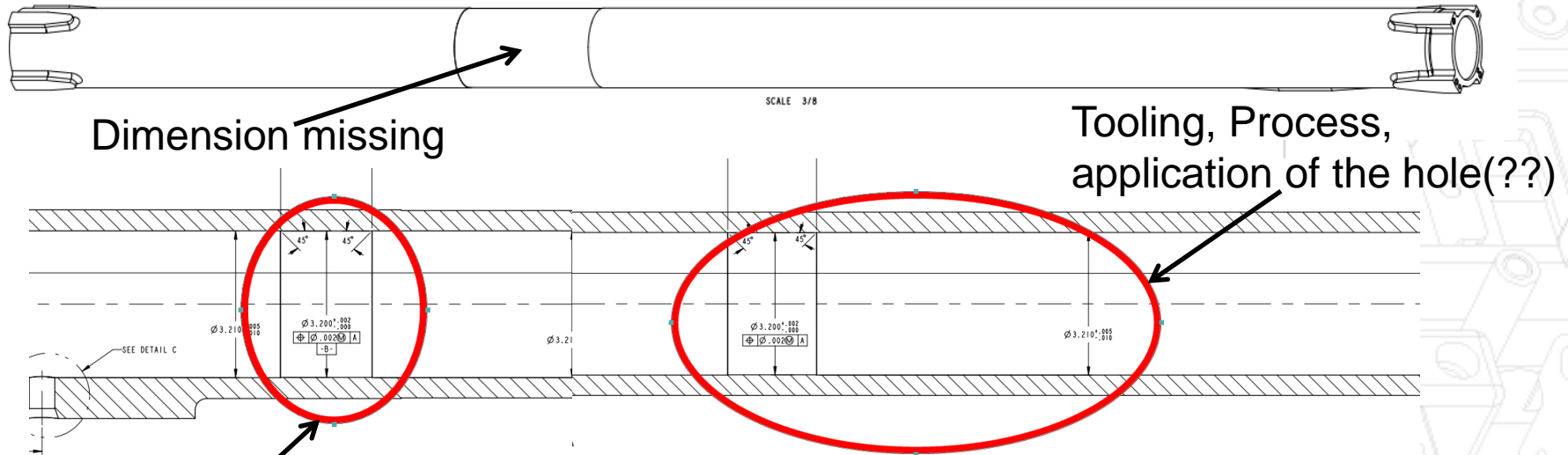
Dia.4.5mm Cross hole
to depth of 250mm



Welding plug

Housing

100865831D_Rev AA_Housing 3bay electronic chassis



Tolerance,
measurement device??

Process

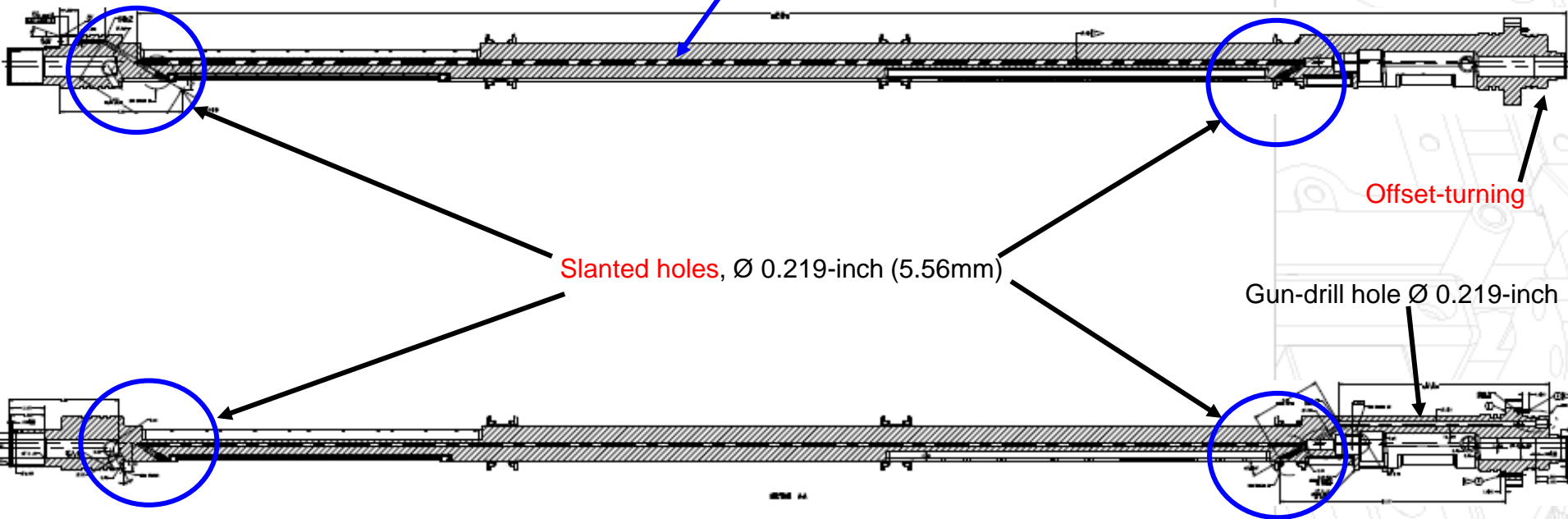
1. OD Turning (skin cut) & face the ends
2. Deep-hole boring
3. Honing
4. Deep-hole boring (bottle-boring operation)
5. OD turning to drawing print
6. Mill all OD profiles, drilling & tapping (radial & axial)

Chassis

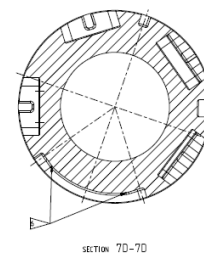
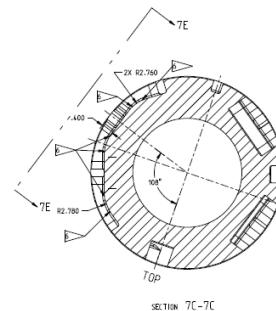
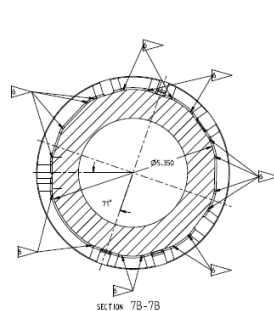
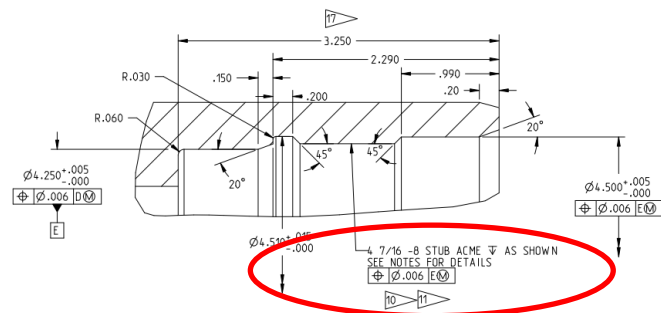
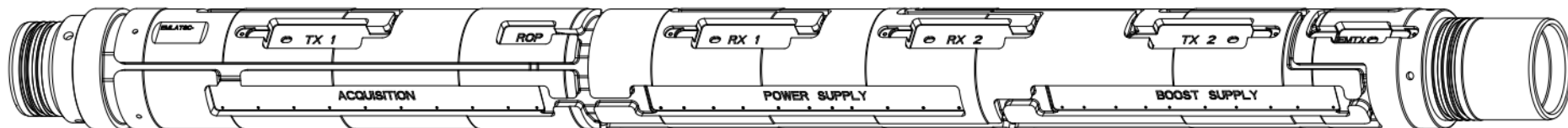
100834944D rev AA



Gun-drill, **off-center** blind hole, \varnothing 0.219-inch x 82.33 inches (2091.2mm)



1. OD turning (skin cut) & face both ends
2. Gun-drill 82.33 "depth with counter-rotation (blind hole)
3. Ultrasonic transducer to find location of the end of the 2100mm gun-drilled hole (blind hole) & Mill a mark on OD to identify it's X- & Y- location
4. Turn OD to be concentric with axis of the 82.33 deep gun-drill hole
5. Offset-turn the OD Profile to meet drawing print
6. Turn off-set diameter at one end of the part
7. Drill remaining dia.0.219 holes. (Straight & Slant holes)
8. Mill all the remaining profiles, slots, etc.



11. REMOVE LEADING THREAD TO FULL THREAD PER BLUNT START SPECIFICATION S-272632.
12. CHECK CHASSIS WITH GAGE 100862285 PRIOR TO SHIPPING BY VENDOR. GAGE CHECK DOES NOT SUPERSEDE PRINT OR TITLE BLOCK TOLERANCES. TIR/FIM/CONCENTRICITY MUST BE WITHIN TOLERANCE BEFORE GAGE CHECK IS PERFORMED.
13. ALL WIRE GROOVE DEPTHS RELATIVE TO 6.195 DIAMETER.
14. REMOVED
15. MACHINE ENGRAVE TEXT WITH .38 HIGH CHARACTERS X .02 DEEP MAX. POSITION THE TEXT SO THAT IT IS CENTERED APPROXIMATELY IN THE BOARD POCKET AS SHOWN.
16. SHOT PEEN OD BETWEEN SHOULDERS PER AREA "C". SEE NOTE 20.
17. SHOT PEEN 3.250" DEEP BORE PER AREA "D". SEE NOTE 20.
18. SHOT PEENING NOT ALLOWED IN AREAS INDICATED. MASK SURFACES PRIOR TO PEENING.
19. MASK ALL SCREW HOLES BEFORE SHOT PEEN.
20. SHOT PEEN COVERAGE, COVERAGE VERIFICATION WITH PEENSCAN PROCESS, SURFACE DECONTAMINATION AND TEST PER S-400807. CERAMIC OR GLASS SHOT PREFERRED.

AREA	INTENSITY
C	10-14 A
D	3-7 A

Mask screw holes
before shot peen

Process

- OD turning (Skin cut)
- Deep hole boring
- OD turn, OD profile, one-side ID profile
- Mill all the OD slots, pockets, profiles and holes

Return

The Machine

- Type, Size, Specifications, Price, Leadtime
- Tooling - Arbors, Holders, Accessories
- Large Mill
 - Options :-
 - Vertical CNC with Tilting B-axis Head & A-axis rotary indexer
 - Horizontal CNC with C-Axis
 - Horizontal Borer with C-Axis
 - Mill-Turn (Mazak Integrex)
 - Shortlisted Vendors :-
 - Mori Seiki / DMG
 - Makino
 - Doosan Puma
 - Mazak
- Large Gun-Drill
 - Shortlisted Vendors :-
 - Auerbach
 - Unisig
 - Tibo
 - Miruku

The Facility

- Machine Size, Weight, Floor Loading, Location
- Structural
- Power
- Moving the machine in-place, Installation & Commissioning
- Material Handling & Lifting Equipment

Inspection

- Trade-in 2x CMM & purchase 2x Large CMM
- CMM Room
 - Preferably on 1st Floor but where?
 - Vibration from Production machines might affect machine performance / measured readings
- Environmental Control – Temperature & Humidity.
 - Frontage & Canopy-side of the building facing the afternoon-sun
- Material Handling
 - How to move parts from the machines to the CMM room and onto the CMM
 - Requires gentle offloading of part onto the CMM to avoid damaging the CMM Table.

People

- Engineers
- Machinists
- Quality
- Skill-sets

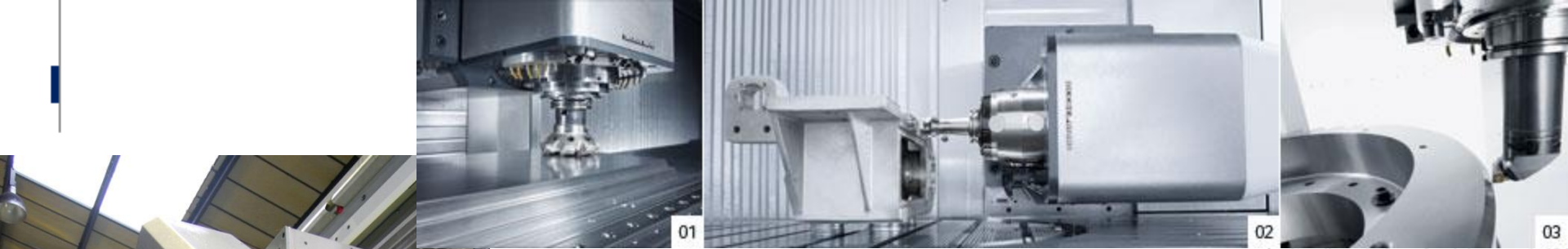
Mazak Integrex



Mazak Double Column CNC FJV-60/120



FJV-60/80 shown



DMG-Mori Seiki DMF 360 Linear



Internal Processes

- Equipment required:
 - EMCO
 - Conventional lathe 3M
 - DHB
 - NL3000, Doosan
 - Honing
 - Gundrilling
 - HM1000, HU80 or A88
 - Sachman
 - TIG welding
 - 600° oven to heat treat at 588°C after welding
 - EDM
 - NL2500
 - NL1500

External processes

- Shot peening
- Pressure testing at 25K psi @ 177°C (Collapse test)???
- Machining of all BeCu plugs
- QPQ

Problems

- EB welding
- Part No.100834944 gundrill hole too deep, unable to do
- Part No. 100844346 Ø1.0” gundrill hole too deep, DHB??
- Part No.100884851 gundrill hole too deep, unable to do
- Part No.100911187 gundrill hole too deep, unable to do

[Return](#)