IIoT in CNC Machining

Course Objectives	• Concept and fundamentals of IIOT in CNC Machining. • Advanced knowledge of CNC machining process and hands on experience to configure machine tool monitoring. • Applying the concepts of data collection and monitoring the status of CNC Turning and Milling machines. • Comprehending the advantages and application of IIOT in CNC turning and milling machines in the manufacturing industry with department wise benefits. • Experiencing a hands-on application of IIOT to improve productivity and processes.
Course Outcomes	• Display IIoT principles and machine tool monitoring role in CNC machining. • Analyse applications of IIOT in a real time scenario. • Apply, monitor & analyse machine tool monitoring operations in CNC machining. • Relate and analyse the way manufacturing processes are monitored, controlled, and optimized in smart factories.

Course Duration: 45 Hours

Course Curriculum:

UNIT I Introduction to IIOT and Machine Tool Monitoring

Definition & overview of IIOT - Evolution and Trends in Industrial Automation - Key Components and Architecture of IIoT Systems - Applications and Use Cases in Various Industries - Overview of Machine Tools and Their Importance in Manufacturing - Challenges in Machine Tool Monitoring - Role of IIoT in Enhancing Machine Tool Performance and Efficiency.

UNIT II Machine Tool Monitoring in CNC Machine

Importance of Real-Time Monitoring in CNC Machining - Sensors and Data Acquisition - Features and Functions of Machine Tool Monitoring Software – Testing & Validation of System Performance under Various Operating Conditions.

UNIT III Machine Tool Monitoring Functionalities - Part 1

Production monitoring: Live state monitoring and alarm recognition - Tool Life monitoring: Tool Life information including tool number, count, life limit - Performance overview: Reviewing operational results and machine utilization - Diagnostics: Viewing diagnostic data, alarm history, and program history.

UNIT IV Machine Tool Monitoring Functionalities - Part 2

Signal monitoring: Monitoring feed rates, spindle/servo load, temperature override, etc - Operational and production results: Graphs displaying machine states and comparing production plans - Alarm history and program history: Analyzing past alarms and program cycle times.

UNIT V Advanced Functionalities and Practical Implementation

Signal history: Identifying correlations between machine signals and checking component conditions - Macro value history: Storing and analyzing macro variable values - Report output: Scheduling and customizing reports for automatic generation - File transfer: Managing NC data and creating backups.

Test Projects:

Use Cases:

Industry Use-Cases

1. **Real time monitoring dashboard**

   Assessment Rubrics:

   Task 1: Data collection

   Task 2: Data Transmission

   Task 3: Data Processing & Storage

   Task 4: Dashboard development

   Task 5: Visualization & Analysis

2. **Calculate Overall Equipment Effectiveness (OEE) of shop**

   Assessment Rubrics:

   Task 1: Availability (A)

   Task 2: Performance (P)

   Task 3: Quality (Q)

   Task 4: Calculation of OEE

   Task 5: Resource Allocation

3. Predictive Maintenance Analytics Report.

Assessment Rubrics:

Task 1: Equipment Health Overview

Task 2: Predictive Maintenance Alert

Task 3: Failure Prediction Trends

Task 4: Maintenance Performance Analysis

Task 5: Recommendations & Action plan

4. Energy Consumption and Efficiency Report

Assessment Rubrics:

Task 1: Data Collection and Aggregation

Task 2: Energy Consumption Analysis

Task 3: Efficiency Assessment

Task 4: Identification of Opportunities

Task 5: Recommendations and Action Plan

5. Quality Assurance Report

Assessment Rubrics:

Task 1: Data Collection and Analysis

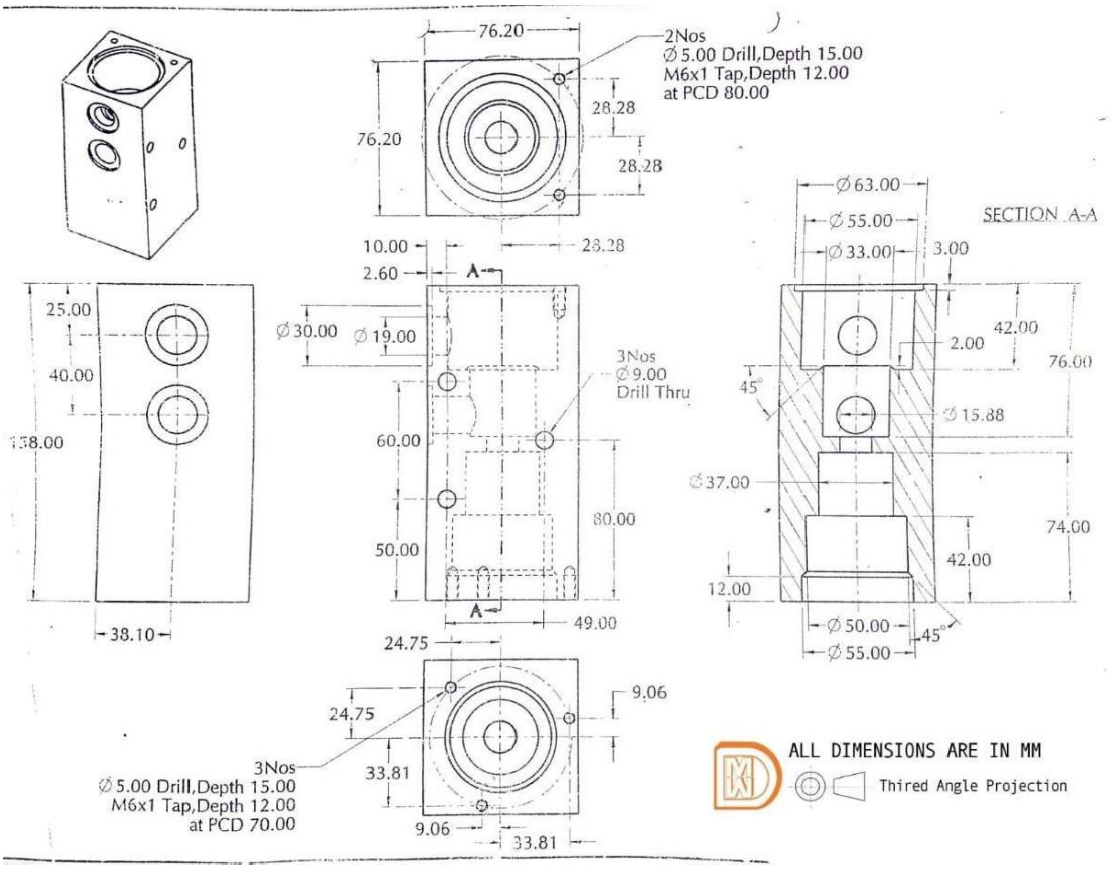
Task 2: Defect Analysis and Root Cause Identification

Task 3: Quality Performance Metrics

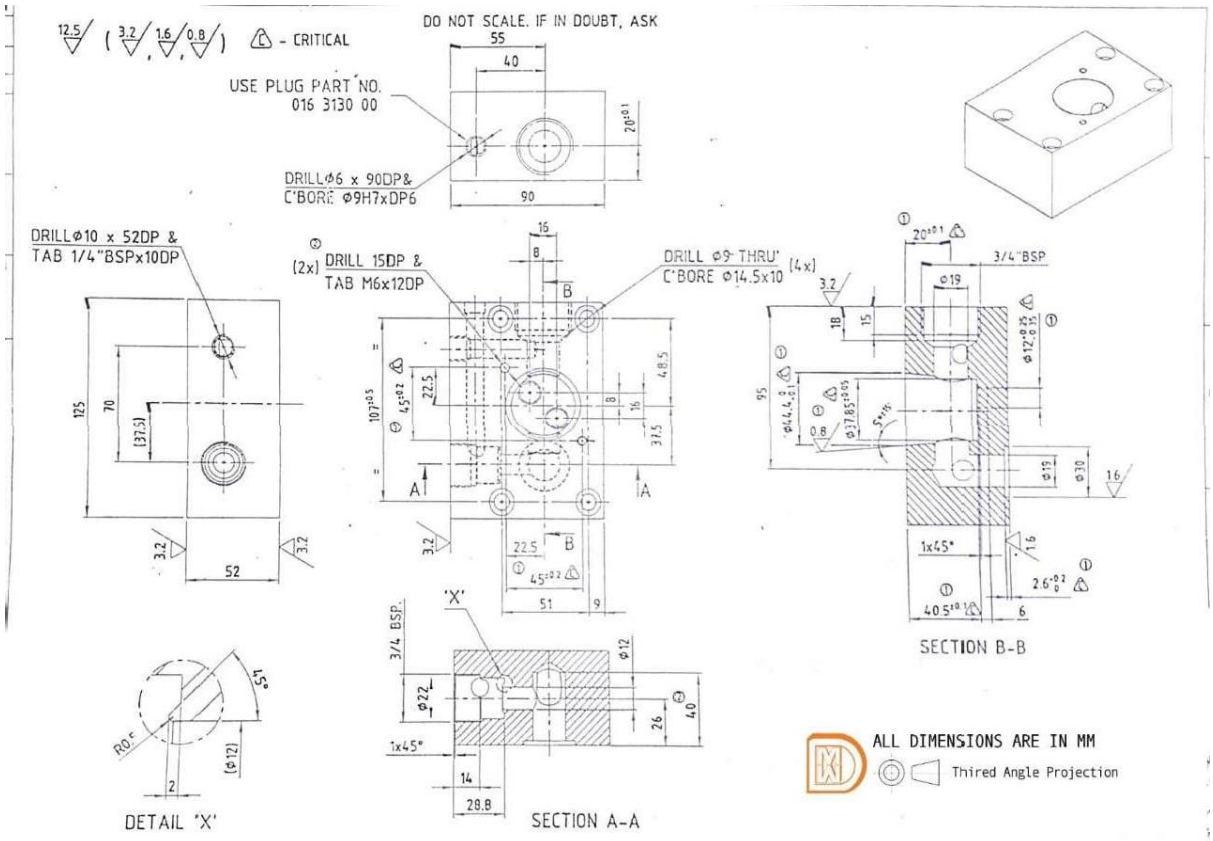
Task 4: Process Improvement Recommendations

Task 5: Continuous Improvement Plan

1) PART NAME - BVI BODY

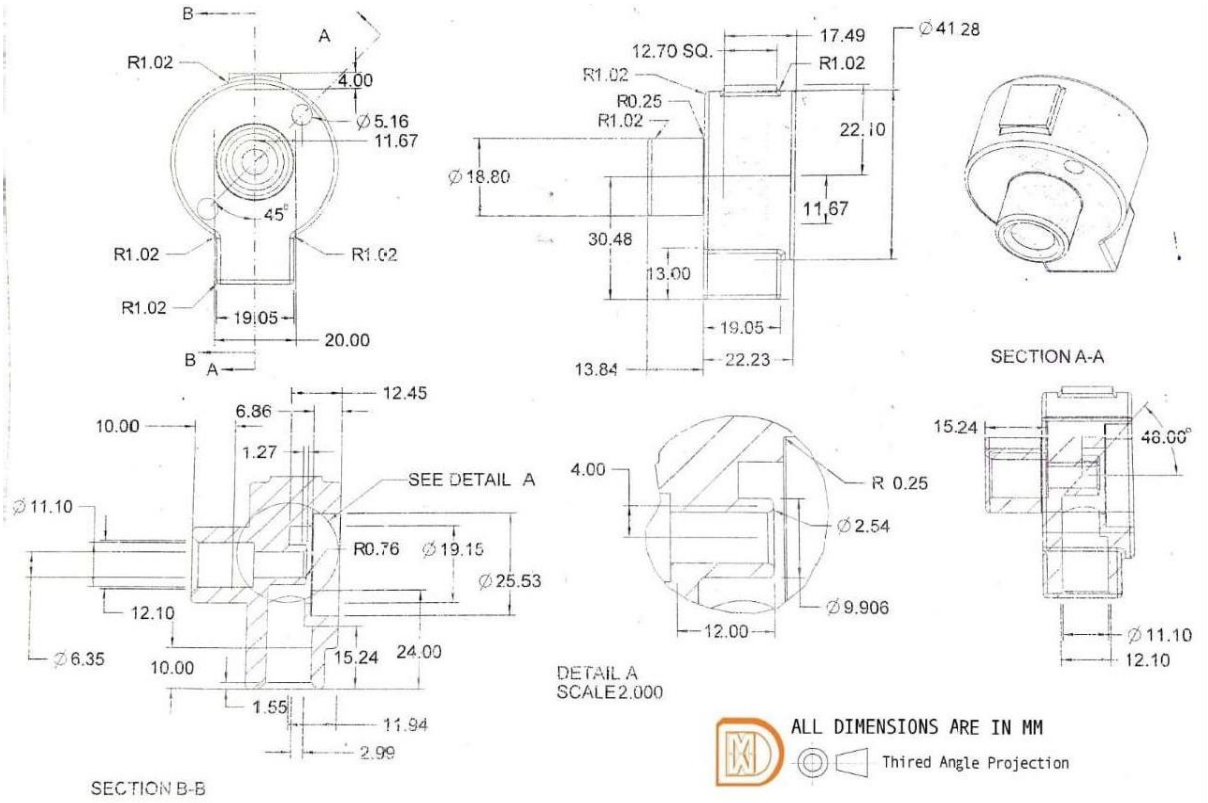


2) PART NAME - COCK BODY

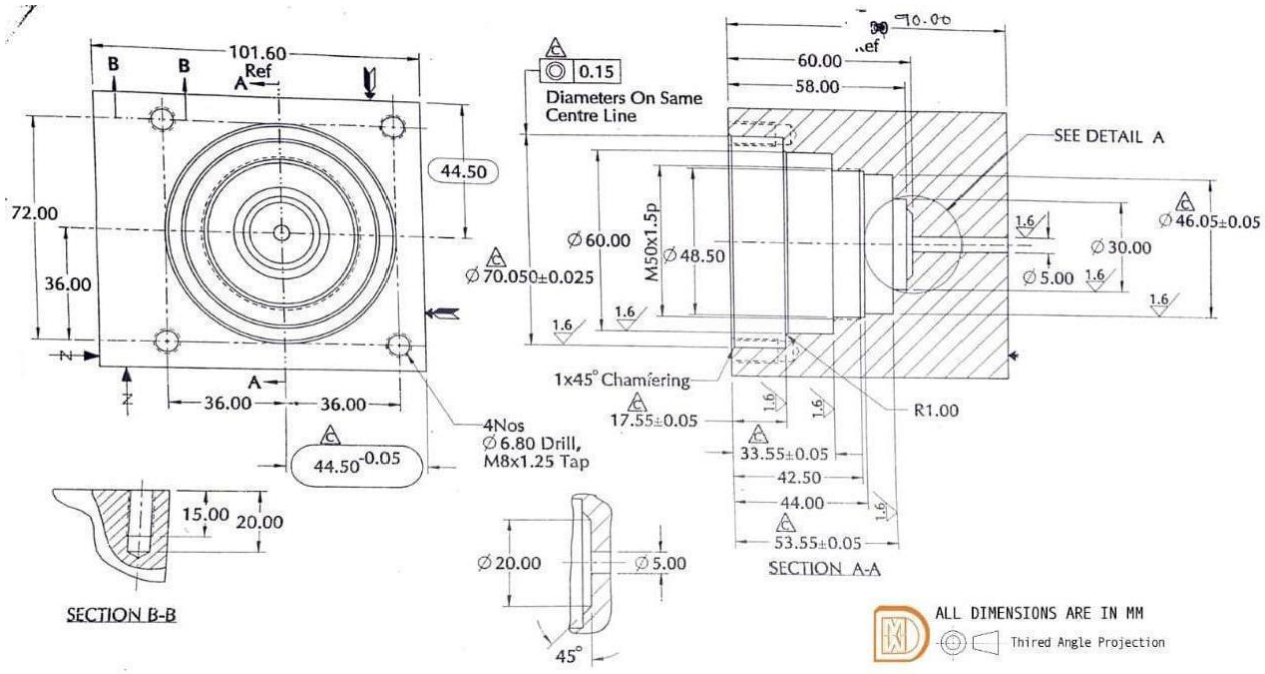


3) PART NAME –BODY ADAPTER QUICK

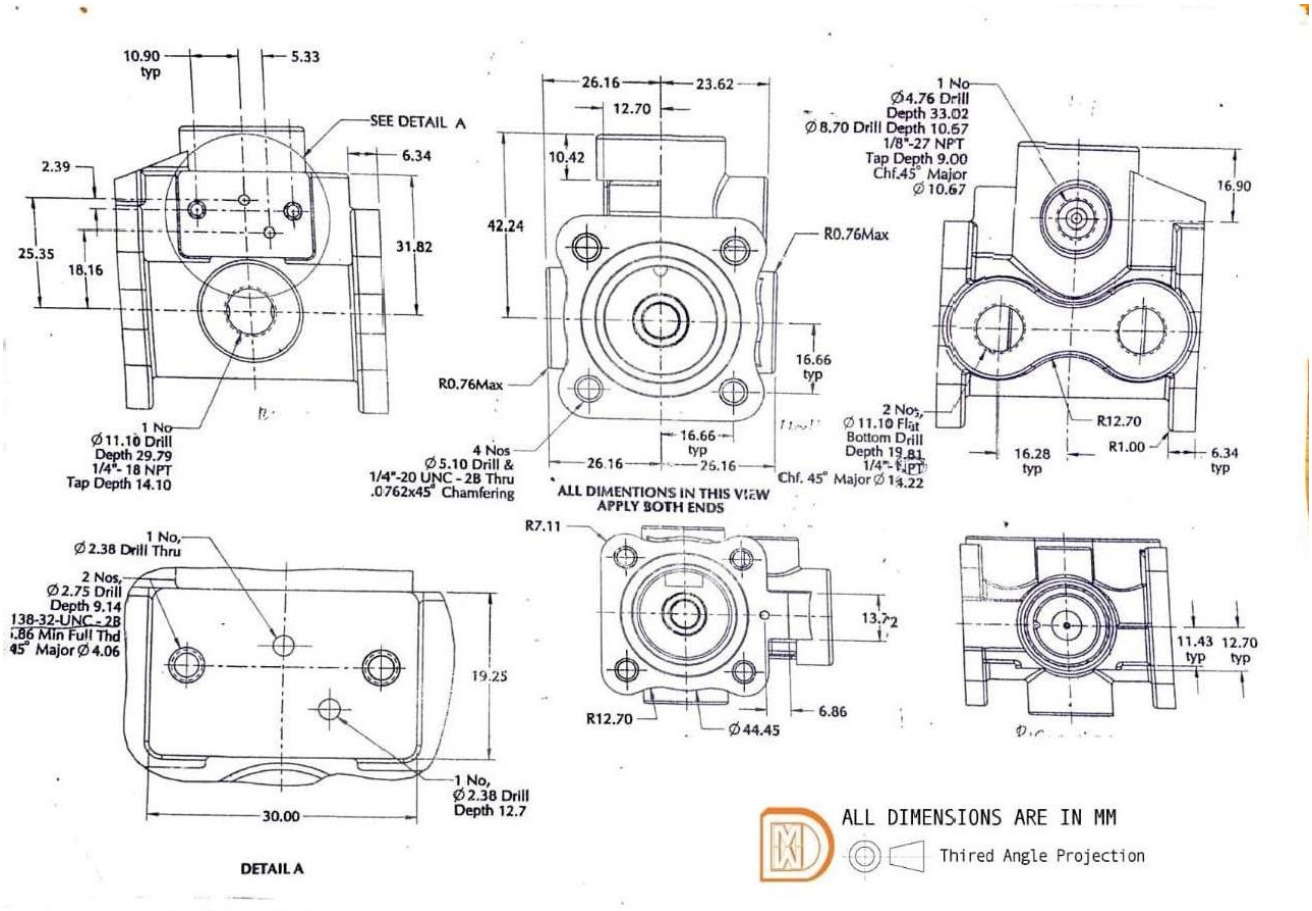
EXHAUST



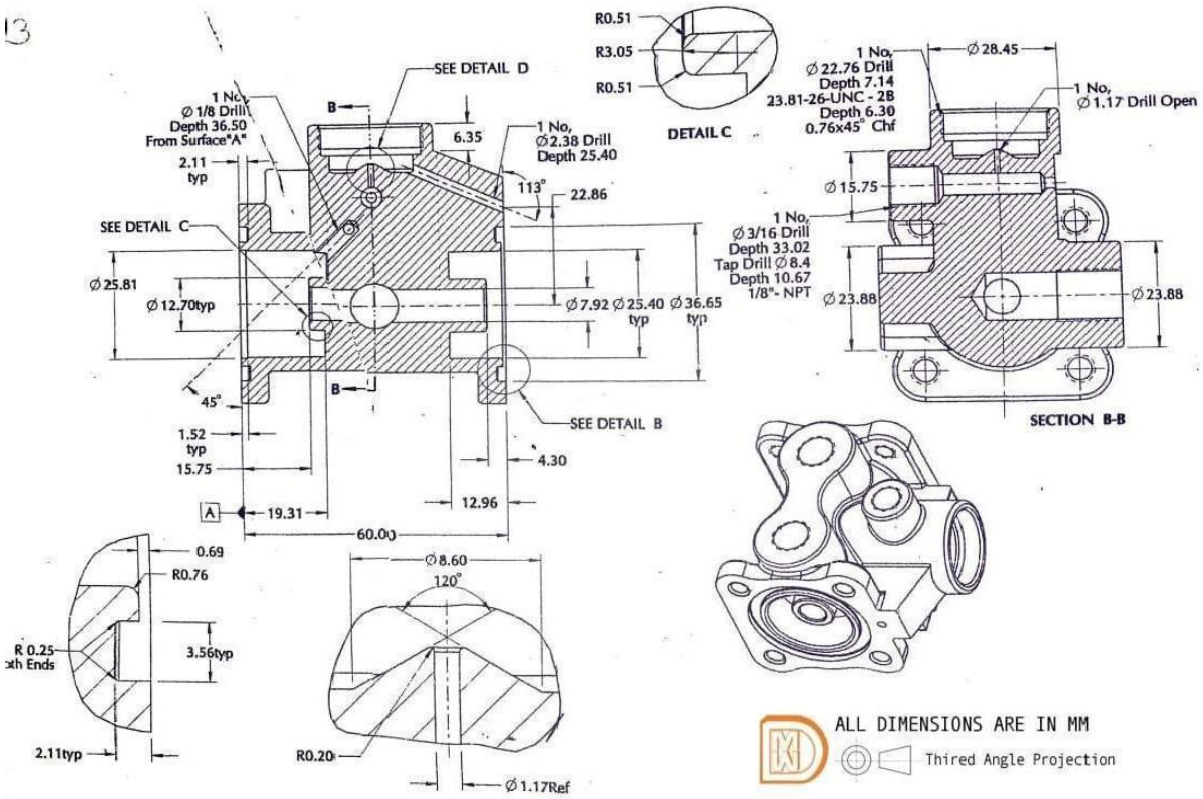
4) PART NAME - DISTRIBUTOR BODY



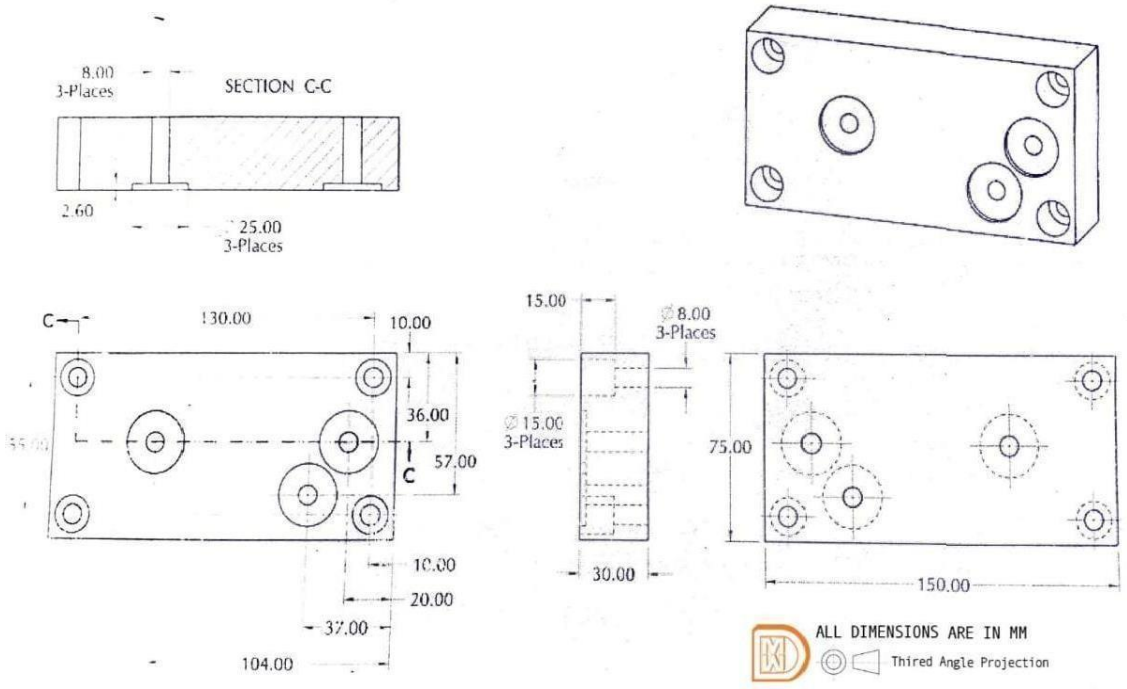
5)PART NAME - BODY PIPE THD SERIES



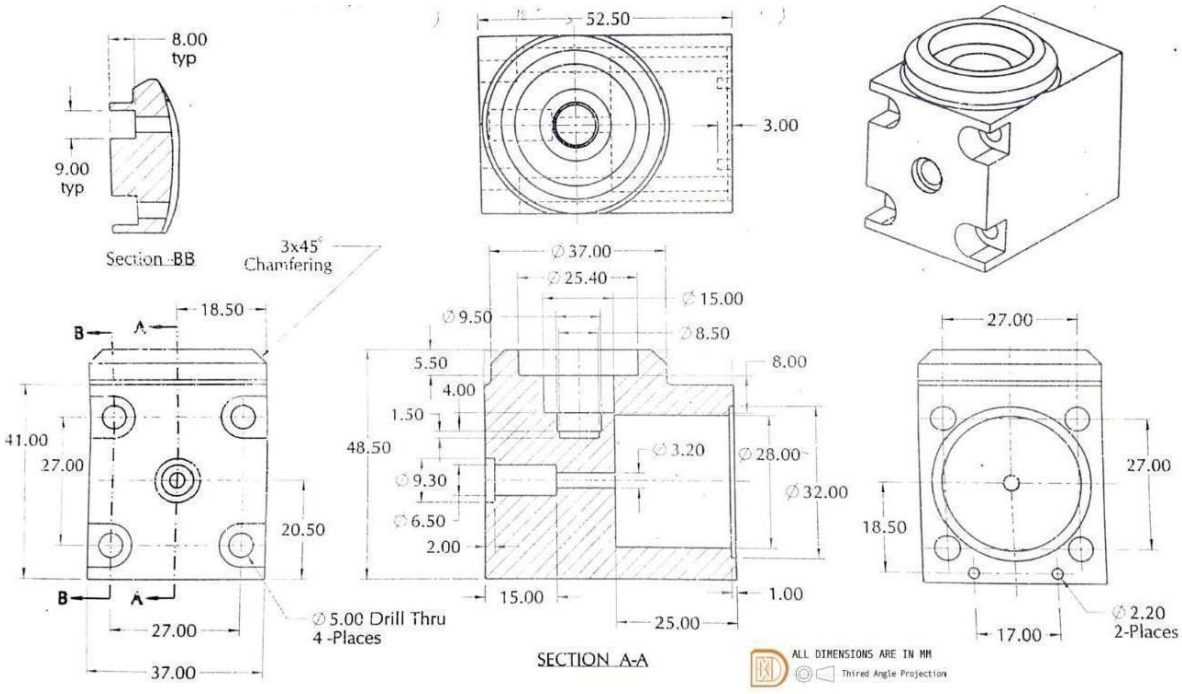
13


SEE DETAIL D
1 No,
Ø 1/8 Drill
Depth 36.50
From Surface"A"
2.11
typ
B
6.35
1 No,
Ø2.38 Drill
Depth 25.40
113°
22.86
SEE DETAIL C
Ø 25.81
Ø 12.70typ
Ø 7.92 Ø 25.40 Ø 36.65
typ typ
45°
B
SEE DETAIL B
1.52
typ
15.75
4.30
A
19.31
12.96
60.00
0.69
R0.76
R 0.25
3.56typ
2.11typ
Ø 8.60
120°
R0.20
Ø 1.17Ref
R0.51
R3.05
R0.51
DETAIL C
1 No,
Ø 22.76 Drill
Depth 7.14
23.81-26-UNC - 2B
Depth 6.30
0.76x45° Chf
Ø 28.45
1 No,
Ø 1.17 Drill Open
Ø 15.75
1 No,
Ø 3/16 Drill
Depth 33.02
Tap Drill Ø 8.4
Depth 10.67
1/8"- NPT
Ø 23.88
Ø 23.88
SECTION B-B
ALL DIMENSIONS ARE IN MM
Thired Angle Projection

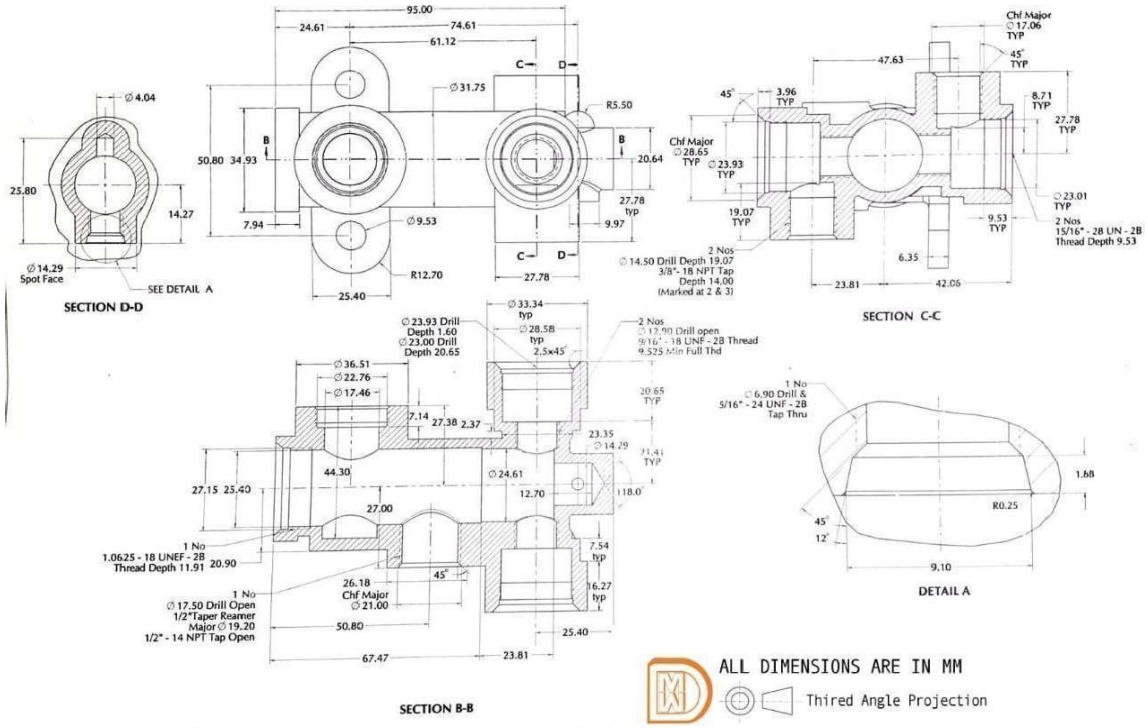
6)PART NAME – MANIFOLD

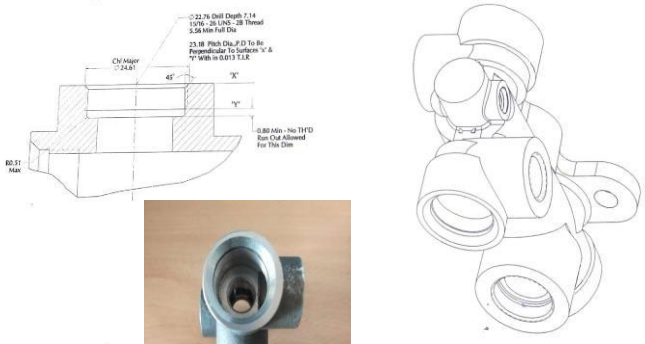


7)PART NAME - SOLENOID CAP

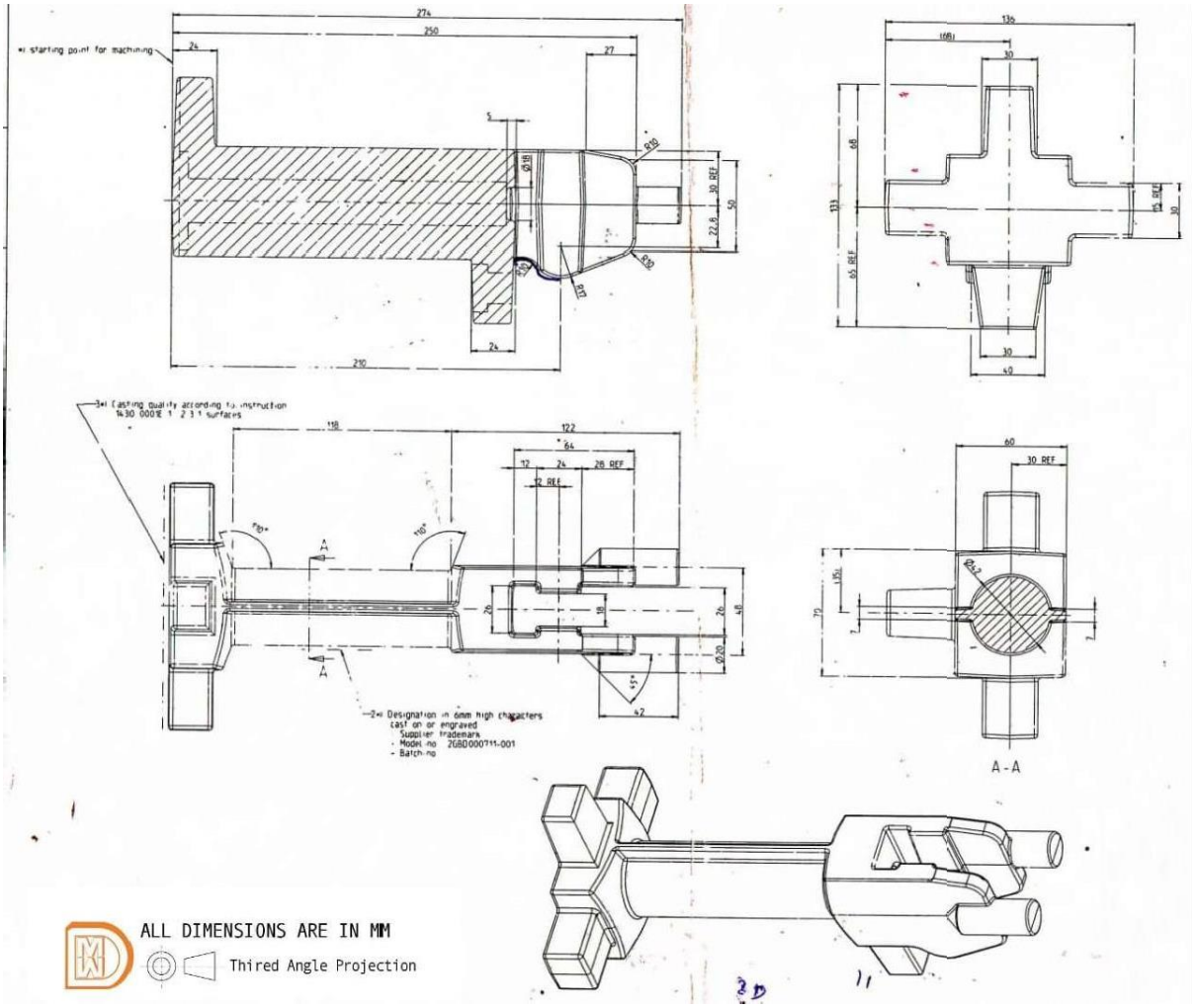


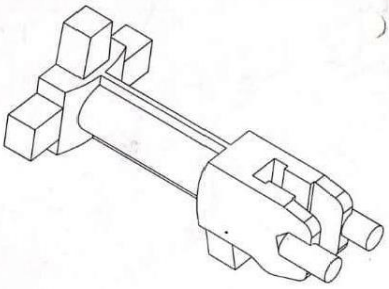
8) PART NAME - BODY BULL

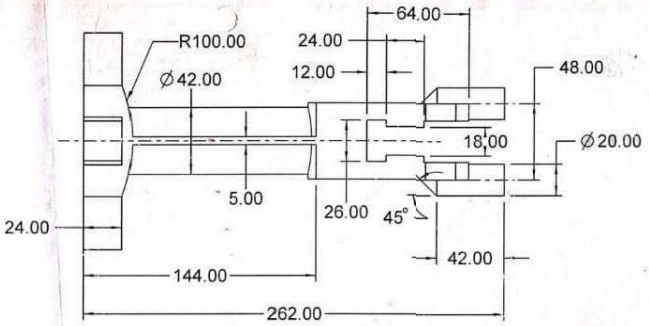


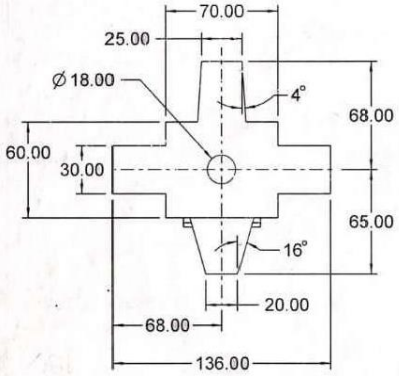


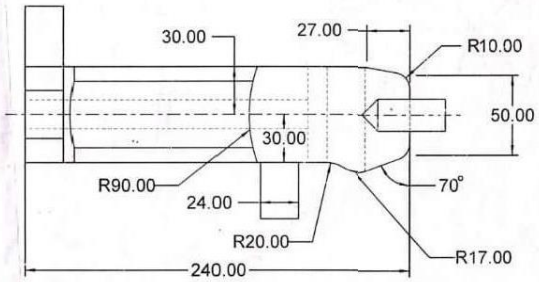
9) PART NAME - SUPPORT





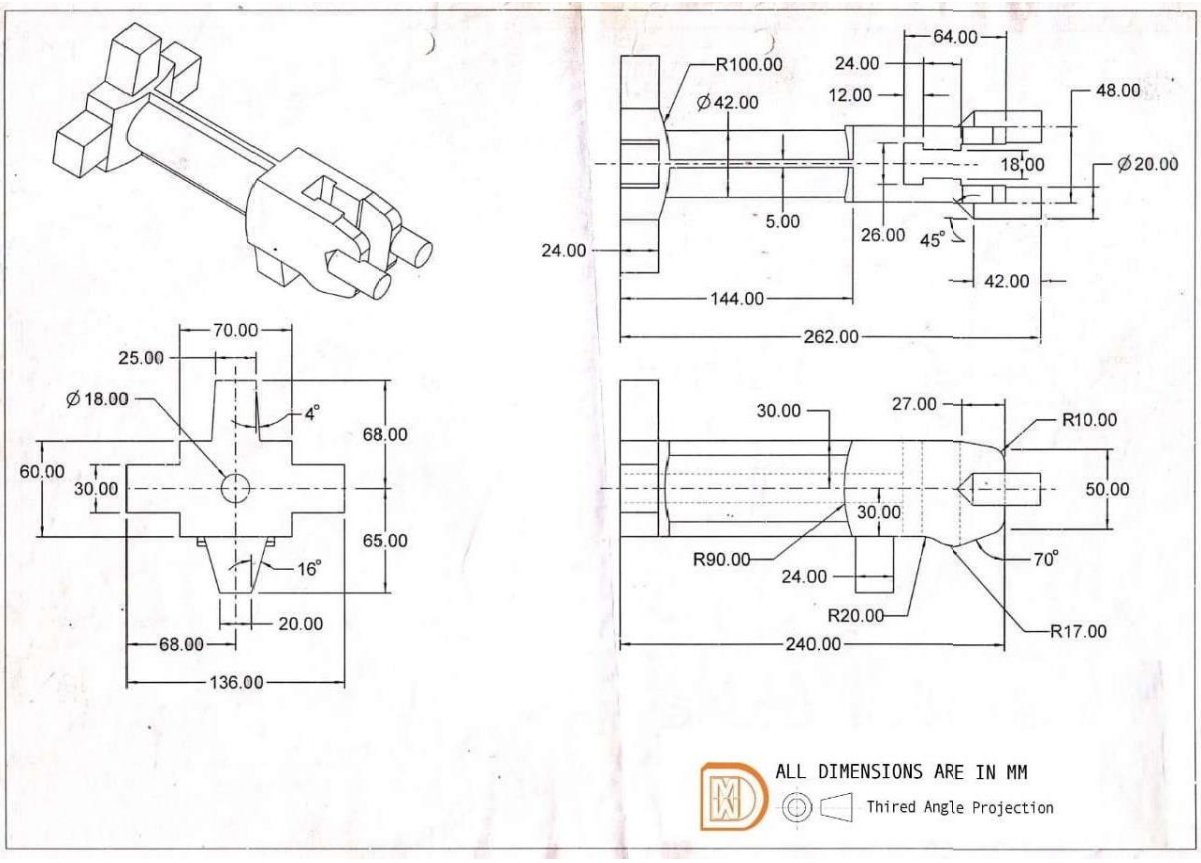


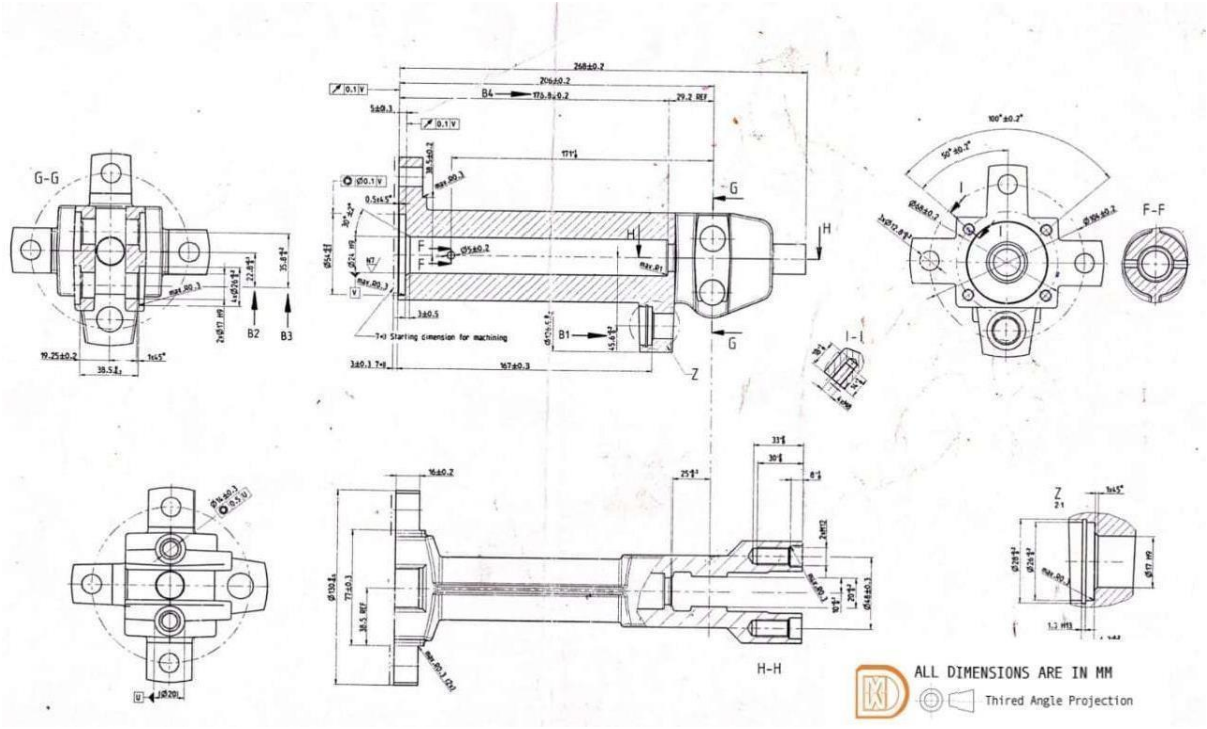




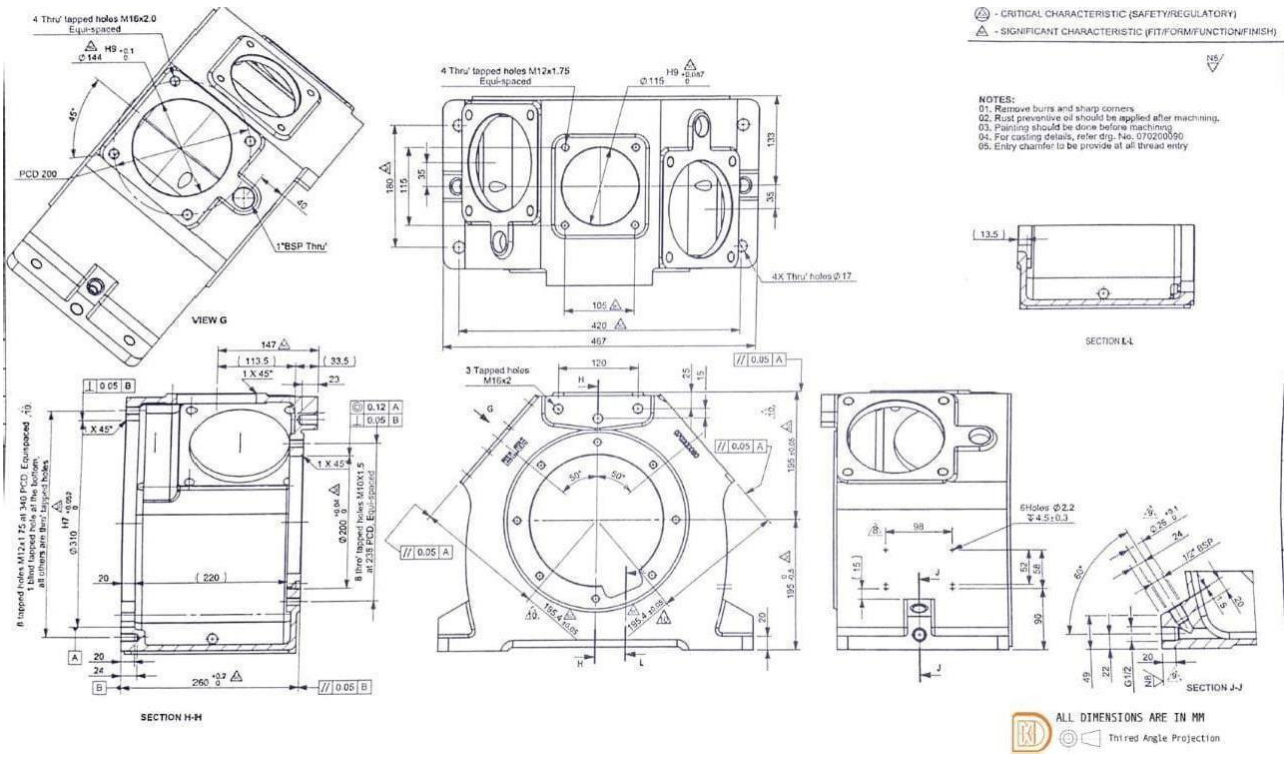
ALL DIMENSIONS ARE IN MM

Thired Angle Projection

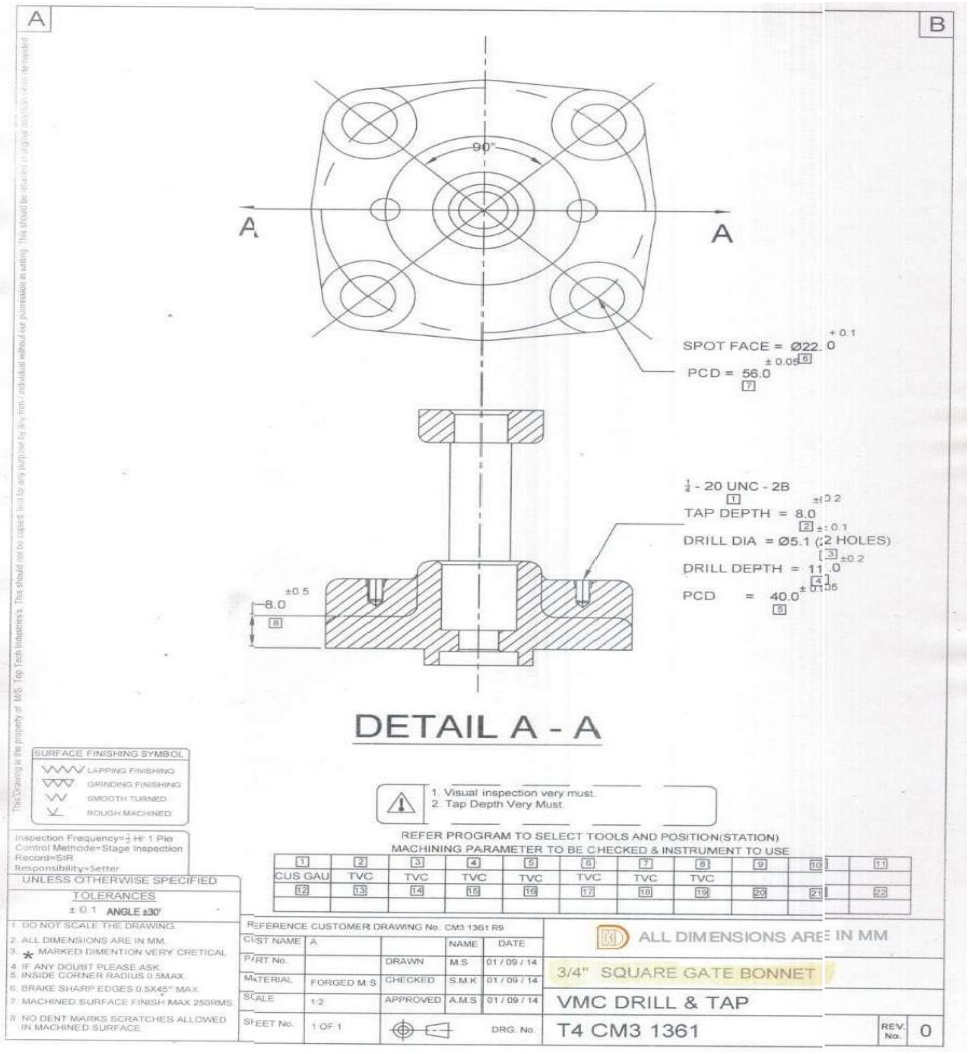

R100.00
Ø42.00
64.00
24.00
12.00
48.00
18.00
Ø20.00
5.00
26.00
45°
24.00
42.00
144.00
262.00
70.00
25.00
Ø18.00
4°
68.00
60.00
30.00
65.00
16°
20.00
68.00
136.00
30.00
27.00
R10.00
50.00
30.00
R90.00
24.00
70°
R20.00
R17.00
240.00
ALL DIMENSIONS ARE IN MM
Thired Angle Projection


G-G
F-F
I-I
H-H
Z
B1
B2
B3
B4
ALL DIMENSIONS ARE IN MM
Thired Angle Projection

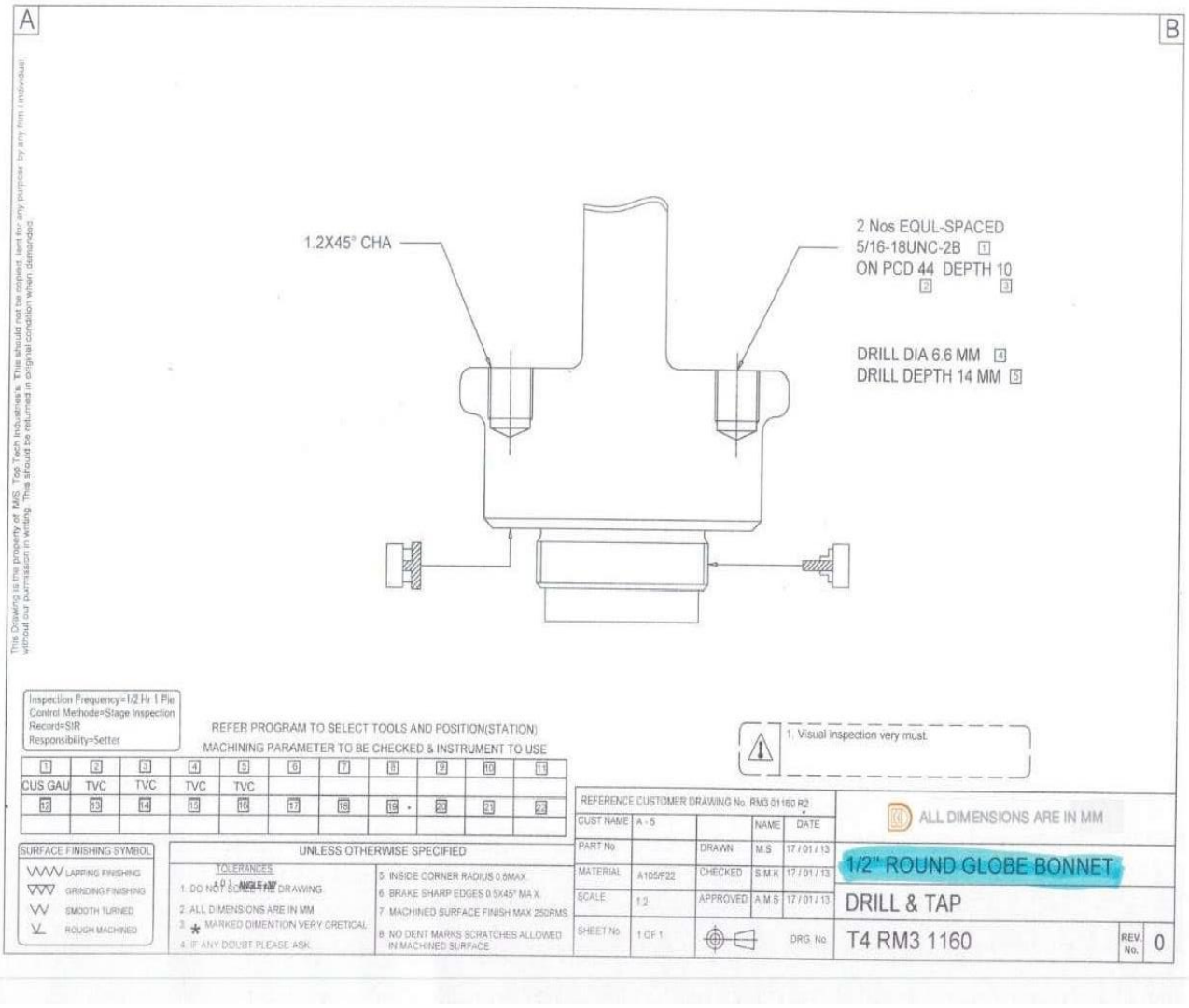
10) PART NAME - CRANK CASE



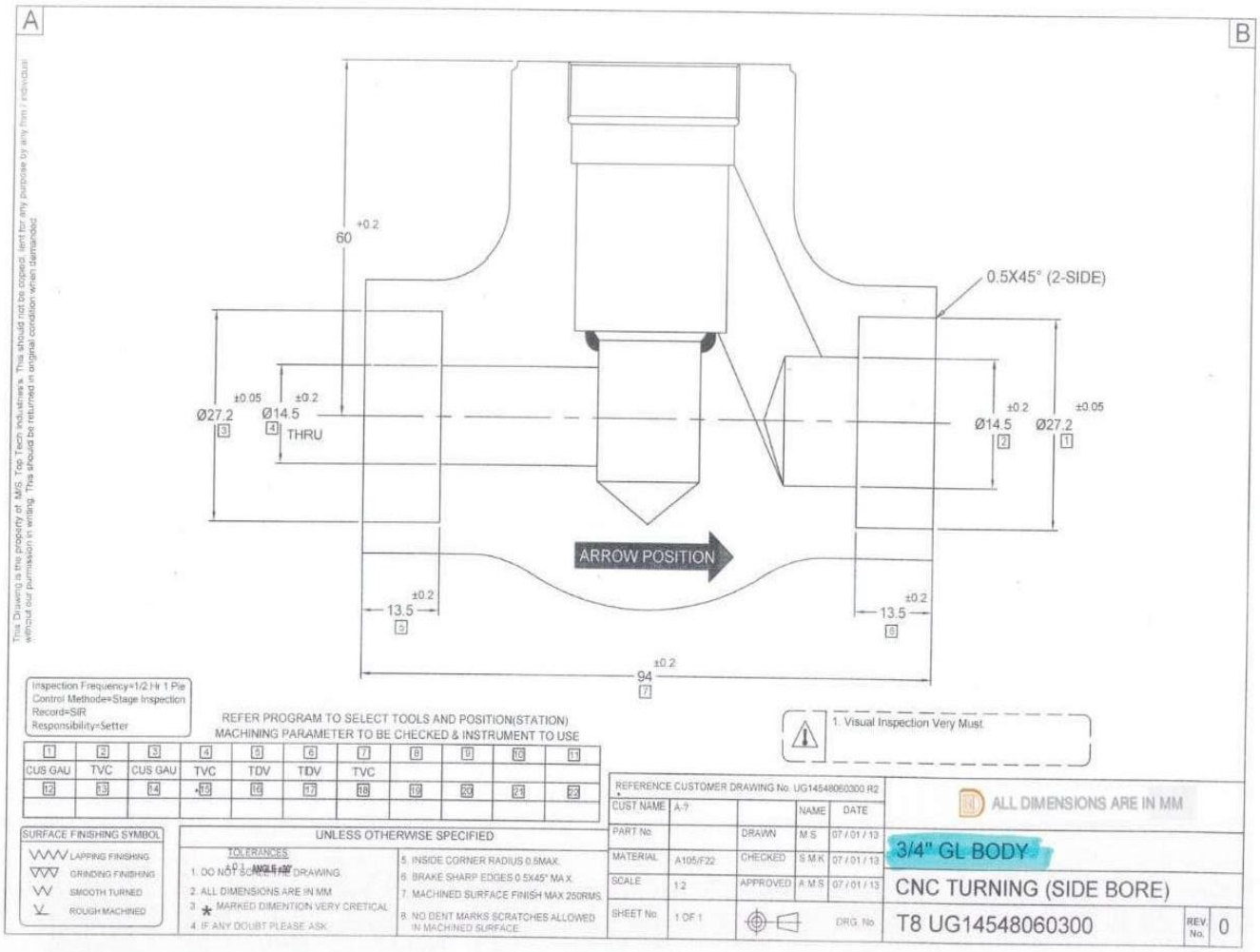
11)PART NAME - SQUARE GATE BONNET



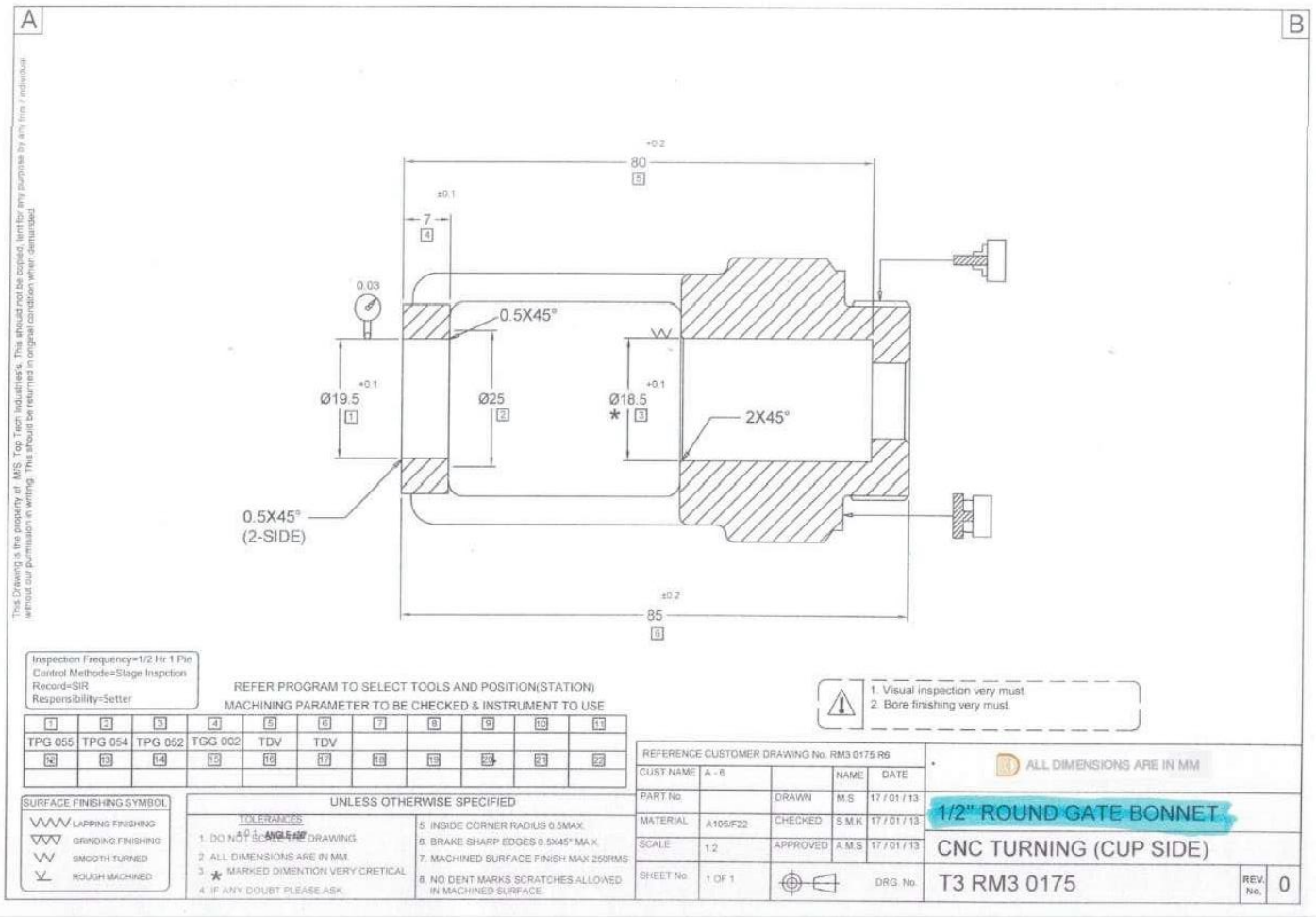
12)PART NAME - ROUND GLOBE BONNET



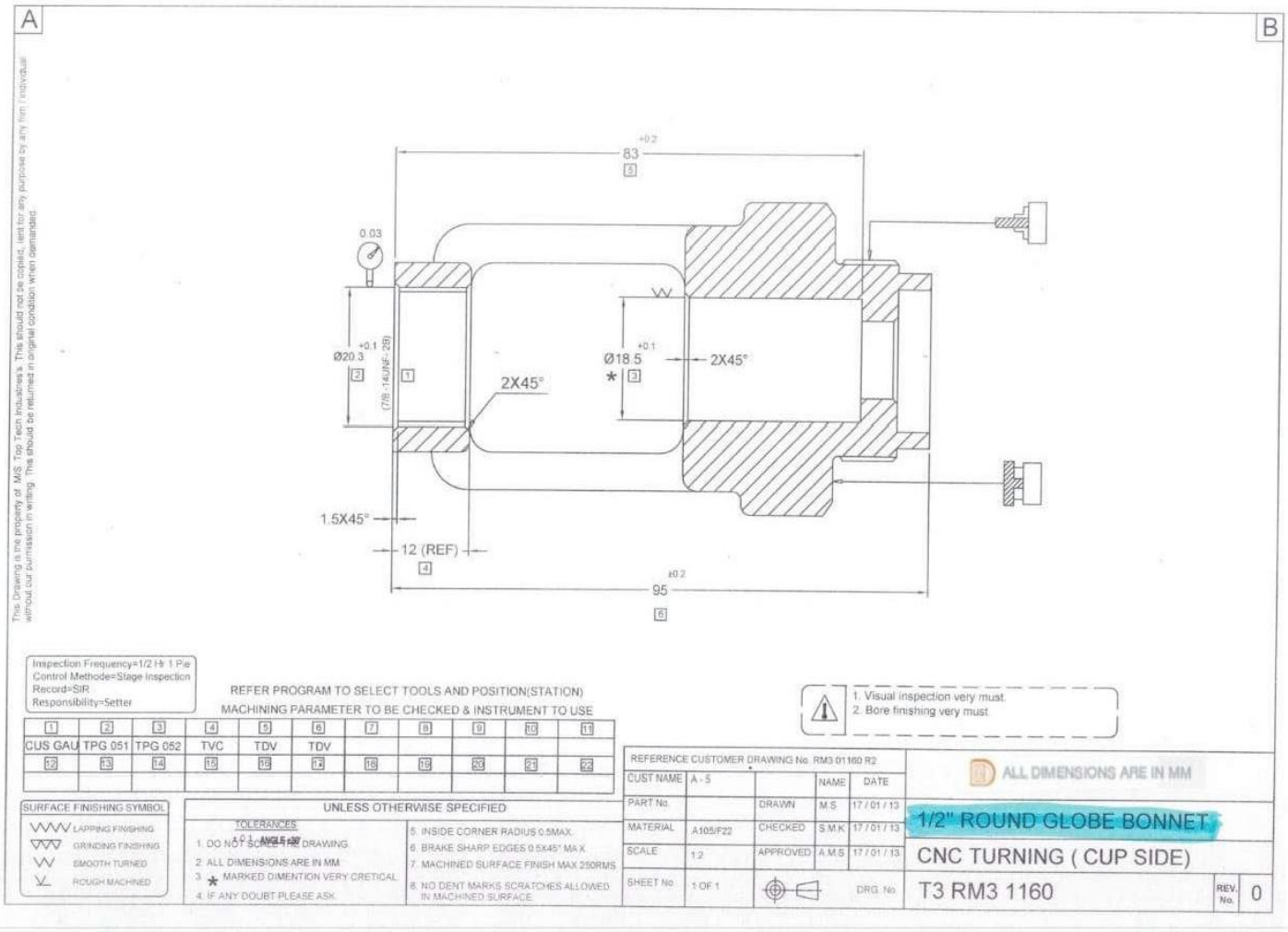
13) PART NAME - GL BODY



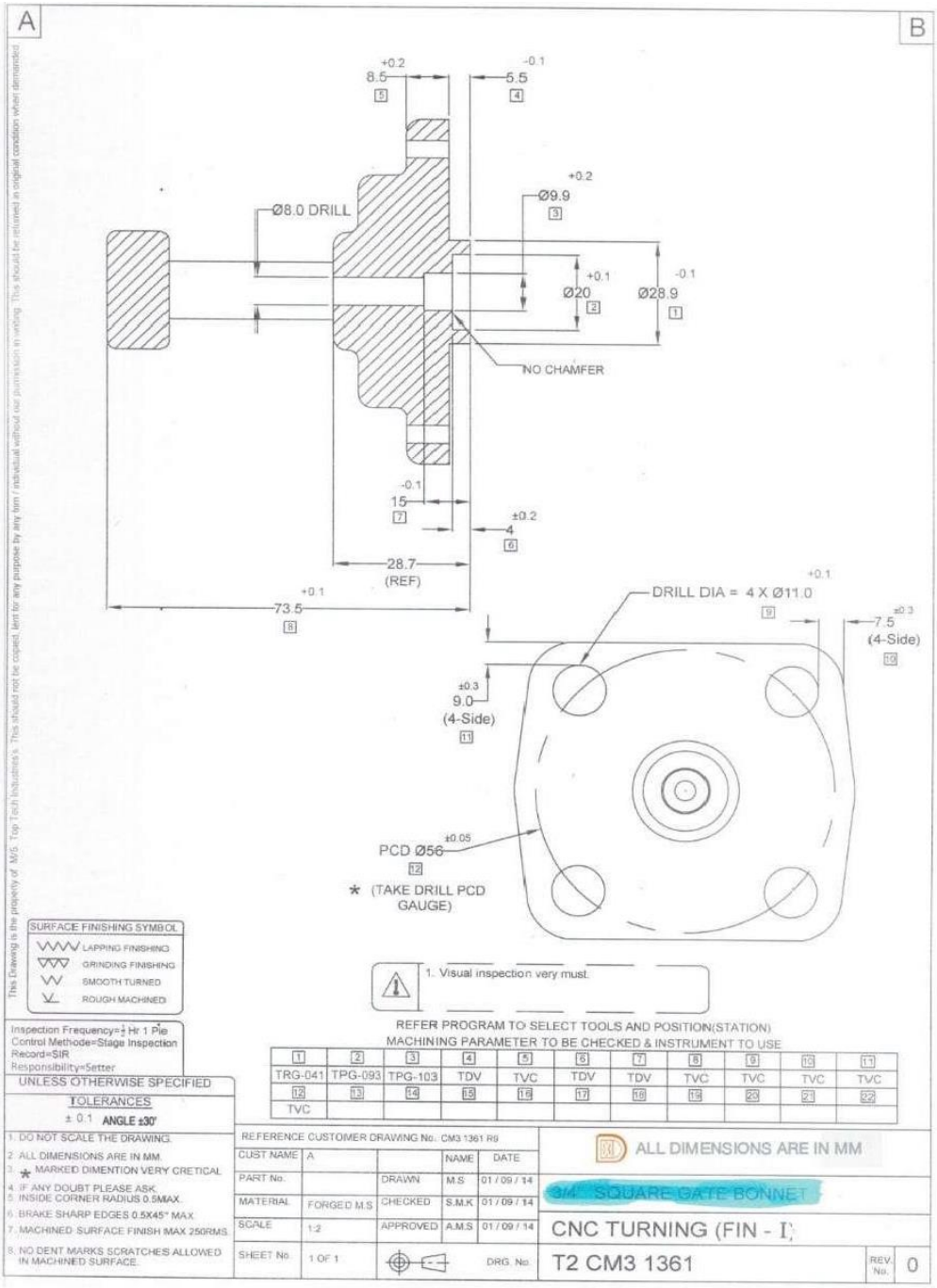
14)PART NAME - ROUND GATE BONNET



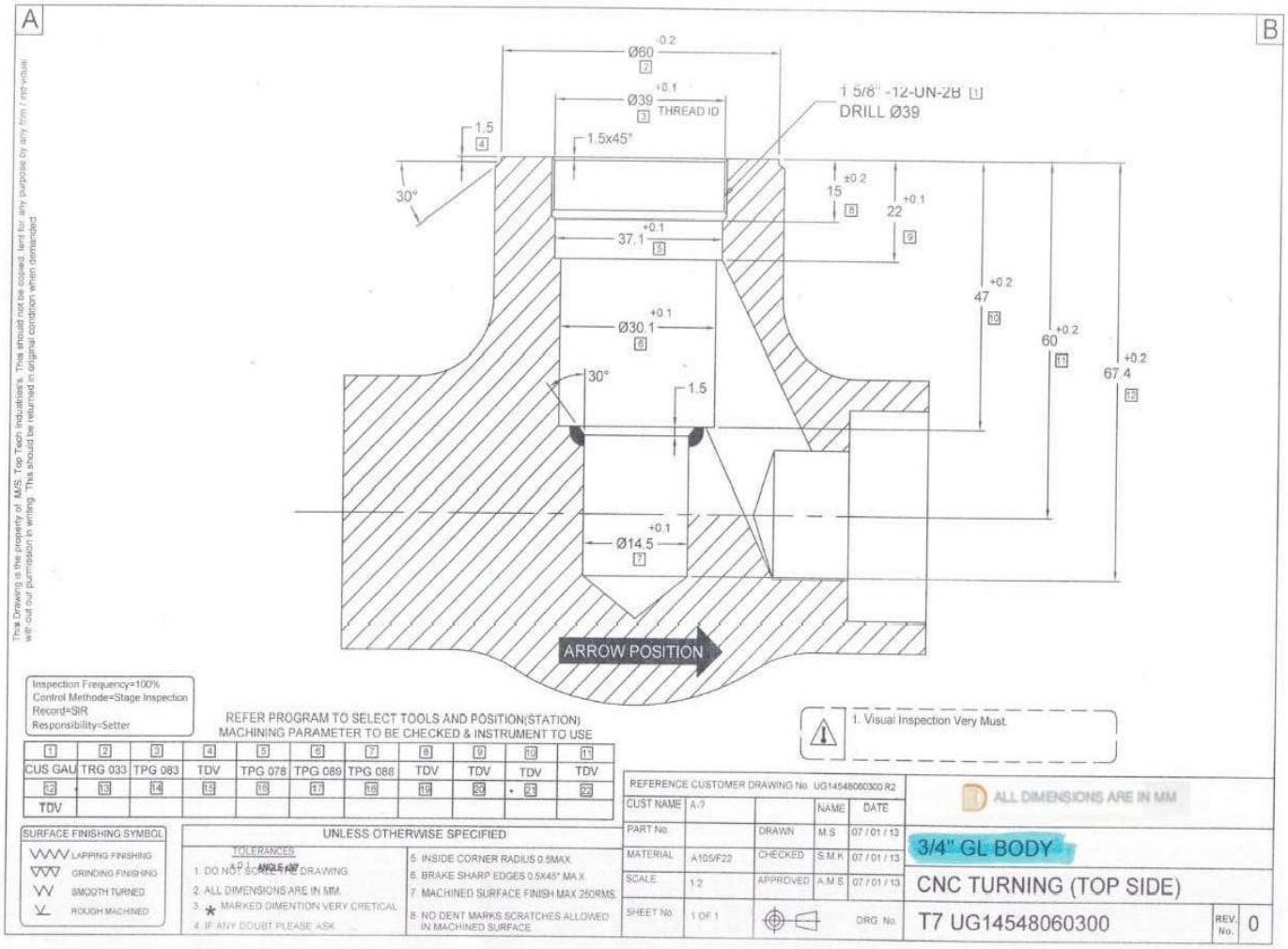
15) PART NAME –ROUND GLOBE BONNET



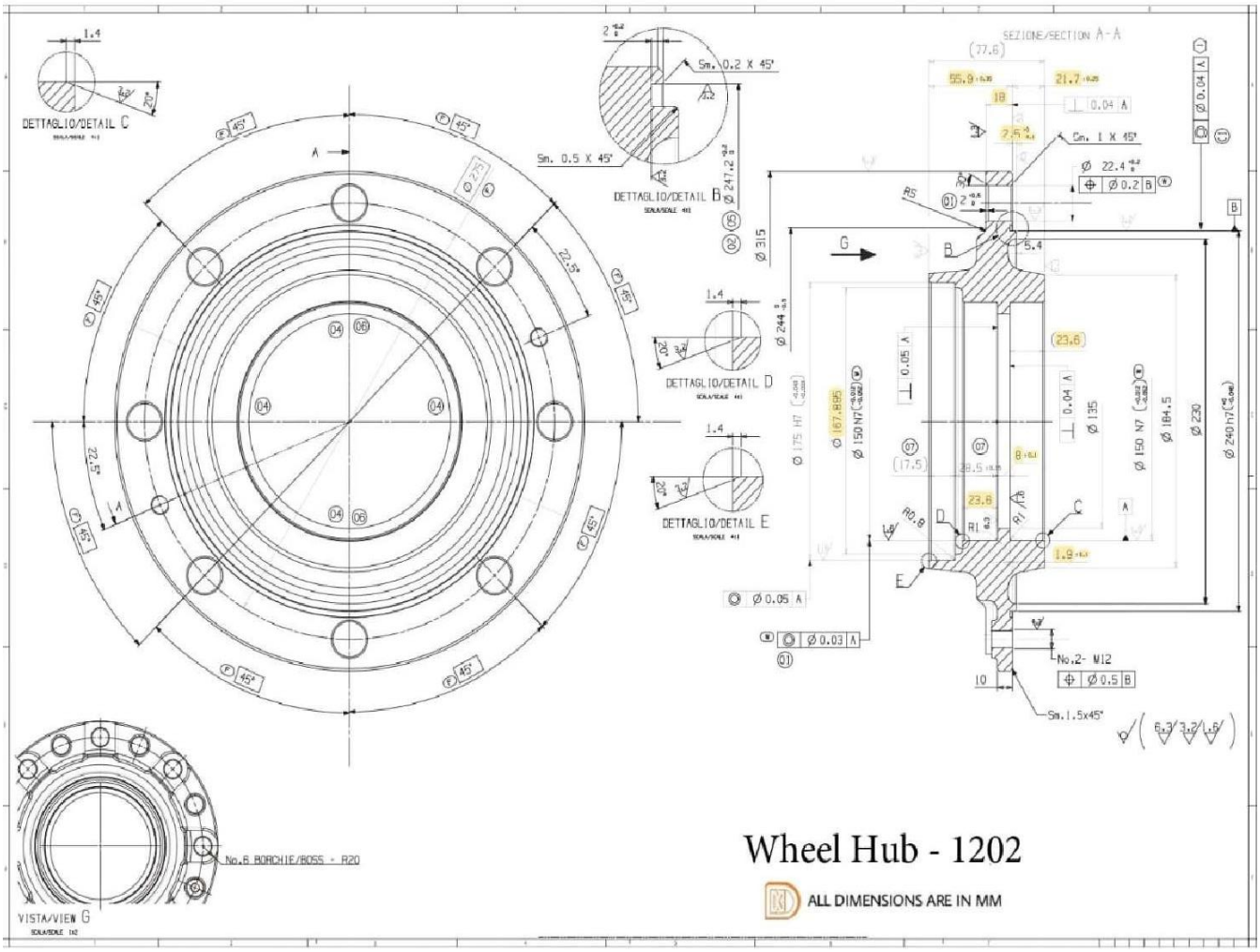
16) PART NAME - SQUARE GATE BONNET



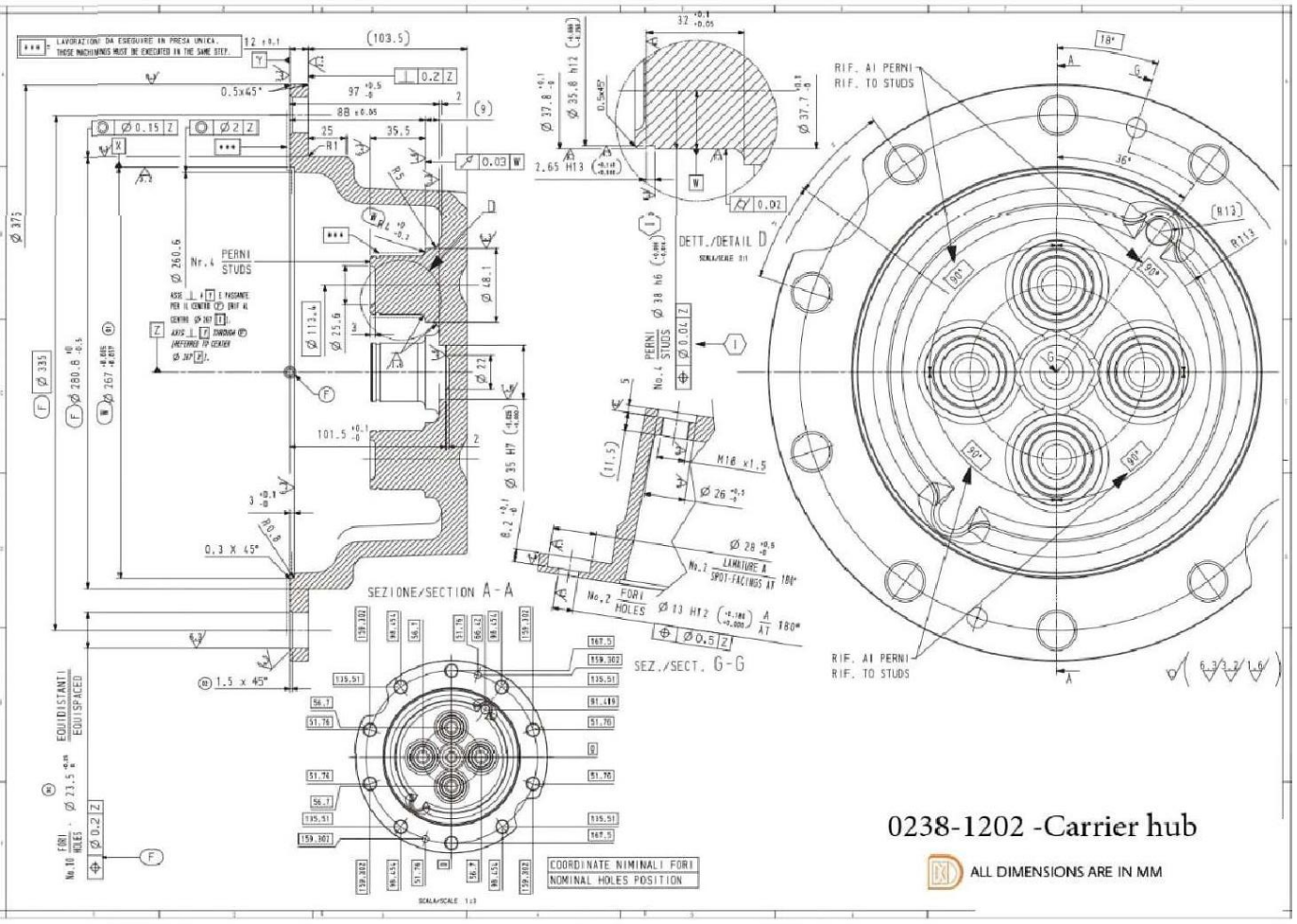
17)PART NAME - GL BODY



18) PART NAME - WHEEL HUB



19)PART NAME - CARRIER HUB



20) PART NAME - BRAKE COUNTER DISC