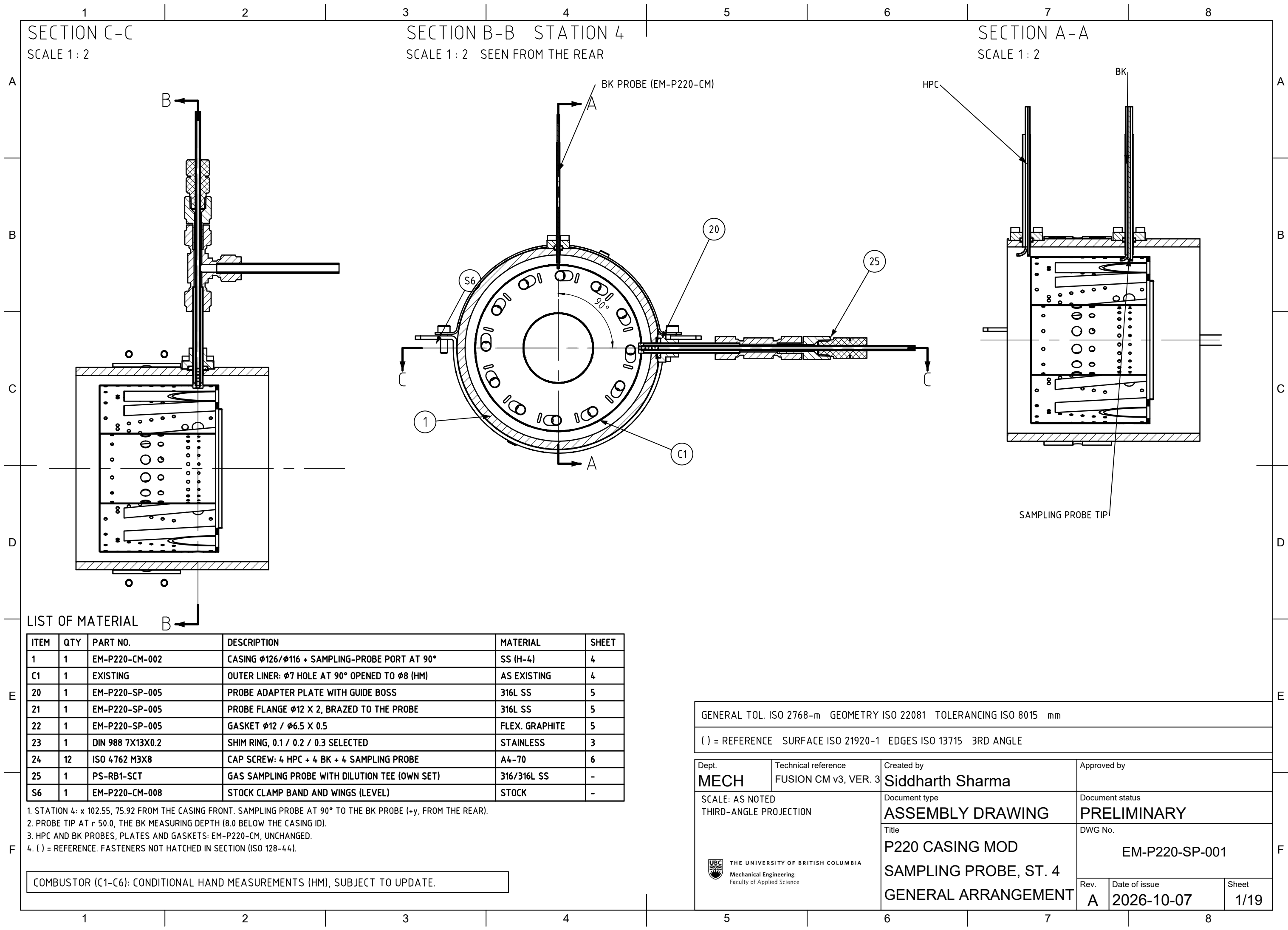
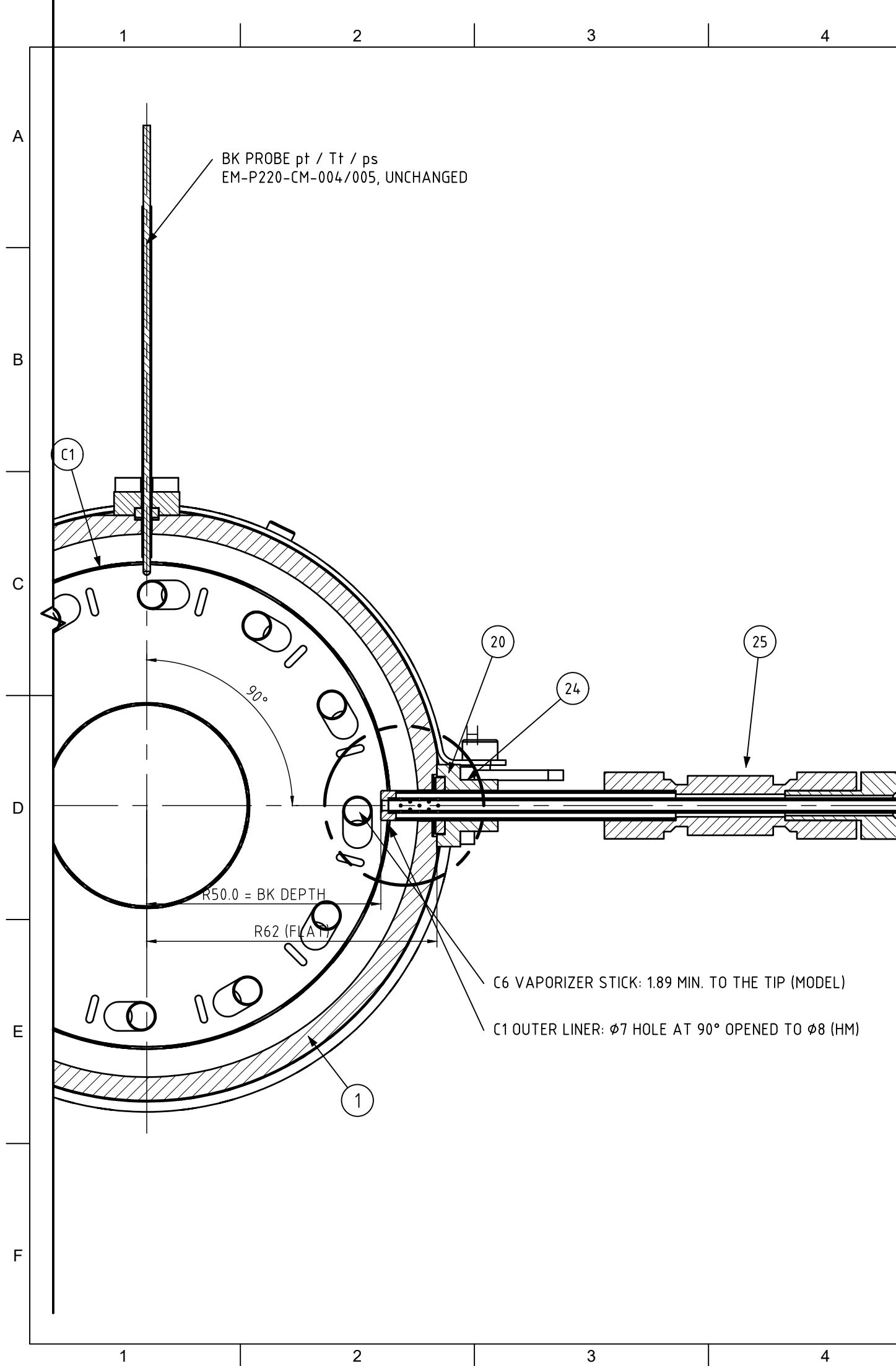
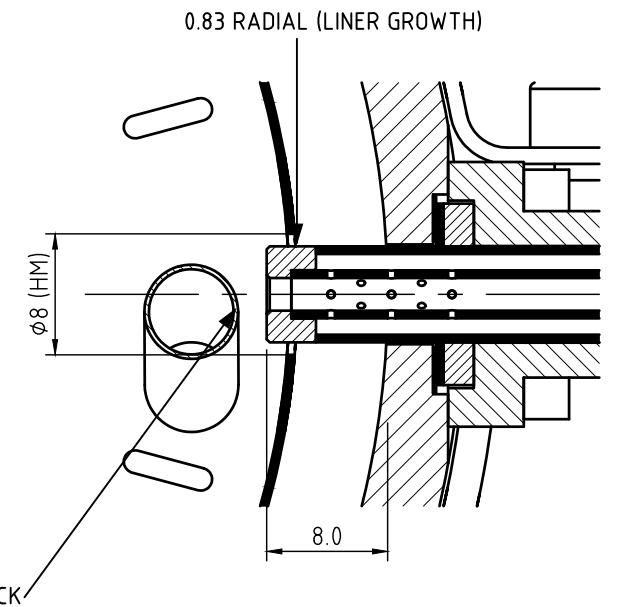






SECTION B-B STATION 4
SCALE 1 : 1 x = 102.55, SEEN FROM THE REAR

DETAIL H
SCALE 2 : 1



STATION 4 PROBES

PROBE	ANGLE	TIP r	BELOW CASING ID	LINER PASS	MOUNT
BK (pt, Tt, ps)	0°	50.0	8.0	Ø7 HOLE AT 0°	EM-P220-CM, PLATE 2
GAS SAMPLING (25)	90°	50.0	8.0	Ø8 HOLE AT 90°	SHEET 3, PLATE 20

COMBUSTOR (HM)

QUANTITY	VALUE	BASIS
OUTER LINER OD	104 (104.11)	CALIPER/PHOTO
OUTER LINER LENGTH	71.96	MEASURED
LINER WALL	0.5	ASSUMED
INNER LINER OD	43.93	REF
DOME, x FROM INTAKE	41.55	ASSUMED H-2
LINER-CASING ID GAP	5.95	DERIVED
Ø7 ROW 12X, x FROM DOME	61 (STATION 4)	±2
Ø7 HOLES	0° + 30° STEPS	HM
VAPORIZER STICKS 12X	Ø5.6 ON R45	HM
STICK vs Ø7 HOLE	1.5°	UNVERIFIED H-9

COMBUSTOR (C1-C6): CONDITIONAL HAND MEASUREMENTS (HM), SUBJECT TO UPDATE.

- BOTH PROBES MEASURE AT r 50.0, 8.0 BELOW THE CASING ID.
- NEAREST VAPORIZER STICK: 1.89 BELOW THE SAMPLING-PROBE TIP (BK: 1.15).
- () = REFERENCE.

GENERAL TOL. ISO 2768-m GEOMETRY ISO 22081 TOLERANCING ISO 8015 mm

() = REFERENCE SURFACE ISO 21920-1 EDGES ISO 13715 3RD ANGLE

Dept. MECH	Technical reference FUSION CM v3, VER. 3	Created by Siddharth Sharma	Approved by
SCALE: AS NOTED THIRD-ANGLE PROJECTION		Document type ASSEMBLY DRAWING	Document status PRELIMINARY
 THE UNIVERSITY OF BRITISH COLUMBIA Mechanical Engineering Faculty of Applied Science		Title P220 CASING MOD SAMPLING PROBE, ST. 4 SECTION AT STATION 4	DWG No. EM-P220-SP-002
		Rev. A	Date of issue 2026-10-07
		Sheet 2/19	

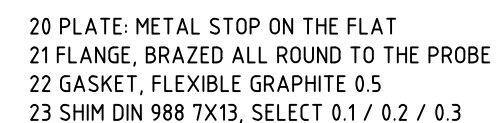
SCALE 4 : 1 PLANE THROUGH THE PROBE AXIS AND THE ENGINE AXIS



SCALE 4 : 1 x = 102.55, SEEN FROM THE REAR

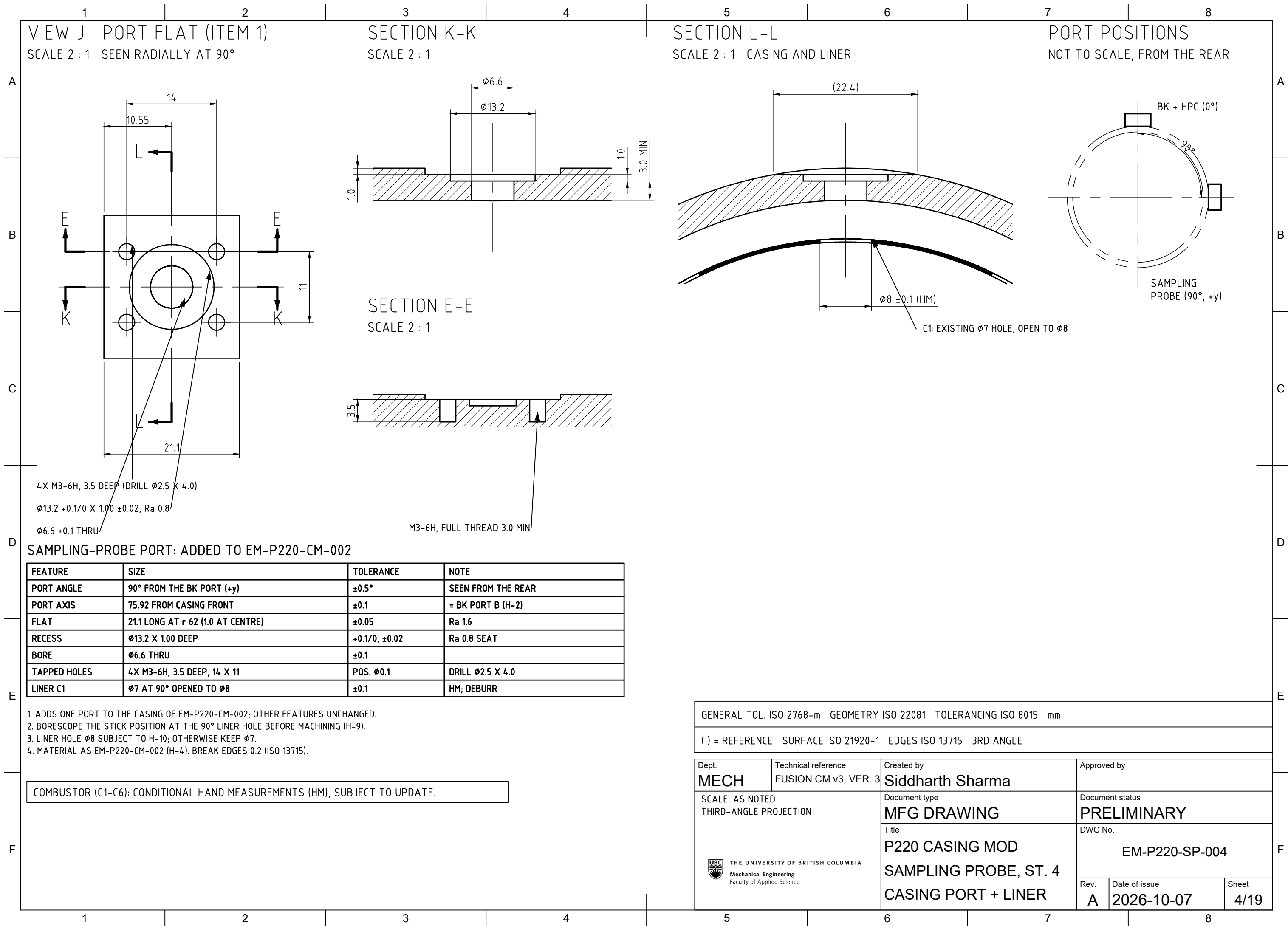


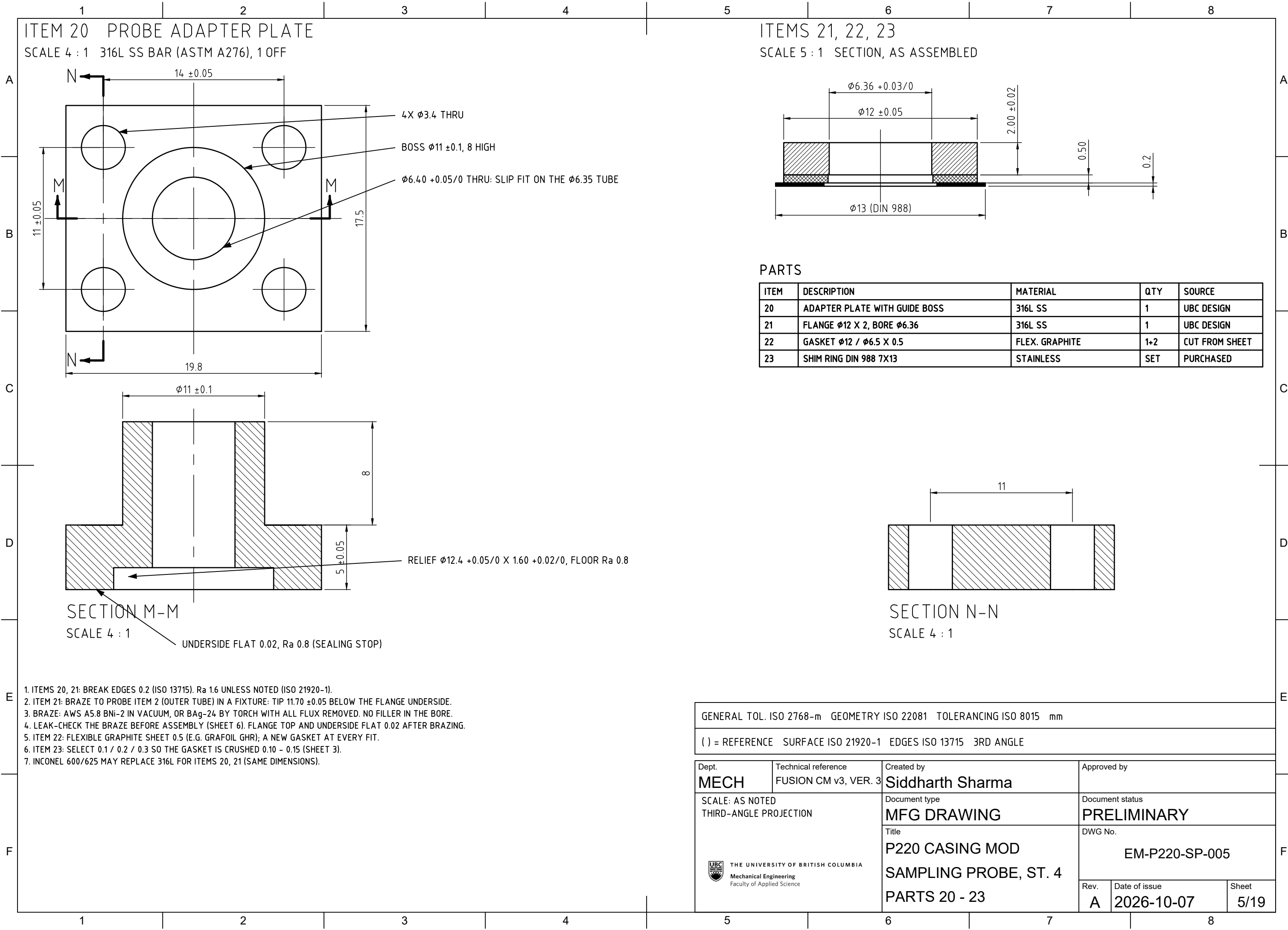
SCALE 5 : 1



1. SEALS: TUBE TO FLANGE BRAZED; FLANGE TO CASING ON A GRAPHITE GASKET.
2. THE PLATE LANDS ON THE FLAT: METAL STOP, GASKET CRUSH SET BY THE SHIM.
3. THE BOSS GUIDES THE TUBE (SLIP FIT); THE TUBE IS NOT GRIPPED.

F





ITEM 20 PROBE ADAPTER PLATE

SCALE 4 : 1 316L SS BAR (ASTM A276), 1 OFF

ITEMS 21, 22, 23

SCALE 5 : 1 SECTION, AS ASSEMBLED

PARTS

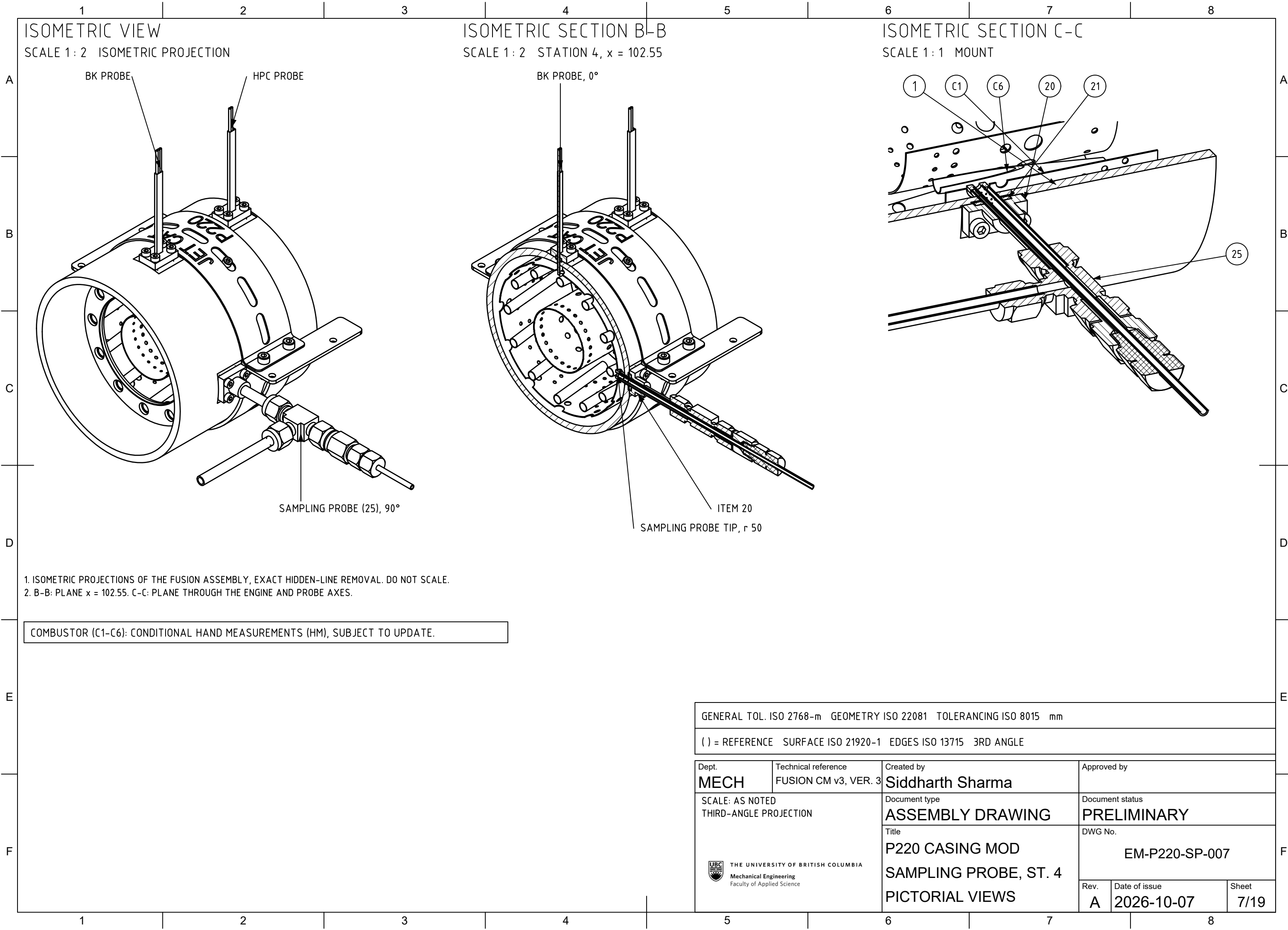
ITEM	DESCRIPTION	MATERIAL	QTY	SOURCE
20	ADAPTER PLATE WITH GUIDE BOSS	316L SS	1	UBC DESIGN
21	FLANGE Ø12 X 2, BORE Ø6.36	316L SS	1	UBC DESIGN
22	GASKET Ø12 / Ø6.5 X 0.5	FLEX. GRAPHITE	1+2	CUT FROM SHEET
23	SHIM RING DIN 988 7X13	STAINLESS	SET	PURCHASED

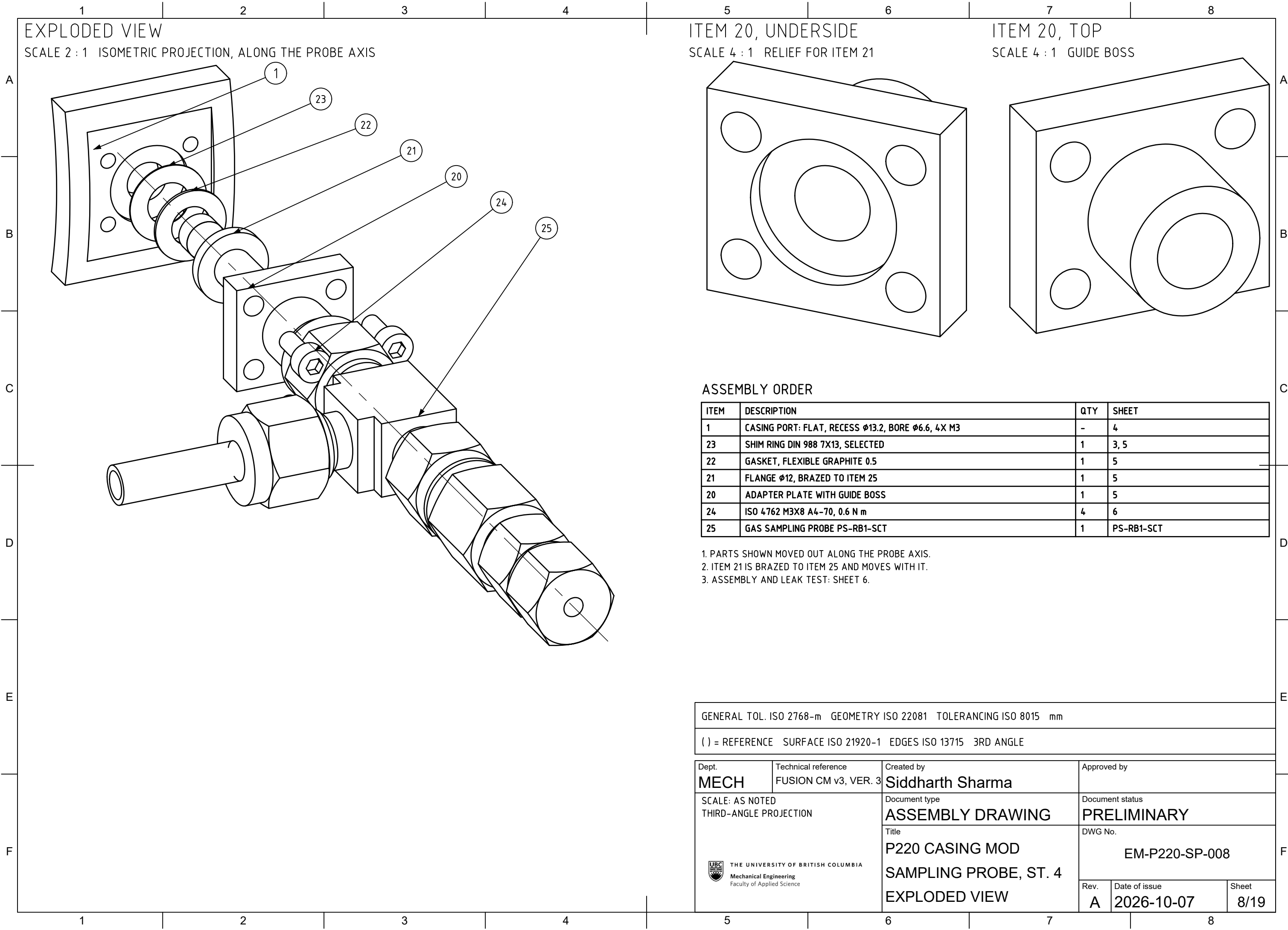
- ITEMS 20, 21: BREAK EDGES 0.2 (ISO 13715). Ra 1.6 UNLESS NOTED (ISO 21920-1).
- ITEM 21: BRAZE TO PROBE ITEM 2 (OUTER TUBE) IN A FIXTURE: TIP 11.70 ±0.05 BELOW THE FLANGE UNDERSIDE.
- BRAZE: AWS A5.8 BNi-2 IN VACUUM, OR BA_g-24 BY TORCH WITH ALL FLUX REMOVED. NO FILLER IN THE BORE.
- LEAK-CHECK THE BRAZE BEFORE ASSEMBLY (SHEET 6). FLANGE TOP AND UNDERSIDE FLAT 0.02 AFTER BRAZING.
- ITEM 22: FLEXIBLE GRAPHITE SHEET 0.5 (E.G. GRAFOIL GHR); A NEW GASKET AT EVERY FIT.
- ITEM 23: SELECT 0.1 / 0.2 / 0.3 SO THE GASKET IS CRUSHED 0.10 - 0.15 (SHEET 3).
- INCONEL 600/625 MAY REPLACE 316L FOR ITEMS 20, 21 (SAME DIMENSIONS).

GENERAL TOL. ISO 2768-m GEOMETRY ISO 22081 TOLERANCING ISO 8015 mm

() = REFERENCE SURFACE ISO 21920-1 EDGES ISO 13715 3RD ANGLE

Dept. MECH	Technical reference FUSION CM v3, VER. 3	Created by Siddharth Sharma	Approved by
SCALE: AS NOTED THIRD-ANGLE PROJECTION		Document type MFG DRAWING	Document status PRELIMINARY
 THE UNIVERSITY OF BRITISH COLUMBIA Mechanical Engineering Faculty of Applied Science		Title P220 CASING MOD SAMPLING PROBE, ST. 4 PARTS 20 - 23	DWG No. EM-P220-SP-005
		Rev. A	Date of issue 2026-10-07
		Sheet 5/19	





EXPLODED VIEW
SCALE 2 : 1 ISOMETRIC PROJECTION, ALONG THE PROBE AXIS

ITEM 20, UNDERSIDE
SCALE 4 : 1 RELIEF FOR ITEM 21

ITEM 20, TOP
SCALE 4 : 1 GUIDE BOSS

ASSEMBLY ORDER

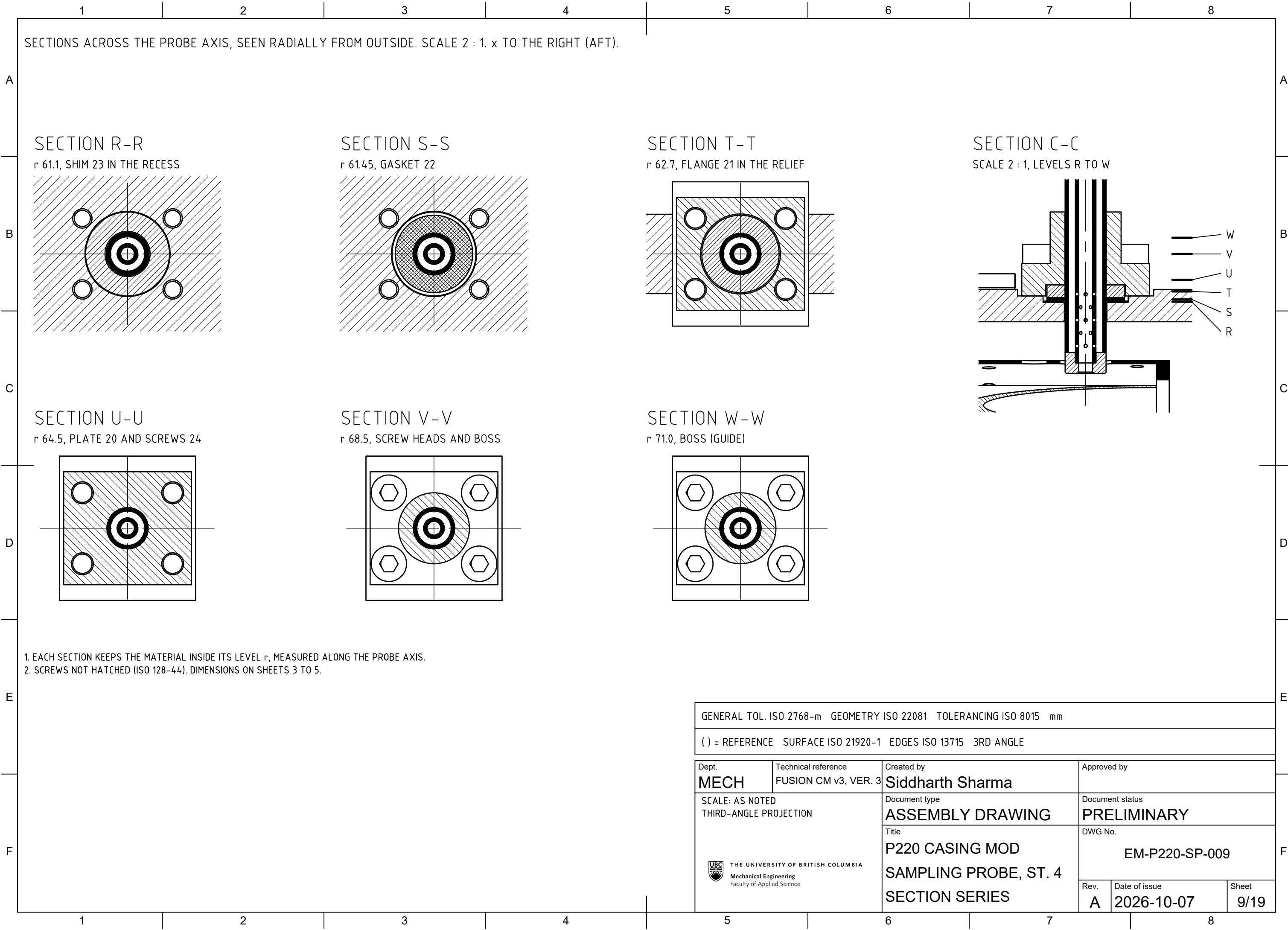
ITEM	DESCRIPTION	QTY	SHEET
1	CASING PORT: FLAT, RECESS ϕ 13.2, BORE ϕ 6.6, 4X M3	-	4
23	SHIM RING DIN 988 7X13, SELECTED	1	3, 5
22	GASKET, FLEXIBLE GRAPHITE 0.5	1	5
21	FLANGE ϕ 12, BRAZED TO ITEM 25	1	5
20	ADAPTER PLATE WITH GUIDE BOSS	1	5
24	ISO 4762 M3X8 A4-70, 0.6 N m	4	6
25	GAS SAMPLING PROBE PS-RB1-SCT	1	PS-RB1-SCT

1. PARTS SHOWN MOVED OUT ALONG THE PROBE AXIS.
2. ITEM 21 IS BRAZED TO ITEM 25 AND MOVES WITH IT.
3. ASSEMBLY AND LEAK TEST: SHEET 6.

GENERAL TOL. ISO 2768-m GEOMETRY ISO 22081 TOLERANCING ISO 8015 mm

() = REFERENCE SURFACE ISO 21920-1 EDGES ISO 13715 3RD ANGLE

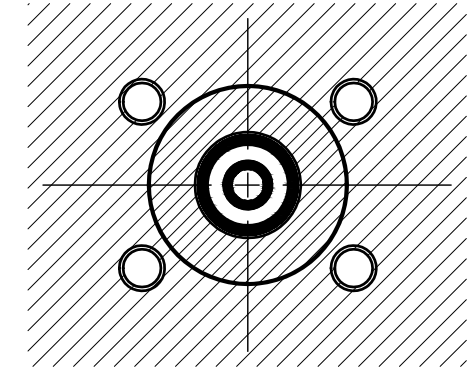
Dept. MECH	Technical reference FUSION CM v3, VER. 3	Created by Siddharth Sharma	Approved by	
SCALE: AS NOTED THIRD-ANGLE PROJECTION		Document type ASSEMBLY DRAWING	Document status PRELIMINARY	
 THE UNIVERSITY OF BRITISH COLUMBIA Mechanical Engineering Faculty of Applied Science		Title P220 CASING MOD SAMPLING PROBE, ST. 4 EXPLODED VIEW	DWG No. EM-P220-SP-008	
			Rev. A	Date of issue 2026-10-07
			Sheet 8/19	



SECTIONS ACROSS THE PROBE AXIS, SEEN RADially FROM OUTSIDE. SCALE 2 : 1. x TO THE RIGHT (AFT).

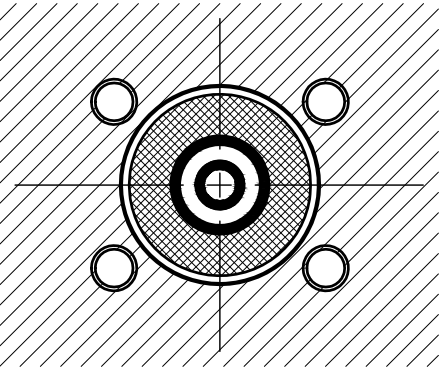
SECTION R-R

r 61.1, SHIM 23 IN THE RECESS



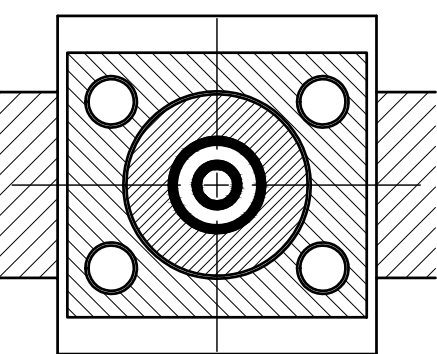
SECTION S-S

r 61.45, GASKET 22



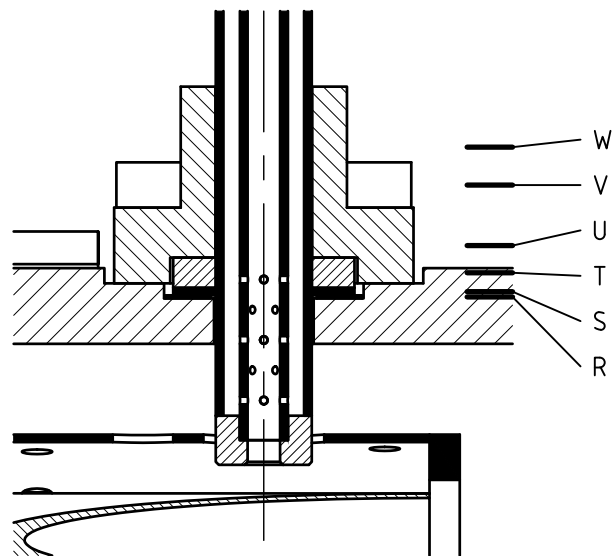
SECTION T-T

r 62.7, FLANGE 21 IN THE RELIEF



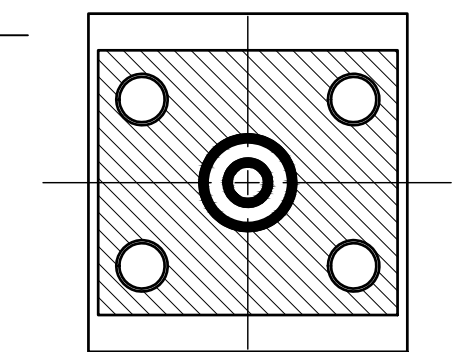
SECTION C-C

SCALE 2 : 1, LEVELS R TO W



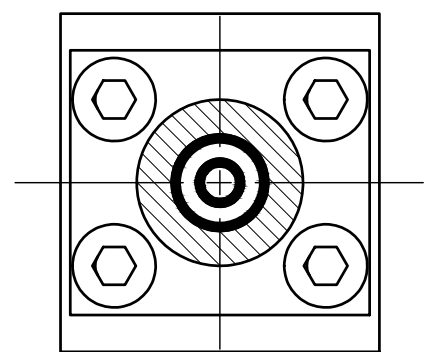
SECTION U-U

r 64.5, PLATE 20 AND SCREWS 24



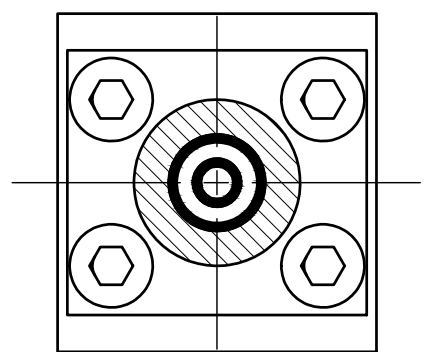
SECTION V-V

r 68.5, SCREW HEADS AND BOSS



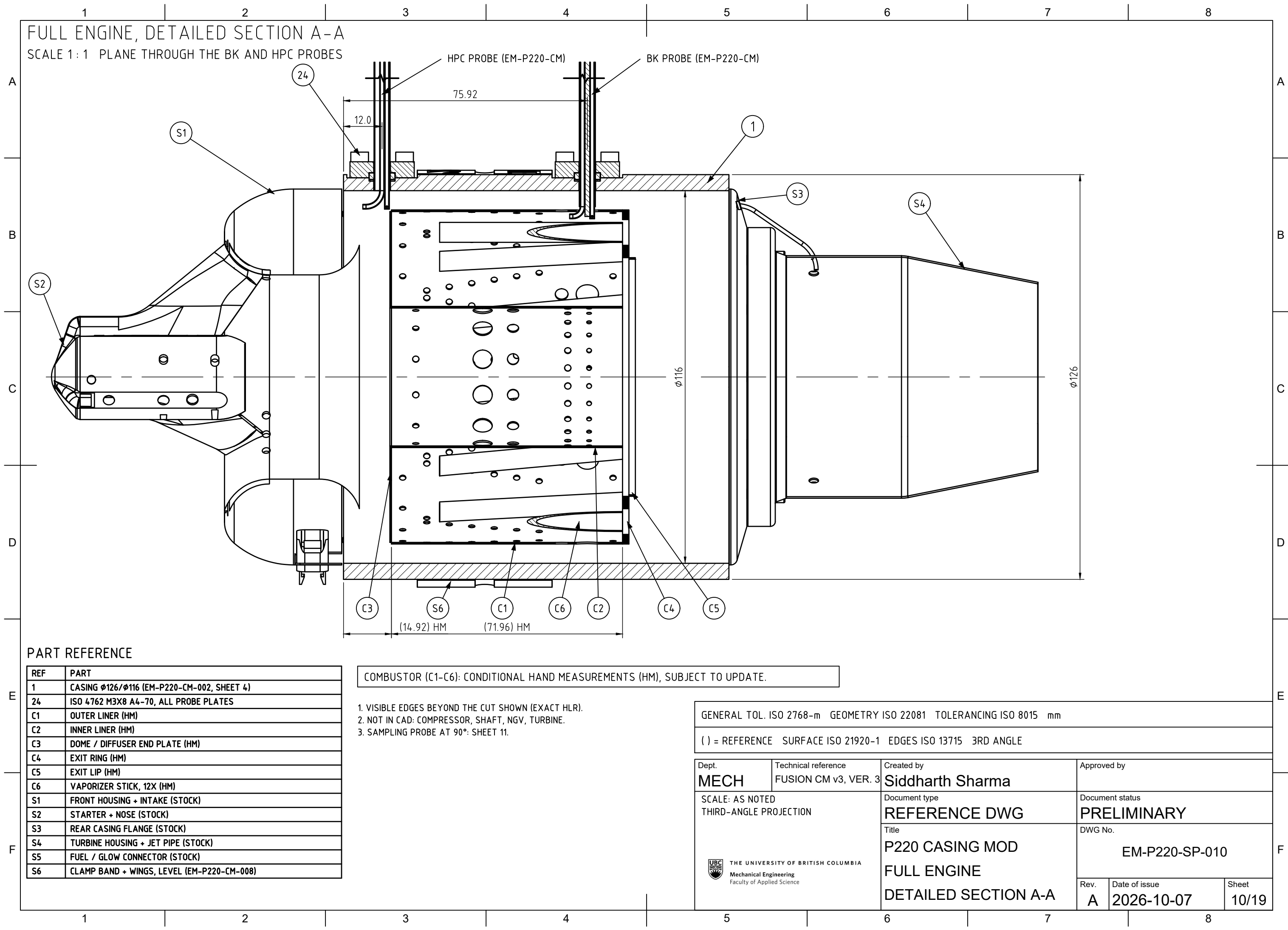
SECTION W-W

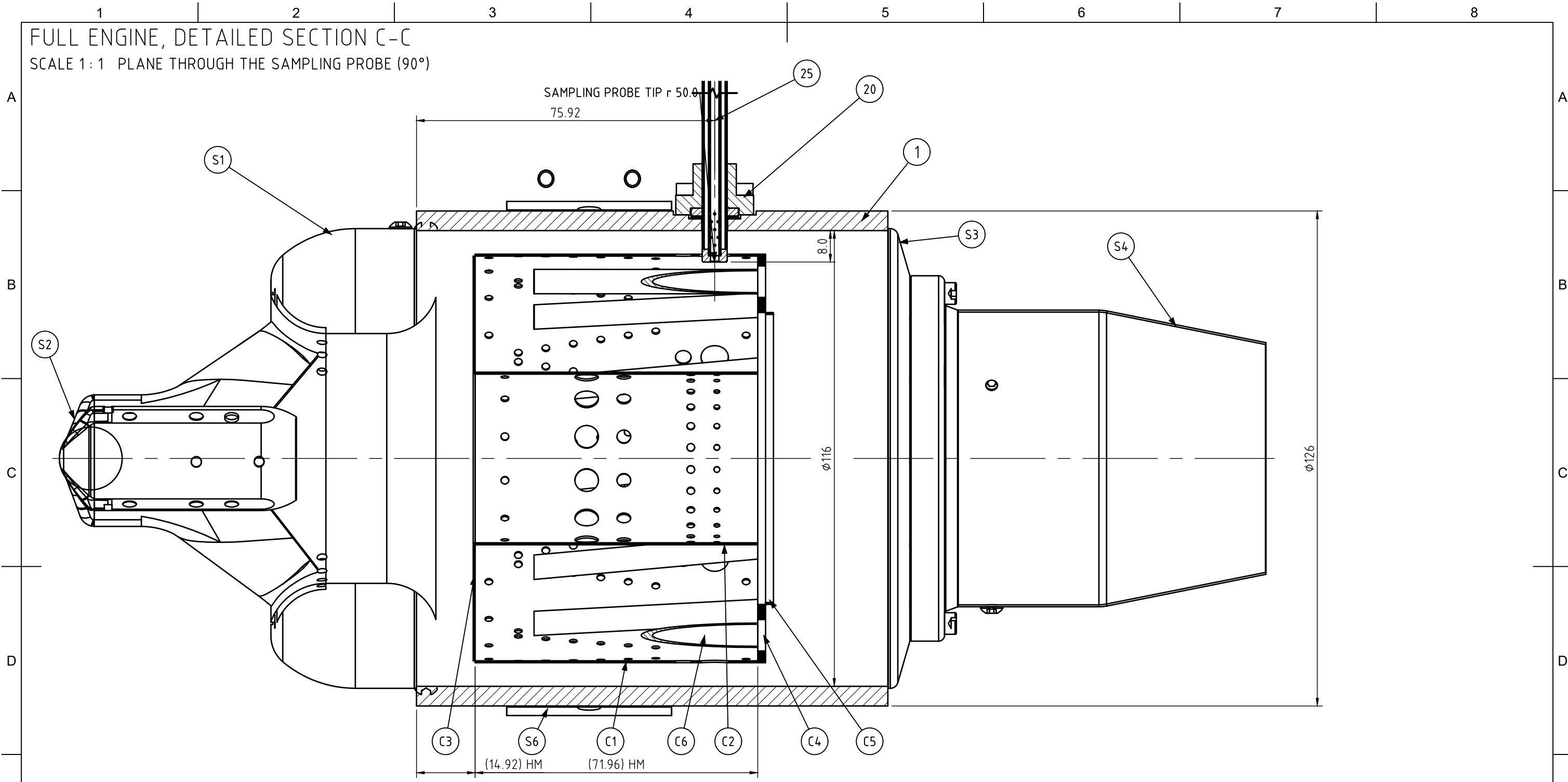
r 71.0, BOSS (GUIDE)



- 1. EACH SECTION KEEPS THE MATERIAL INSIDE ITS LEVEL r, MEASURED ALONG THE PROBE AXIS.
- 2. SCREWS NOT HATCHED (ISO 128-44). DIMENSIONS ON SHEETS 3 TO 5.

GENERAL TOL. ISO 2768-m GEOMETRY ISO 22081 TOLERANCING ISO 8015 mm			
() = REFERENCE SURFACE ISO 21920-1 EDGES ISO 13715 3RD ANGLE			
Dept. MECH	Technical reference FUSION CM v3, VER. 3	Created by Siddharth Sharma	Approved by
SCALE: AS NOTED THIRD-ANGLE PROJECTION		Document type ASSEMBLY DRAWING	Document status PRELIMINARY
 THE UNIVERSITY OF BRITISH COLUMBIA Mechanical Engineering Faculty of Applied Science		Title P220 CASING MOD SAMPLING PROBE, ST. 4 SECTION SERIES	DWG No. EM-P220-SP-009
		Rev. A	Date of issue 2026-10-07
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PART REFERENCE

REF	PART
1	CASING $\phi 126/\phi 116$ (EM-P220-CM-002, SHEET 4)
24	ISO 4762 M3X8 A4-70, ALL PROBE PLATES
C1	OUTER LINER (HM)
C2	INNER LINER (HM)
C3	DOME / DIFFUSER END PLATE (HM)
C4	EXIT RING (HM)
C5	EXIT LIP (HM)
C6	VAPORIZER STICK, 12X (HM)
S1	FRONT HOUSING + INTAKE (STOCK)
S2	STARTER + NOSE (STOCK)
S3	REAR CASING FLANGE (STOCK)
S4	TURBINE HOUSING + JET PIPE (STOCK)
S5	FUEL / GLOW CONNECTOR (STOCK)
S6	CLAMP BAND + WINGS, LEVEL (EM-P220-CM-008)

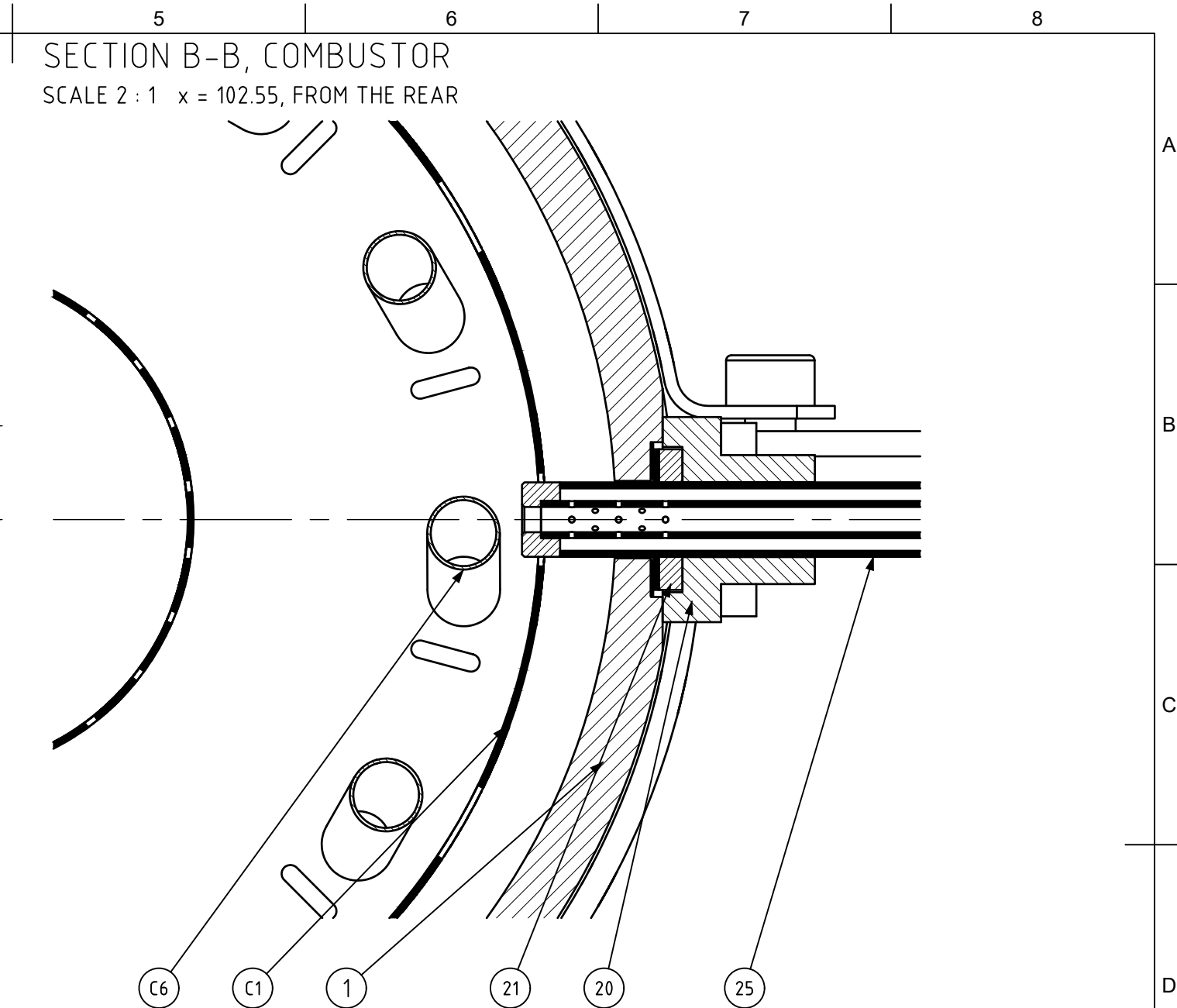
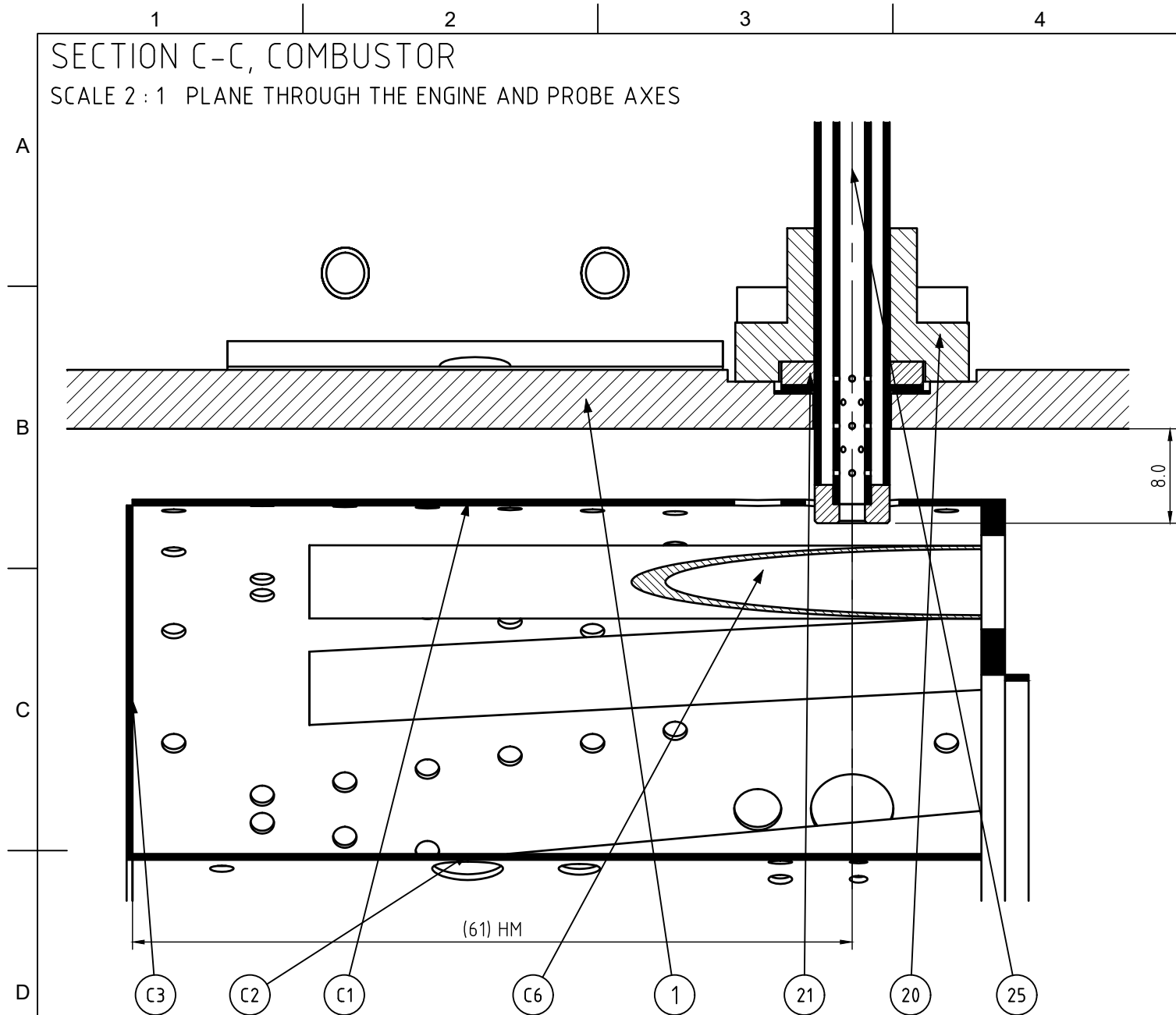
COMBUSTOR (C1-C6): CONDITIONAL HAND MEASUREMENTS (HM), SUBJECT TO UPDATE.

1. VISIBLE EDGES BEYOND THE CUT SHOWN (EXACT HLR).
2. PROBE BROKEN BELOW THE TEE; FULL PROBE ON SHEETS 1 AND 7.
3. ITEMS 20, 25 AS SHEET 1.

GENERAL TOL. ISO 2768-m GEOMETRY ISO 22081 TOLERANCING ISO 8015 mm

() = REFERENCE SURFACE ISO 21920-1 EDGES ISO 13715 3RD ANGLE

Dept. MECH	Technical reference FUSION CM v3, VER. 3	Created by Siddharth Sharma	Approved by
SCALE: AS NOTED THIRD-ANGLE PROJECTION		Document type REFERENCE DWG	Document status PRELIMINARY
 THE UNIVERSITY OF BRITISH COLUMBIA Mechanical Engineering Faculty of Applied Science		Title P220 CASING MOD FULL ENGINE DETAILED SECTION C-C	DWG No. EM-P220-SP-011
		Rev. A	Date of issue 2026-10-07
		Sheet 11/19	



SAMPLING PROBE IN THE COMBUSTOR

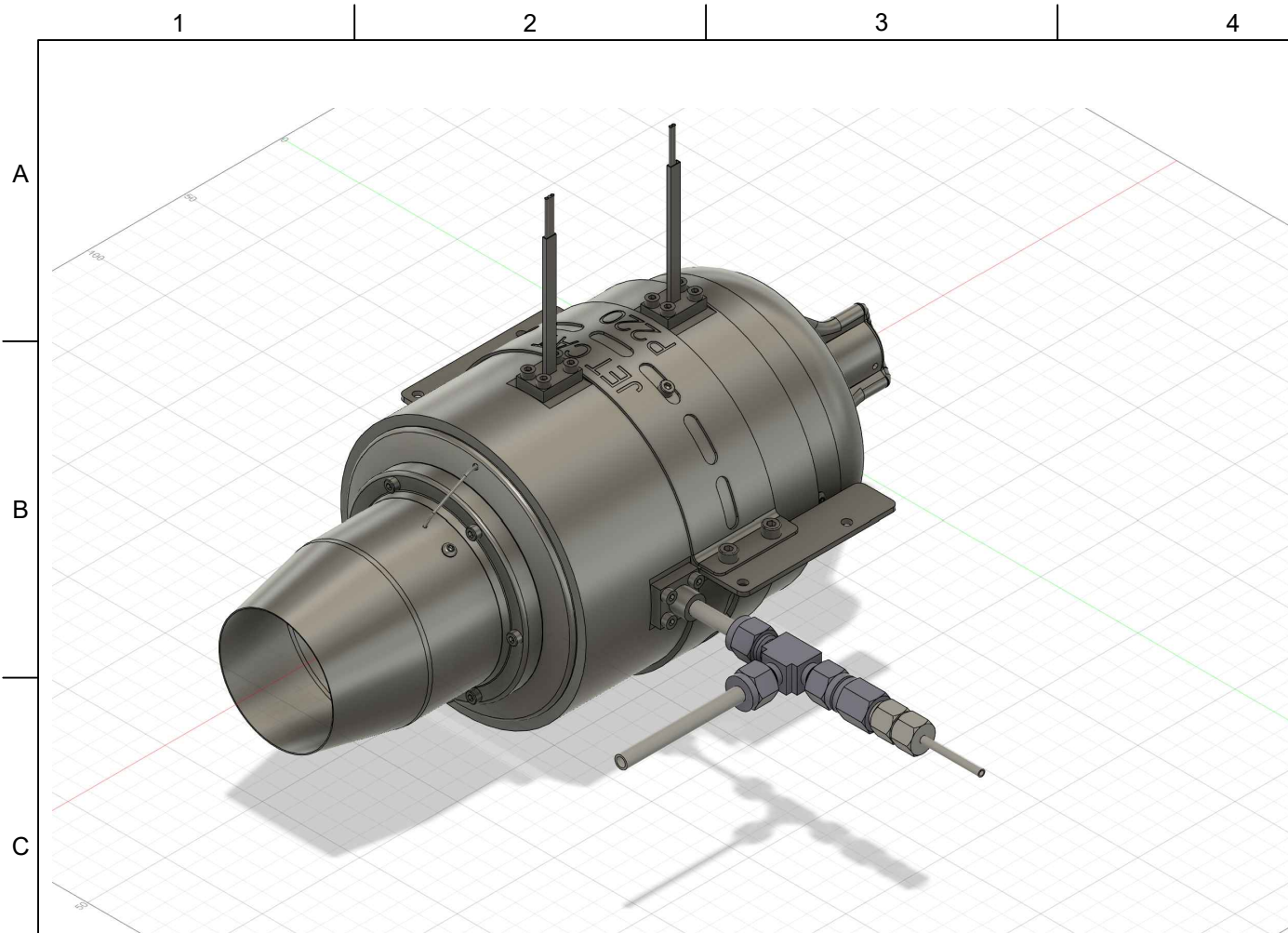
QUANTITY	VALUE	NOTE
TIP RADIUS	r 50.0 ±0.25	SAME AS BK
TIP BELOW CASING ID	8.0	SAME AS BK
AXIAL POSITION	x 102.55	75.92 FROM CASING FRONT
LINER PASS	Ø8 AT 90°	EXISTING Ø7 OPENED (HM)
CLEARANCE IN LINER HOLE	0.83 RADIAL	LINER GROWTH
NEAREST VAPORIZER STICK	1.89	MODEL (HM)

COMBUSTOR (C1-C6): CONDITIONAL HAND MEASUREMENTS (HM), SUBJECT TO UPDATE.

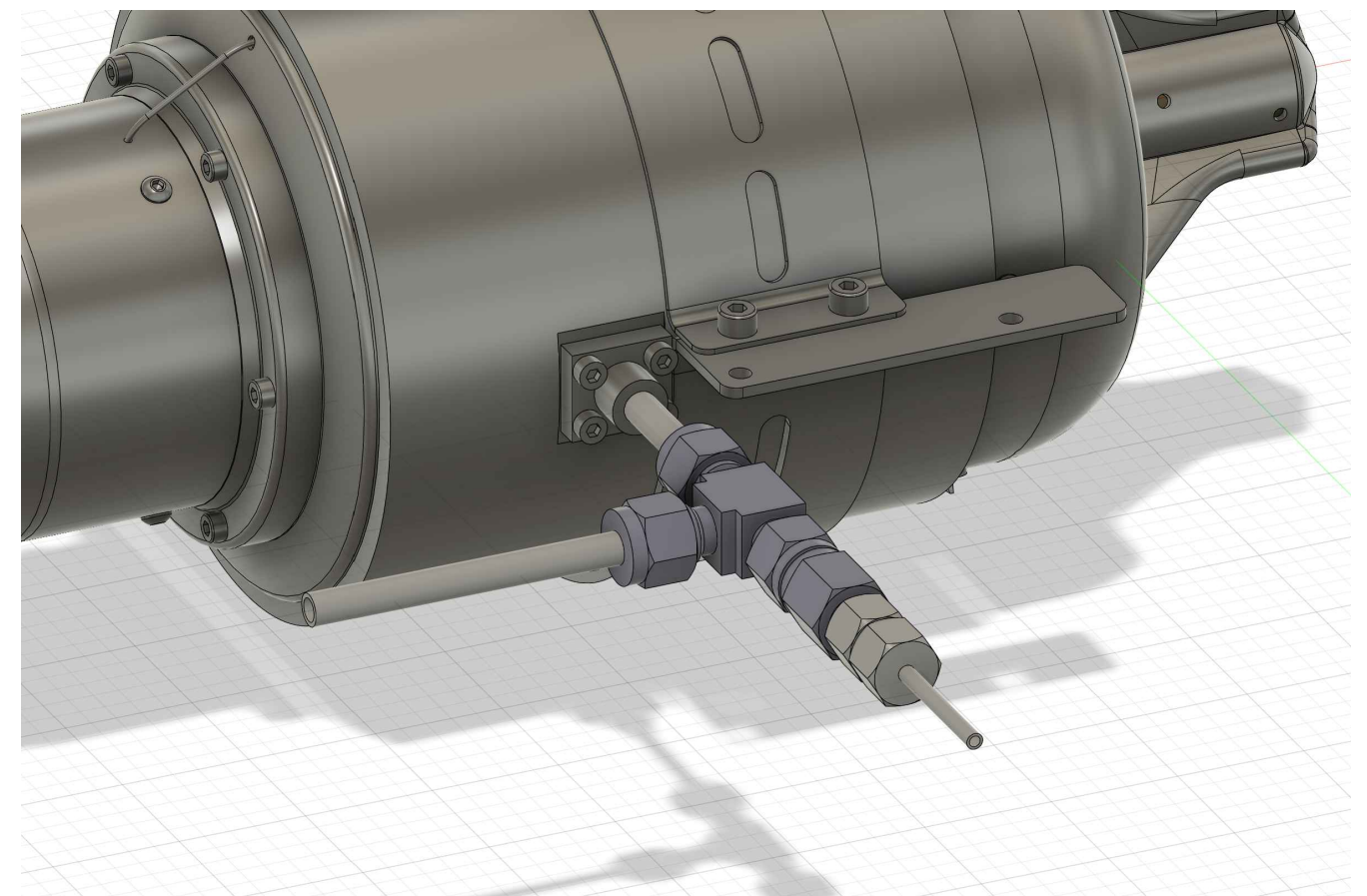
GENERAL TOL. ISO 2768-m GEOMETRY ISO 22081 TOLERANCING ISO 8015 mm

() = REFERENCE SURFACE ISO 21920-1 EDGES ISO 13715 3RD ANGLE

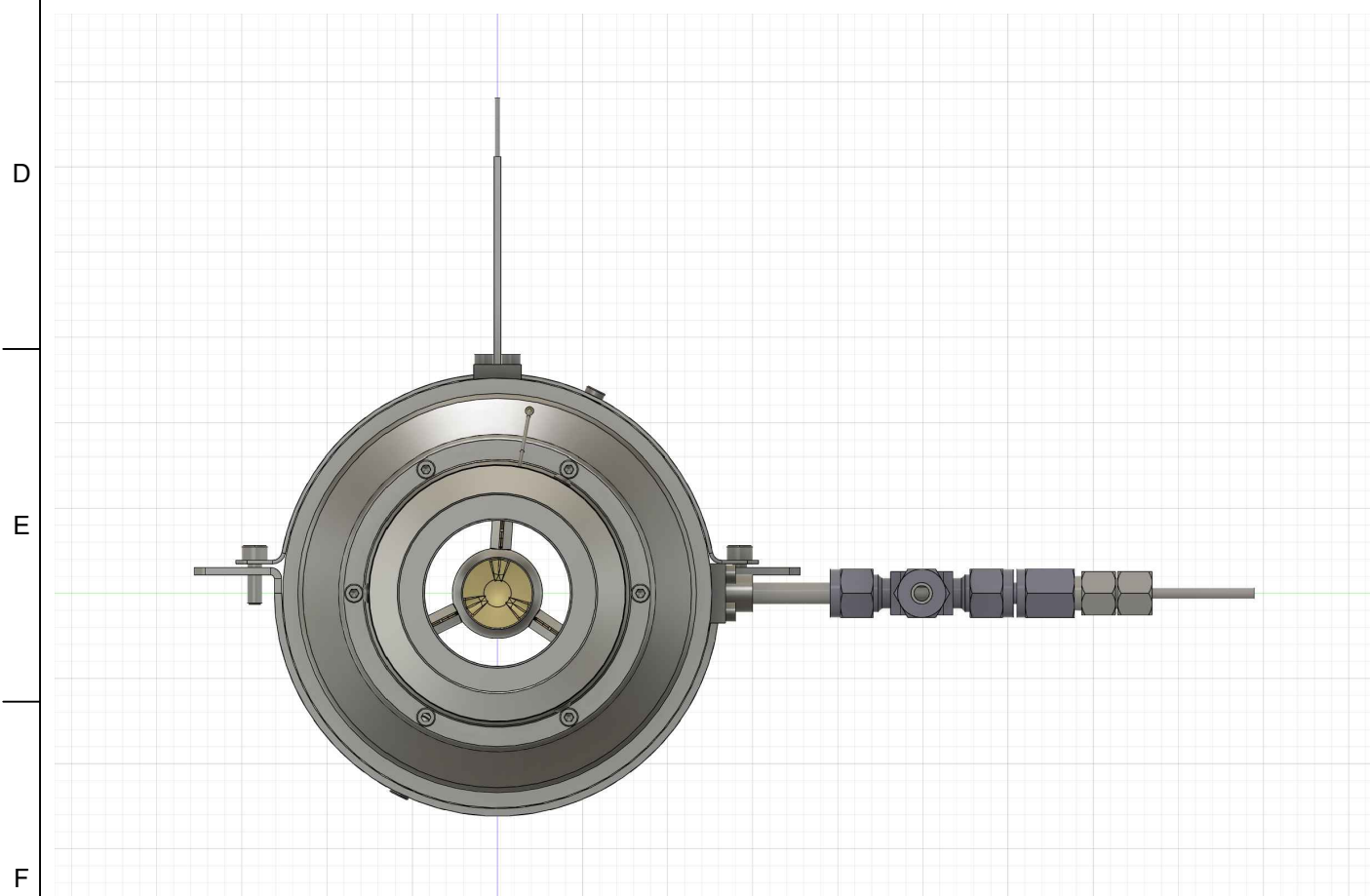
Dept. MECH	Technical reference FUSION CM v3, VER. 3	Created by Siddharth Sharma	Approved by
SCALE: AS NOTED THIRD-ANGLE PROJECTION		Document type ASSEMBLY DRAWING	Document status PRELIMINARY
 THE UNIVERSITY OF BRITISH COLUMBIA Mechanical Engineering Faculty of Applied Science		Title P220 CASING MOD SAMPLING PROBE, ST. 4 PROBE IN COMBUSTOR	DWG No. EM-P220-SP-012
		Rev. A	Date of issue 2026-10-07
		Sheet 12/19	



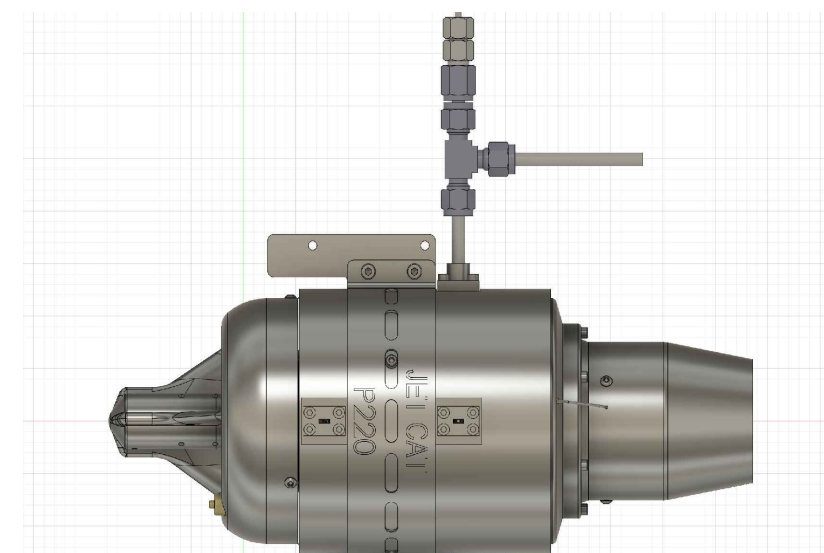
P1 ISOMETRIC, FROM THE REAR



P2 SAMPLING-PROBE MOUNT



P3 FROM THE REAR



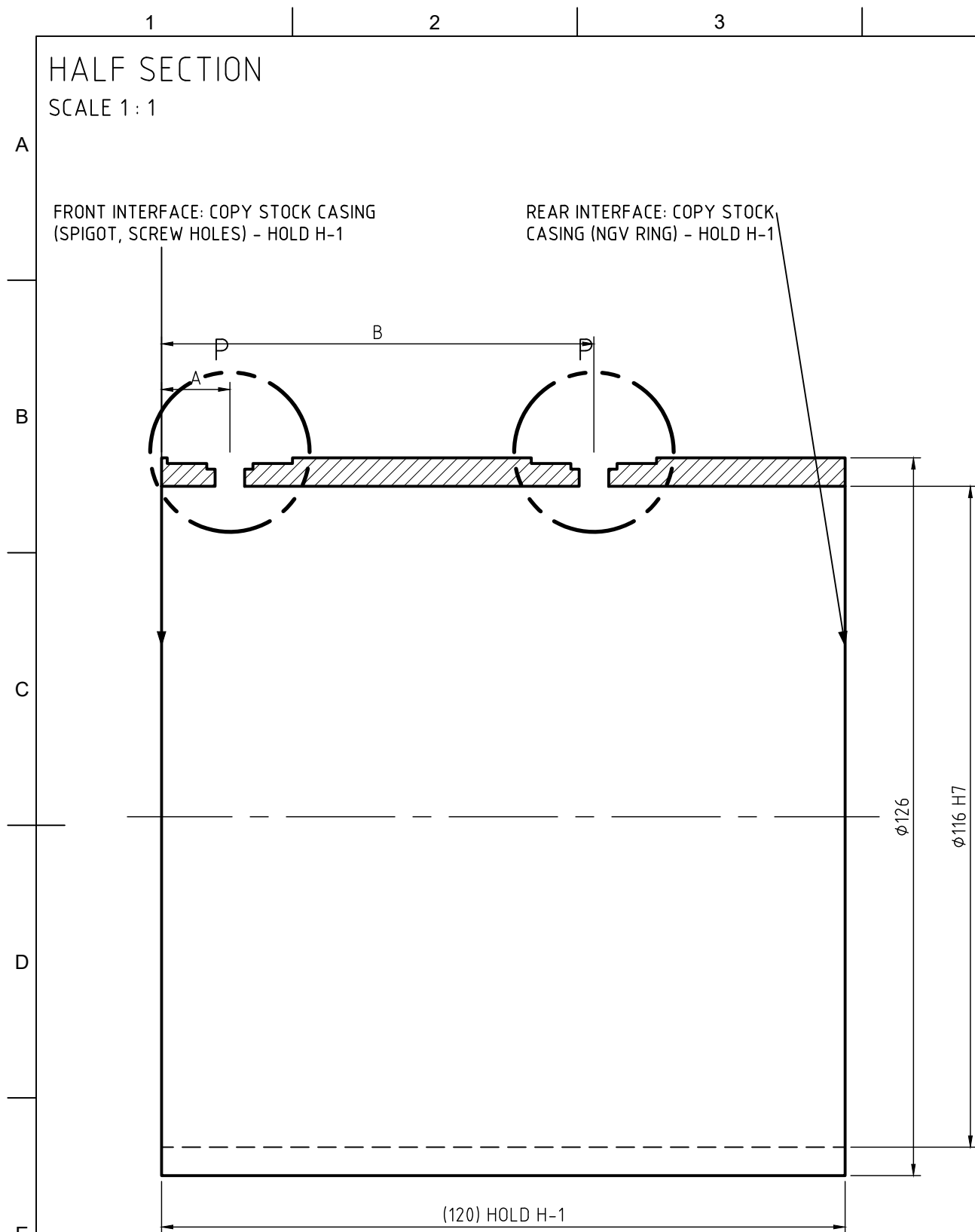
P4 FROM ABOVE

FUSION RENDERS.
NOT TO SCALE.

GENERAL TOL. ISO 2768-m GEOMETRY ISO 22081 TOLERANCING ISO 8015 mm

() = REFERENCE SURFACE ISO 21920-1 EDGES ISO 13715 3RD ANGLE

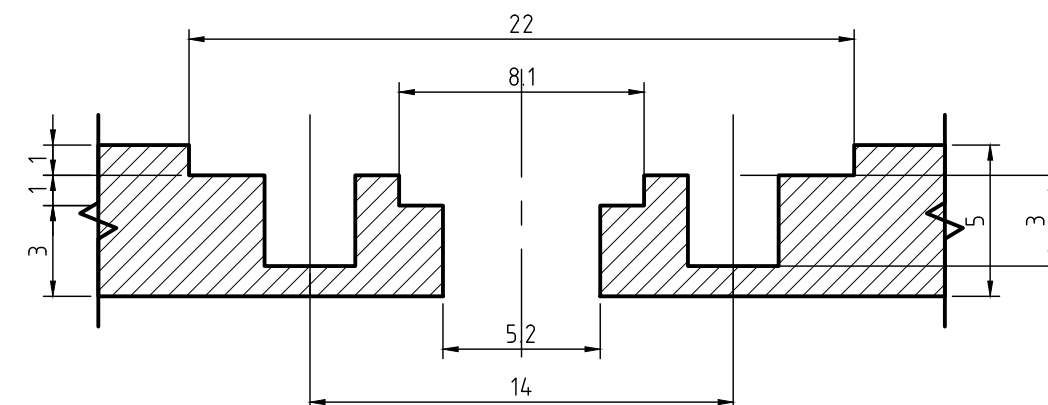
Dept. MECH	Technical reference FUSION CM v3, VER. 3	Created by Siddharth Sharma	Approved by
SCALE: AS NOTED THIRD-ANGLE PROJECTION		Document type REFERENCE DWG	Document status PRELIMINARY
		Title P220 CASING MOD SAMPLING PROBE, ST. 4 RENDERED VIEWS	DWG No. EM-P220-SP-013
		Rev. A	Date of issue 2026-10-07
		Sheet 13/19	



- NOTES
1. FLAT SPOT-FACE AT EACH PORT: MILL FLAT 1.0 DEEP AT CENTRE (PLANE AT R62.0), 22 LONG AXIALLY; WIDTH IS THE NATURAL RUN-OUT (22.4 REF). FLANGE RECESS 8.1 x 5.1 x 1.0 DEEP IN THE FLAT, LEAVING 3.0 WALL. SLOT 5.2 x 2.2 THRU.
 2. PORT POSITIONS A, B AND ANGLE 0 DEG: SEE CM-001, HOLD H-2.
 3. $\phi 116$ BORE: CONCENTRIC TO $\phi 126$ WITHIN 0.05; Ra 1.6. HOLD H-4: MATERIAL (STOCK CASING IS THIN STAINLESS SHEET) - PROPOSE 304/321 SS BAR OR TUBE.
 4. ENDS: COPY THE STOCK P220 RXi CASING (MEASURE THE REMOVED PART).
 5. DEBURR SLOT AND RECESS; NO BURRS INTO THE GAS PATH.

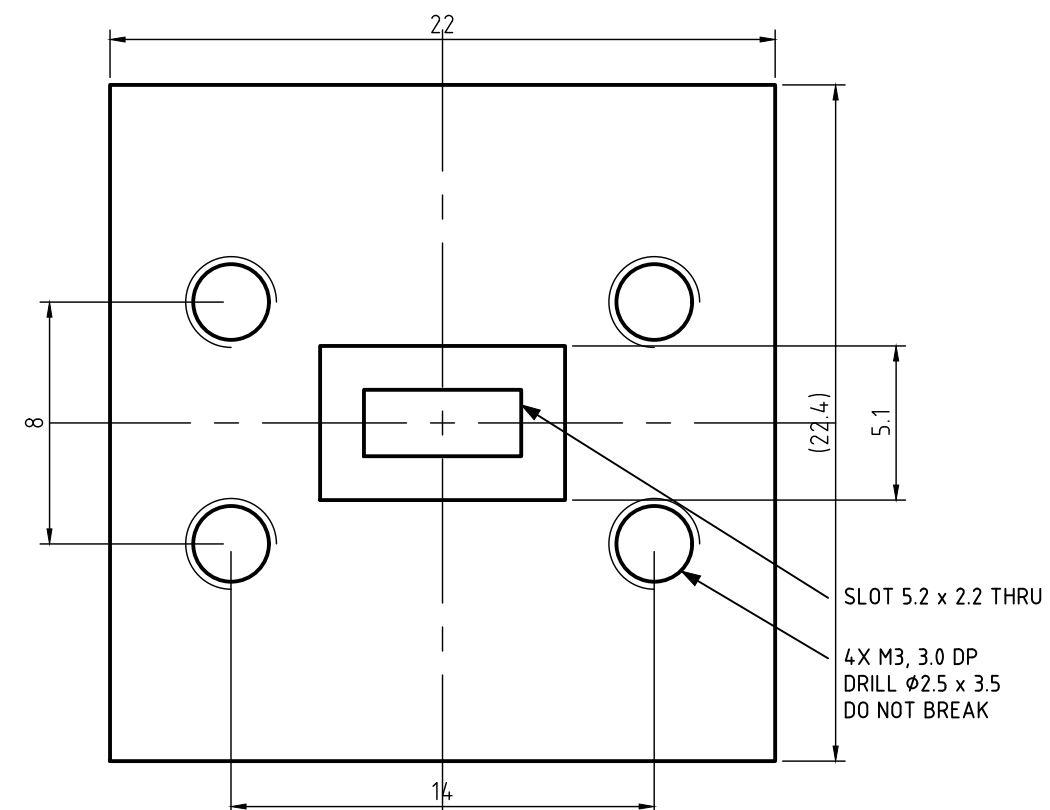
DETAIL P (AXIAL SECTION)

SCALE 4 : 1 BOTH PORTS ALIKE



VIEW ON P (RADIAL)

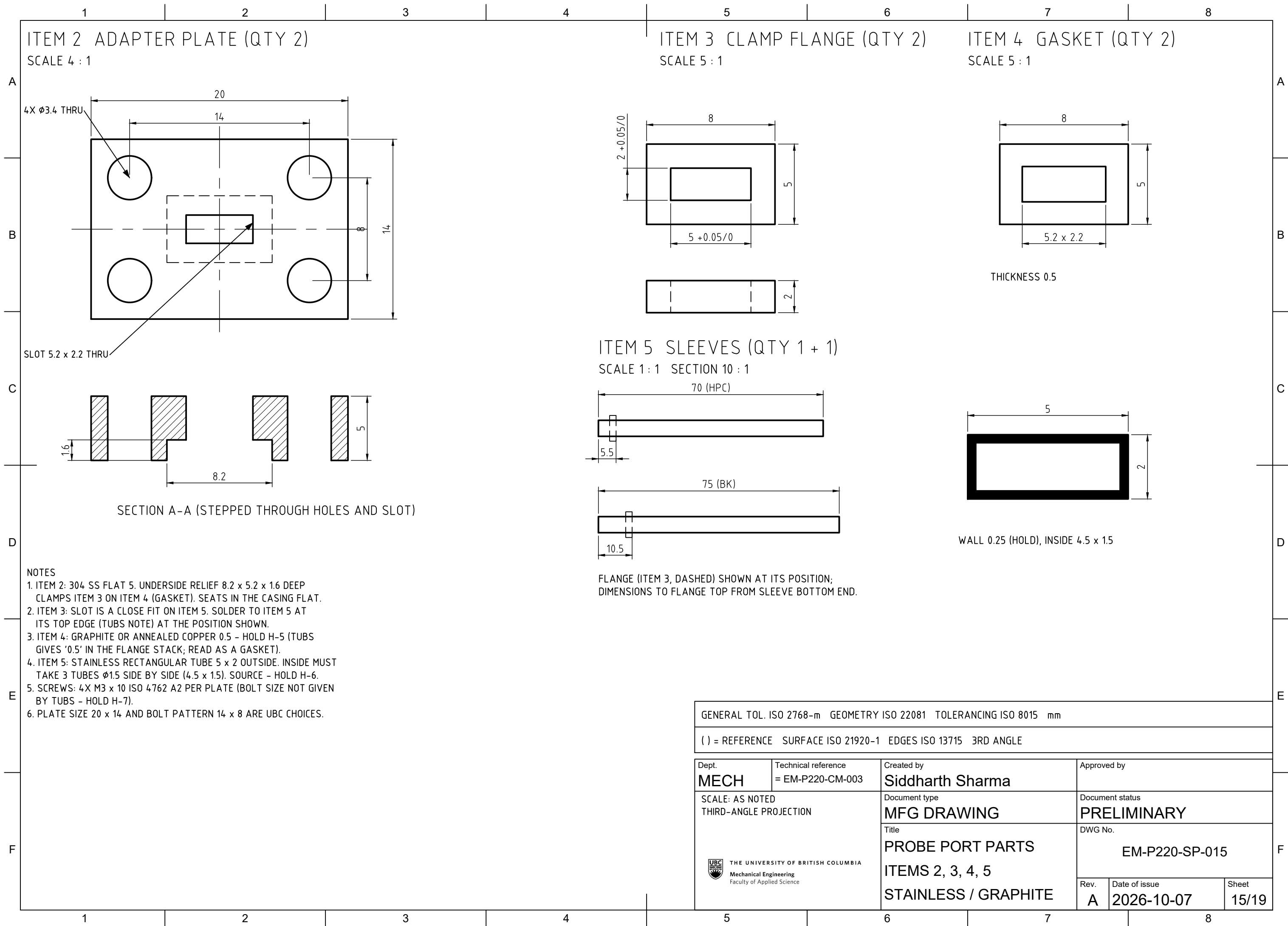
SCALE 4 : 1



GENERAL TOL. ISO 2768-m GEOMETRY ISO 22081 TOLERANCING ISO 8015 mm

() = REFERENCE SURFACE ISO 21920-1 EDGES ISO 13715 3RD ANGLE

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SCALE: AS NOTED THIRD-ANGLE PROJECTION		Document type MFG DRAWING	Document status PRELIMINARY	
 THE UNIVERSITY OF BRITISH COLUMBIA Mechanical Engineering Faculty of Applied Science		Title P220 RXi OUTER CASING ITEM 1 - NEW CASING MATERIAL: HOLD H-4	DWG No. EM-P220-SP-014	
		Rev. A	Date of issue 2026-10-07	Sheet 14/19



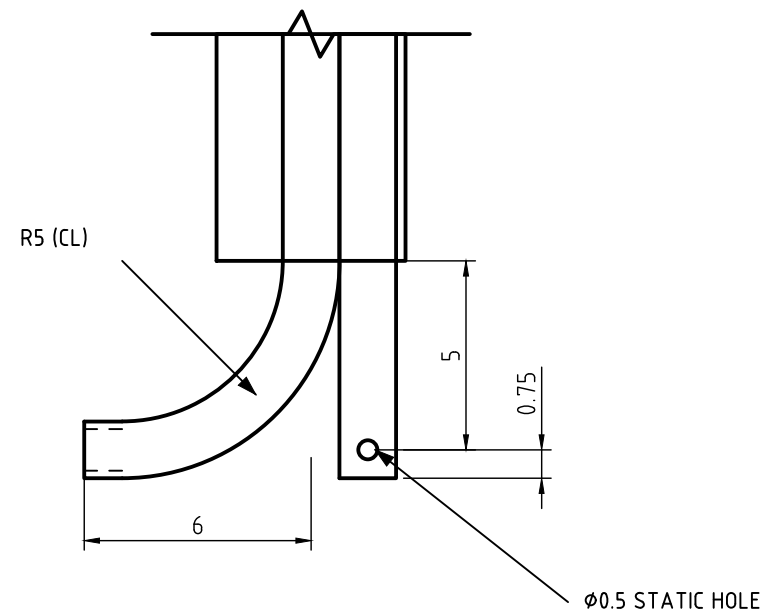
SCALE 1 : 1



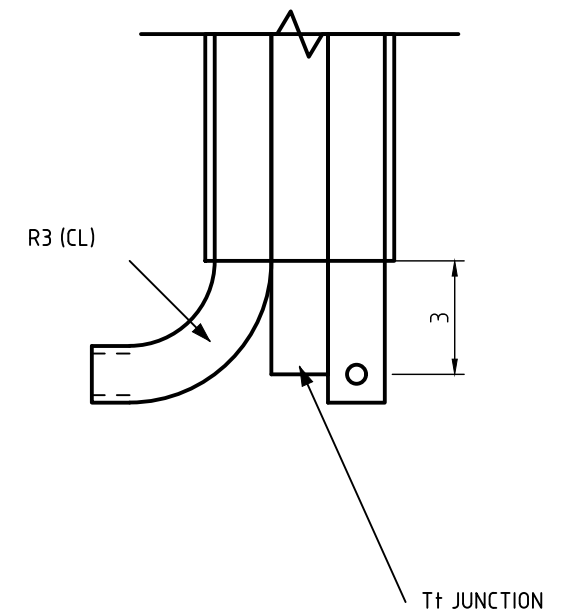
SCALE 1 : 1



SCALE 5 : 1



SCALE 5 : 1



PROBE	TUBE	STRAIGHT	BEND + TIP	CUT LENGTH (REF)
HPC	p†	87.25	R5 90 + 1	96.1
HPC	ps	93.0 CLOSED	-	93.0
BK	p†	92.25	R3 90 + 1	98.0
BK	T† (TC)	95.25	-	95.25 + LEADS
BK	ps	96.0 CLOSED	-	96.0

BK IMMERSION 3 BELOW SLEEVE: CLEARS THE VAPORIZER STICK (HM, H-8).

1. CUT AND BEND TUBES: pt R5 (HPC) / R3 (BK, H-8) ON TUBE CL; MANDREL, NO KINKS.
2. CLOSE ps ENDS WITH HARD SOLDER; DRILL $\phi 0.5$ STATIC HOLE 0.75 FROM THE END, NORMAL TO FLOW. DEBURR INSIDE AND OUT.
3. TUBES INTO SLEEVE (pt-ps, OR pt-Tt-ps); HARD SOLDER BOTH ENDS; FILL THE GAP AT THE BEND AND GRIND TO 1.5 WIDE.
4. SOLDER CLAMP FLANGE: TOP EDGE 5.5 (HPC) / 10.5 (BK) FROM SLEEVE END.
5. FLOW-CHECK EACH TUBE; LEAK-CHECK CLOSED ENDS.
6. Tt: TYPE K $\phi 1.5$ MI INCONEL 600, EXPOSED JUNCTION AT THE TIP.

() = REFERENCE SURFACE ISO 21920-1 EDGES ISO 13715 3RD ANGLE

Dept. MECH	Technical reference = EM-P220-CM-004	Created by Siddharth Sharma	Approved by		
SCALE: AS NOTED THIRD-ANGLE PROJECTION		Document type MFG DRAWING	Document status PRELIMINARY		
		Title PROBE ASSEMBLIES HPC + BK PROBES STAINLESS + TYPE K TC	DWG No. EM-P220-SP-016		
 THE UNIVERSITY OF BRITISH COLUMBIA Mechanical Engineering Faculty of Applied Science			Rev. A	Date of issue 2026-10-07	Sheet 16/19

SCALE 4 : 1 (LINER AND DIFFUSER = REF)



COMBUSTOR (HM)	VALUE
LINER OD	104 (104.11)
LINER LENGTH	71.96
LINER WALL	0.5
INNER LINER OD	43.93
DOMES, x FROM INTAKE	41.55
DIFFUSER EXIT-DOME	10
LINER-CASING ID GAP	5.95
Ø7 ROW 12X, x	61
STICKS 12X	Ø5.6 ON R45

REF ONLY - CHECK ON ENGINE

1. CUT AND BEND TUBES: R5 HPC, R3 BK (H-8), ON TUBE CL; MANDREL, NO KINKS.
2. CLOSE p_s TUBE ENDS WITH HARD SOLDER; DRILL $\phi 0.5$ STATIC HOLE 0.75 FROM THE END, FACING SIDEWAYS (NORMAL TO FLOW). DEBURR.
3. INSERT TUBES IN THE SLEEVE (ORDER p_t - p_s , OR p_t - T_t - p_s); HARD SOLDER AT BOTH SLEEVE ENDS. FILL THE GAP AT THE BEND, GRIND TO 1.5 WIDE.
4. SOLDER CLAMP FLANGE TO THE SLEEVE, TOP EDGE AT 5.5 (HPC) / 10.5 (BK).
5. FLOW-CHECK EACH TUBE (BLOW THROUGH) AND LEAK-CHECK THE CLOSED END.
6. INSTALL: GASKET, PROBE, ADAPTER PLATE, 4X M3. p_t TIP POINTS UPSTREAM.

FUSION CHECK: HPC p_s 0.72 FROM LINER LIP. BK 1.25 IN $\phi 7$ HOLE. 1.15 TO STICK.

SCALE 4 : 1



GENERAL TOL. ISO 2768-m GEOMETRY ISO 22081 TOLERANCING ISO 8015 mm

() = REFERENCE SURFACE ISO 21920-1 EDGES ISO 13715 3RD ANGLE

Dept. MECH	Technical reference = EM-P220-CM-005	Created by Siddharth Sharma	Approved by		
SCALE: AS NOTED THIRD-ANGLE PROJECTION  THE UNIVERSITY OF BRITISH COLUMBIA Mechanical Engineering Faculty of Applied Science		Document type MFG DRAWING	Document status PRELIMINARY		
		Title PROBES + CASING HPC + BK, INSTALLED SEE LIST, CM-001	DWG No. EM-P220-SP-017		
			Rev. A	Date of issue 2026-10-07	Sheet 17/19

SCALE 2 : 1 UPPER HALF, SECTION A-A



COMBUSTOR (HM)	VALUE	BASIS
LINER OD	104 (104.11)	CALIPER/PHOTO
LINER LENGTH	71.96	MEASURED
LINER WALL	0.5	ASSUMED
INNER LINER OD	43.93	REF
DOVE, x FROM INTAKE	41.55	ASSUMED H-2
DIFFUSER EXIT-DOVE	10	TUBS
LINER-CASING ID GAP	5.95	DERIVED
Ø2 ROWS, x FROM DOVE	3.5, 11-46	+/-2
Ø4 ROW 12X, x	53	+/-2
Ø7 ROW 12X, x	61	+/-2
STICKS 12X	Ø5.6 ON R45	HM
STICK vs Ø7 HOLE	1.5 DEG	UNVERIFIED

COMBUSTOR (C1-C6): CONDITIONAL HAND MEASUREMENTS (HM), SUBJECT TO UPDATE.

1. CHECK ON THE ENGINE: DIFFUSER EXIT, DOME, STICK CLOCKING (H-2, H-8).
2. BK TUBES 3 BELOW THE SLEEVE, THROUGH A $\phi 7$ LINER HOLE.

GENERAL TOL. ISO 2768-m GEOMETRY ISO 22081 TOLERANCING ISO 8015 mm

() = REFERENCE SURFACE ISO 21920-1 EDGES ISO 13715 3RD ANGLE

Dept. MECH	Technical reference = EM-P220-CM-006	Created by Siddharth Sharma	Approved by		
SCALE: AS NOTED THIRD-ANGLE PROJECTION		Document type MFG DRAWING	Document status PRELIMINARY		
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