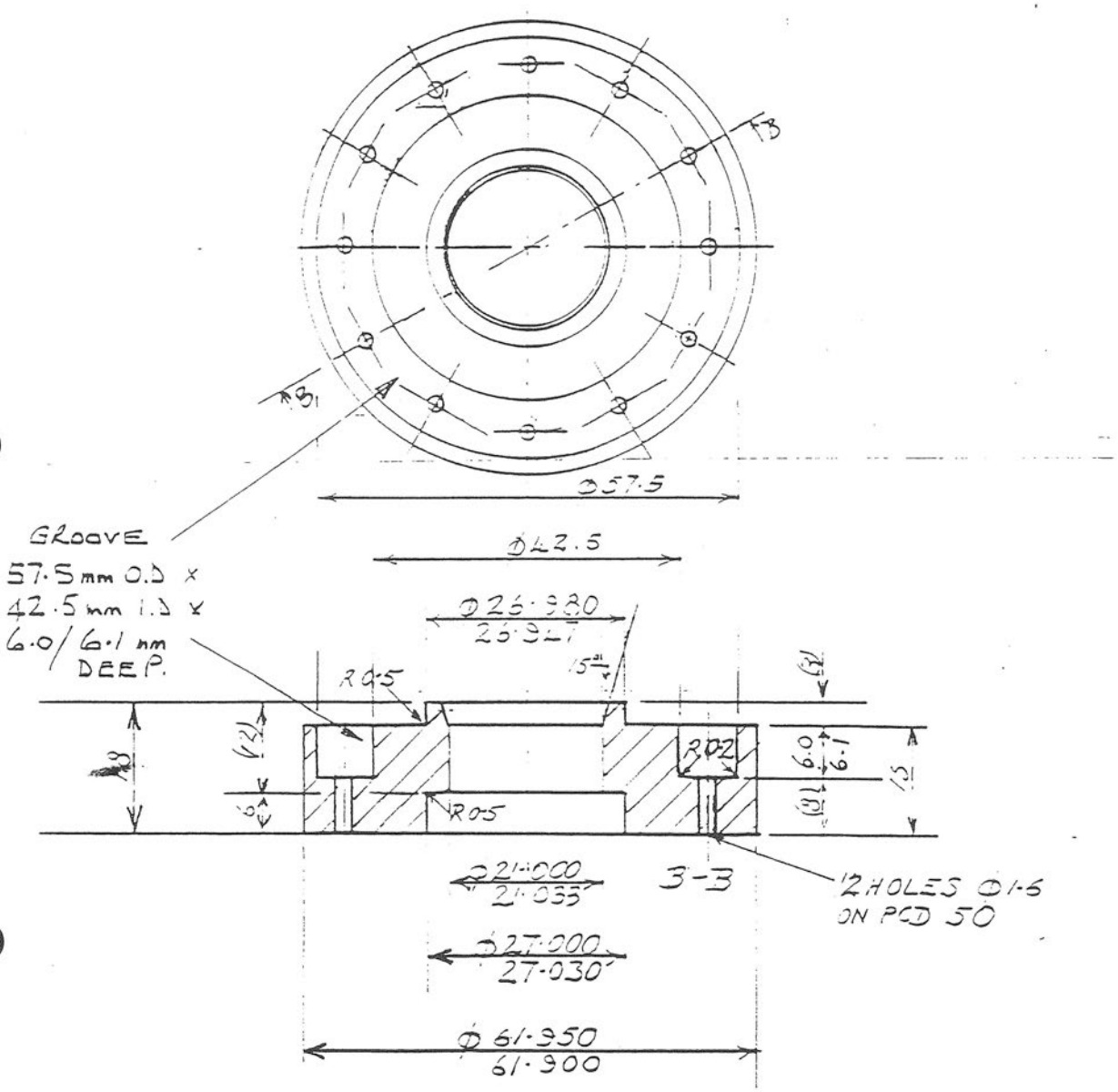


PSZ FURNACE COMPONENT. DRAWING 3106 REV

ITEM 14.

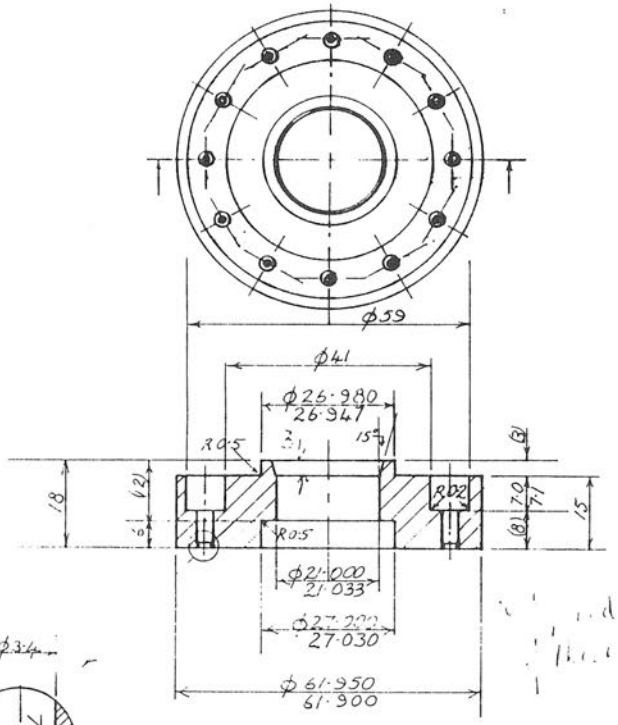
TOLERANCES ±0.3 UNLESS STATED

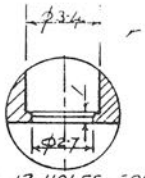
PATERSON INSTRUMENTS PTY LTD

ACN 008 644 273

c/o ANU RESEARCH SCHOOL OF EARTH SCIENCES
Canberra ACT 0200, Australia

Prof M S Paterson Tel: +61 6 249 2497 Fax: +61 6 249 0738



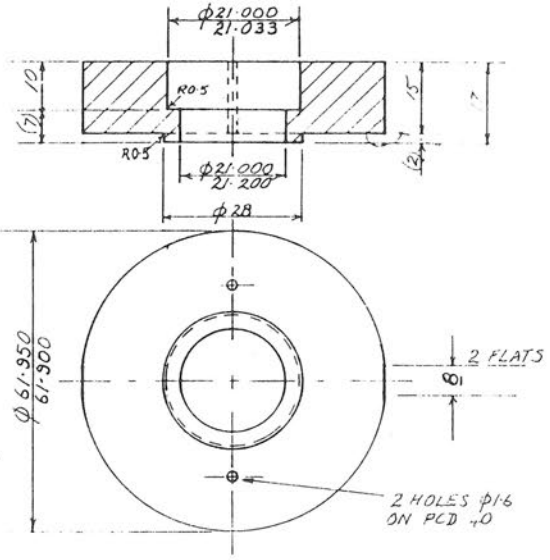


12 HOLES EQUISPACED ON PCD 50 WITH LIP TO LOCATE φ3 Al_2O_3 LINER

(14) STAINLESS STEEL (18/8)

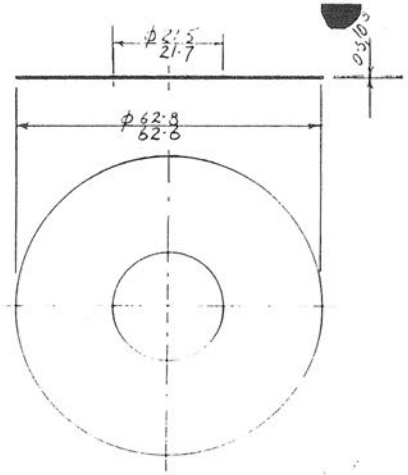
FOR USE WITH 1 MM THICK PSZ INSULATORS UNDER CONNECTORS

ALTERNATIVELY : PSZ WITH GROOVE 57·5 OD × 42·5 ID × 6 DEEP & PLAIN HOLES φ2

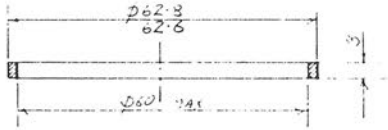


(21) 18/8 STAINLESS STEEL

ALTERNATIVELY PSZ

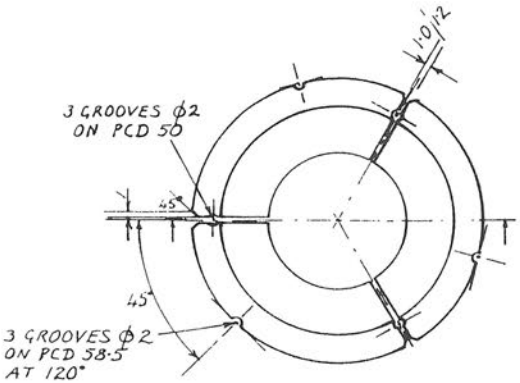


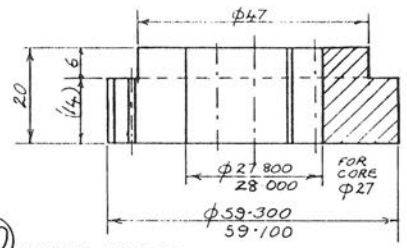
(22) STAINLESS STEEL SPRING SHEET



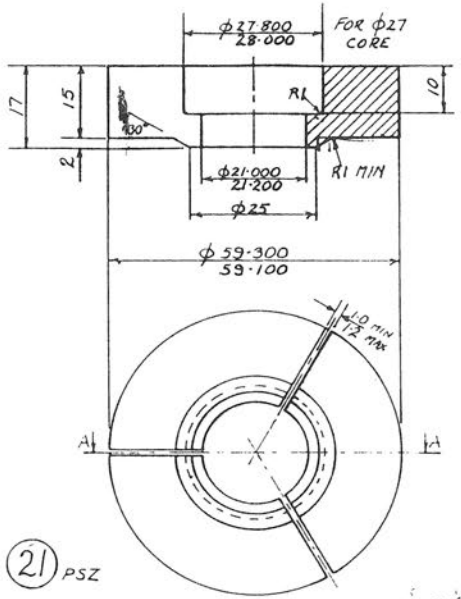
(23) SS OR BRASS

DIMENSIONS IN MILLIMETERS — DO NOT SCALE	PATERSON INSTRUMENTS PTY LTD
TOLERANCES ± 0·3 UNLESS STATED	HPT TESTING MACHINE FURNACE COMPONENTS DETAILS (14) & (21) TO (23)
	SCALE DATE

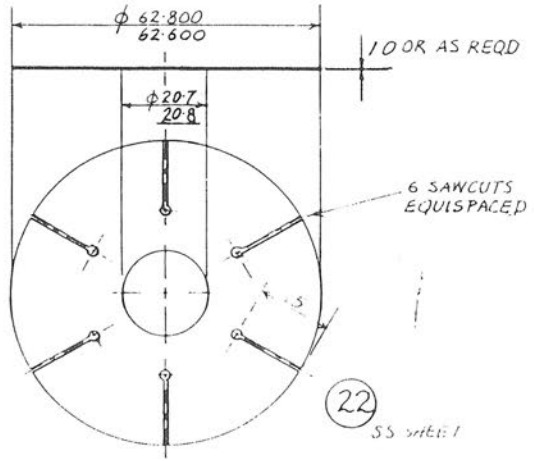




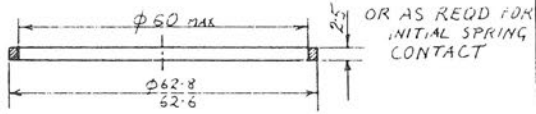
(20) MACOR OR PSZ



(21) PSZ

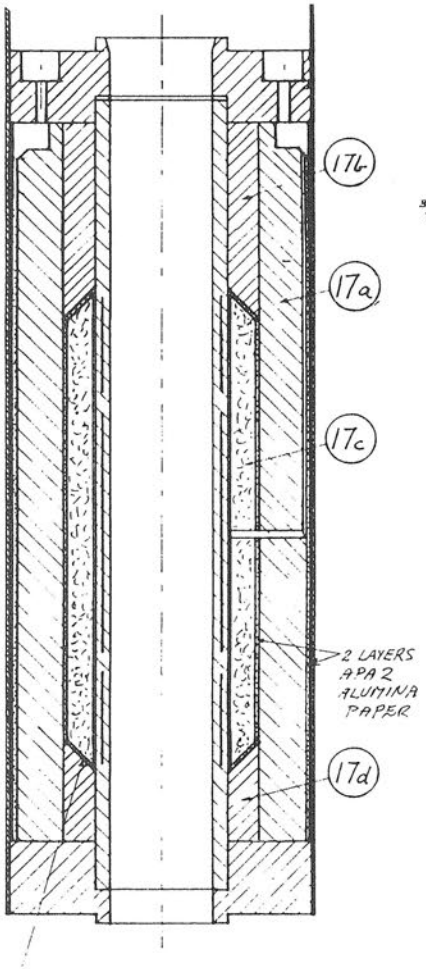


(22) SS SHEET

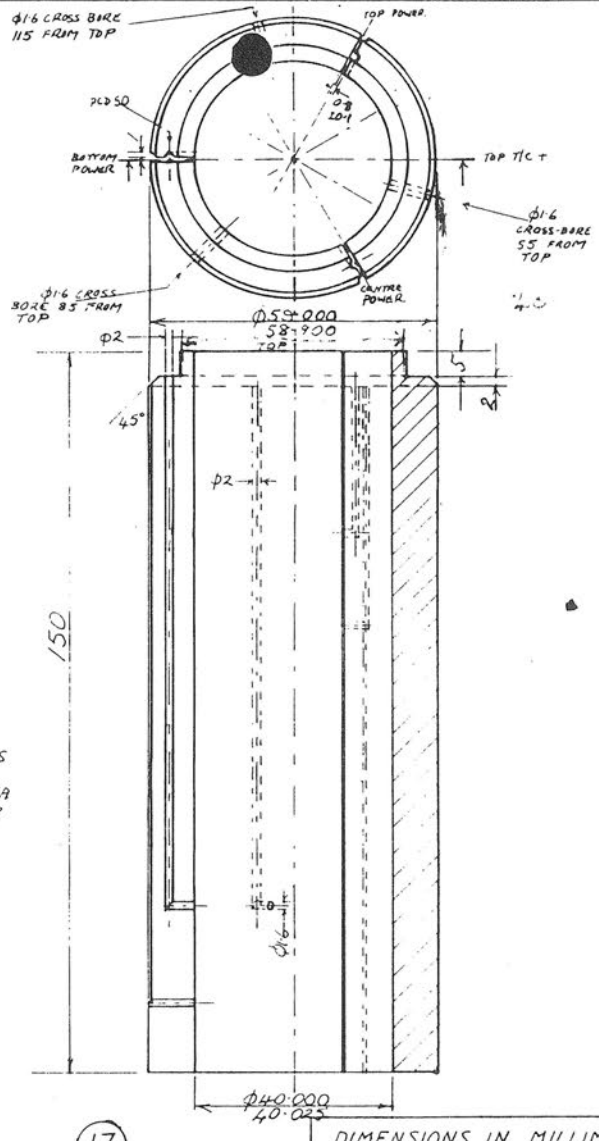


(23) BRASS OR SS

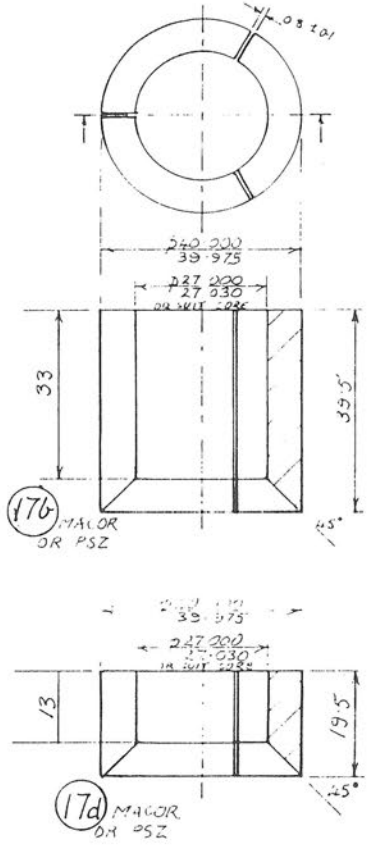
DIMENSIONS IN MILLIMETRES DO NOT SCALE	ANU RESEARCH SCHOOL OF EARTH SCIENCES
TOLERANCES ± UNLESS STATED	HIGH PRESSURE/TEMPERATURE TESTING MACHINE FURNACE ASSEMBLY DETAILS (20) TO (23)
A3 SCALE	DATE DRAWING NO 3106



CUT FROM APA2 ALUMINA PAPER 56·50D 38·51D (2 LAYERS)

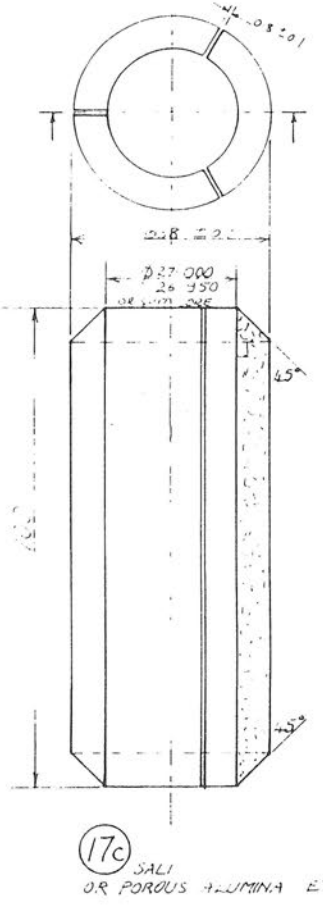


17a PSZ



17b MACOR OR PSZ

17d MACOR OR PSZ



17c SALI OR POROUS ALUMINA ETC

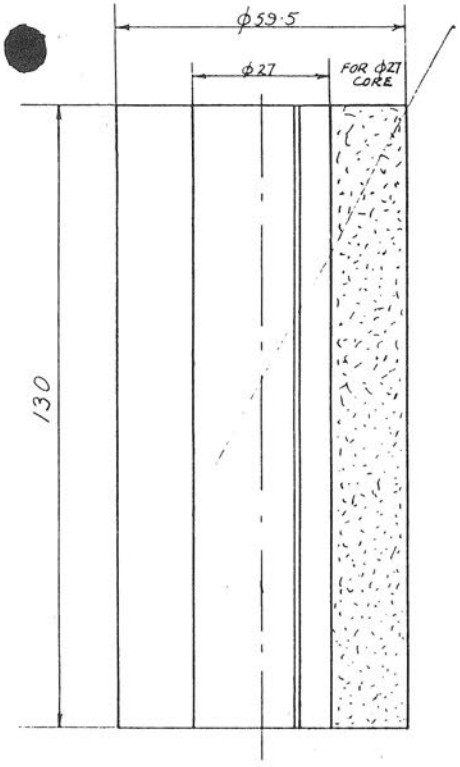
DIMENSIONS IN MILLIMETERS – DO NOT SCALE

TOLERANCES ± 0·3 UNLESS STATED

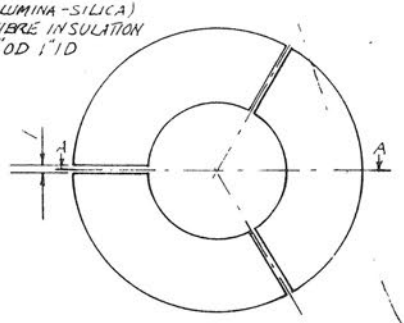
PATERSON INSTRUMENTS PTY LTD

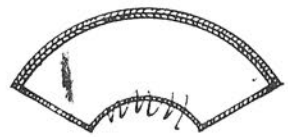
HPT TESTING MACHINE
FURNACE ASSEMBLY
DETAIL (17) - ALTERNATIVE INSULATION

	SCALE	DATE	DRAWING NO.



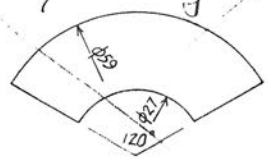
(17) ZIRCAR ASH (ALUMINA-SILICA) FIBRE INSULATION 3"OD 1"ID



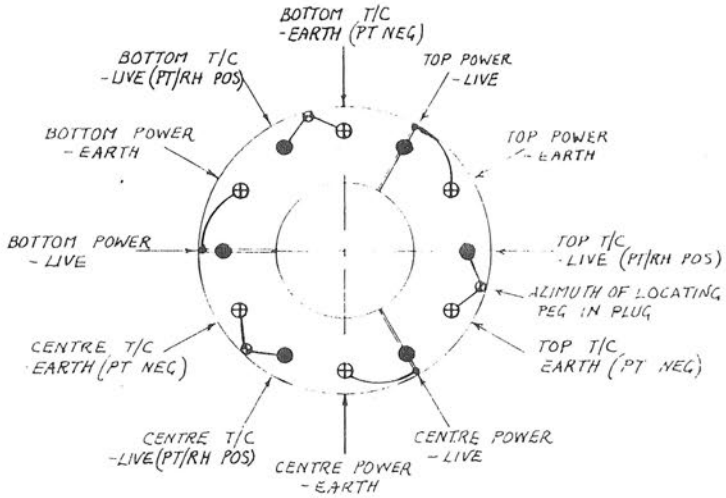


(18) ZIRCAR APA2 ALUMINA PAPER 9 PIECES 62 × 165 WITH CUT-OUT 5×29 AT BOTTOM OF 3 TO ACCOMMODATE TO (21)

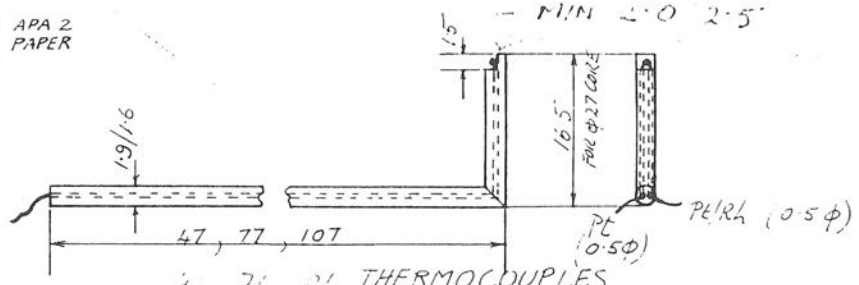
See also note on 3107a assembly drawing



(19) ZIRCAR APA 2 ALUMINA PAPER 6 PIECES

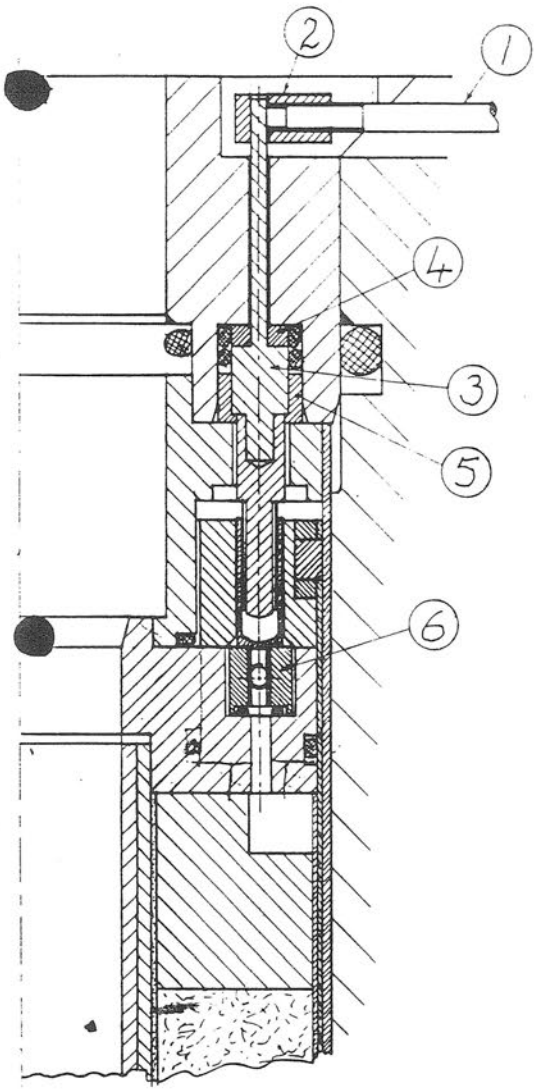


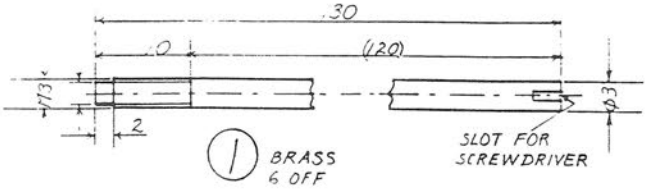
WIRING CONNECTIONS - VIEW FROM ABOVE



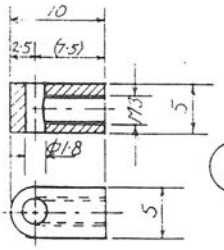
THERMOCOUPLES

DIMENSIONS IN MILLIMETRES DO NOT SCALE	ANU RESEARCH SCHOOL OF EARTH SCIENCES
TOLERANCES ± UNLESS STATED	HIGH PRESSURE/TEMPERATURE TESTING MACHINE FURNACE ASSEMBLY DETAILS (17) TO (19) ETC
	A3 | SCALE | DATE | DRAWING NO 3107b

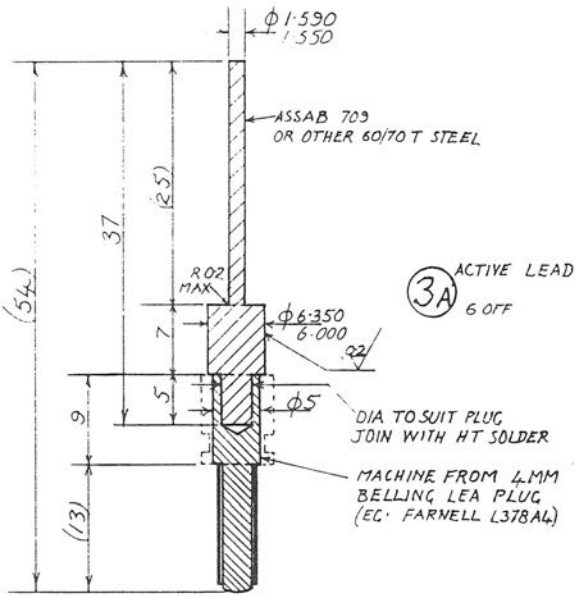




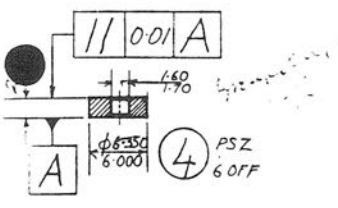
1 BRASS 6 OFF



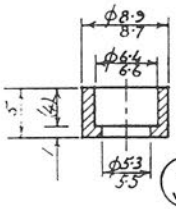
2 BRASS 6 OFF



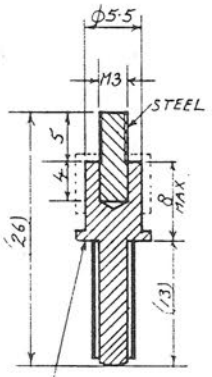
3A ACTIVE LEAD 6 OFF



4 PSZ 6 OFF

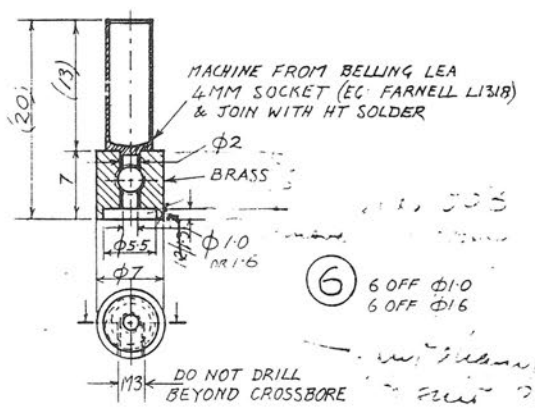


5 NYLON OR OTHER PLASTIC 6 OFF



MACHINE FROM 4MM BELLING LEA PLUG (EG: FARNELL L378AL) & JOIN WITH HT OR SILVER SOLDER

3B EARTH LEAD 6 OFF



6 6 OFF Ø1·0
6 OFF Ø1·6

DIMENSIONS IN MILLIMETRES
DO NOT SCALE

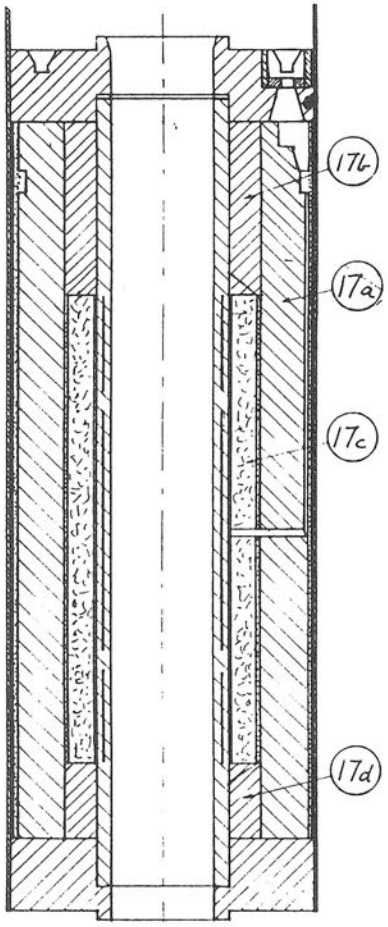
TOLERANCES ± UNLESS STATED

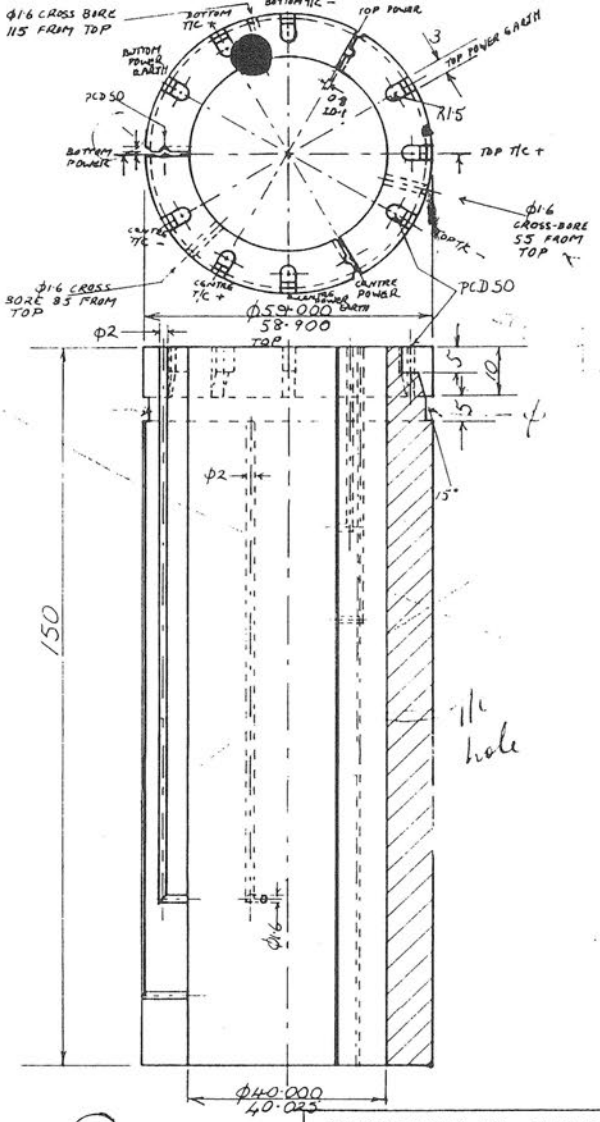
ACN 008 644 273

PATERSON INSTRUMENTS PTY LTD

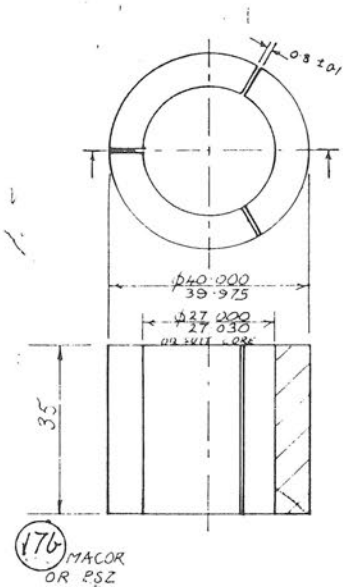
HPT TESTING MACHINE
FURNACE ASSEMBLY
DETAILS OF CONNECTORS

A3	SCALE 2:1	DATE NOV 1993	DRAWING NO 3108

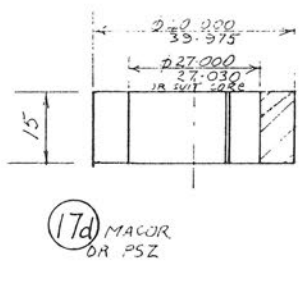




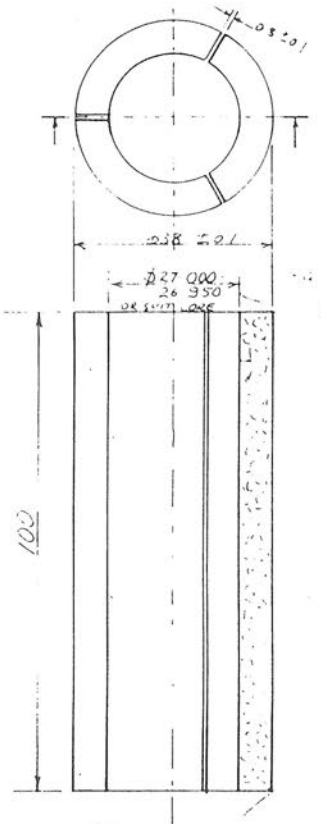
17a PSZ



17b MACOR OR PSZ



17d MACOR OR PSZ



17c SALI OR POROUS ALUMINA ETC

DIMENSIONS IN MILLIMETERS — DO NOT SCALE

TOLERANCES ± 0·3 UNLESS STATED

PATERSON INSTRUMENTS PTY LTD

HPT TESTING MACHINE
FURNACE ASSEMBLY
DETAIL (17) - ALTERNATIVE INSULATION

A3	SCALE	DATE	DRAWING NO. 3107 a

PATERSON INSTRUMENTS PTY LTD

ACN 008 644 273

ANU RESEARCH SCHOOL OF EARTH SCIENCES
Canberra ACT 0200, Australia

Prof M S Paterson Tel: +61 6 249 2497 Fax: +61 6 249 0738

Facsimile Message

Date: 7 July 1995 *No. of pages:* 3

To: Fax No. + 33-67-14-36-03

Name Dr David Mainprice

Address Laboratoire de Tectonophysique,
Universite Montpellier II
34095 Montpellier cedex 05
France

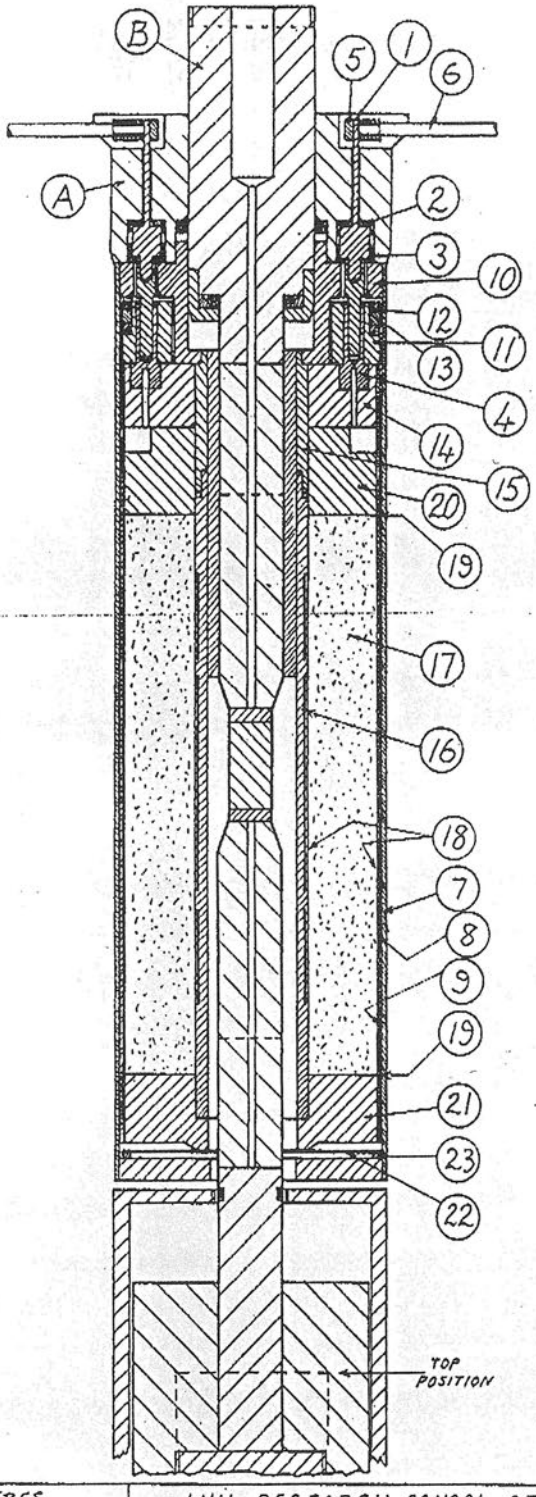
Dear David,

I attach the two furnace drawings mentioned in my e-mail message.

The differences to look at are in parts 14 and 17. Part 14 now overlaps the top of the core and is a snug fit on it as well as on the outer can (the earlier version had alumina paper on the OD). Then the insulation 17, which was previously fibre (such as Zircar ASH), is now a combination of PSZ, precision ground to fit together with minimal gaps (parts 17a, b and d), and an inner fibre insulation 17c. Both the outer PSZ piece and the fibre insulation are spring loaded inwards by alumina paper on their OD's, so as to follow the thermal expansion. I think that this device is not working 100% with the fibre insulation as mentioned in my email but I am optimistic that this can be fixed. Here I have so far used a hard insulation called SALI for its greater refractoriness but may revert to ASH which is itself a bit springy.

The PSZ is more thermally conducting than the ASH so the power consumption is a bit greater but not to an extent that matters (I plan to put a couple extra turns in the bottom winding in future to drop the bottom current back a bit). Such a furnace runs quite readily up to 1300°C and I have had one higher. They should have much better life at high temperature than the earlier furnaces.

Best wishes,



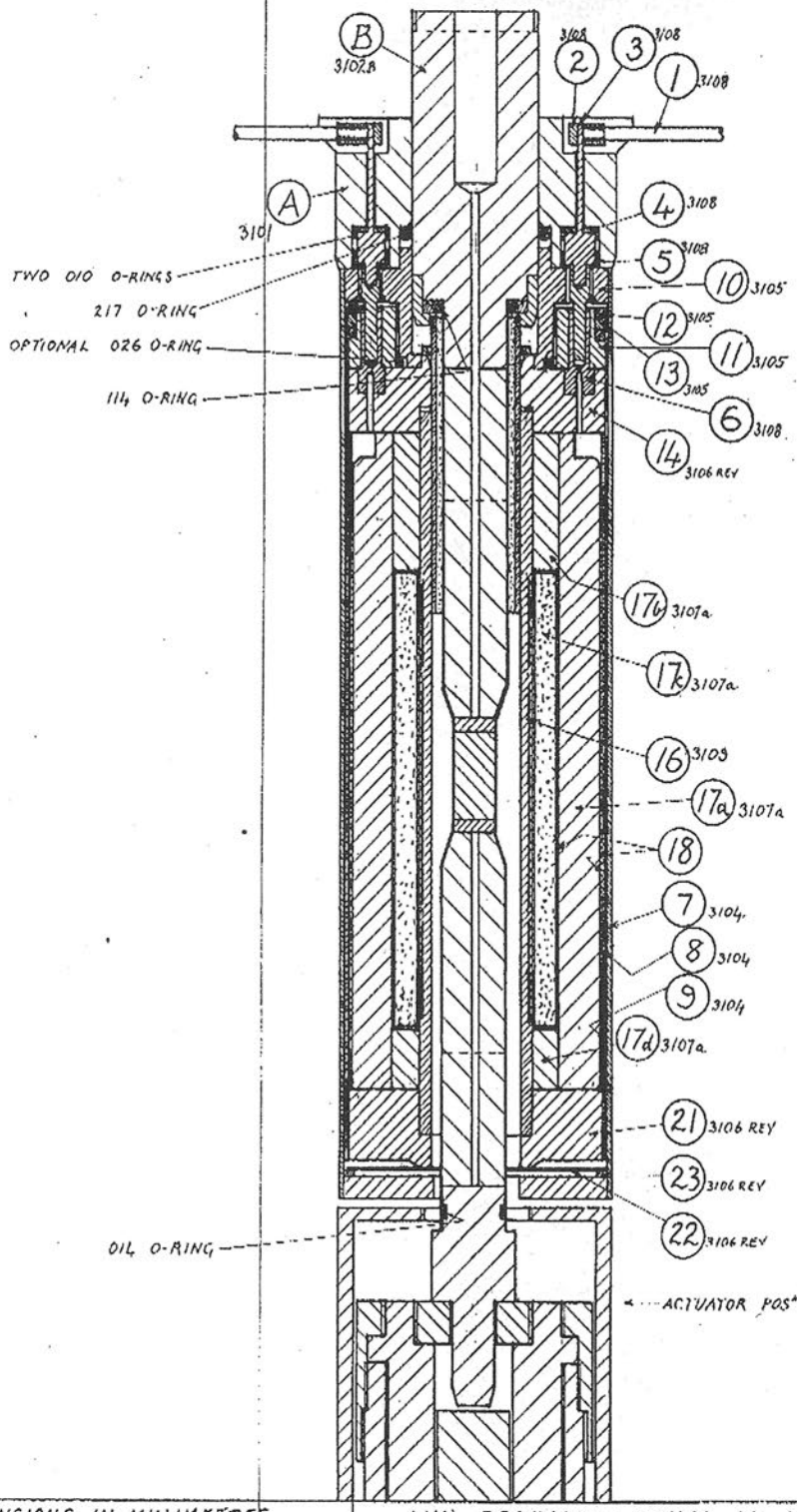
1990 VERSION

DIMENSIONS IN MILLIMETRES
DO NOT SCALE

ANU RESEARCH SCHOOL OF EARTH SCIENCES

HIGH PRESSURE/TEMPERATURE TESTING MACHINE
FURNACE ASSEMBLY
GENERAL VIEW

A3	SCALE 1:1	DATE AUG 1990	DRAWING NO 3100



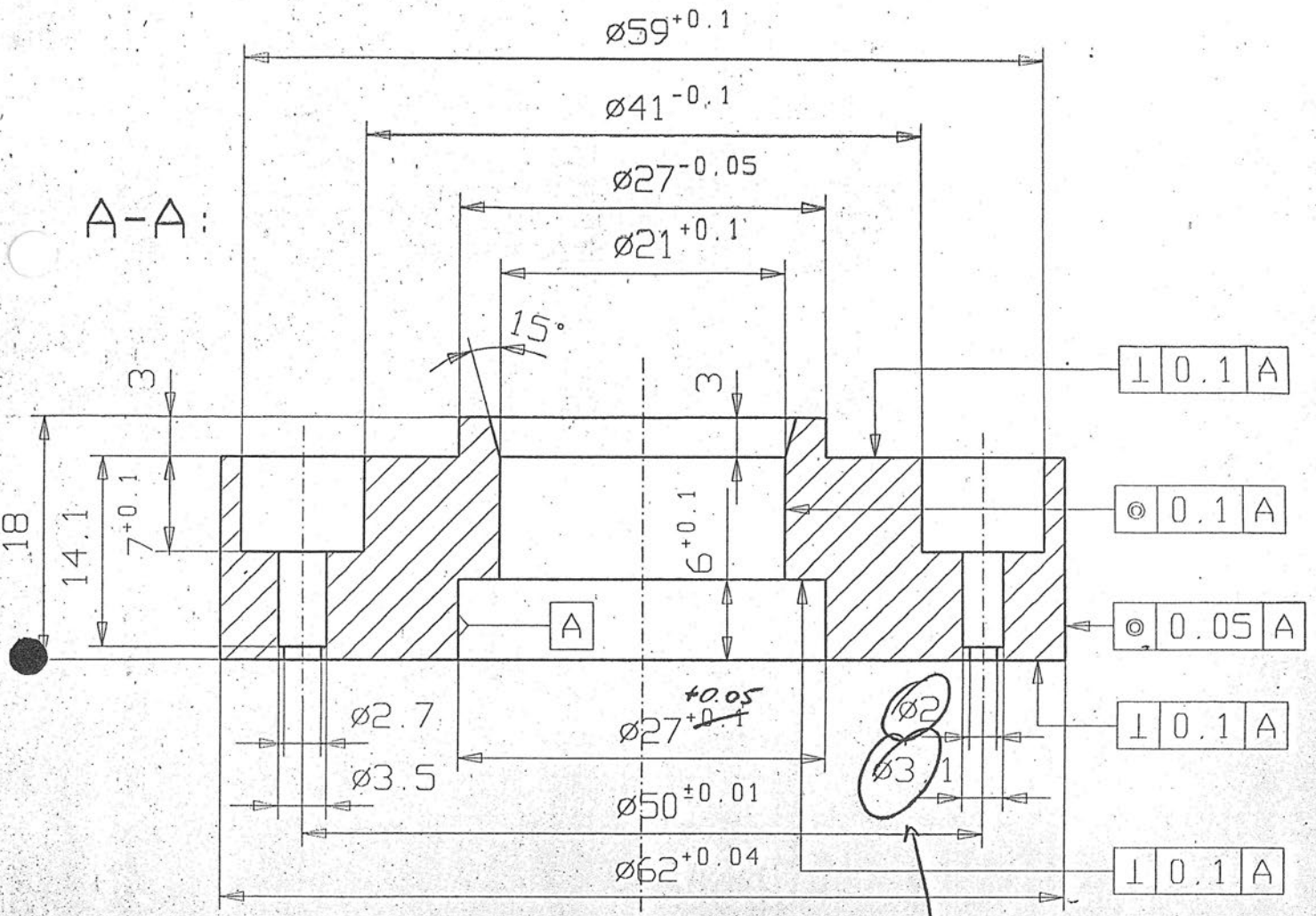
1995 VERSION

DIMENSIONS IN MILLIMETRES
DO NOT SCALE

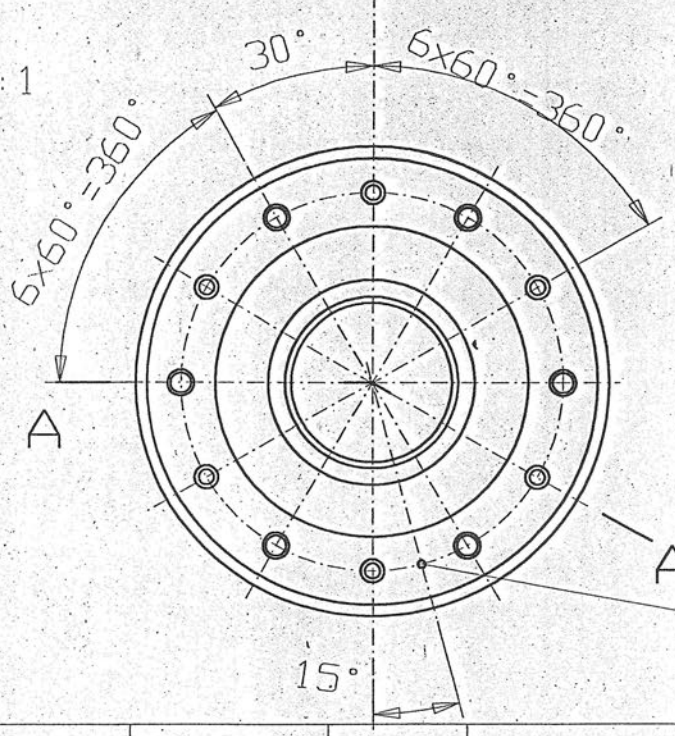
ANU RESEARCH SCHOOL OF EARTH SCIENCES

HIGH PRESSURE/TEMPERATURE TESTING MACHINE
FURNACE ASSEMBLY
GENERAL VIEW

A3	SCALE 1:1	DATE AUG 1990	DRAWING NO 3100



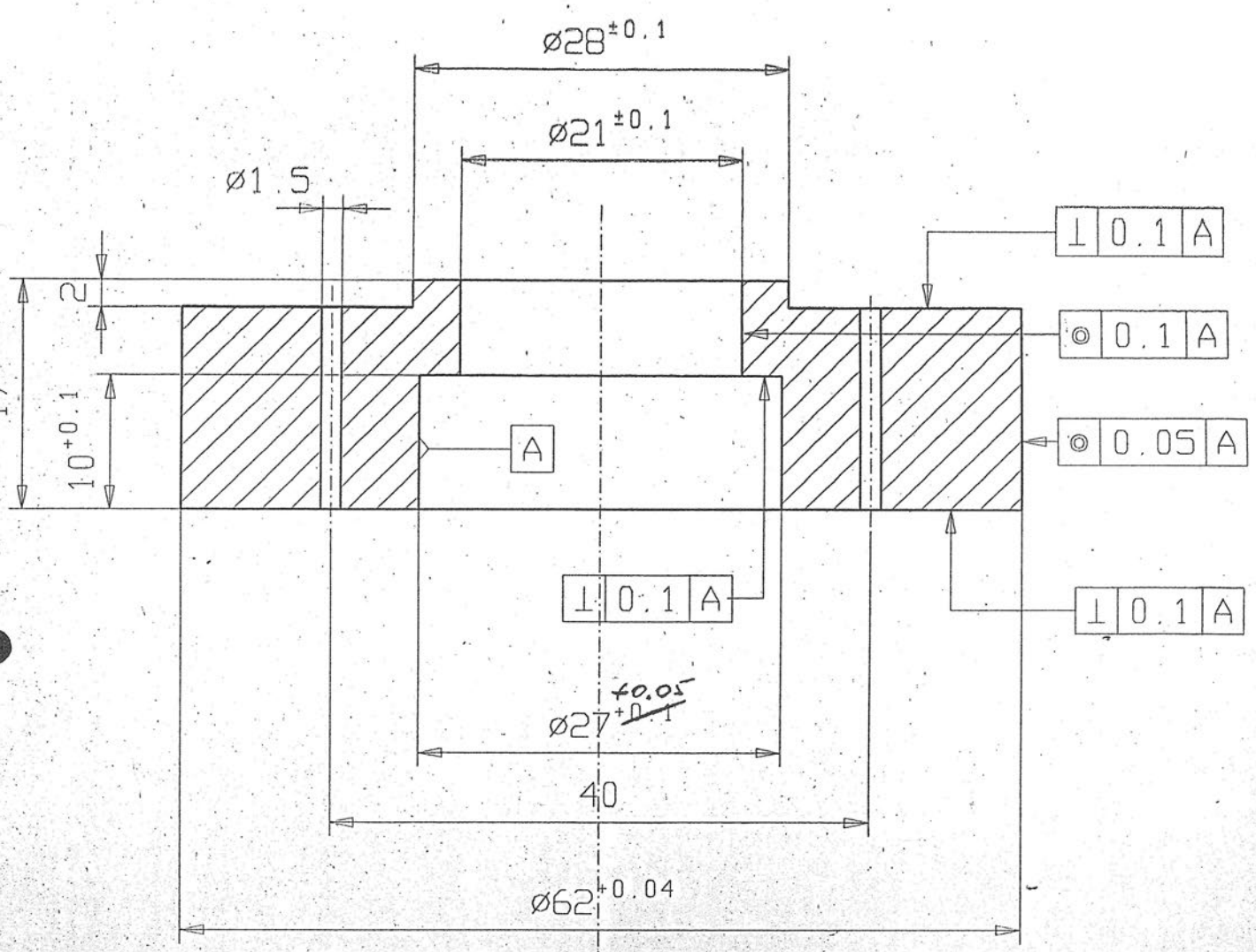
Ansicht M 1:1

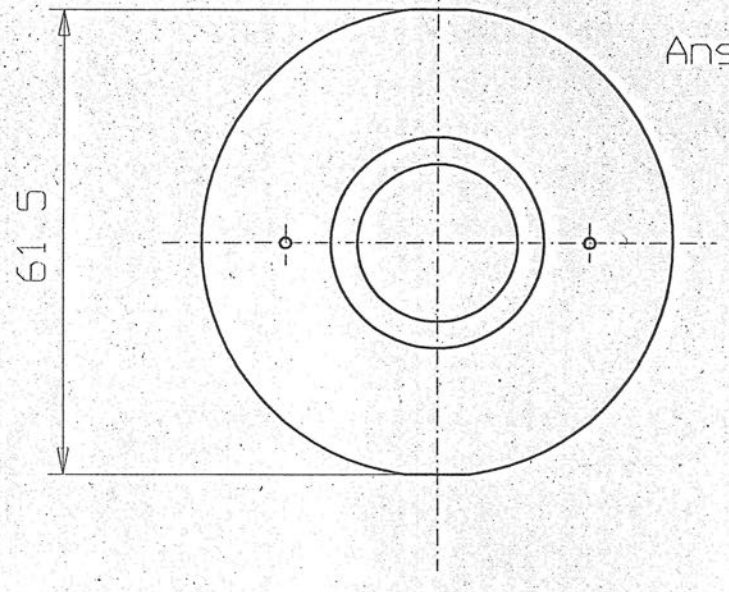


19.6.82
alle Bohrungen mit
größerem ø fertigen.

Bohrung 1mm tief

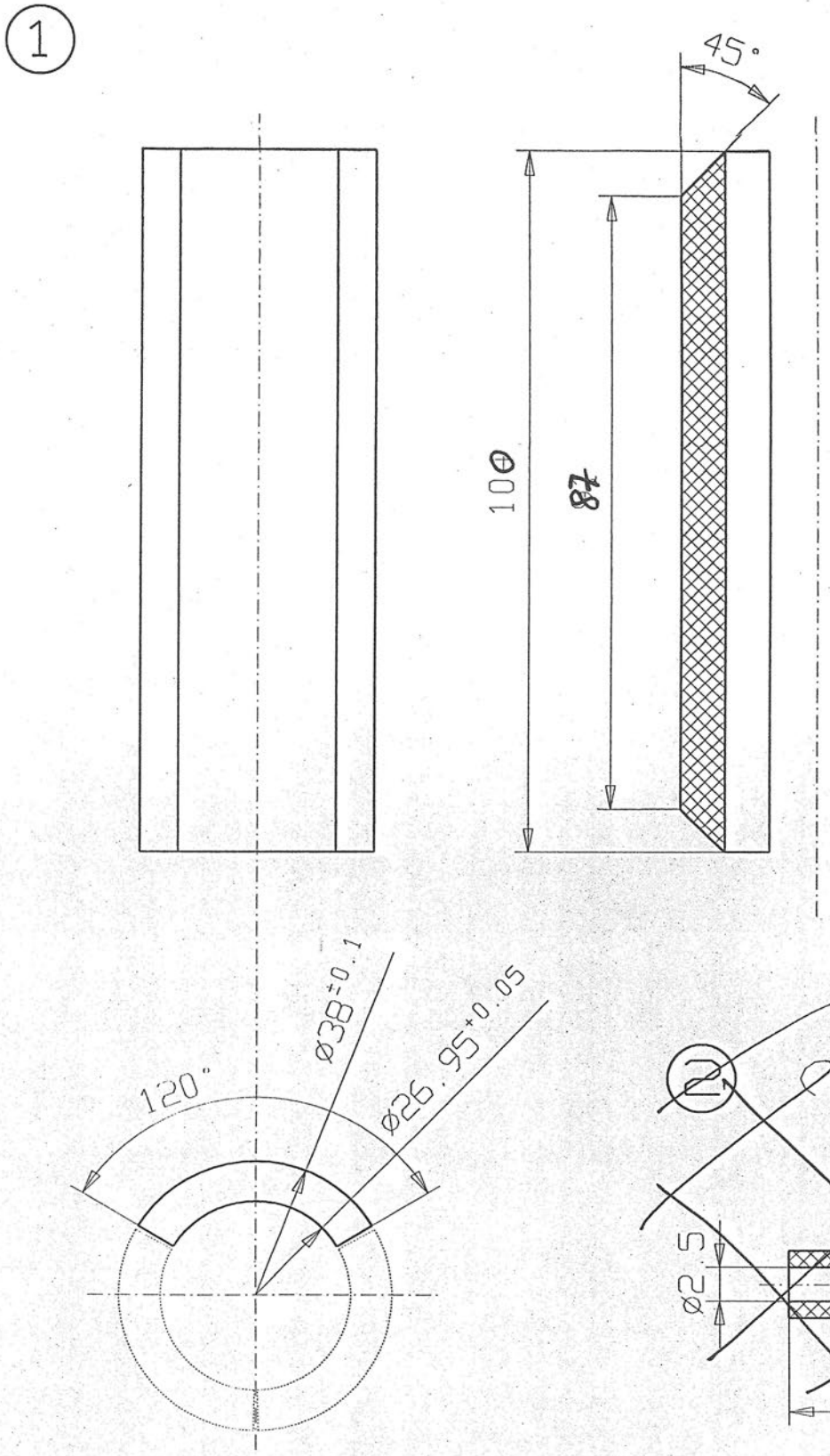
	M. Naumann			
	Datum 3.7.96	1 ×	M 2:1	Material 1.2344 / 1.2343
Z.-Nummer P 4.2.5		Z.-Titel Paterson-Apparatur Furnace - Topplatte		
GFZ Potsdam				



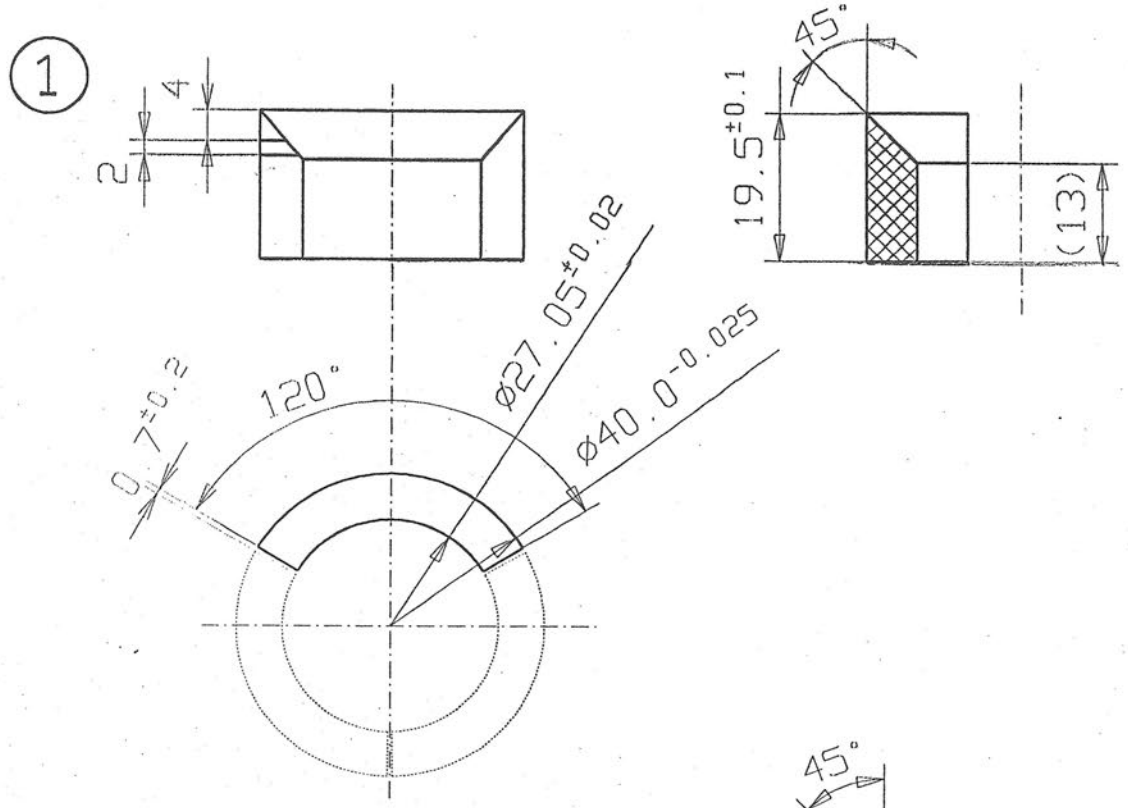


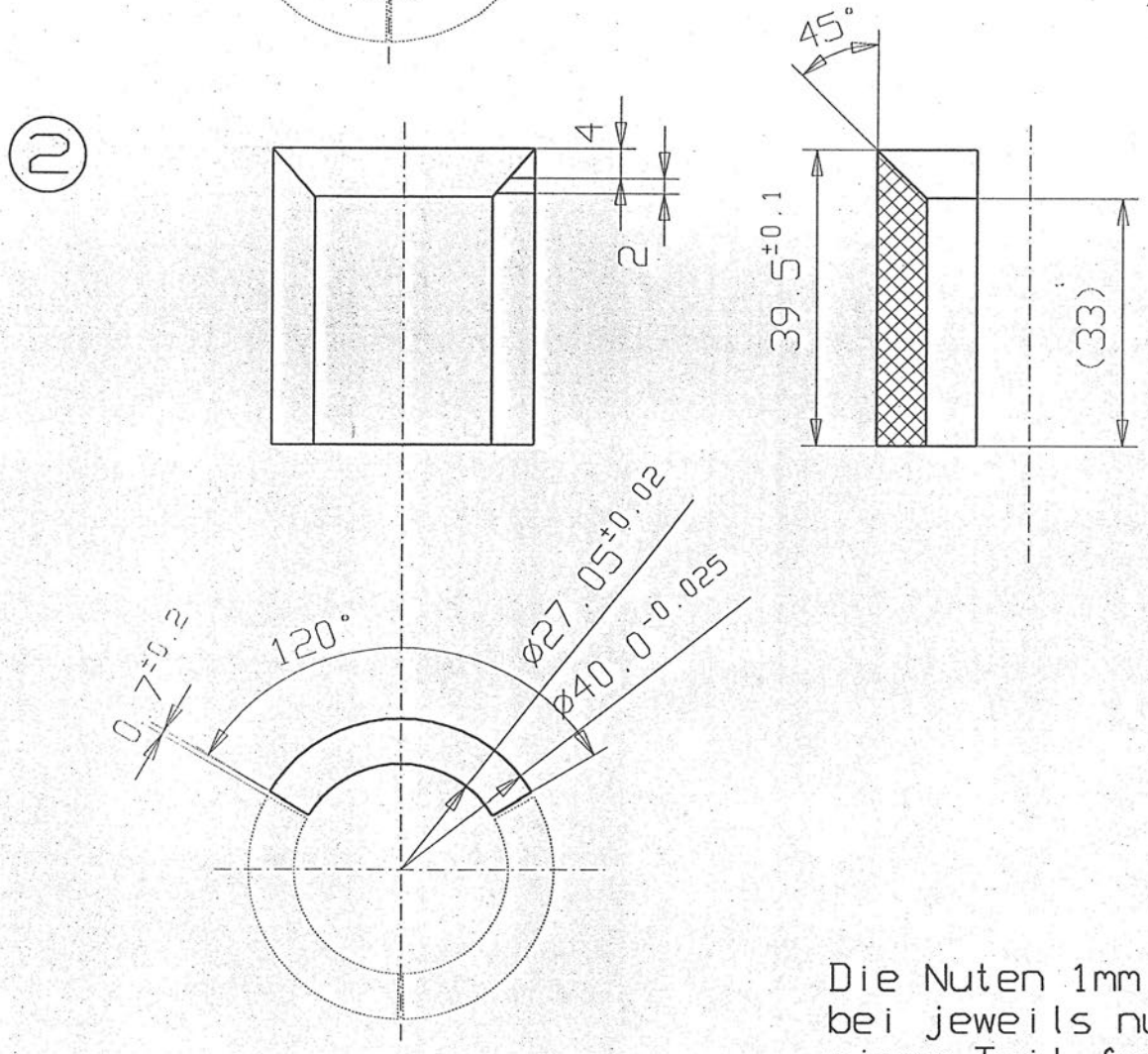
Ansicht M 1:1

	M. Naumann				
	Datum 3.7.96	1 ×	M 2:1	Material 1.2344 / 1.2343	
Z.-Nummer P 4.2.6		Z.-Titel	Paterson-Apparatur Furnace - Bodenplatte		
GFZ Potsdam					



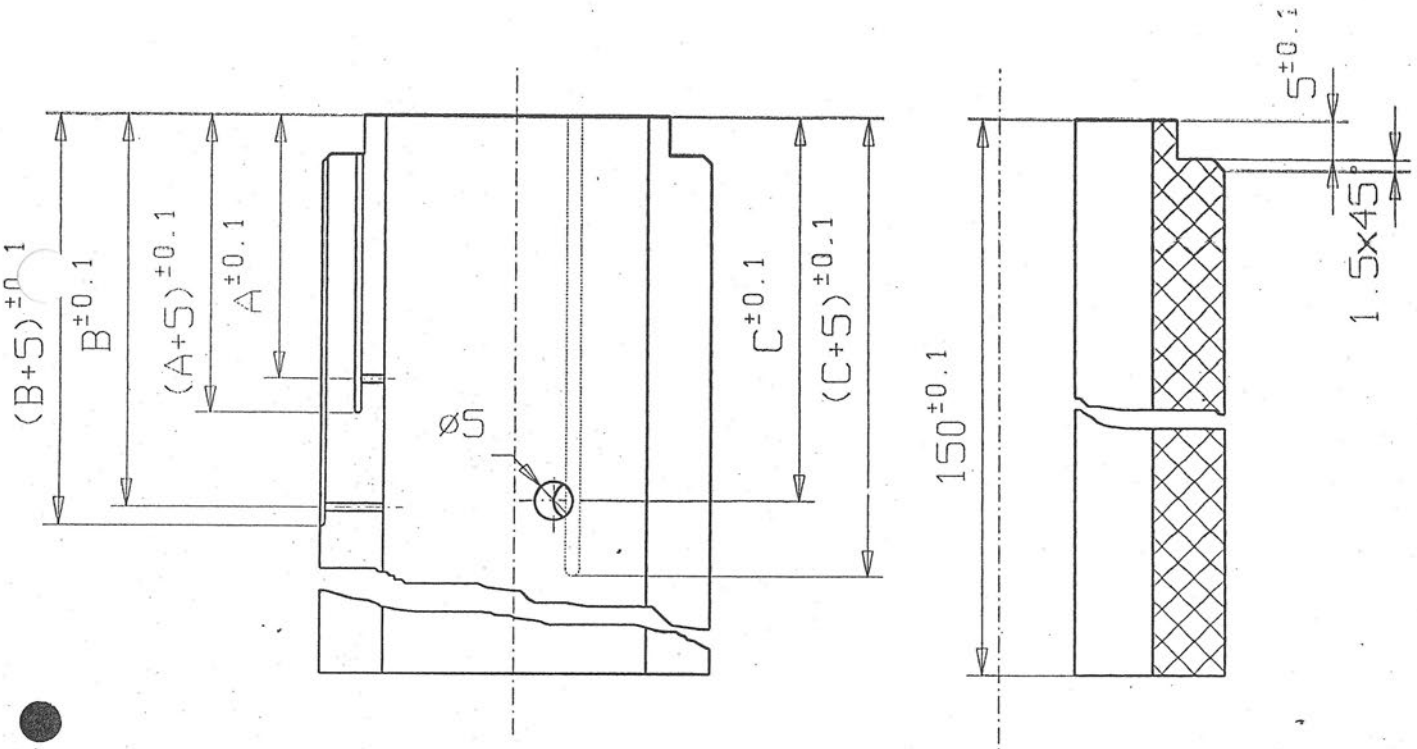
	M. Naumann				
	Datum 18.10.96	je 3x	M 1:1	Material ~~Al2O3 porös~~ KKS 174/400	
Z.-Nummer P 4.2.7		Z.-Titel	Paterson-Apparatur Furnace - Aluash		
GFZ Potsdam					



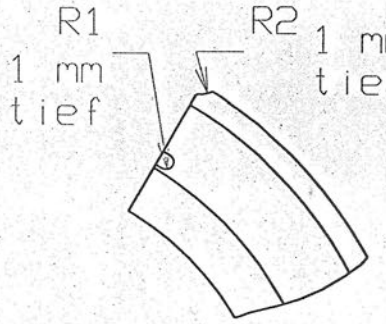


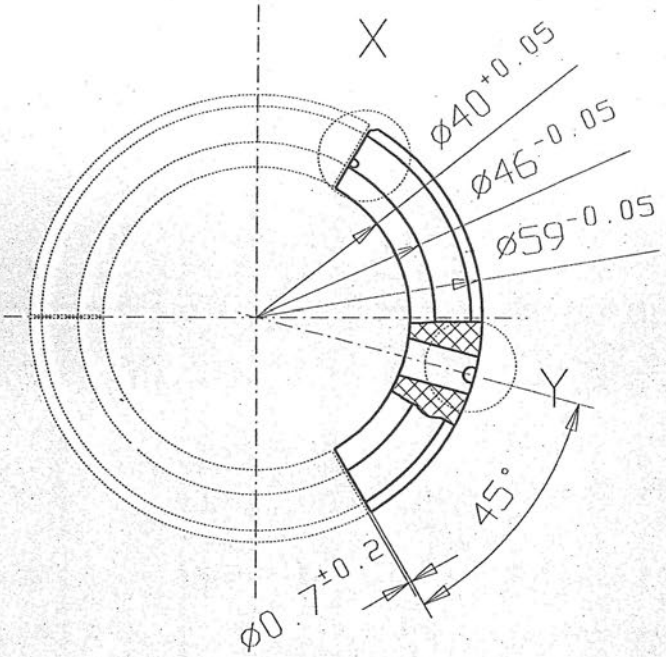
Die Nuten 1mm tief
bei jeweils nur
einem Teil fertigen.

	M. Naumann				
	Datum 7.7.97	je 3x	M 1:1	Material PSZ	
Z.-Nummer P 4.2.8		Z.-Titel Paterson-Apparatur Furnace - PSZ-Segmente			
GFZ Potsdam					

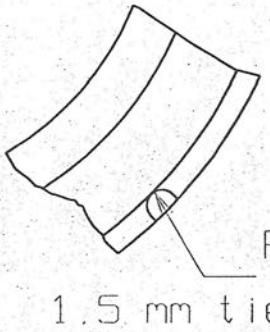


Einzelheit X (Nut A + B):
M 2:1





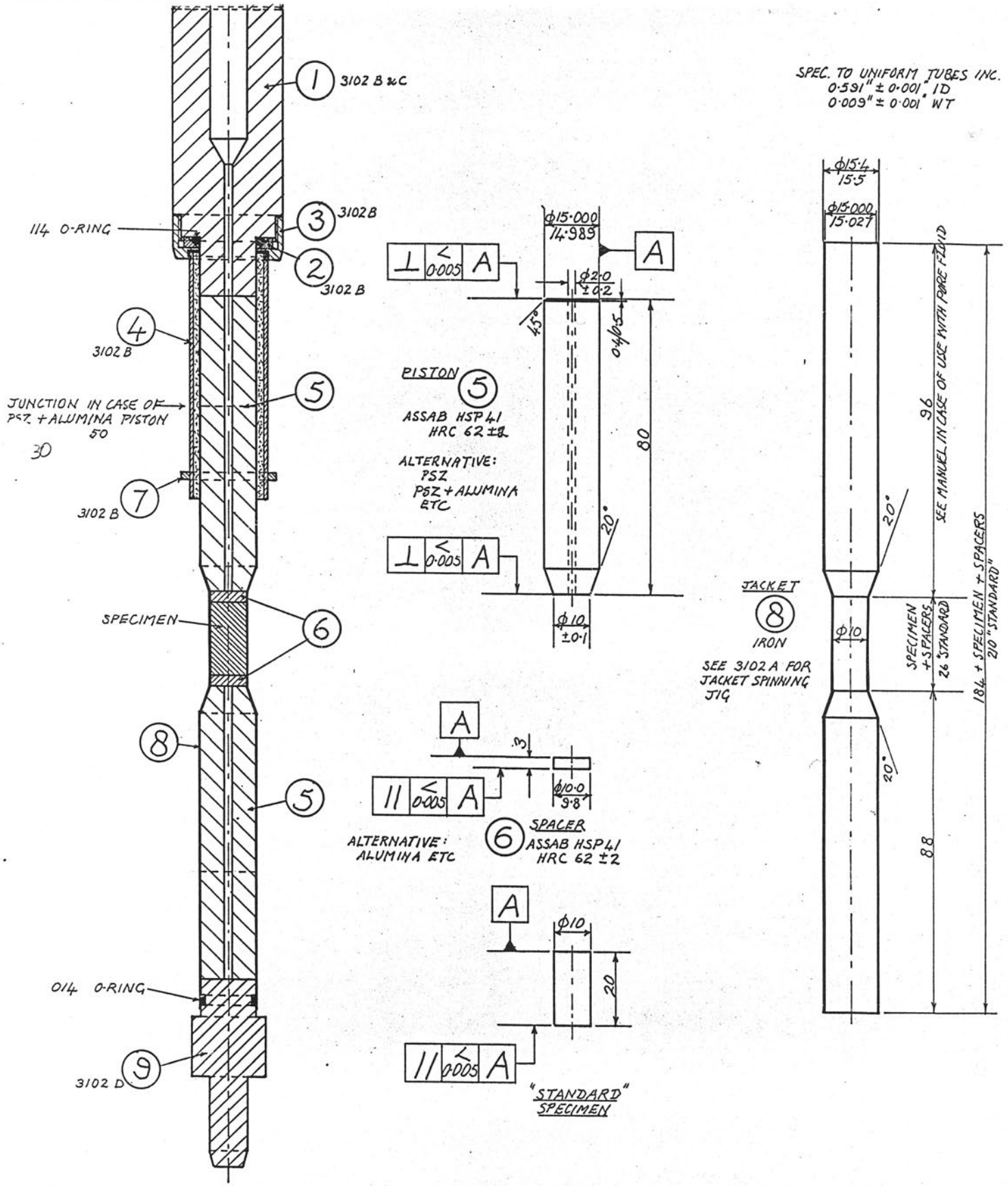
Einzelheit Y (Nut C):
M 2:1



Länge der Nuten / Lage der Bohrung

Teil	A	B	C
1	34	56	55.5
2	58.5	111.5	85.5
3	110	135	115.5

	M. Naumann				
	Datum 7.7.97	3x	M 1:1	Material PSZ	
Z.-Nummer P 4.2.9		Z.-Titel Paterson-Apparatur Furnace - PSZ-Segmente			
GFZ Potsdam					



0.707 14

DIMENSIONS IN MILLIMETRES
DO NOT SCALE

TOLERANCES ± 0·3 UNLESS STATED

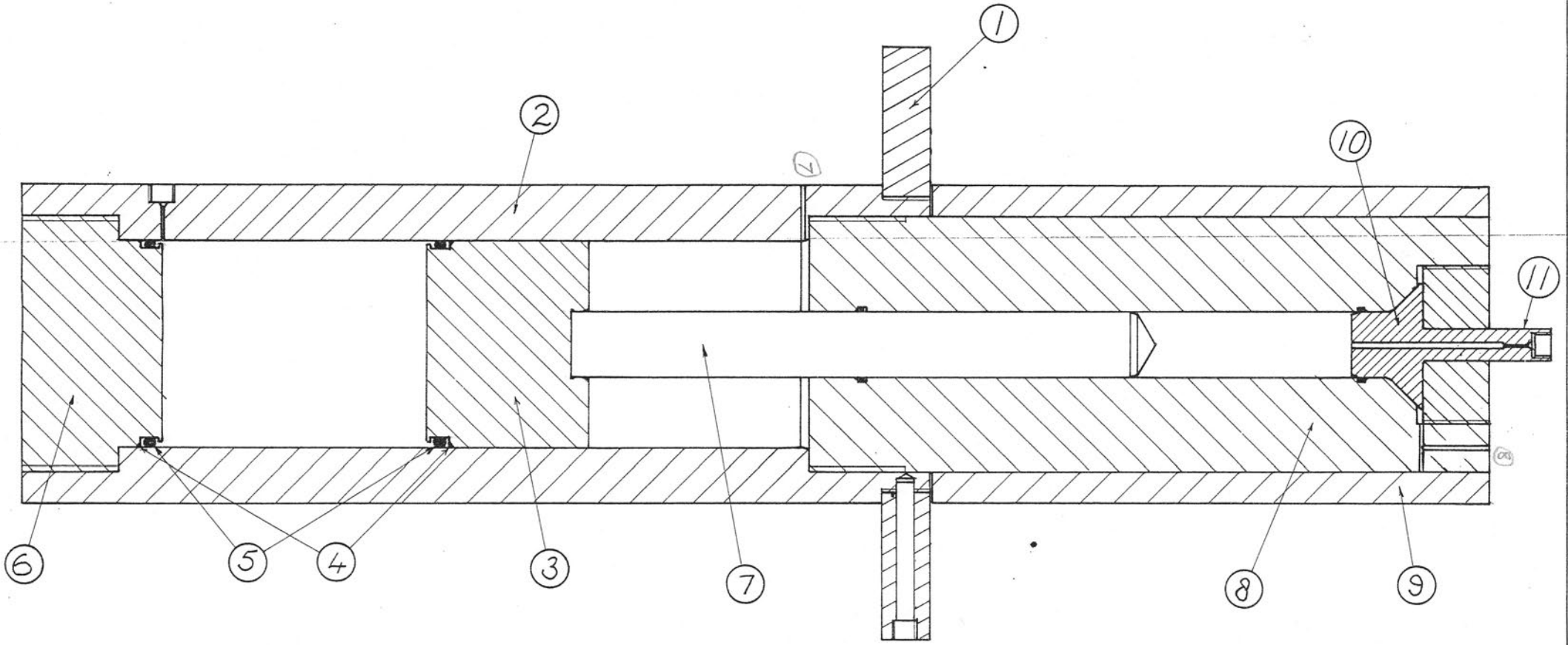
ACN 008 644 273

PATERSON INSTRUMENTS PTY LTD

HPT TESTING MACHINE
SPECIMEN ASSEMBLY
GENERAL ARRGT. & PISTON/JACKET DETAIL

A3	SCALE 1:1	DATE SEPT 1994	DRAWING NO 3102

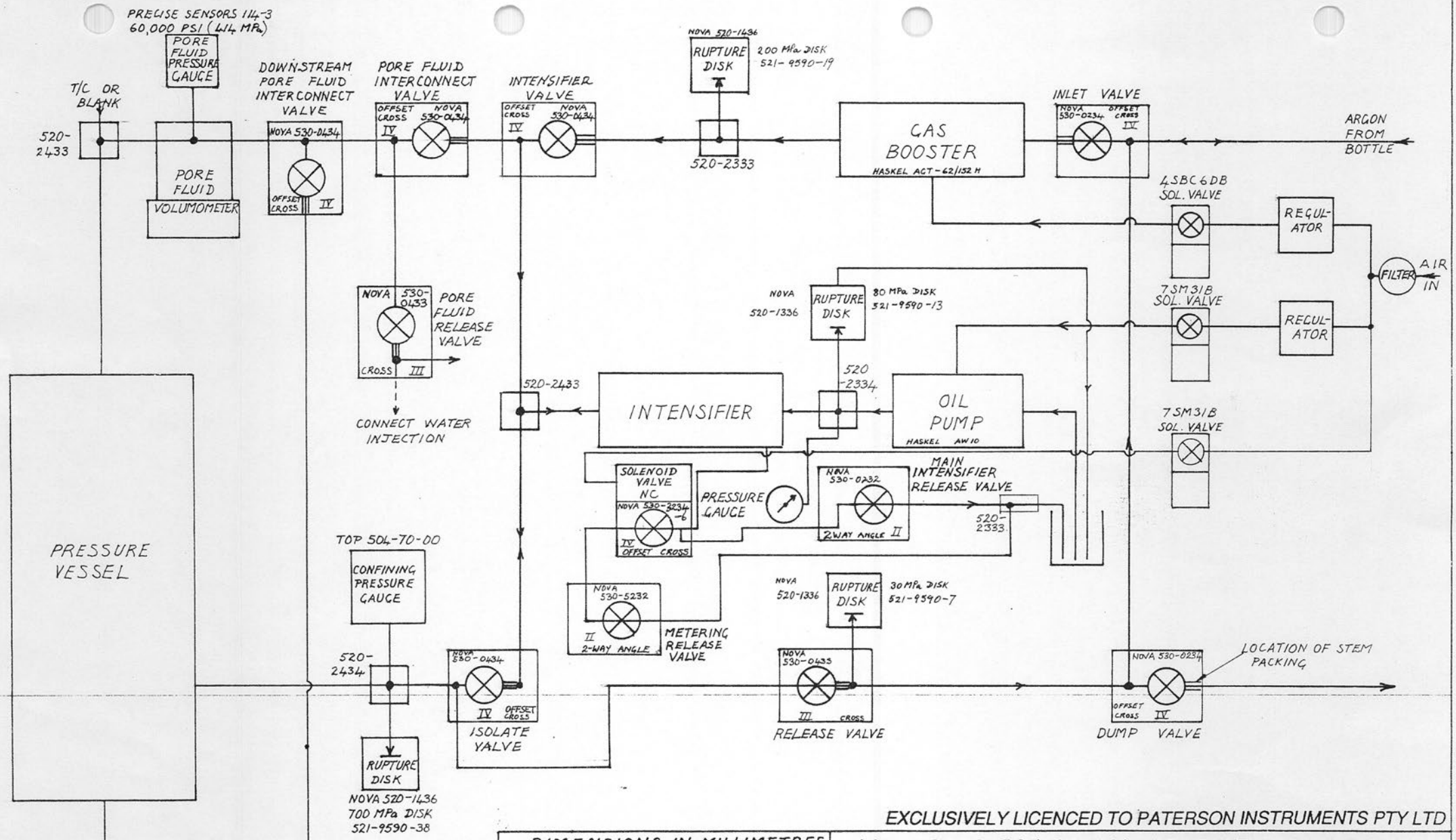
REPLACES 3102 REV & ORIGINAL 3102



SWEPT GAS VOL 400 ML
RATIO 10:1
BORE 41
STROKE 302
OIL CAPACITY 4 LITRES

DIMENSIONS IN MILLIMETRES DO NOT SCALE	ANU RESEARCH SCHOOL OF EARTH SCIENCES
TOLERANCES ± UNLESS STATED	HIGH PRESSURE/TEMPERATURE TESTING MACHINE INTENSIFIER GENERAL ASSEMBLY

A3	SCALE 1:2·5	DATE AUG 1989	DRAWING NO 2300 REVISED FEB 1993



DIMENSIONS IN MILLIMETRES
DO NOT SCALE

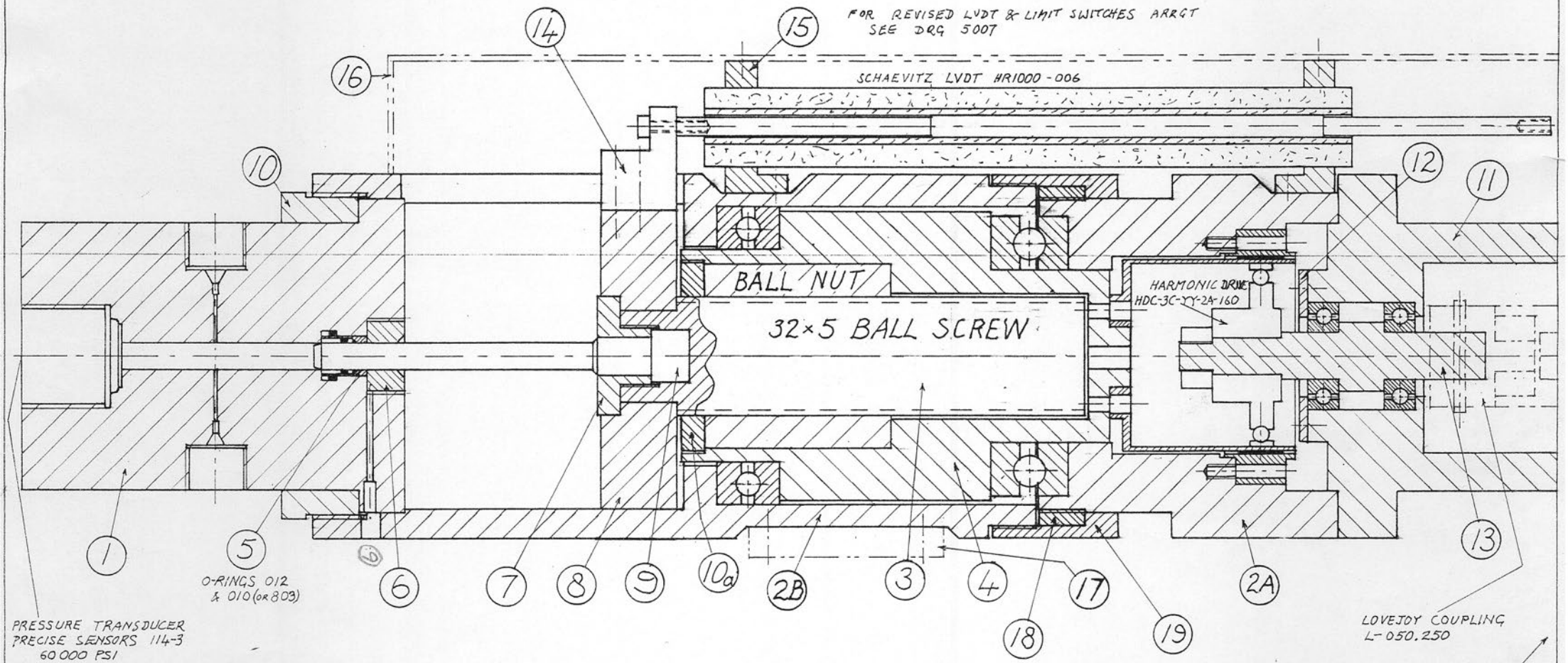
TOLERANCES ± UNLESS STATED

ANU RESEARCH SCHOOL OF EARTH SCIENCES

HIGH PRESSURE/TEMPERATURE TESTING MACHINE
HIGH PRESSURE PLUMBING LAYOUT

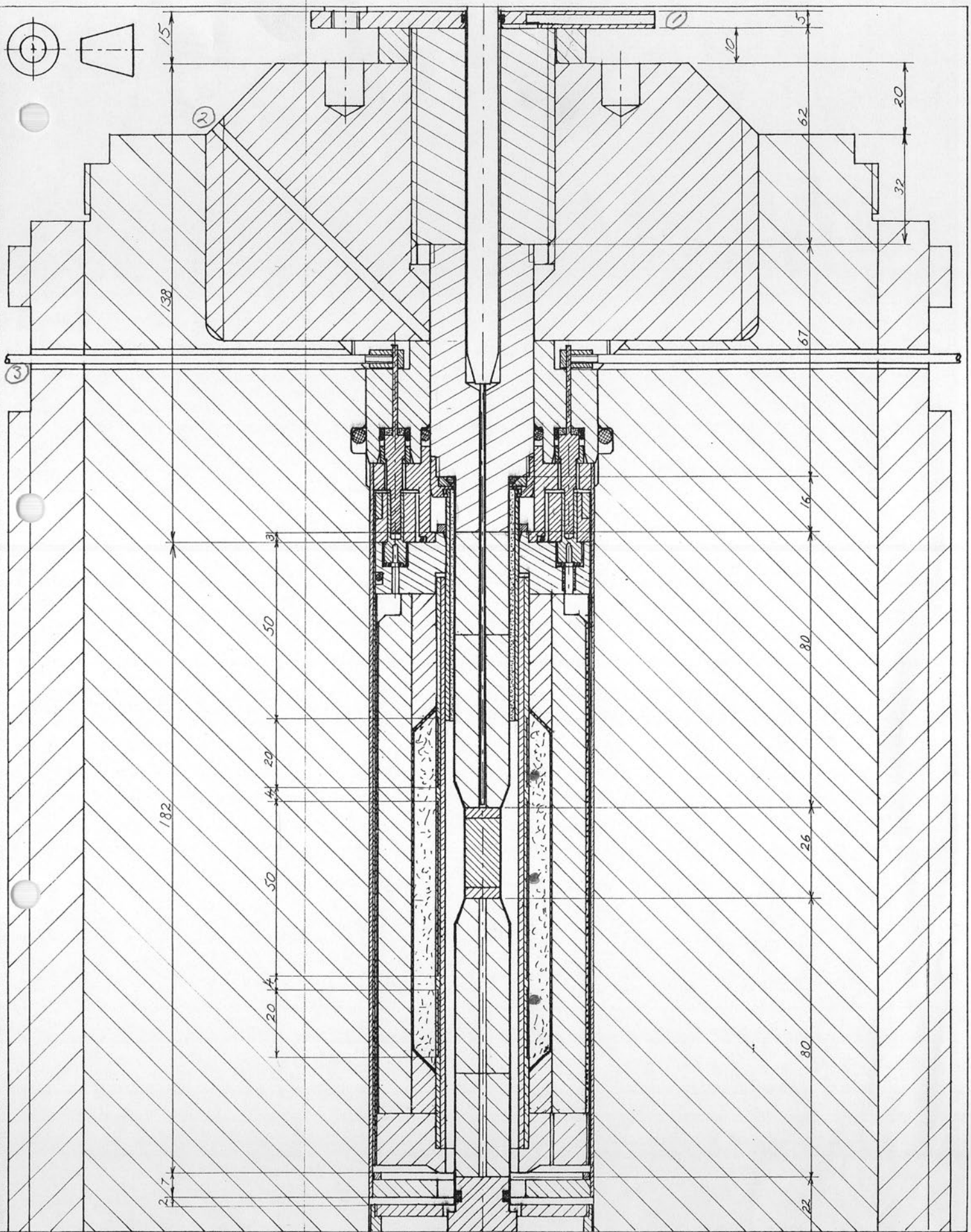
A3	SCALE	DATE MAR 1989	DRAWING NO 2109

REVISED JAN 1993. JULY 1994. JAN 1995



TOTAL LENGTH WITH MOTOR & P. TRANSDUCER 601

DIMENSIONS IN MILLIMETERS – DO NOT SCALE	PATERSON INSTRUMENTS PTY LTD		
TOLERANCES ± UNLESS STATED	HPT TESTING MACHINE PORE FLUID VOLUMOMETER GENERAL ARRANGEMENT		
ACN 008 644 273	A3	SCALE 1:1	DATE JUNE 1994	DRAWING NO 5000 REV



DIMENSIONS IN MILLIMETRES
DO NOT SCALE

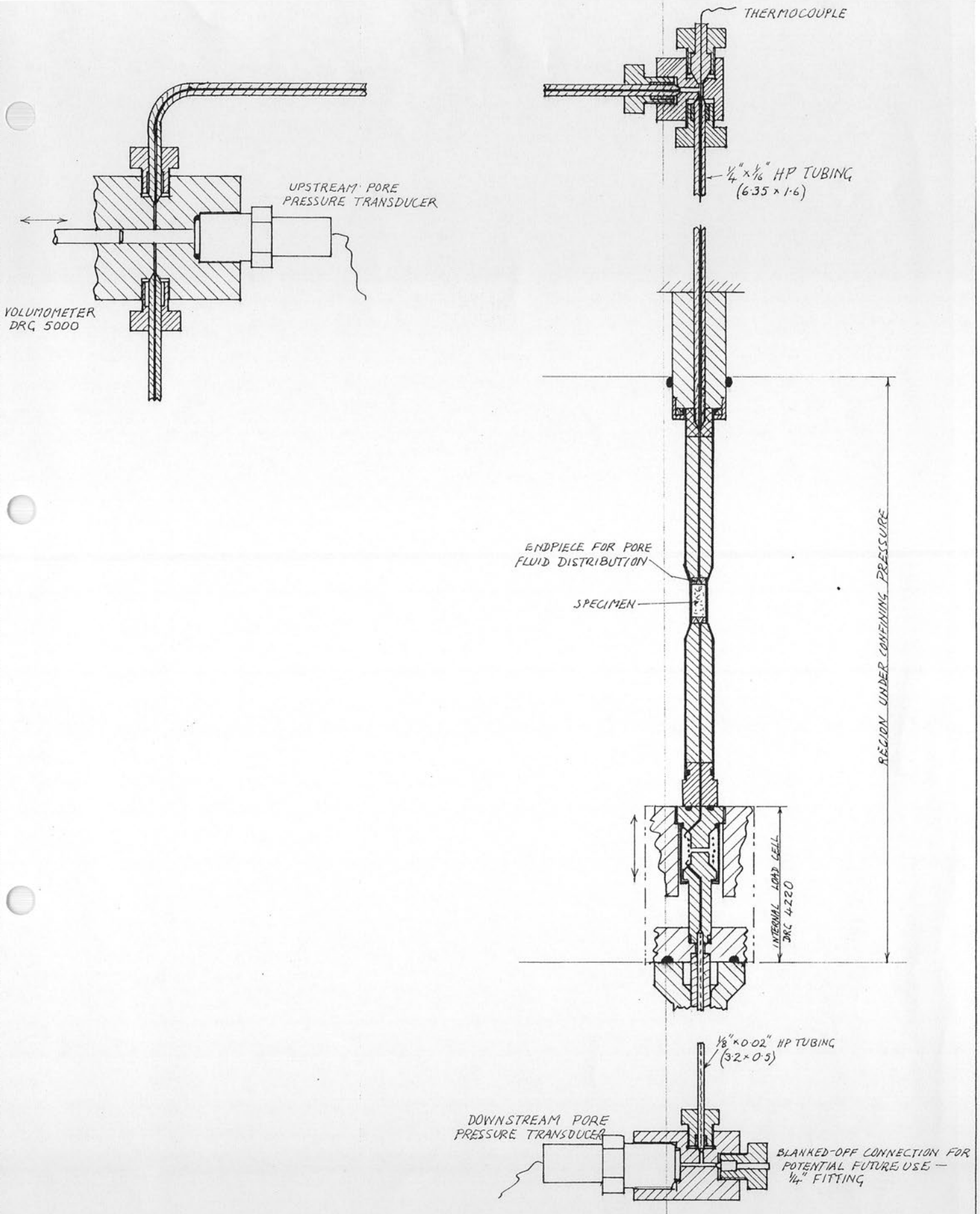
TOLERANCE ± UNLESS STATED

EXCLUSIVELY LICENCED TO
PATERSON INSTRUMENTS PTY LTD

ANU - RESEARCH SCHOOL OF EARTH SCIENCES

HIGH PRESSURE/TEMPERATURE TESTING MACHINE
PRESSURE VESSEL ASSEMBLY
- UPPER PARTS, REVISED

A3	SCALE 1:1	DATE JULY 1993	DRAWING NO 2100 B	REV



DIMENSIONS IN MILLIMETRES
DO NOT SCALE

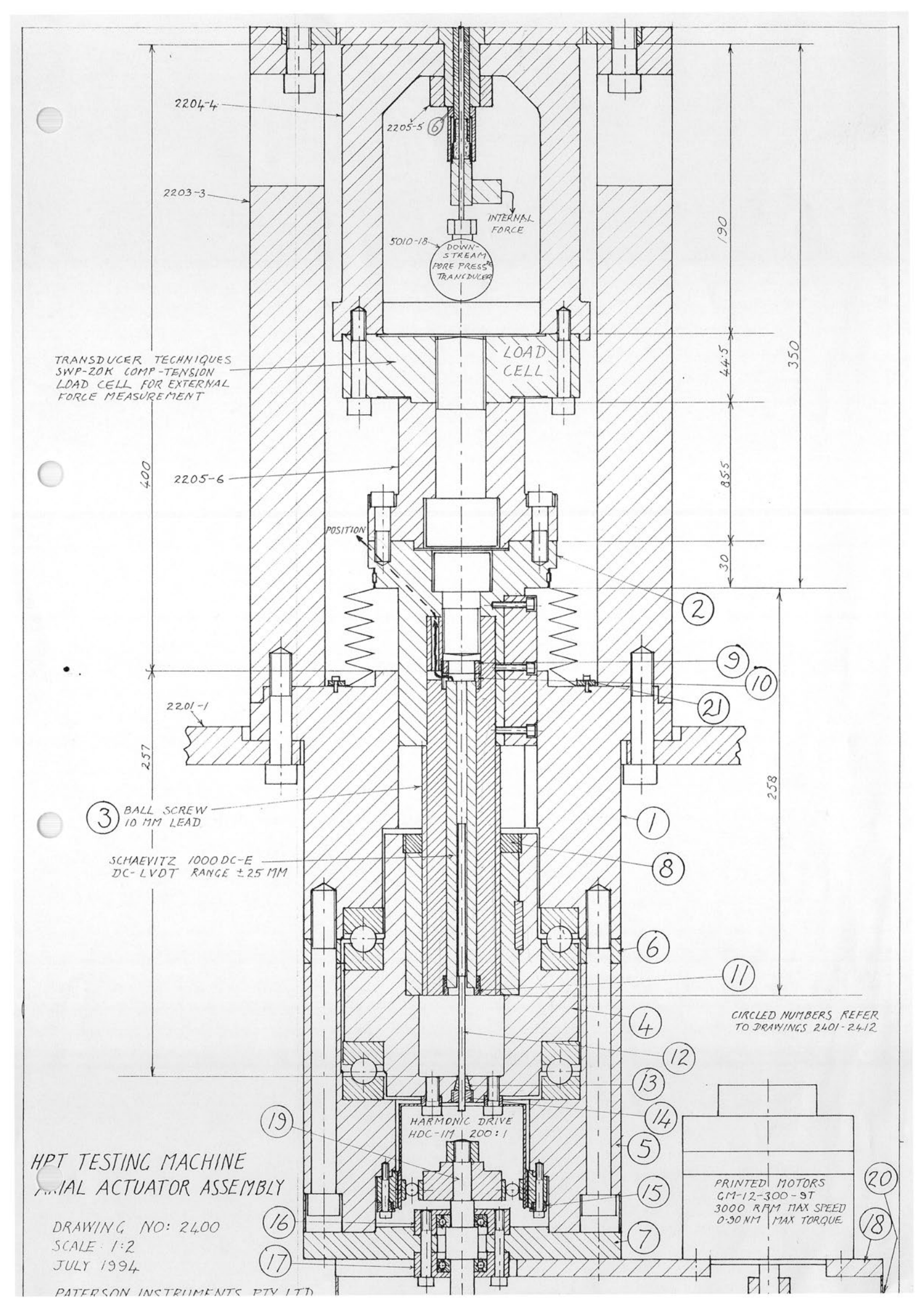
TOLERANCES ± UNLESS STATED

ACN 008 644 273

PATERSON INSTRUMENTS PTY LTD

HPT TESTING MACHINE
PORE FLUID SYSTEM
GENERAL CONFIGURATION

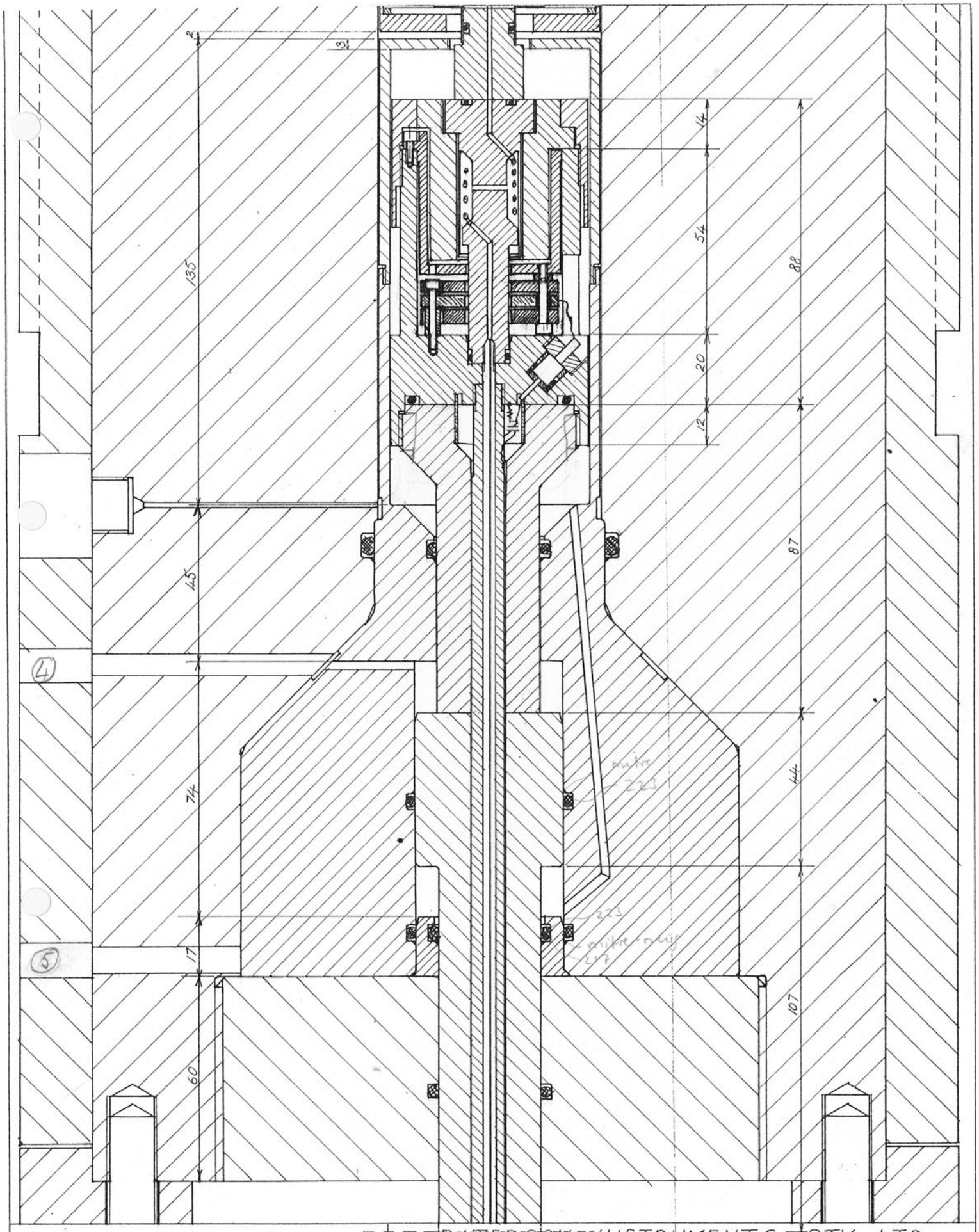
A3	SCALE 1:2	DATE JULY 1994	DRAWING NO 5009



HPT TESTING MACHINE
AXIAL ACTUATOR ASSEMBLY

DRAWING NO: 2400
SCALE 1:2
JULY 1994

PATERSON INSTRUMENTS PTY LTD



DIMENSIONS IN MILLIMETRES
DO NOT SCALE

OLERANCES ± UNLESS STATED

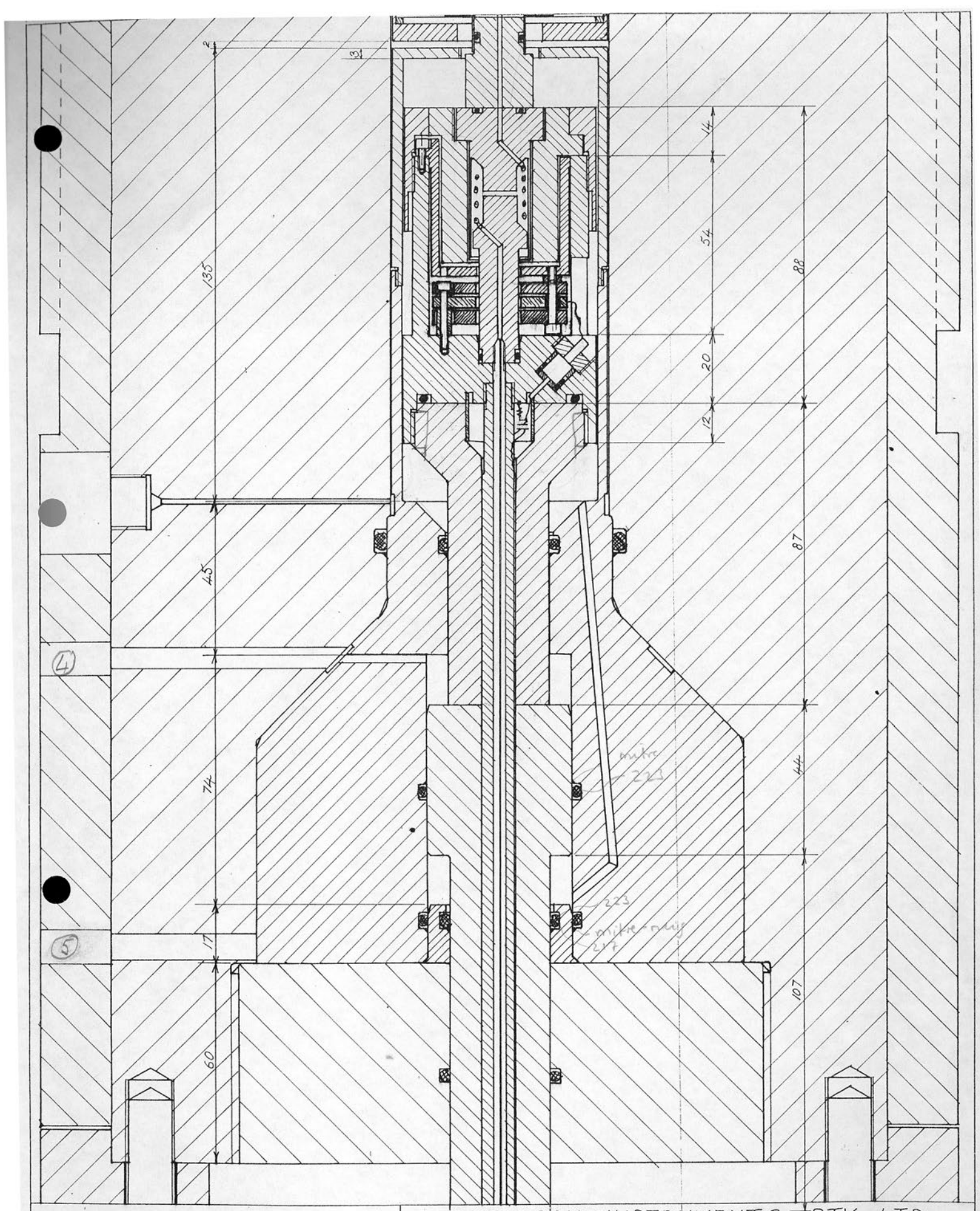
LENGTH OF PRESSURE VESSEL = 640
BORE " " " = 65

ACN 008 644 273

PATERSON INSTRUMENTS PTY LTD

HPT TESTING MACHINE
PRESSURE VESSEL ASSEMBLY
GENERAL ARRANGEMENT - LOWER PARTS

A3	SCALE 1:1	DATE APR 1994	DRAWING NO 2100 C	REV



DIMENSIONS IN MILLIMETRES
DO NOT SCALE

TOLERANCES ± UNLESS STATED

LENGTH OF PRESSURE VESSEL = 640
BORE " " " = 65

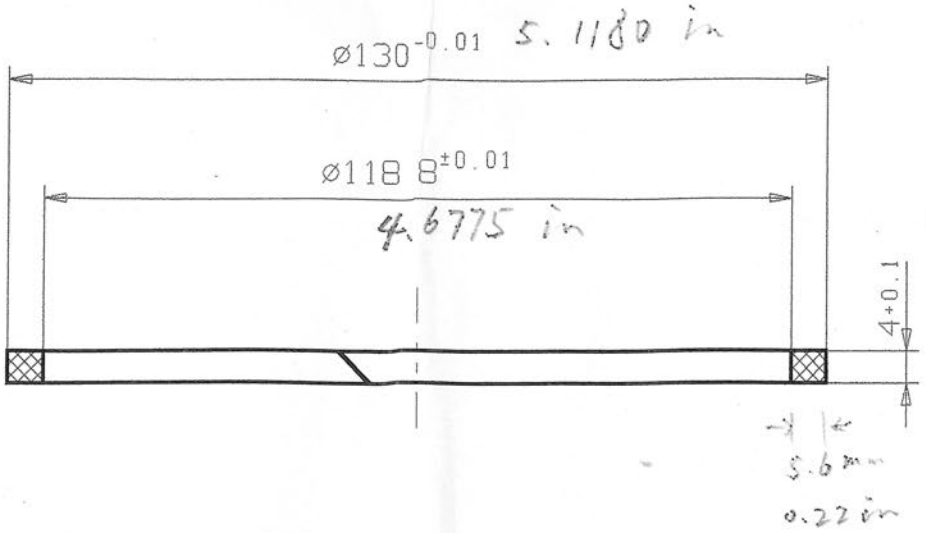
ACN 008 644 273

PATERSON INSTRUMENTS PTY LTD

HPT TESTING MACHINE
PRESSURE VESSEL ASSEMBLY
GENERAL ARRANGEMENT - LOWER PARTS

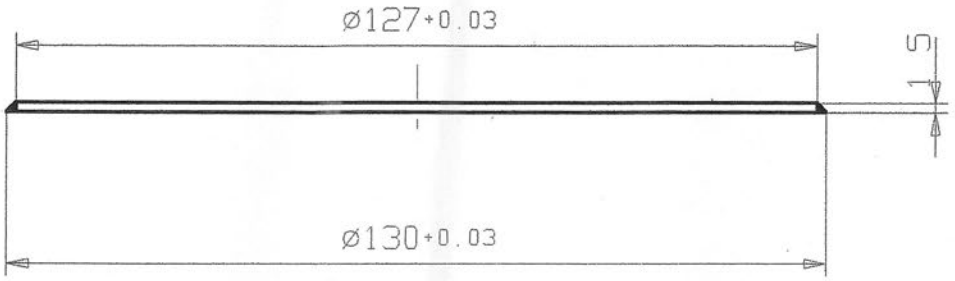
A3	SCALE 1:1	DATE APR 1994	DRAWING NO 2100 C	REV

①



Teflon

②



Brass

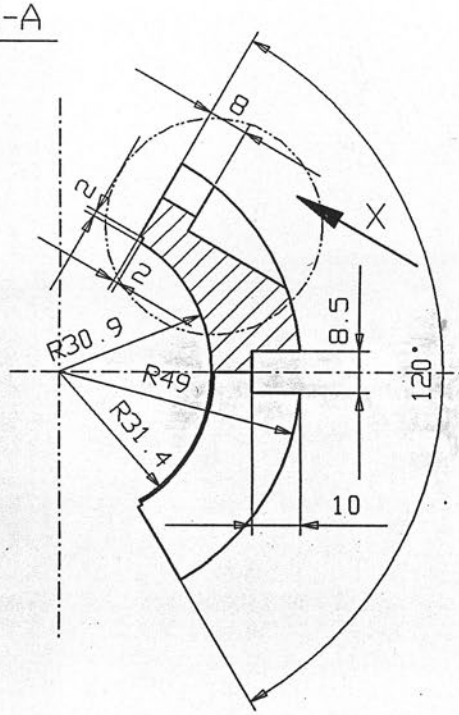
Die scharfen Kanten an der 45°-Phase leicht brechen.

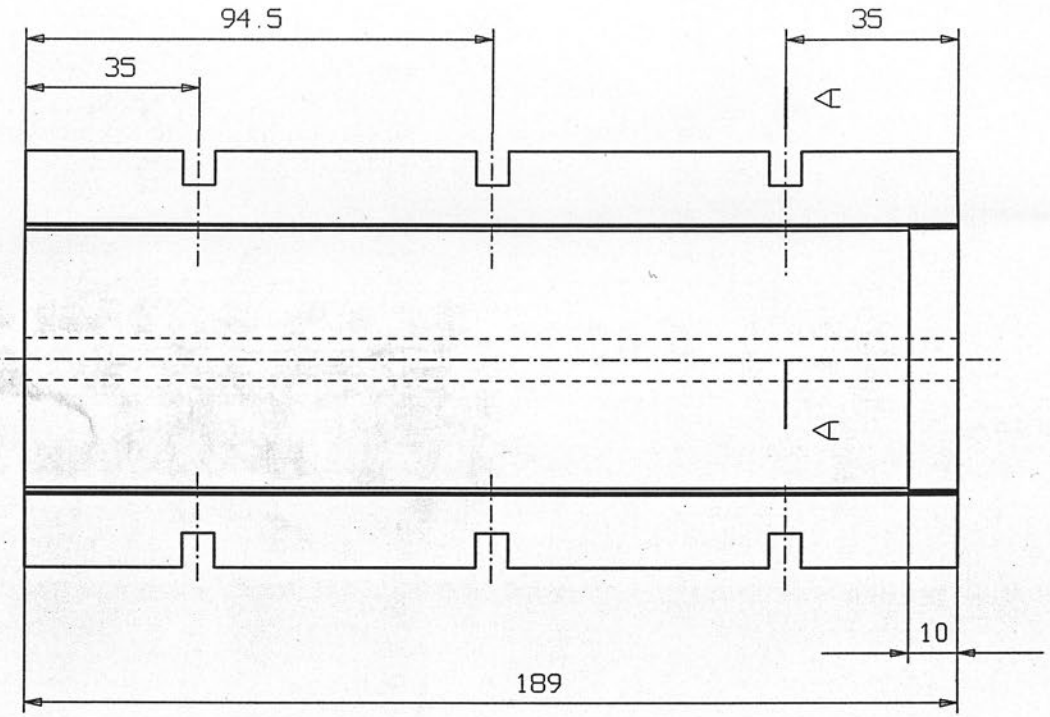
Alle Flächen polieren (Rz=0.4).

Wärmebehandlung:
315°C / 3h (lösungsgeglüht - F420A - >rund130)

	M. Naumann				
	Datum 17.05.00	je 1x	M 1:1	Material 1: Teflon / 2: CuBe2	
Z.-Nummer P.10.8.0		Z.-Titel Paterson - App.			
GFZ Potsdam		Intensifier - Mitre / Back-up			

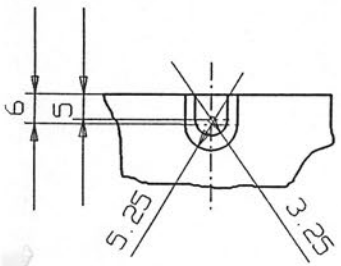
A-A



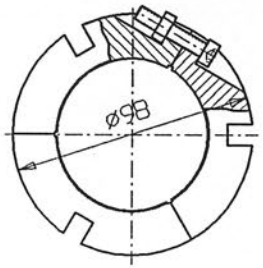


Detail X
(um 90° bzw. 30° gedreht)

rotated

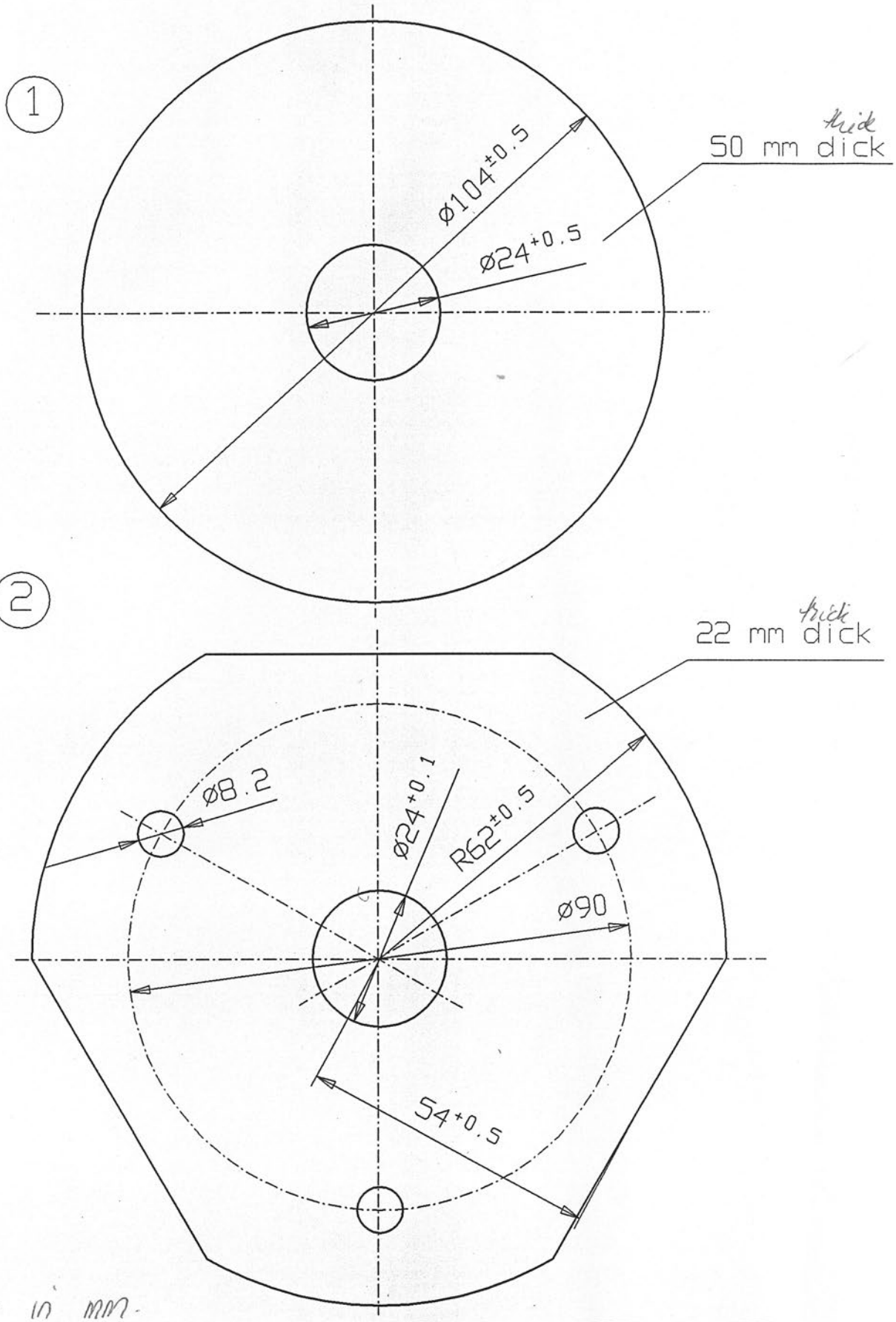


Zusammenbau (M1:2)



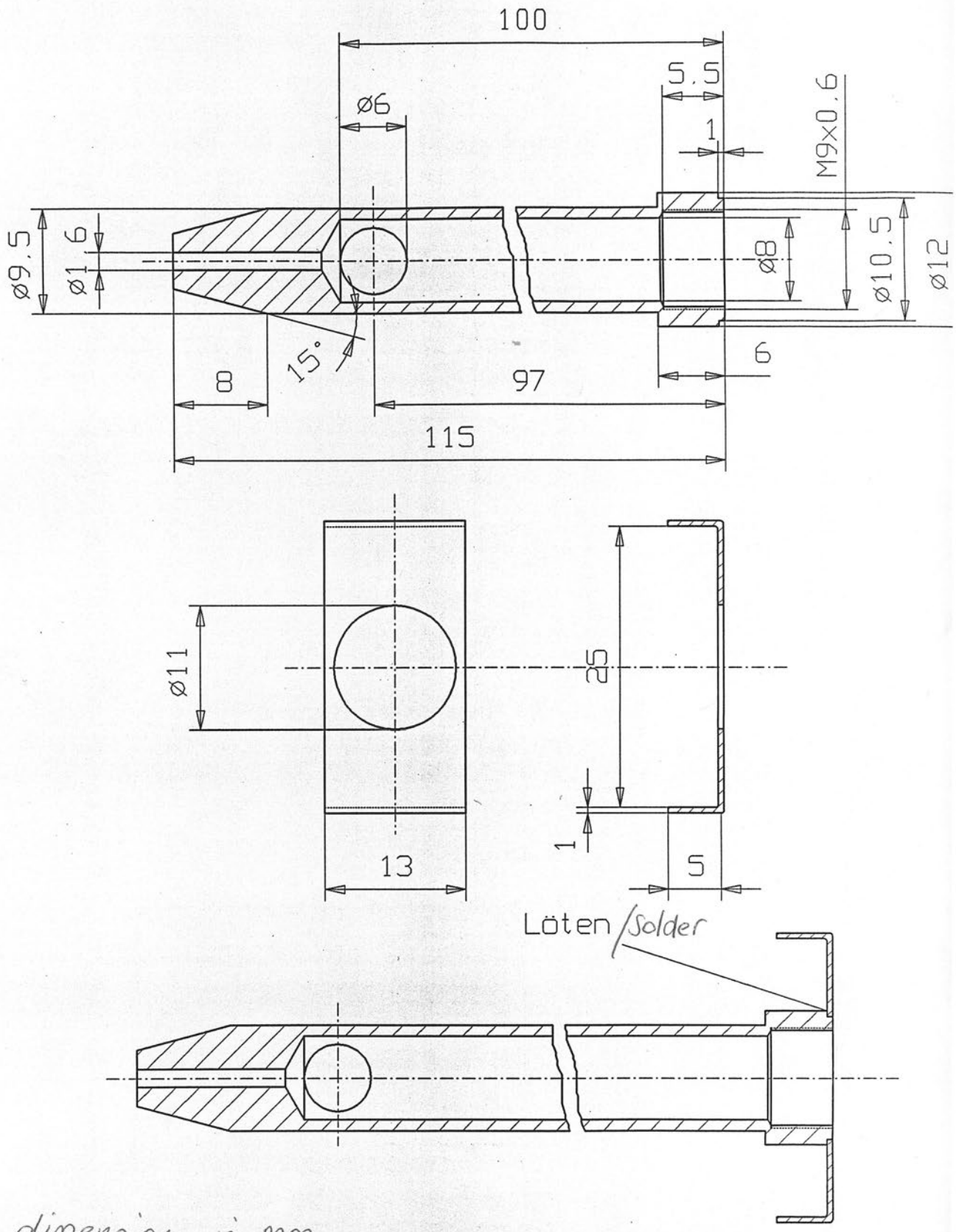
all dimensions in mm.

	M. Naumann				
	Datum 28.4.94	3 ×	M 1:1	Material Alu	
Z.-Nunner 1				Z.-Titel Montage Ofen - Körper	
GFZ Potsdam					



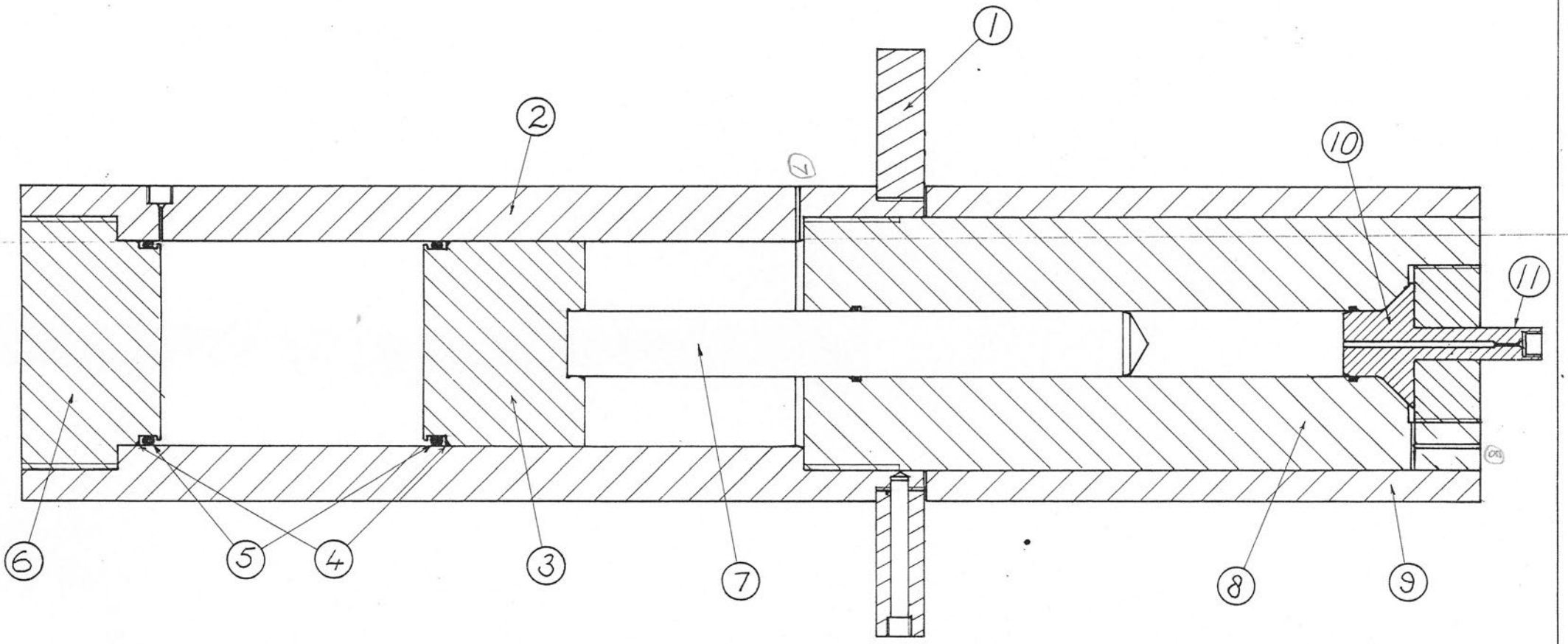
all dimensions in mm.

	M. Naumann			
	Datum 28.4.94	1: 1x 2: 2x	M 1:1	Material Aluminium.
Z.-Nummer 3				Z.-Titel Montage Ofen - furnace disks 1 and 2



all dimensions in mm.

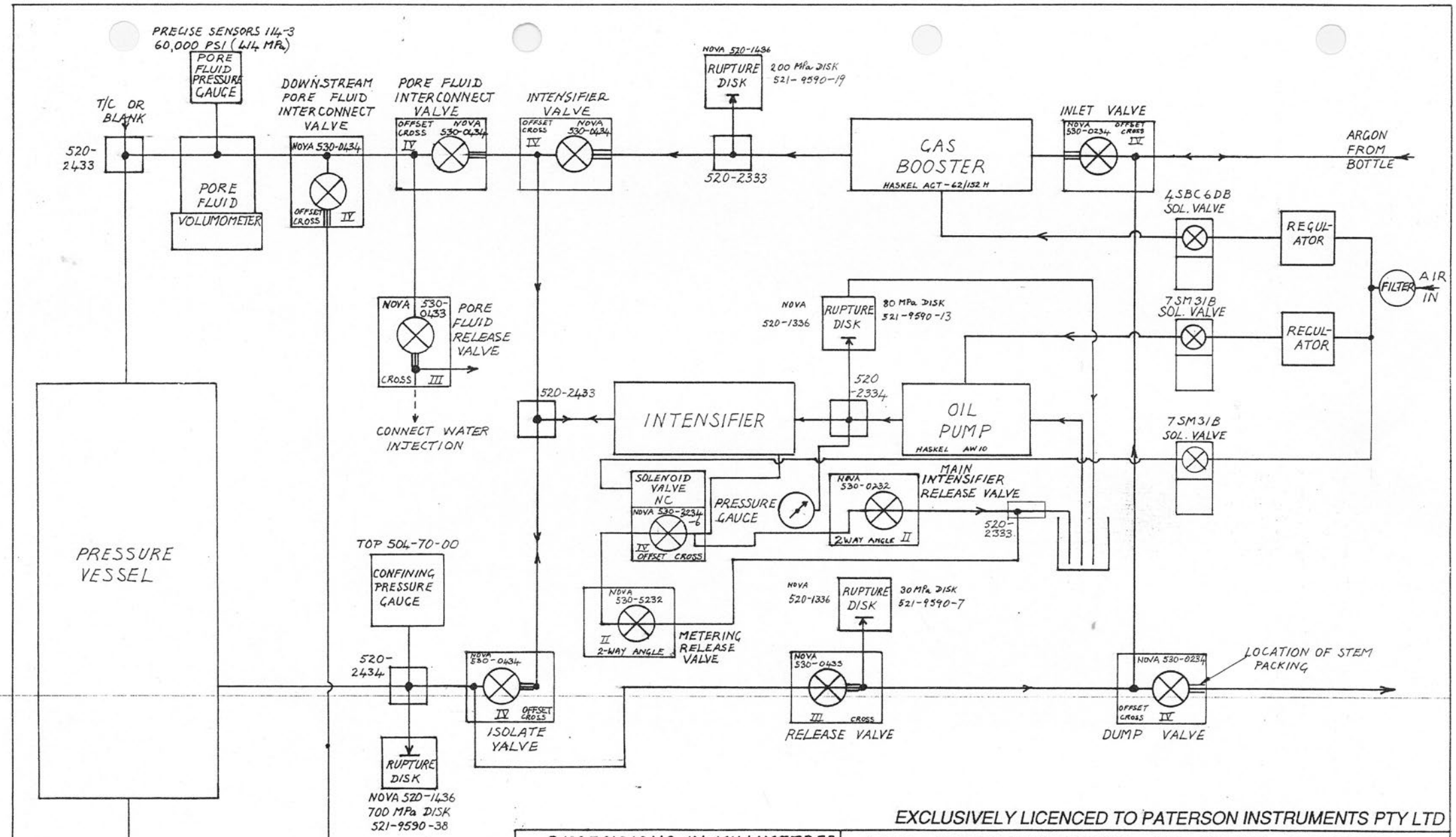
	M. Naumann				
	Datum 18.5.95	2 x	M 2:1	Material	Messing / Brass.
Z.-Nummer				Z.-Titel	Thermo couple - housing Thermoelement-Hül
	GFZ Potsdam				



SWEPT GAS VOL 400 ML
RATIO 10:1
BORE 41
STROKE 302
OIL CAPACITY 4 LITRES

DIMENSIONS IN MILLIMETRES DO NOT SCALE	ANU RESEARCH SCHOOL OF EARTH SCIENCES
TOLERANCES ± UNLESS STATED	HIGH PRESSURE/TEMPERATURE TESTING MACHINE INTENSIFIER GENERAL ASSEMBLY

A3	SCALE 1:2.5	DATE AUG 1989	DRAWING NO 2300 REVISED FEB 1993



DIMENSIONS IN MILLIMETRES DO NOT SCALE

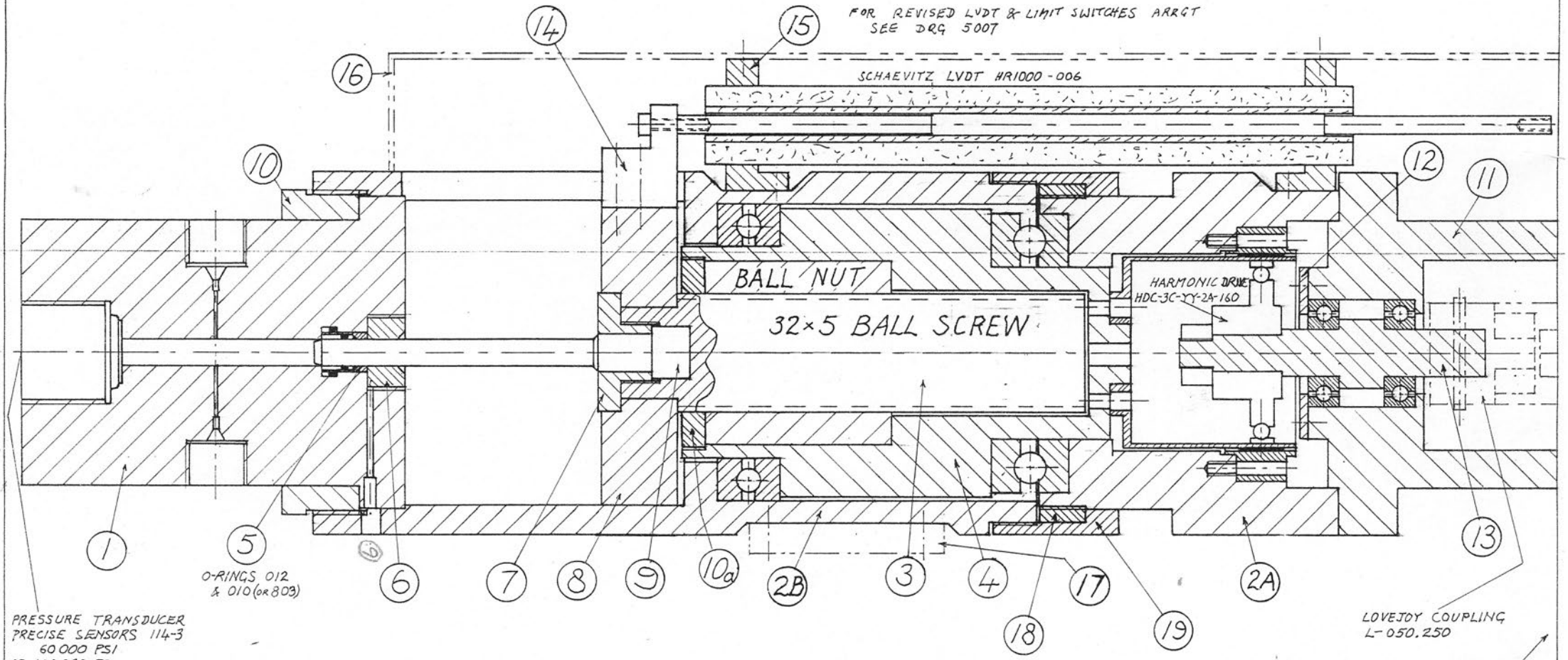
TOLERANCES ± UNLESS STATED

ANU RESEARCH SCHOOL OF EARTH SCIENCES

HIGH PRESSURE/TEMPERATURE TESTING MACHINE HIGH PRESSURE PLUMBING LAYOUT

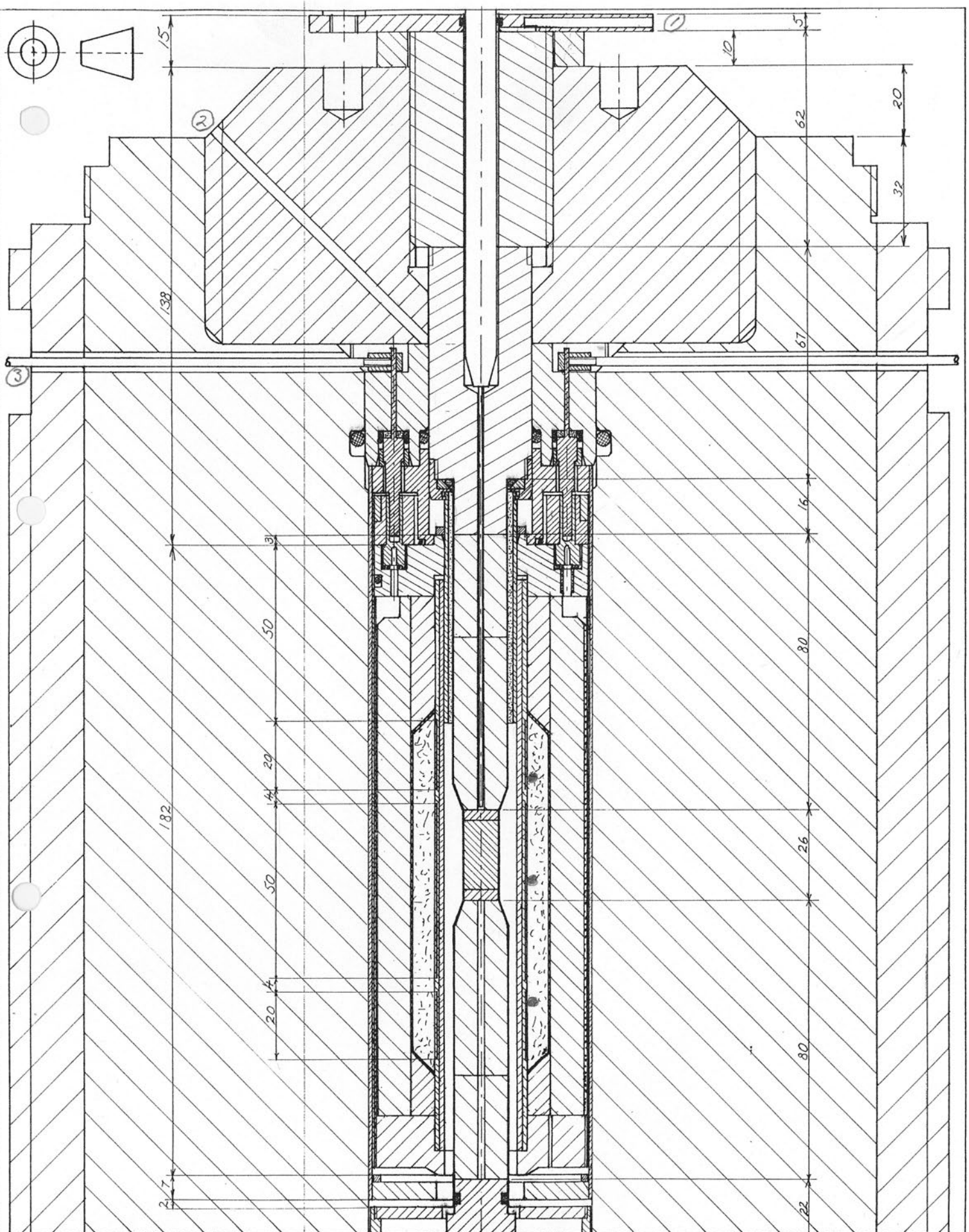
A3	SCALE	DATE MAR 1989	DRAWING NO 2109

REVISED JAN 1993, JULY 1994, JAN 1995



TOTAL LENGTH WITH MOTOR & P. TRANSDUCER 601

DIMENSIONS IN MILLIMETERS – DO NOT SCALE	PATERSON INSTRUMENTS PTY LTD
TOLERANCES ± UNLESS STATED	HPT TESTING MACHINE PORE FLUID VOLUMOMETER GENERAL ARRANGEMENT
ACN 008 644 273	A3 · SCALE 1:1 · DATE JUNE 1994 · DRAWING NO 5000 REV



DIMENSIONS IN MILLIMETRES
DO NOT SCALE

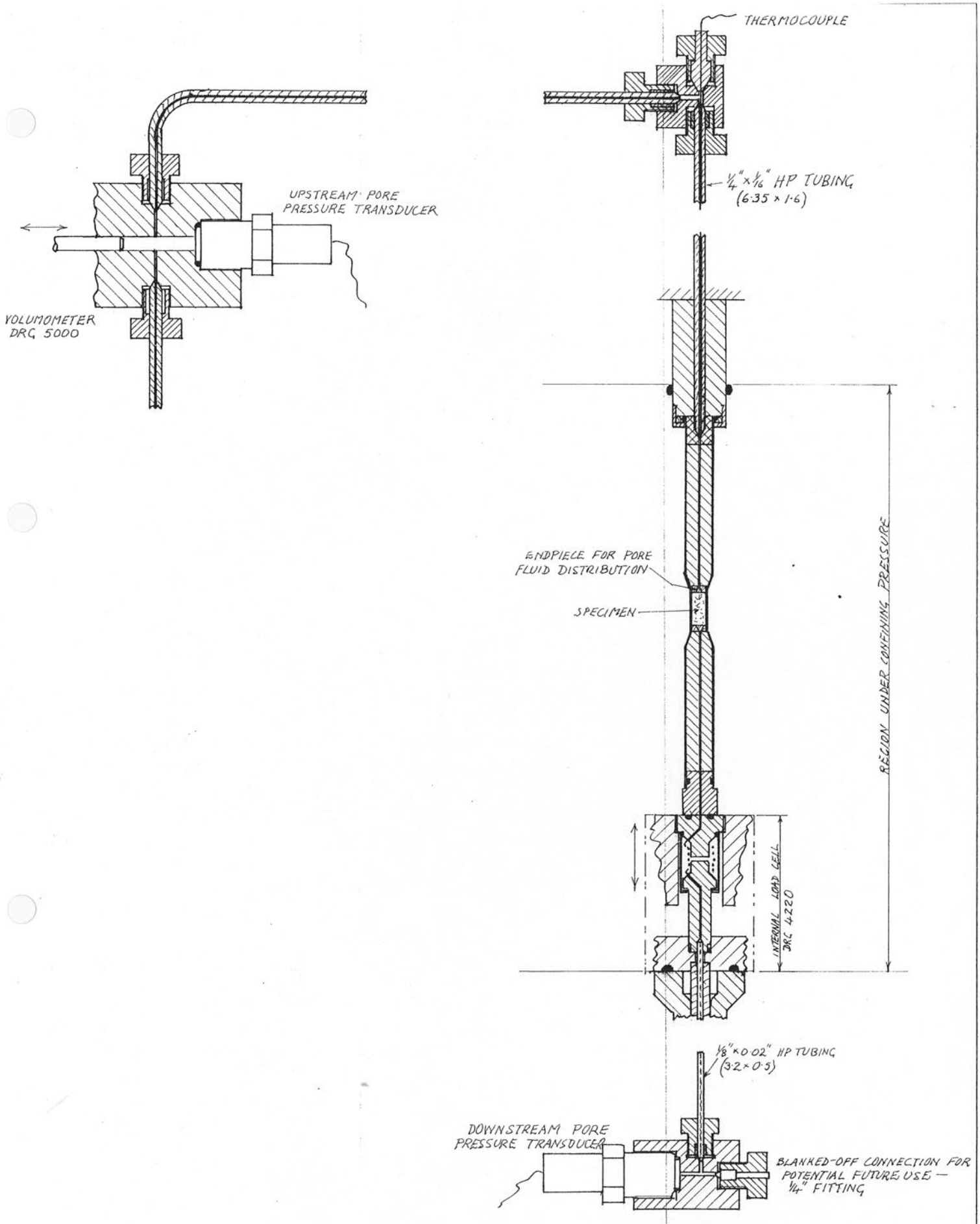
TOLERANCE ± UNLESS STATED

EXCLUSIVELY LICENCED TO
PATERSON INSTRUMENTS PTY LTD

ANU - RESEARCH SCHOOL OF EARTH SCIENCES

HIGH PRESSURE/TEMPERATURE TESTING MACHINE
PRESSURE VESSEL ASSEMBLY
– UPPER PARTS, REVISED

A3	SCALE 1:1	DATE JULY 1993	DRAWING NO 2100 B	REV.



DIMENSIONS IN MILLIMETRES
DO NOT SCALE

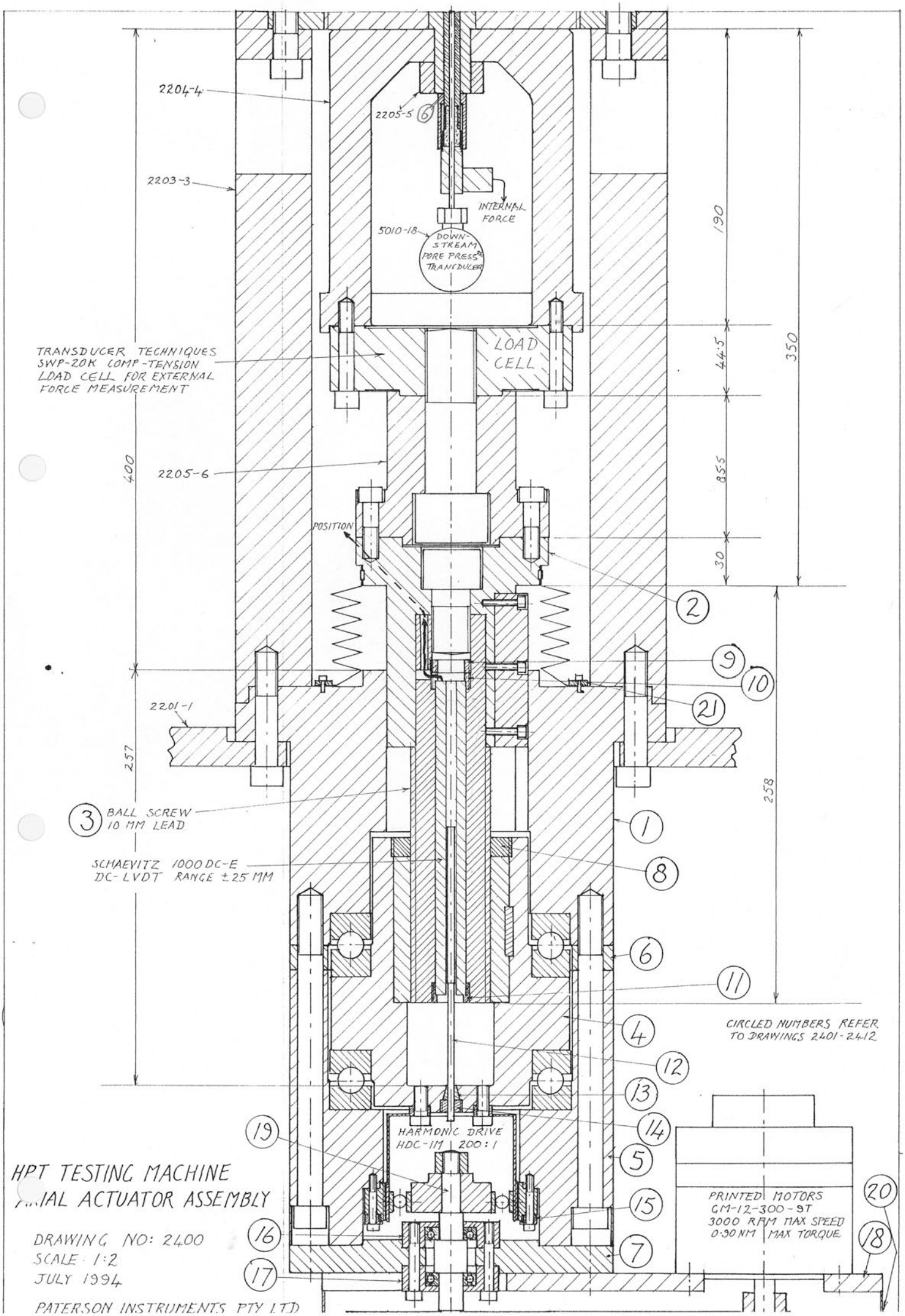
TOLERANCES ± UNLESS STATED

ACN 008 644 273

PATERSON INSTRUMENTS PTY LTD

HPT TESTING MACHINE
PORE FLUID SYSTEM
GENERAL CONFIGURATION

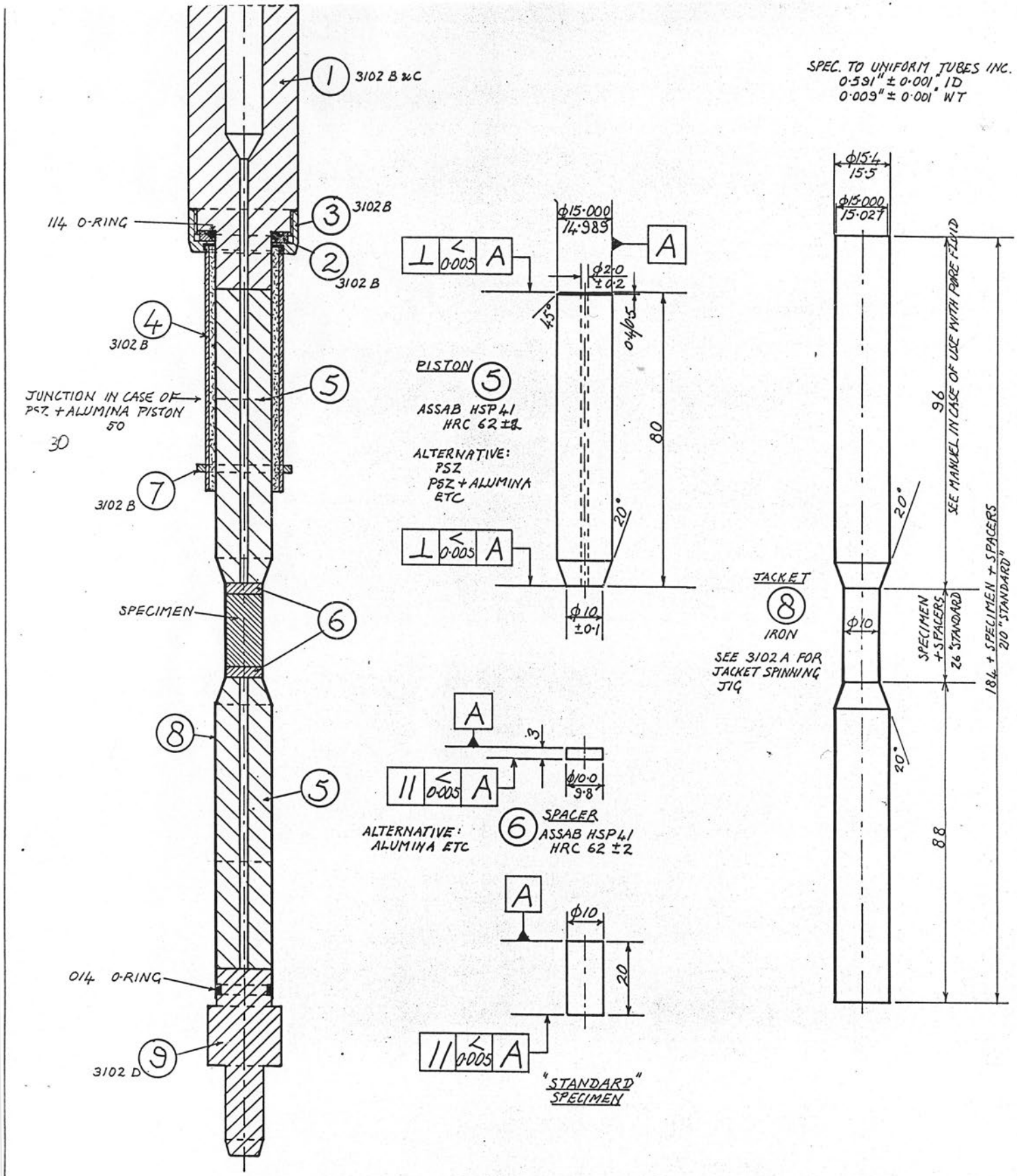
A3	SCALE 1:2	DATE JULY 1994	DRAWING NO 5009



HPT TESTING MACHINE
AXIAL ACTUATOR ASSEMBLY

DRAWING NO: 2400
SCALE: 1:2
JULY 1994

PATERSON INSTRUMENTS PTY LTD



0.707 14

DIMENSIONS IN MILLIMETRES
DO NOT SCALE

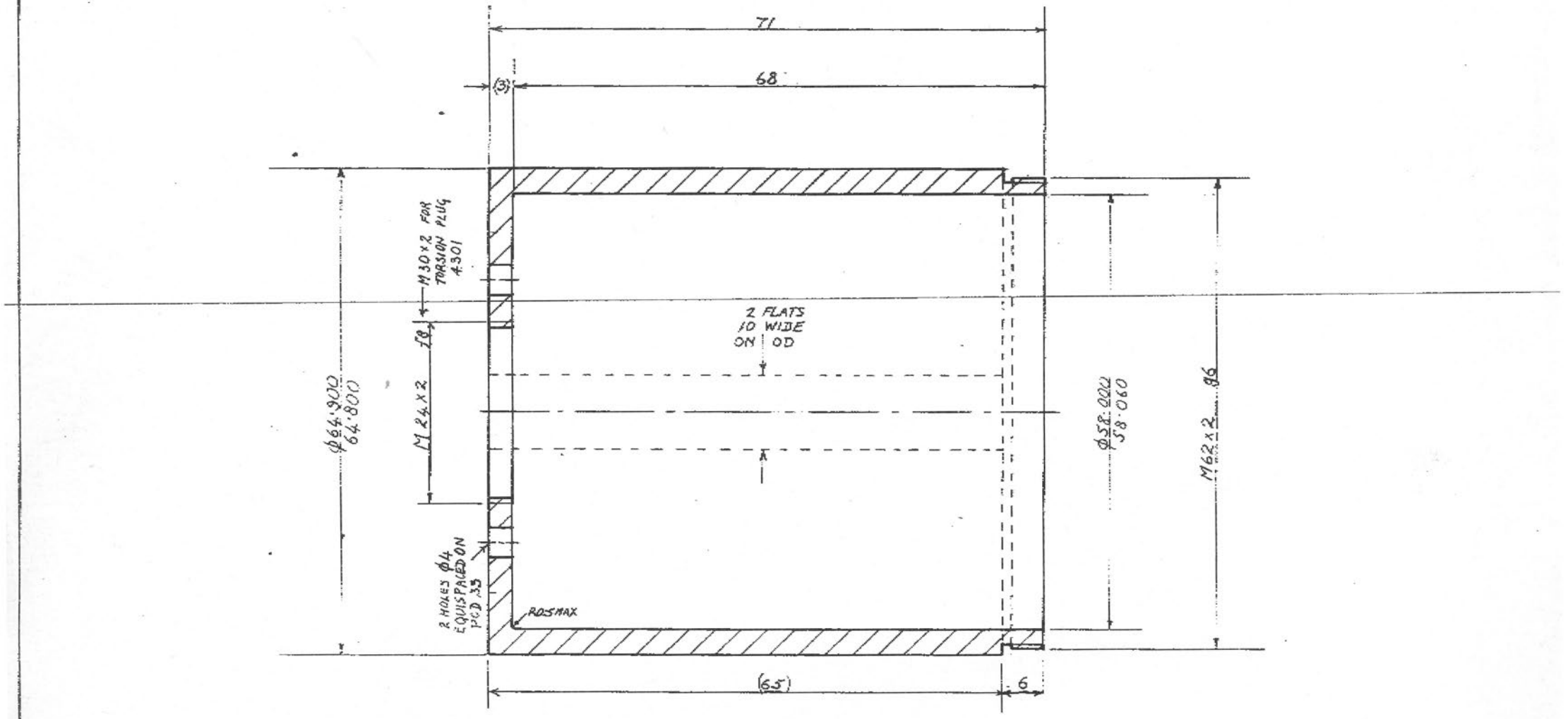
TOLERANCES ± 0.3 UNLESS STATED

ACN 008 644 273

PATERSON INSTRUMENTS PTY LTD

HPT TESTING MACHINE
SPECIMEN ASSEMBLY
GENERAL ARRGT. & PISTON/JACKET DETAIL

A3	SCALE 1:1	DATE SEPT 1994	DRAWING NO 3102



MATERIAL: ASSAB 709
OR SIMILAR

DIMENSIONS IN MILLIMETRES
DO NOT SCALE

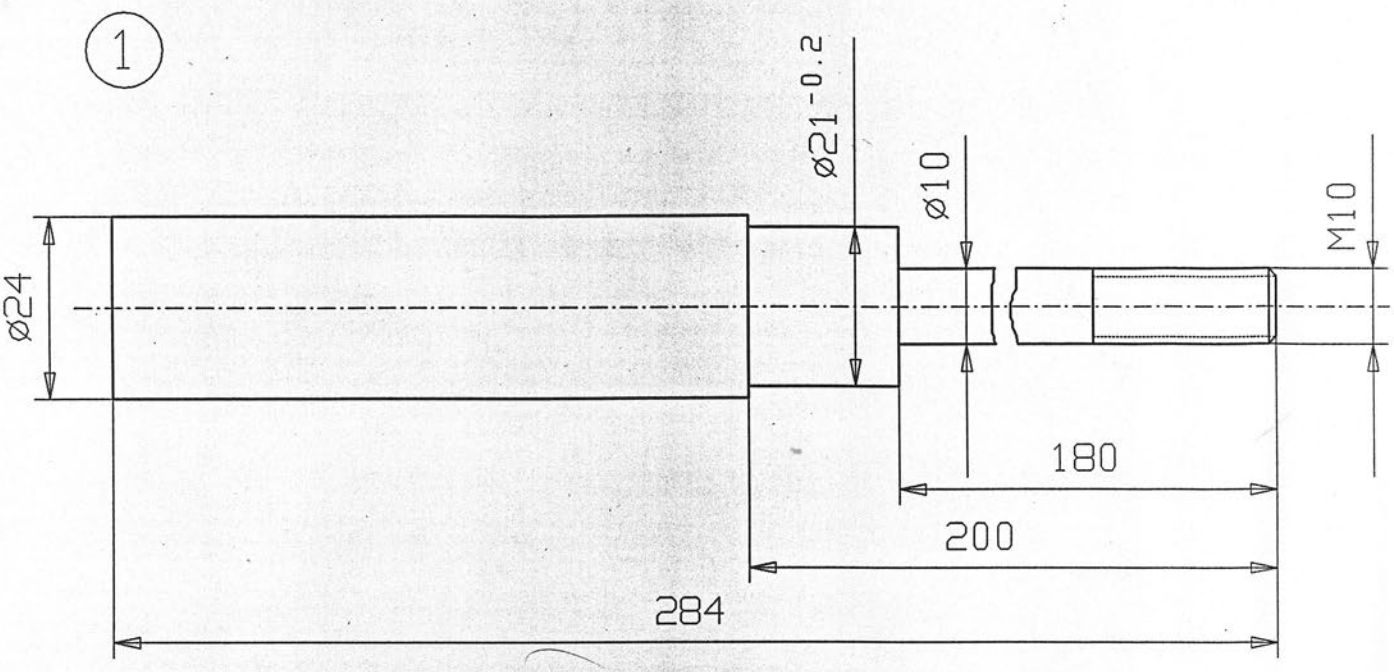
TOLERANCES ±0.3 UNLESS STATED

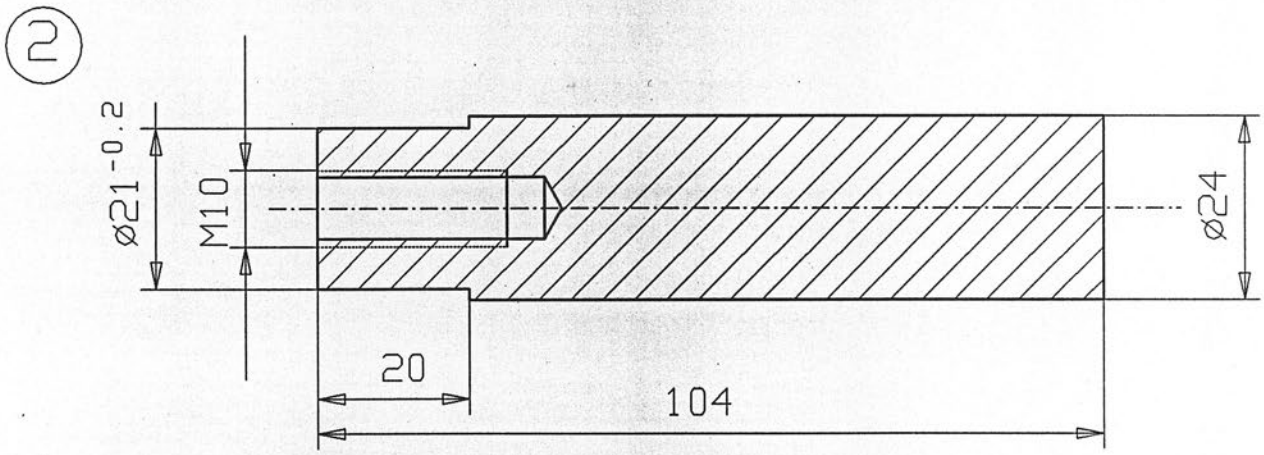
ANU RESEARCH SCHOOL OF EARTH SCIENCES

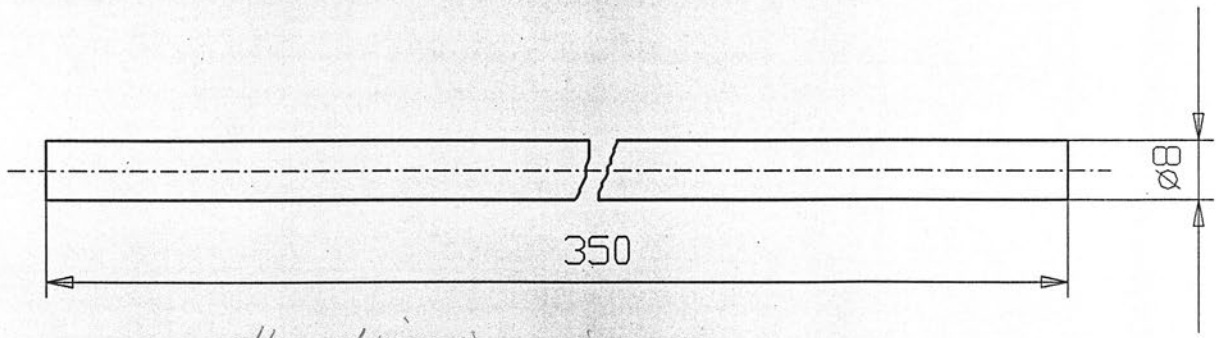
HIGH PRESSURE/TEMPERATURE TESTING MACHINE
PRESSURE VESSEL ASSEMBLY
DETAIL (13) – CAP FOR BOTTOM CLOSURE PLUG

A3	SCALE 2:1	DATE AUG 1989	DRAWING NO L102

REV MAR 1994

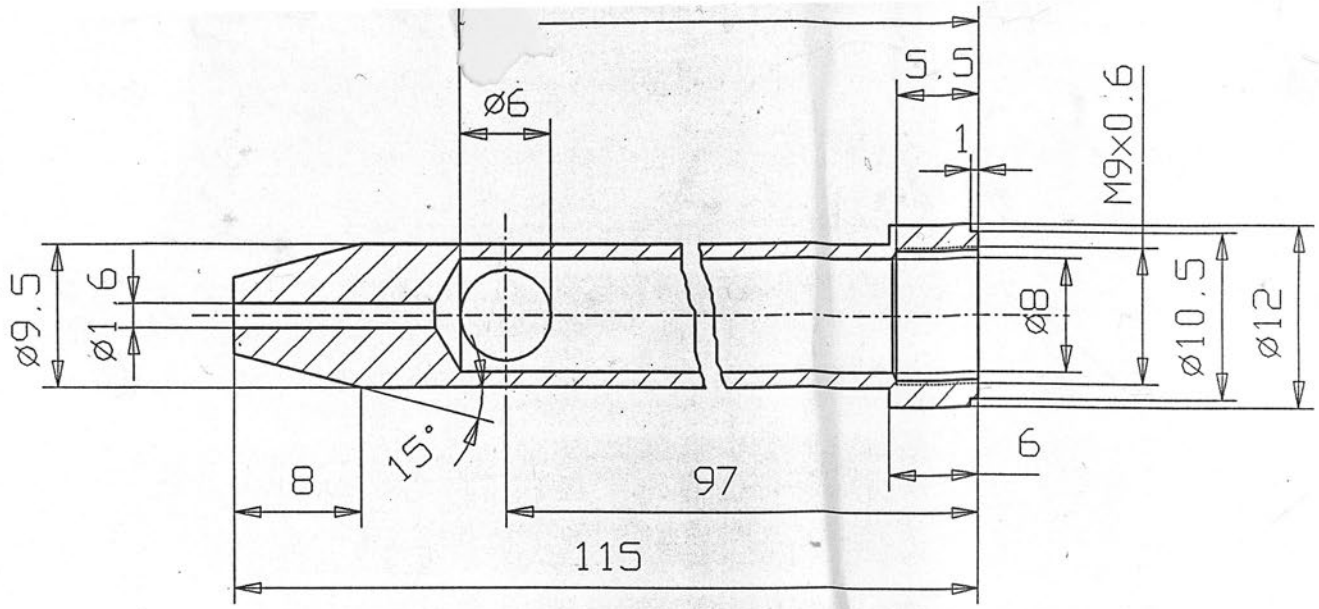


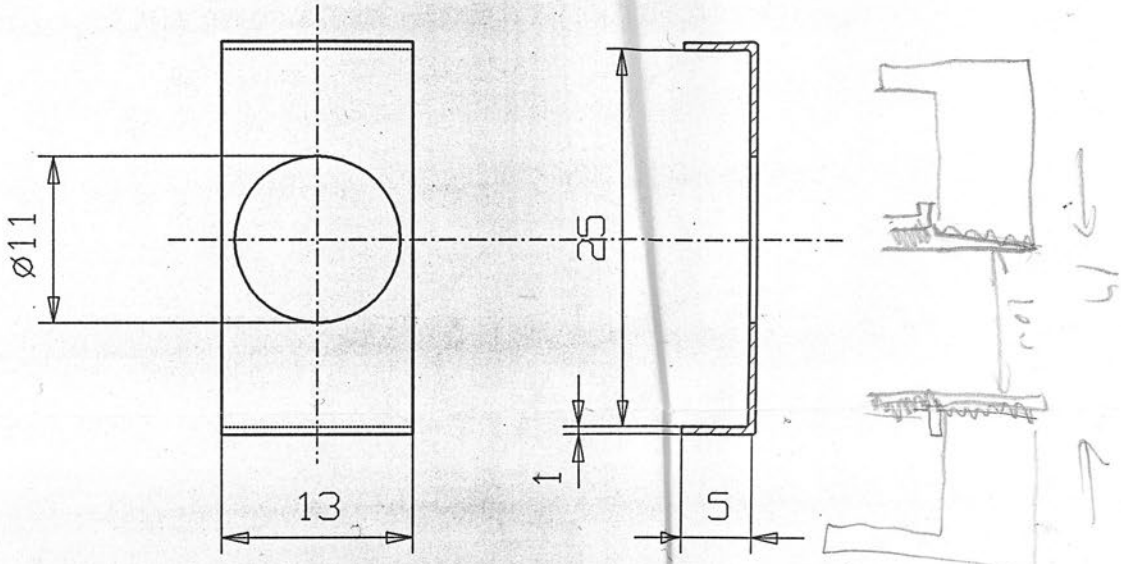


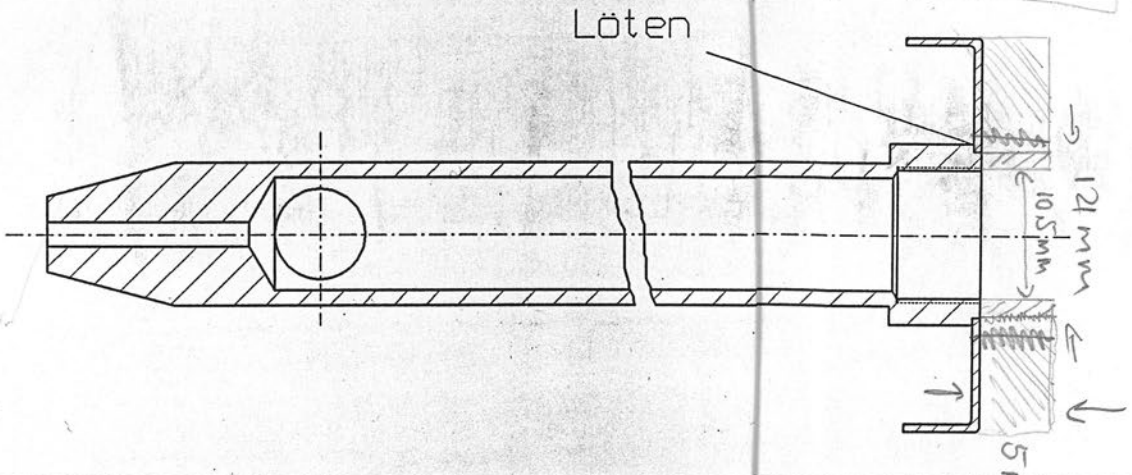


all dimensions in mm

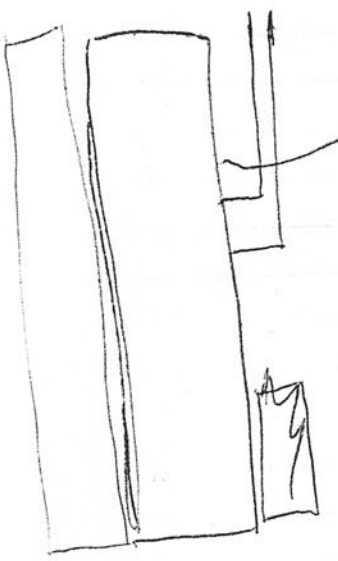
	M. Naumann				
	Datum 28.4.94	1.2: 1x 3: 3x	M 1:1	Material aluminium 1.2: Alu / 3: St steel ?	
	Z.-Nummer 2			Z.-Titel Montage Ofen - rod 1 Stab 1 rod 2. Stab 2 handle Knop	
	CFZ Rotterdam				





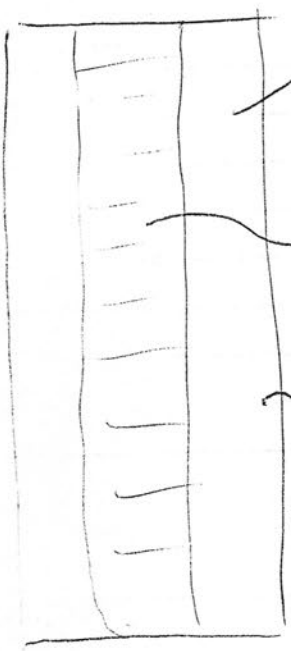


	M. Naumann				
	Datum 18.5.95	2 x	M 2:1	Material	Messing
Z.-Nummer				Z.-Titel	Thermoelement-Hülse
GFZ Potsdam					



coat windings and leads w/ Cement

Zircar Alumina type 30 A



Zircar ceramic

two layers of APA-2 (one on each side of lead)

two layers of APA-2

two layers APA-2

Building

(17) use outer steel pieces to form outer APA-2 layer

12.54
5.55
18.09

(a). 1 outer layer of APA-2 to match Zircar 30 piece. (same length as sleeve

(b) place Zircar 30 piece and the end ceramic pieces on, place APA-2 (1 layer) below ceramic pieces.

(c) place 2 layers APA-2 on inner part of Z-30 piece.

(d) 1 layer on both "sides" of Z-30 piece

R6-9+

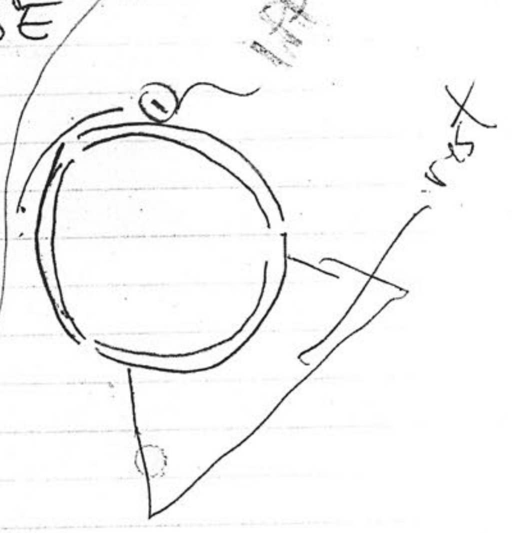
120° 50' W 47° 22.5' N

Cle-Elem Range Sketch

Township + Range
T22N R16E

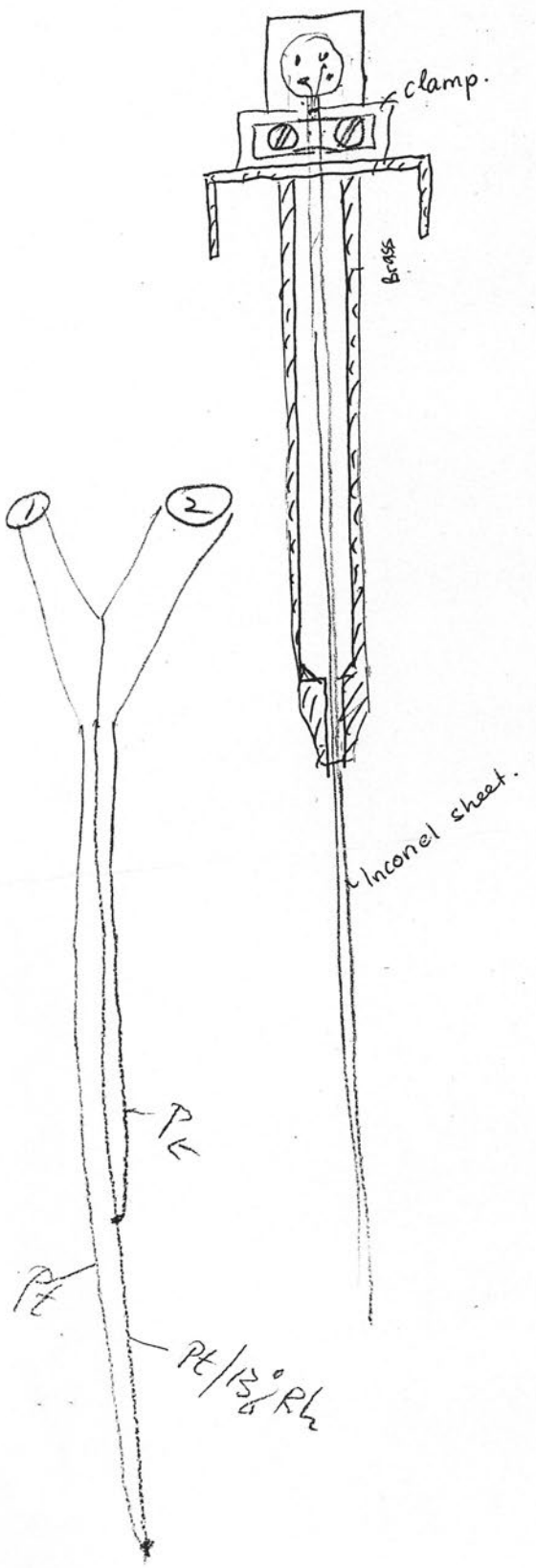
1½ × 2° sheet

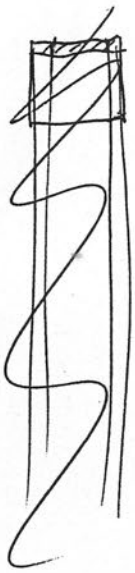
Stafford Creek Cow dom
Bear Creek 1

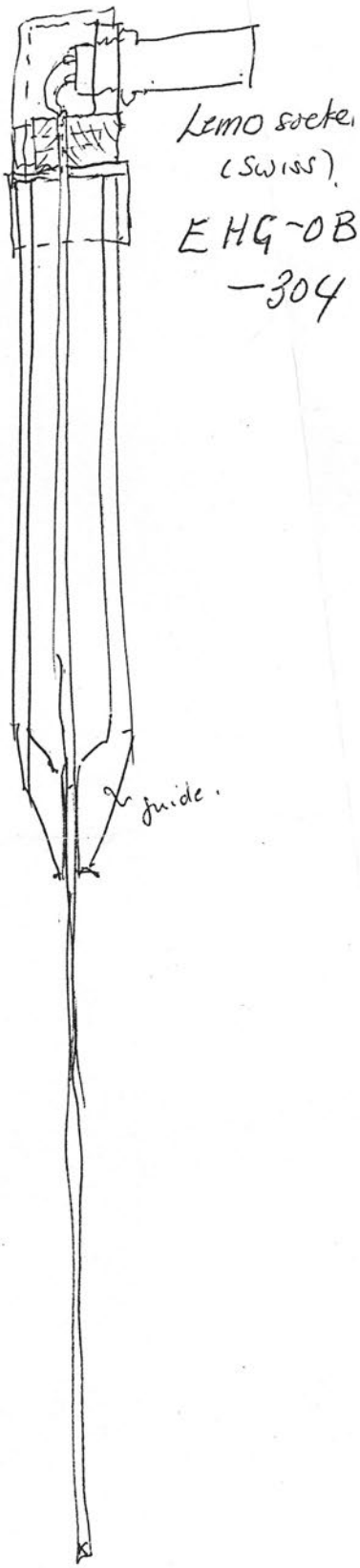


598-0353

Thermocouple.

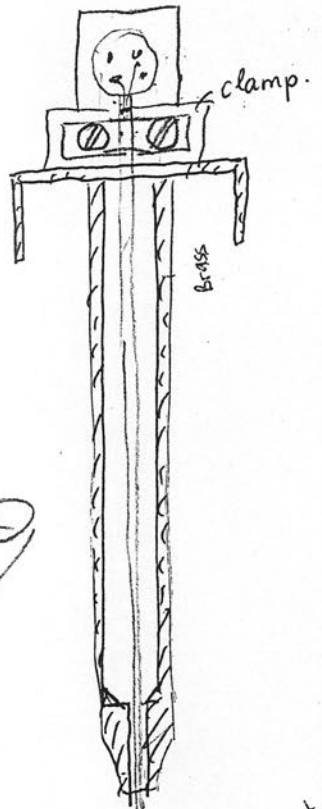


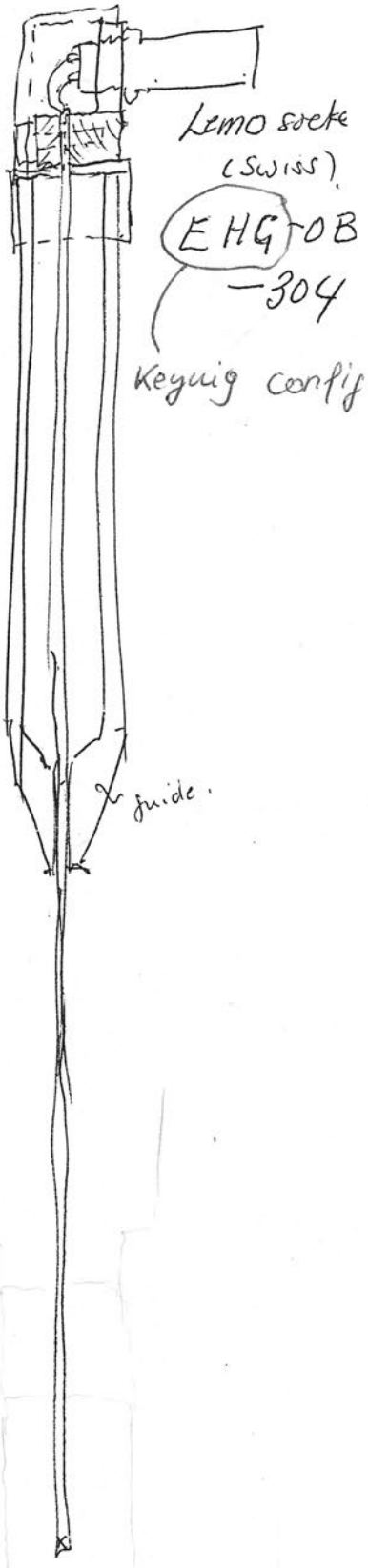


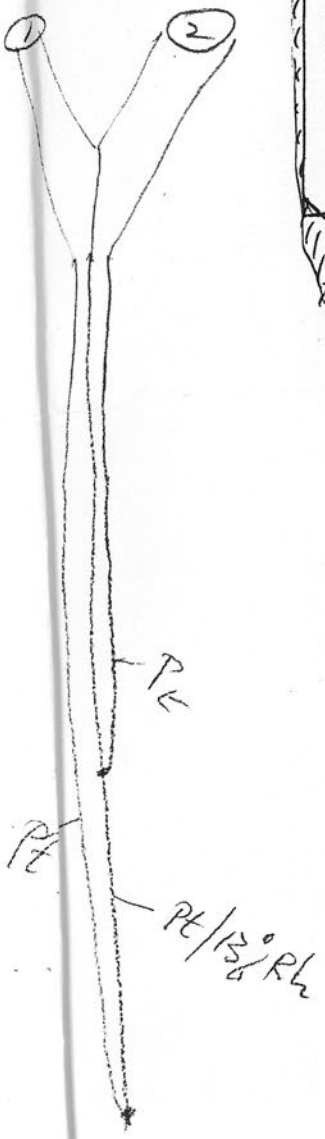


ermocouple.

B-Series. -multicontact.
(keyed).

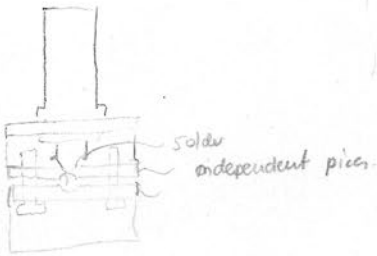






addiho 10/APR/95

top view.



OB - Keyed connector

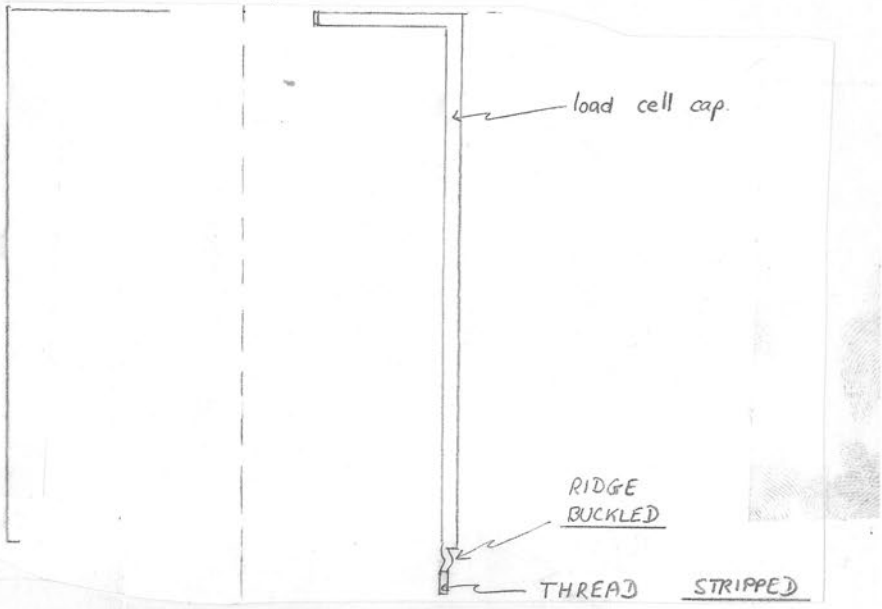
Dear Mervyn,

here is a sketch of the buckled load cell cap and some answers to your questions:

- we exchanged the 334 O-ring before we focussed on the electrical feed-throughs. Maybe it was the 400 MPa confining pressure that did it. I had been up there quite a bit in the recent past. One of the O-rings on one of the feed-throughs was in fact slightly damaged. It was the one which surrounds a small zirconia (?) disk.

- the solid block we used was the furnace substitute with the spherical indent.

- here is a sketch of the load cell cap: you are correct - it is not part #8 of #4220, but rather the piece which is visible on #2100 C REV. 'beyond salvage' means that a narrow (previously straight) ridge just above the thread is buckled. The thread itself is stripped. The stripping presumably occurred when we unscrewed the protective cap. We did this because it appeared to be the smallest bullet to bite. Inside the protective cap is trapped part #8 of drawing #4220 . Due to the buckling it can not slip out.

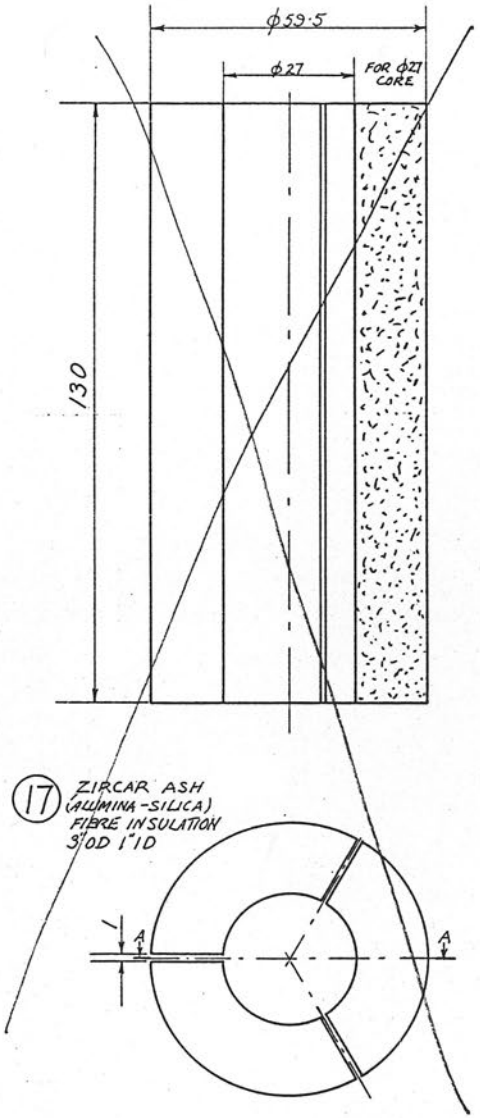


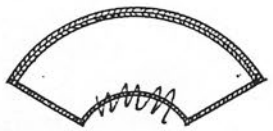
- now on to the scoring of the surface of the plug which houses the electrical leads: because there was material caught up between this surface and the interior surface of the outermost hardened steel casing the load cell plugs did not rotate freely when we unscrewed the load cell cap. The twist was large enough to cause a radial crack in the plastic cover. There were plastic and metal (origin unknown: maybe stripped thread?) next to the solder connections of the electrical leads. So we can not say where the foreign material came from, but I am quite convinced that the score is new and not an inherited one. I don't think you mentioned the 'old' score when we looked at the interal load cell. In any event: we polished the surfaces of the plug and casing with a small hand-held dremel, which seemed to work fine. Now the plugs slides in easily and rotated freely inside the casing. One question though: why does the clearing have to be so narrow? From what I understand, the cylindrical surface is not a bearing/sealing surface. Also bending moments would only occur if the surfaces actually touched. Is the width necessary to provide a good face seal against the lower piston?

Anyway, the internal load cell on the bench - when connected - gives a zero of -3kN ; this is not an unusual offset; so I do not expect any more 'lower-level' fundamental zeroing to be done.
I hope I clarified some points of my previous message and that the drawing makes things a little better to understand.

Thanks very much for your prompt reply.

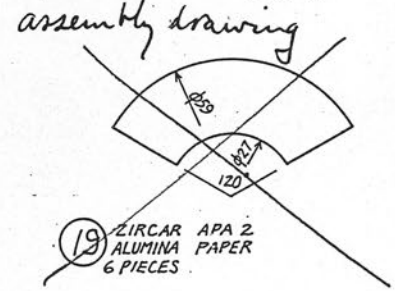
All the best
Gunter



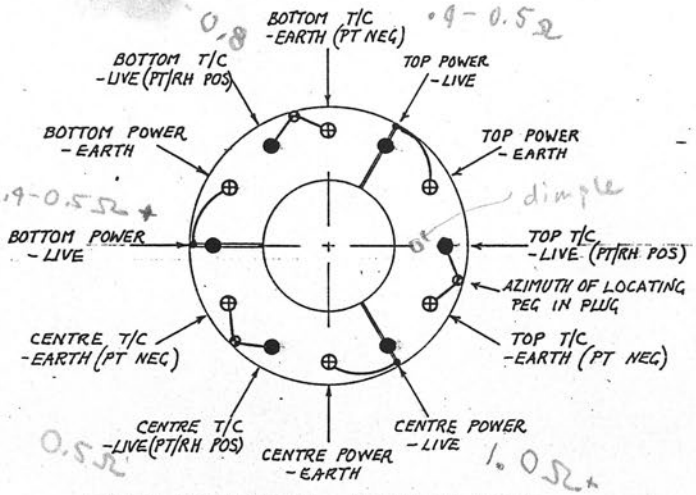


18 ZIRCAR APA2 ALUMINA PAPER 3 PIECES 62 × 165 WITH CUT-OUT 5×29 AT BOTTOM OF 3 TO ACCOMMODATE TO (21)

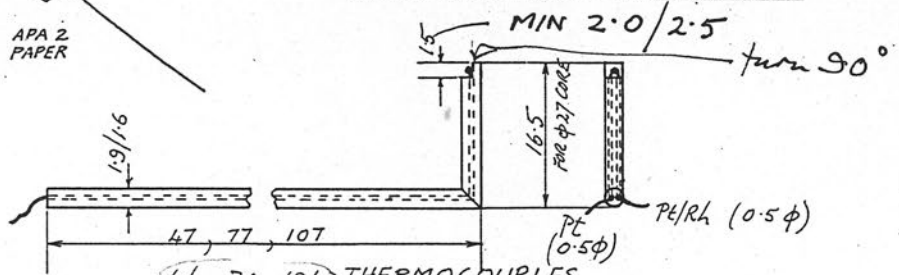
see also note on 3107a assembly drawing



19 ZIRCAR APA 2 ALUMINA PAPER 6 PIECES



WIRING CONNECTIONS – VIEW FROM ABOVE



41, 71, 101 THERMOCOUPLES with PS2 insulation

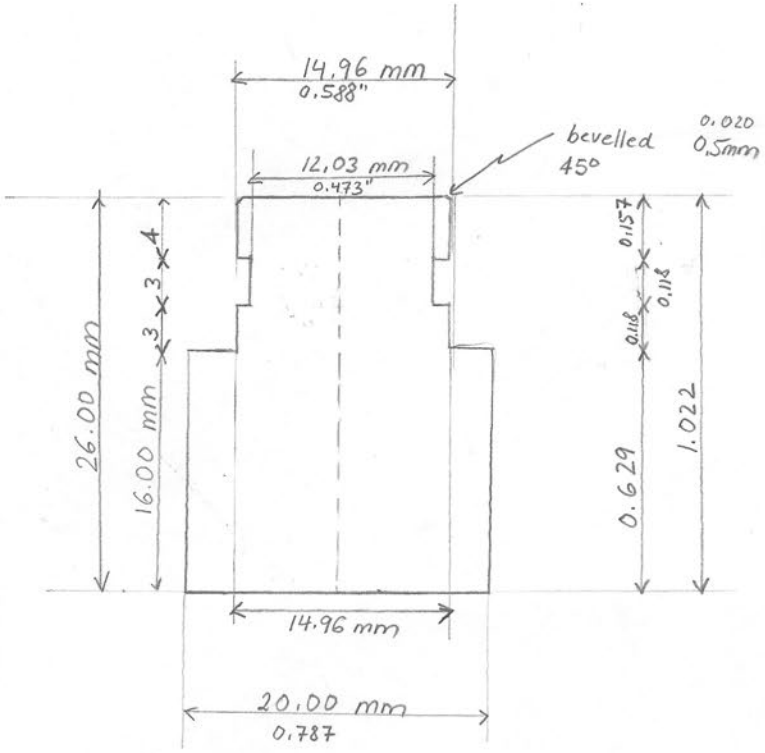
DIMENSIONS IN MILLIMETRES DO NOT SCALE	ANU RESEARCH SCHOOL OF EARTH SCIENCES		
TOLERANCES ± UNLESS STATED	HIGH PRESSURE/TEMPERATURE TESTING MACHINE FURNACE ASSEMBLY DETAILS (17) TO (19) ETC		
	A3	SCALE 1:1 & 2:1	DATE OCT 1990
	DRAWING NO 3107b		

REV NOV 1993

FORMERLY 3108

Jack, dead par pressure bottom anvil

Paterson Rig



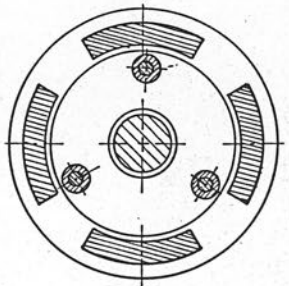
hardened steel.

.588
.473
2(.115) .0575 + .118

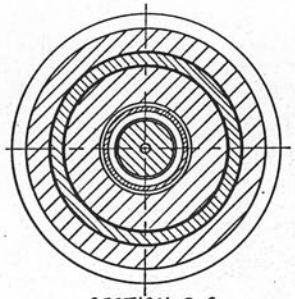
1.022
.629
.393

reduced 86%

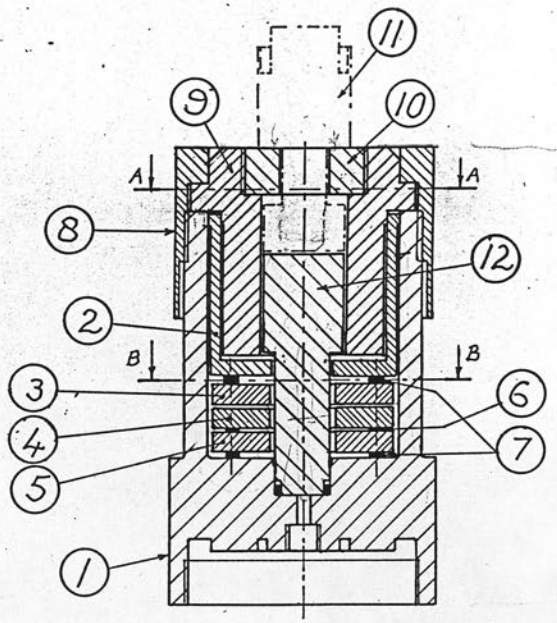
SECTION A-A

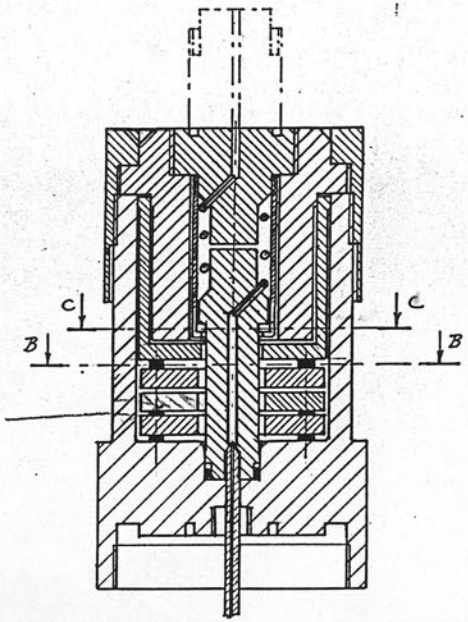


SECTION B-B



SECTION C-C



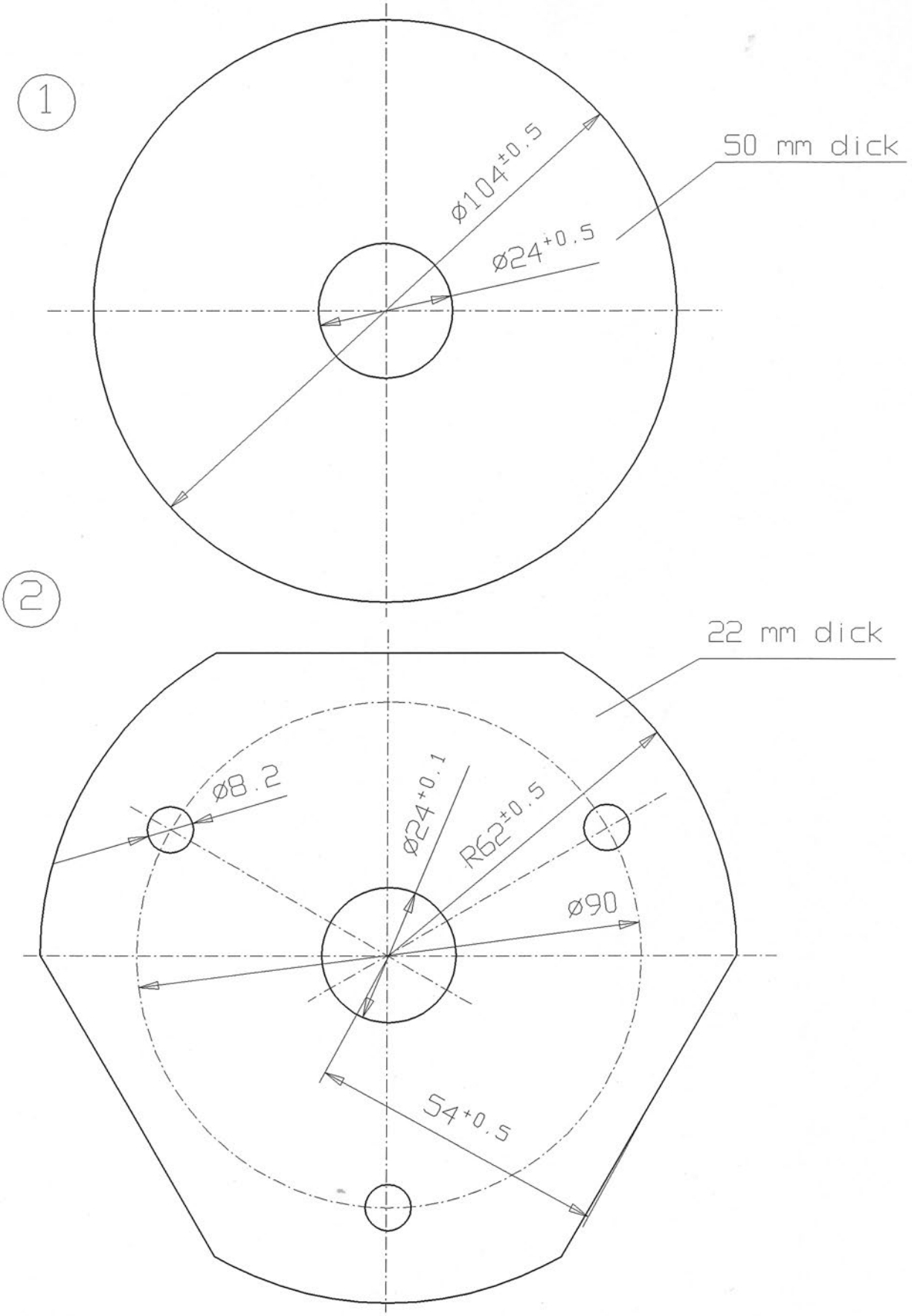


016 o-ring

012 o-ring

DIMENSIONS IN MILLIMETERS – DO NOT SCALE	PATERSON INSTRUMENTS PTY LTD
TOLERANCES ± UNLESS STATED	HPT TESTING MACHINE AXIAL LOAD CELL GENERAL ASSEMBLIES
ACN 008 644 273	A3 | SCALE 1:1 | DATE OCT 1993 | DRAWING NO 4220

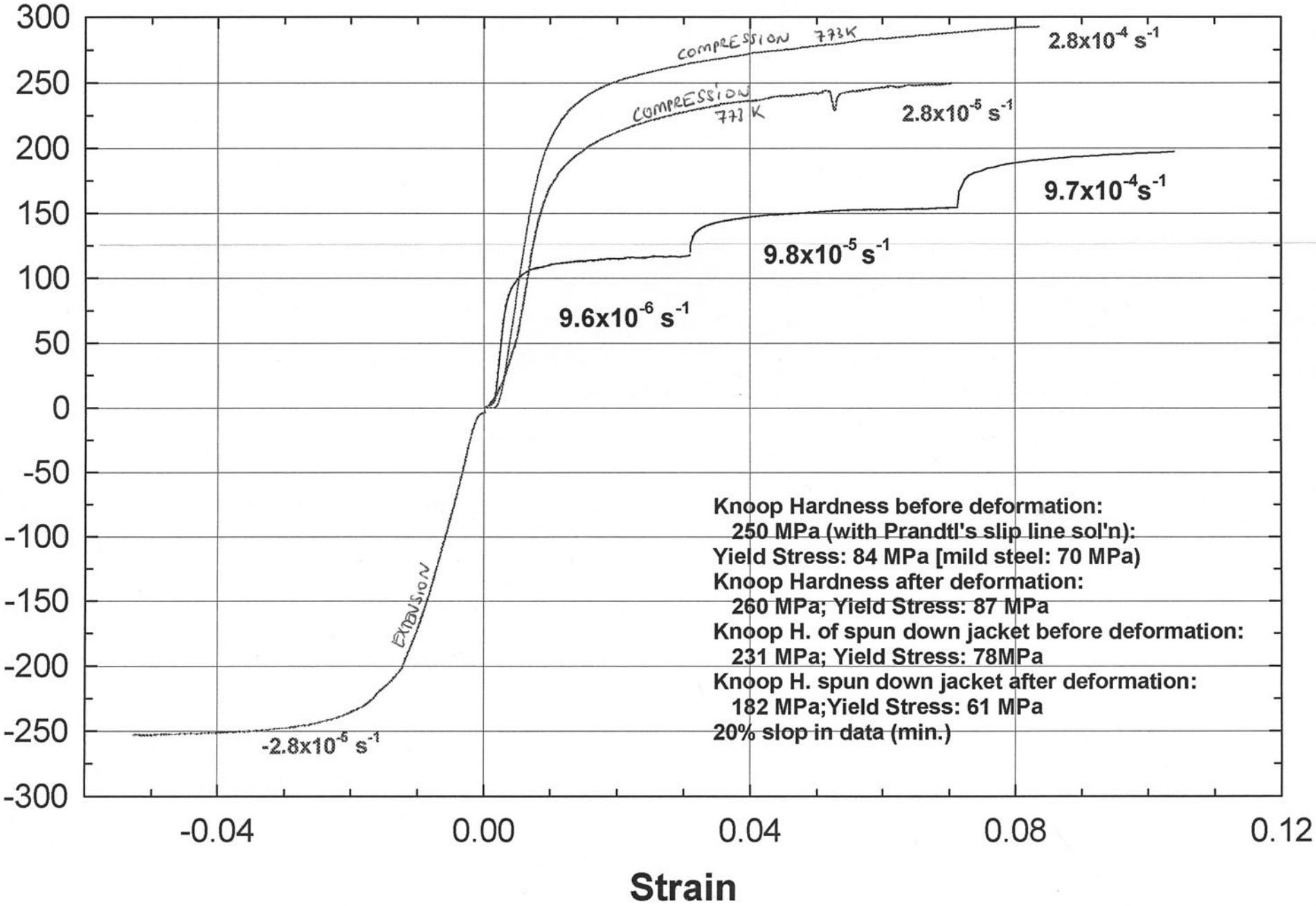
original version



	M. Naumann				
	Datum 28.4.94	1: 1x 2: 2x	M 1:1	Material Alu	
Z.-Nummer 3				Z.-Titel Montage Ofen - Scheibe 1 und 2	
GFZ Potsdam					

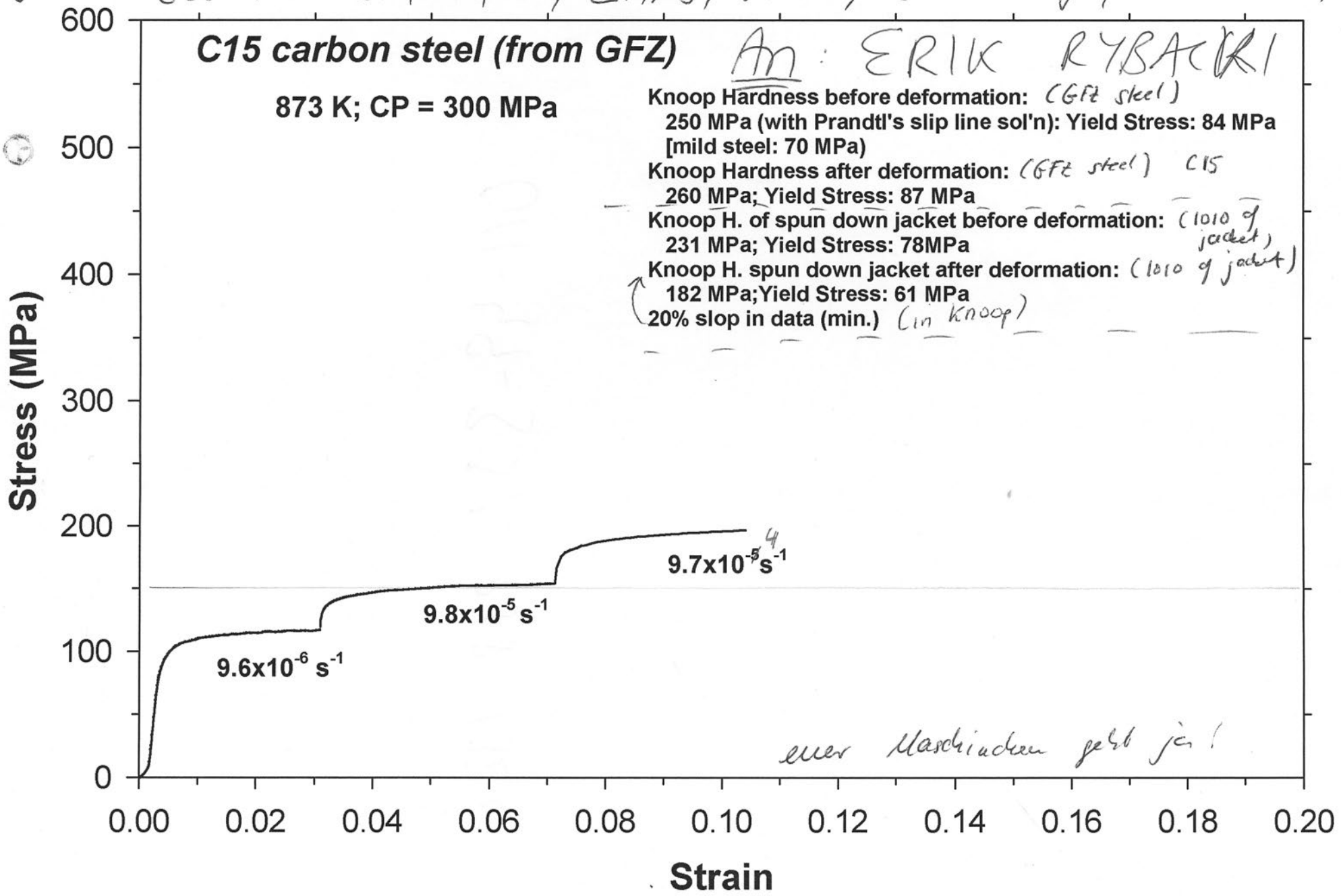
C15 carbon steel (from GFZ)

873 K; CP = 300 MPa
773 K; CP = 300 MPa (new)



Knoop Hardness before deformation:
250 MPa (with Prandtl's slip line sol'n):
Yield Stress: 84 MPa [mild steel: 70 MPa)
Knoop Hardness after deformation:
260 MPa; Yield Stress: 87 MPa
Knoop H. of spun down jacket before deformation:
231 MPa; Yield Stress: 78MPa
Knoop H. spun down jacket after deformation:
182 MPa;Yield Stress: 61 MPa
20% slop in data (min.)

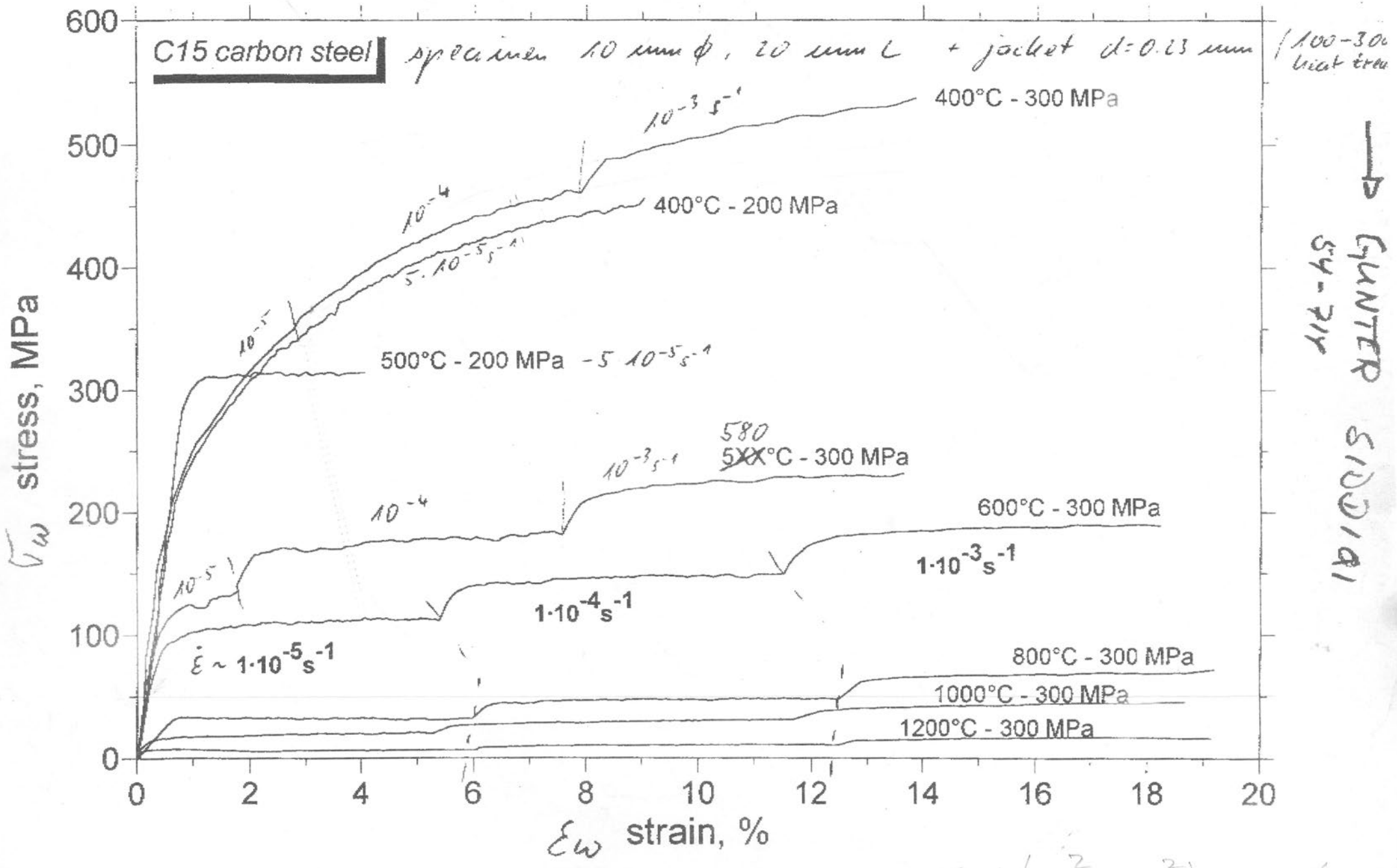
An: Georg Dresen oder Erik Rybacki (ms (61+) 253-(699)
von: Gunter Siddiqi, EAPS, MIT; Cambridge, MA 02139



An: ERIK RYBACKI

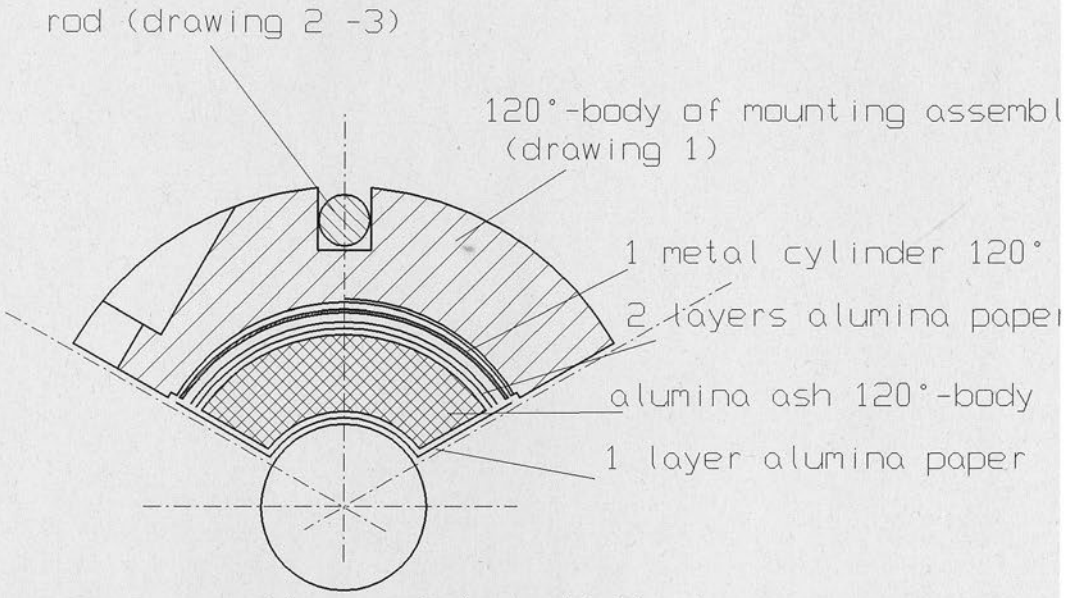
euer Maschinchen geht ja!

Data from G. Dresen, PI #4 on steel cylinders



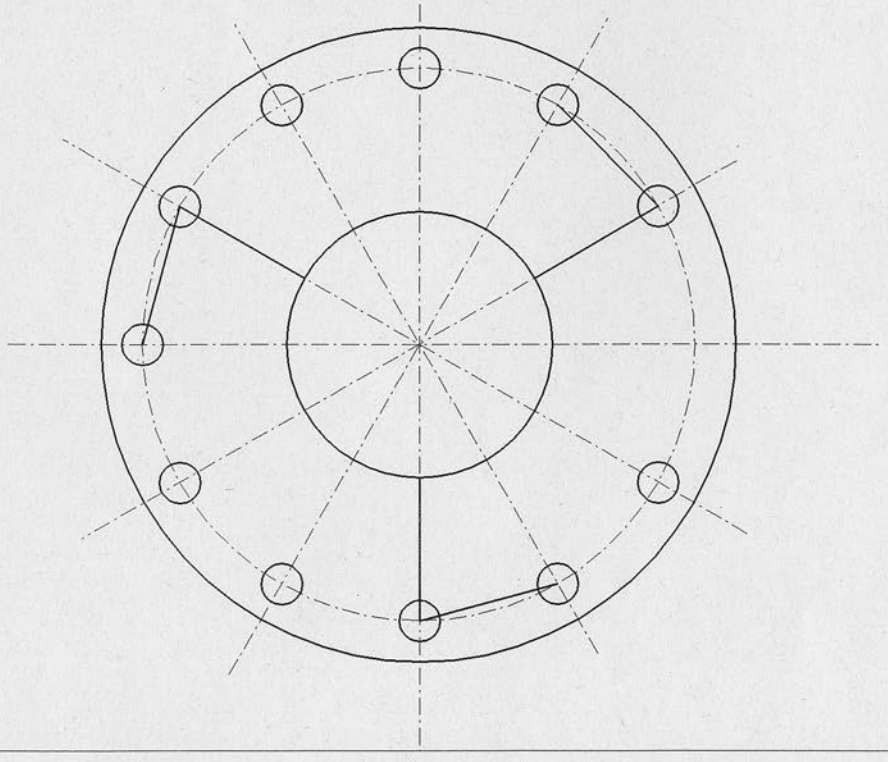
18.09.96 17:02:16 C:\ERIK\PATERSON\STAHL\Stahl C15.spf

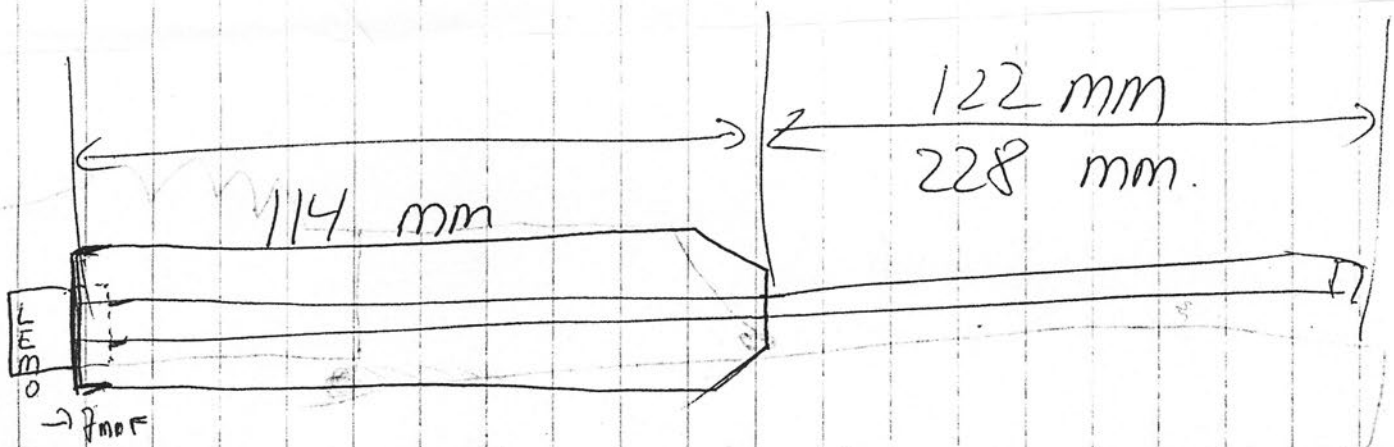
$\pi(r_o^2 - r_i^2)$



Alumina Tube with Windings

two lead wires for each winding
(one to earth)





$\Sigma_{RUN} = 236\,mm$

$=$

$\Sigma_{calc} = 342\,mm$

$\Sigma_{pp} = 32.6\,mm$

$= 12,82"$

XPA-P13R-U-062-30-RP-12"

ϕ 1,D.

ϕ 2mm = 0,079"

$\pm 0.5\,mm = 0.020"$

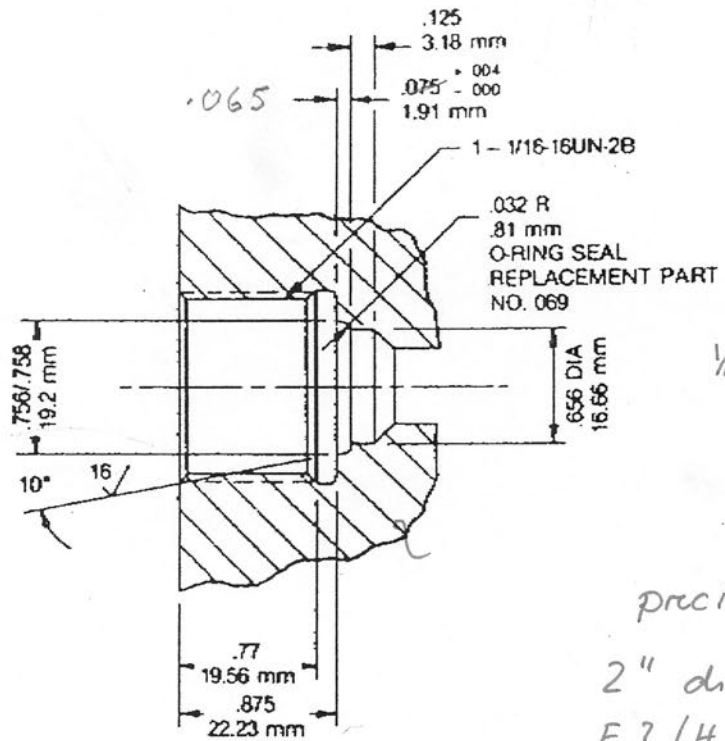
$0.079 \pm 0.020"$ [0.059" - 0.099"]

$\Sigma_{RUN} = 236 - 5 = 231\,m = 9.084"$ 9,084 3,084

$\Sigma_{calc} = 342 - 5 = 337\,m = 13.252$ 13,252 7,21

30	10 + 2.31 = 12,31$
10	10 + 5.44 = 15.44$

RECOMMENDED MOUNTING



114-1 & 114-3

MOUNTING TORQUE
25 Ft. Lbs.

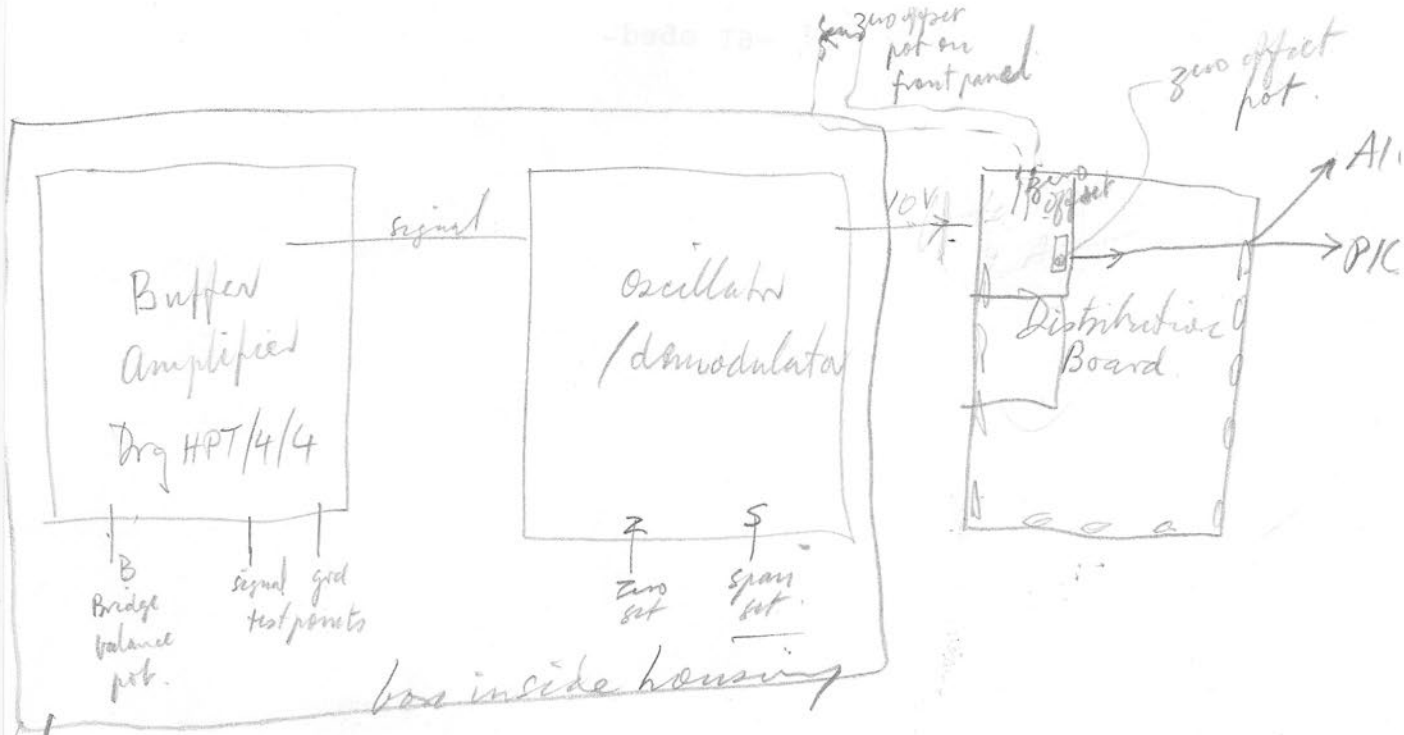
ENLARGEMENT
200 %

¼" HPT 141-3
MOUNTING

precise sensors use for their process connector:
2" diameter 15-5 or 17-4 PH material
F?/H? 900 heat treated.

– 36 BRIDGE

+ SIGNAL

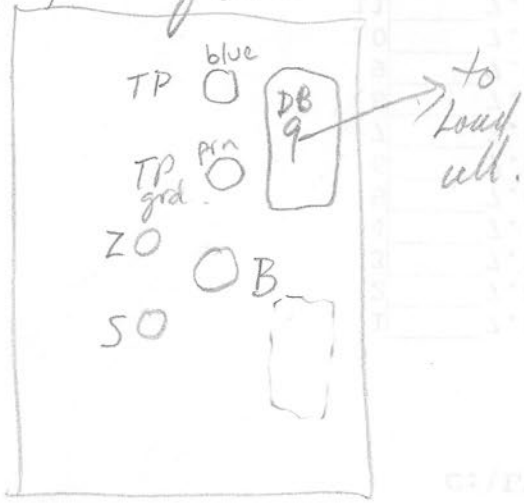


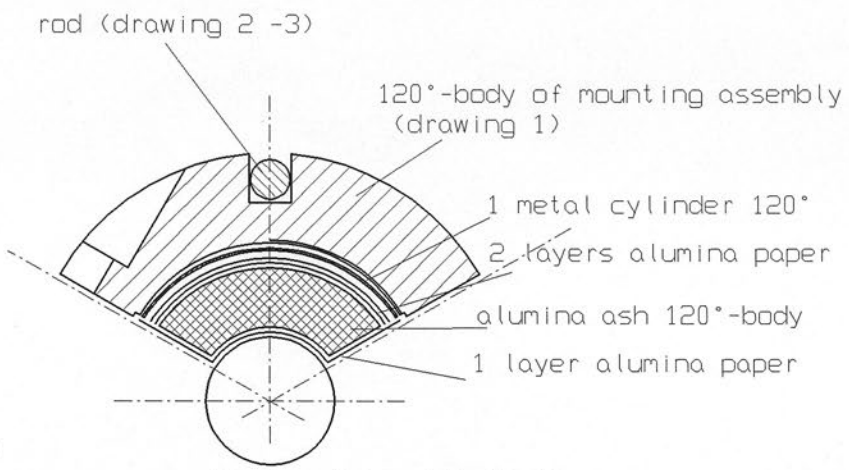
(1) Balance bridge at B, using AC mVmeter or oscilloscope

(2) Set front panel offset pot to 500

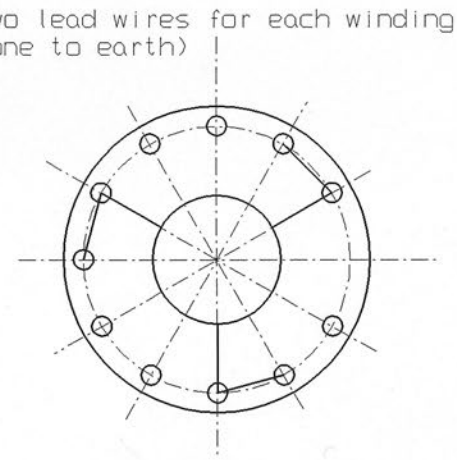
(3) Adjust offset pot on distribution board to give zero AIC meter reading

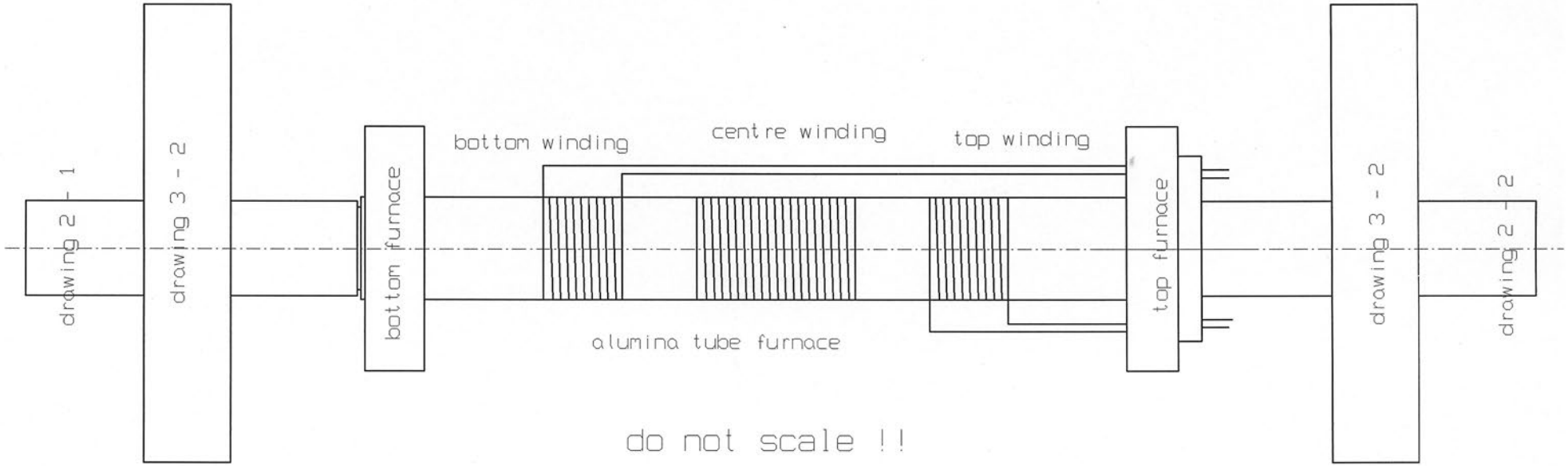
(4) Adjust zero offset in PICS to also give zero PICS reading if necessary



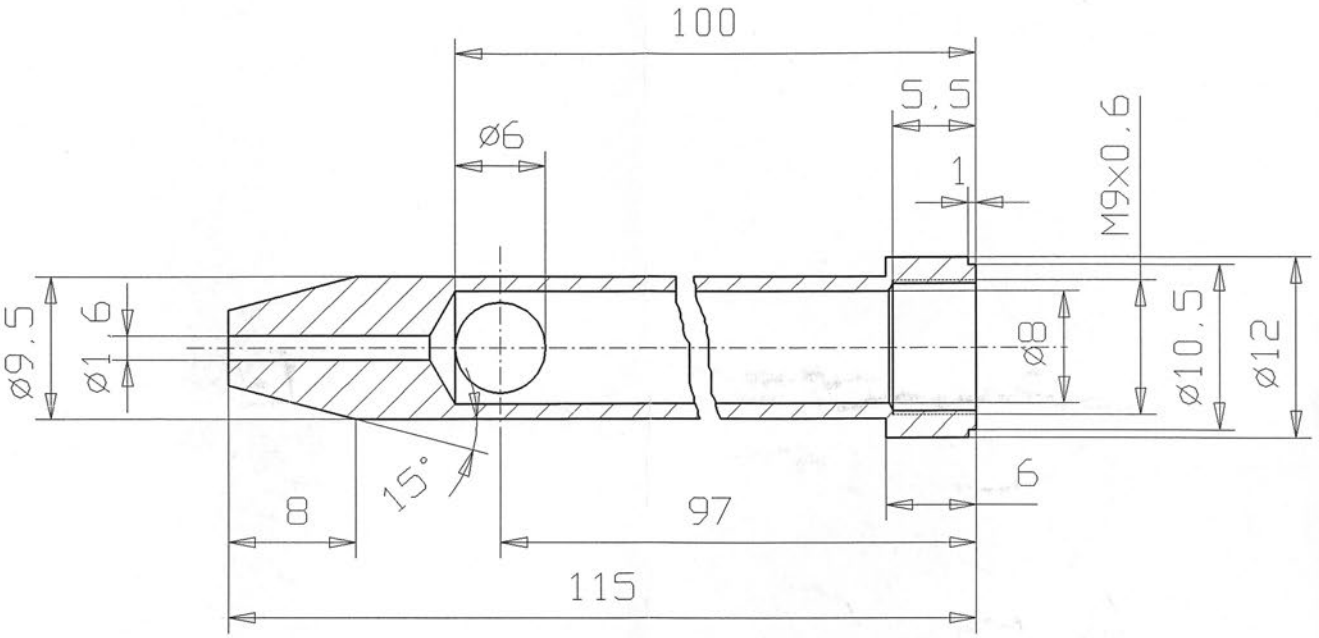


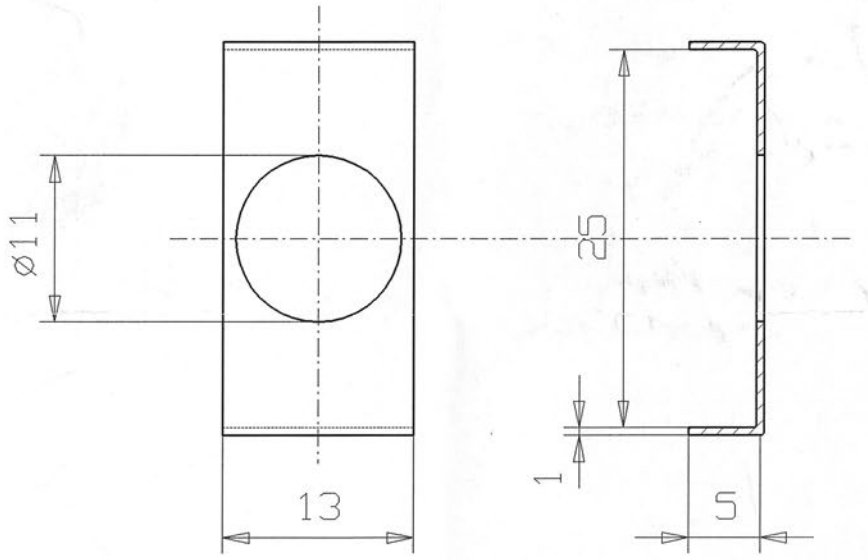
Alumina Tube with Windings

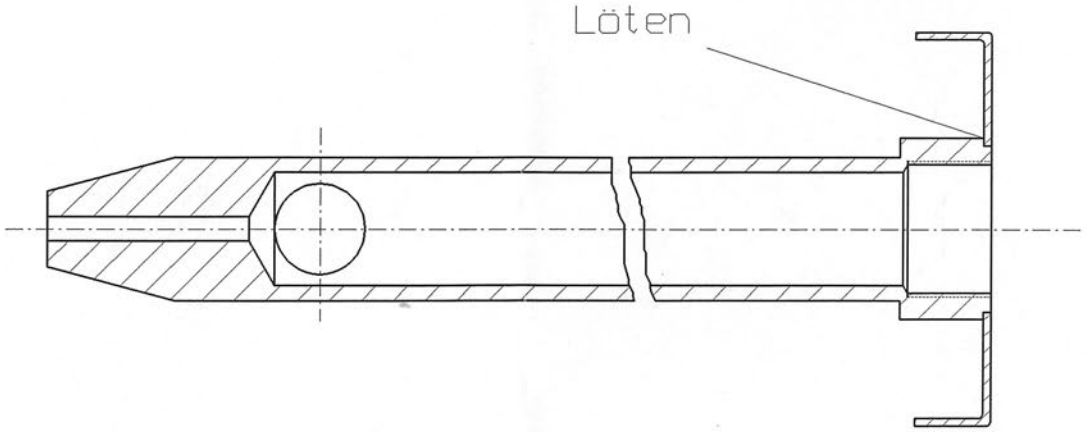




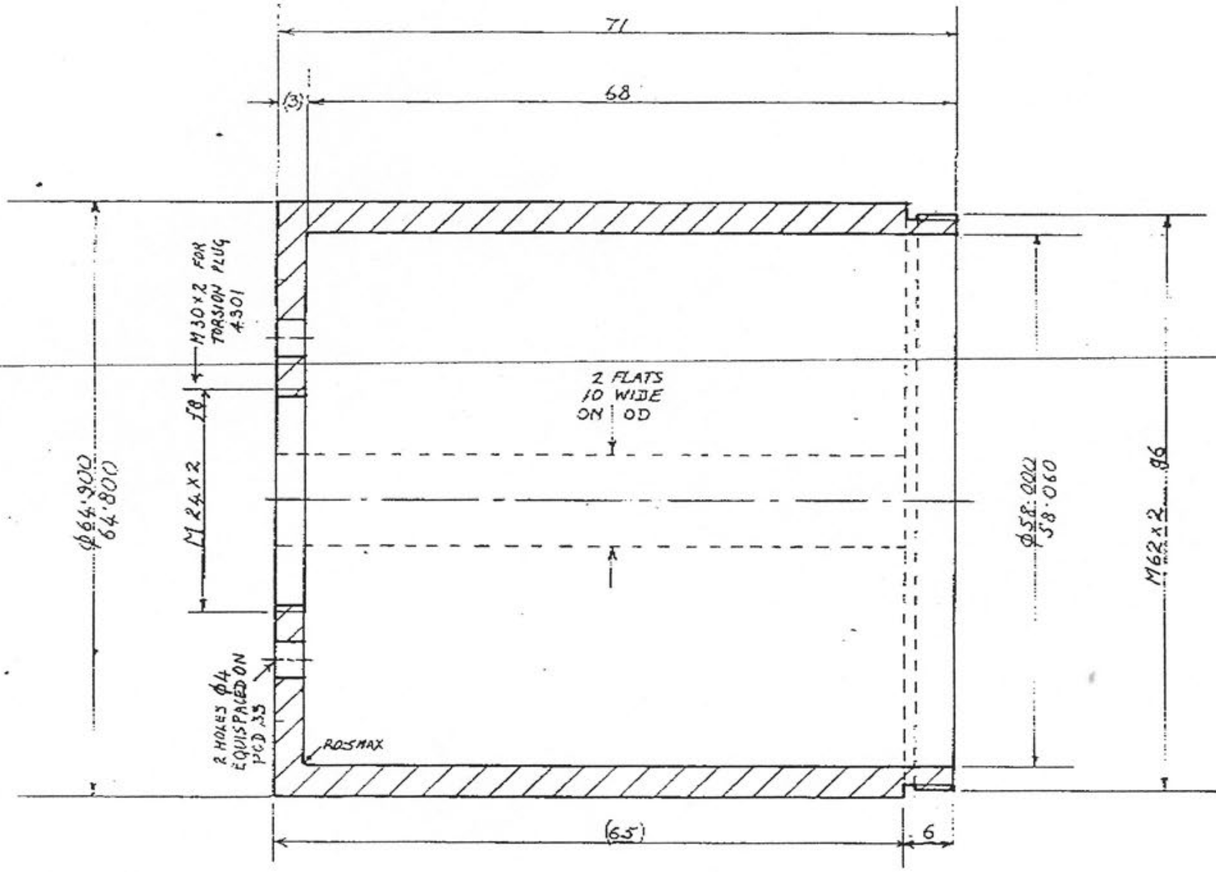
do not scale !!







	M. Naumann				
	Datum 18.5.95	2 x	M 2:1	Material Messing	
Z.-Nummer				Z.-Titel Thermoelement-Hülse	
GFZ Potsdam					

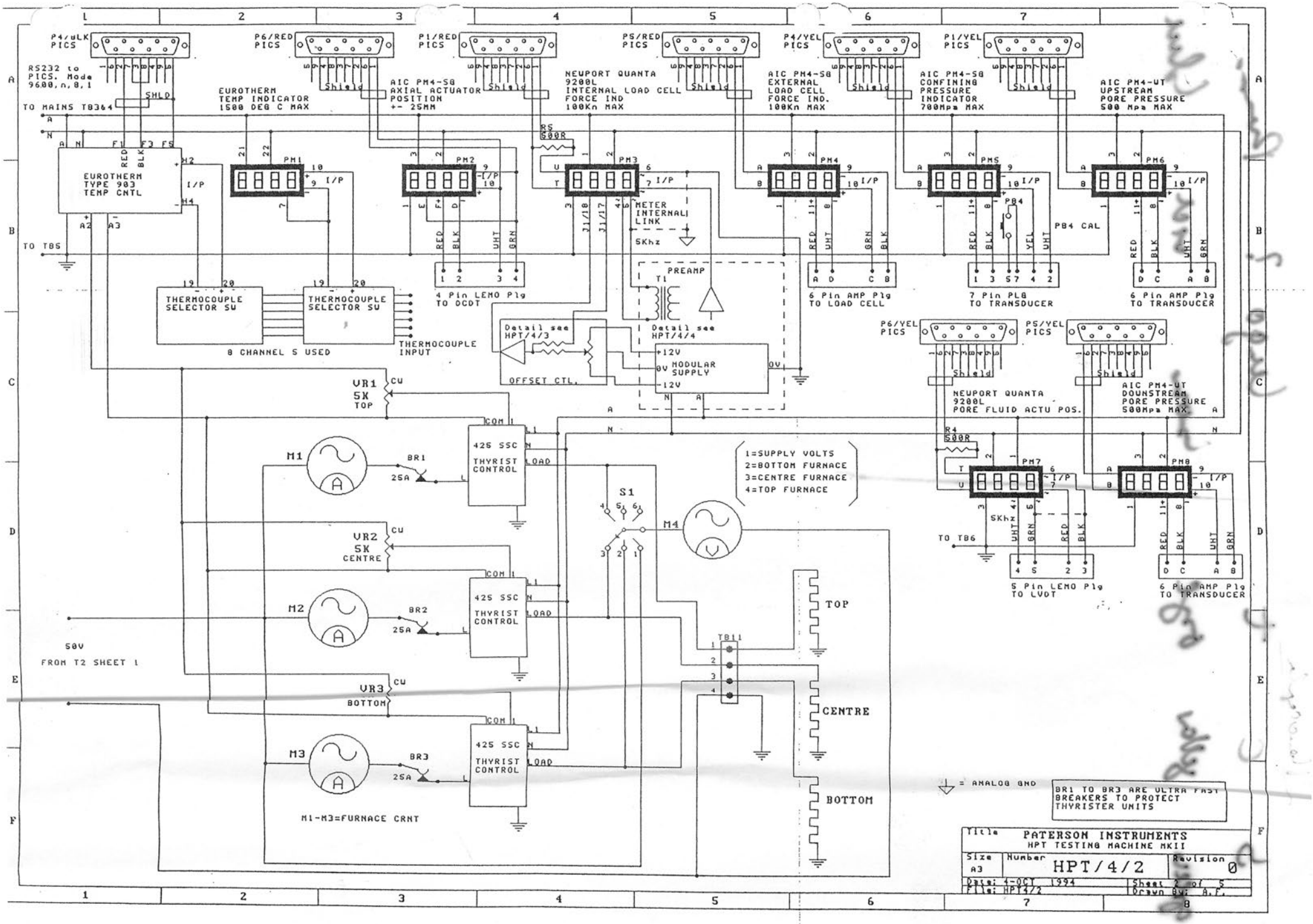


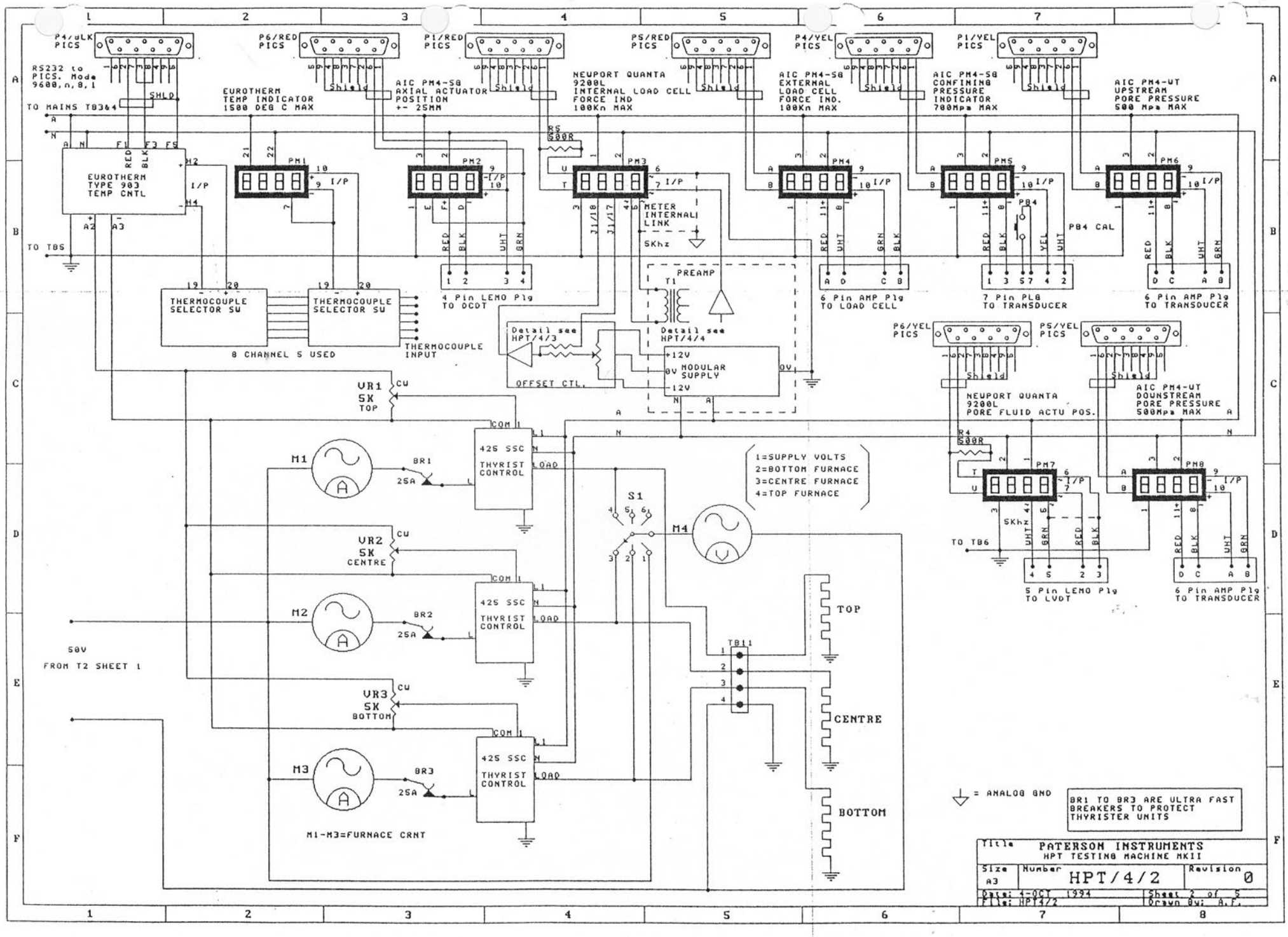
MATERIAL: ASSAB 709
OR SIMILAR

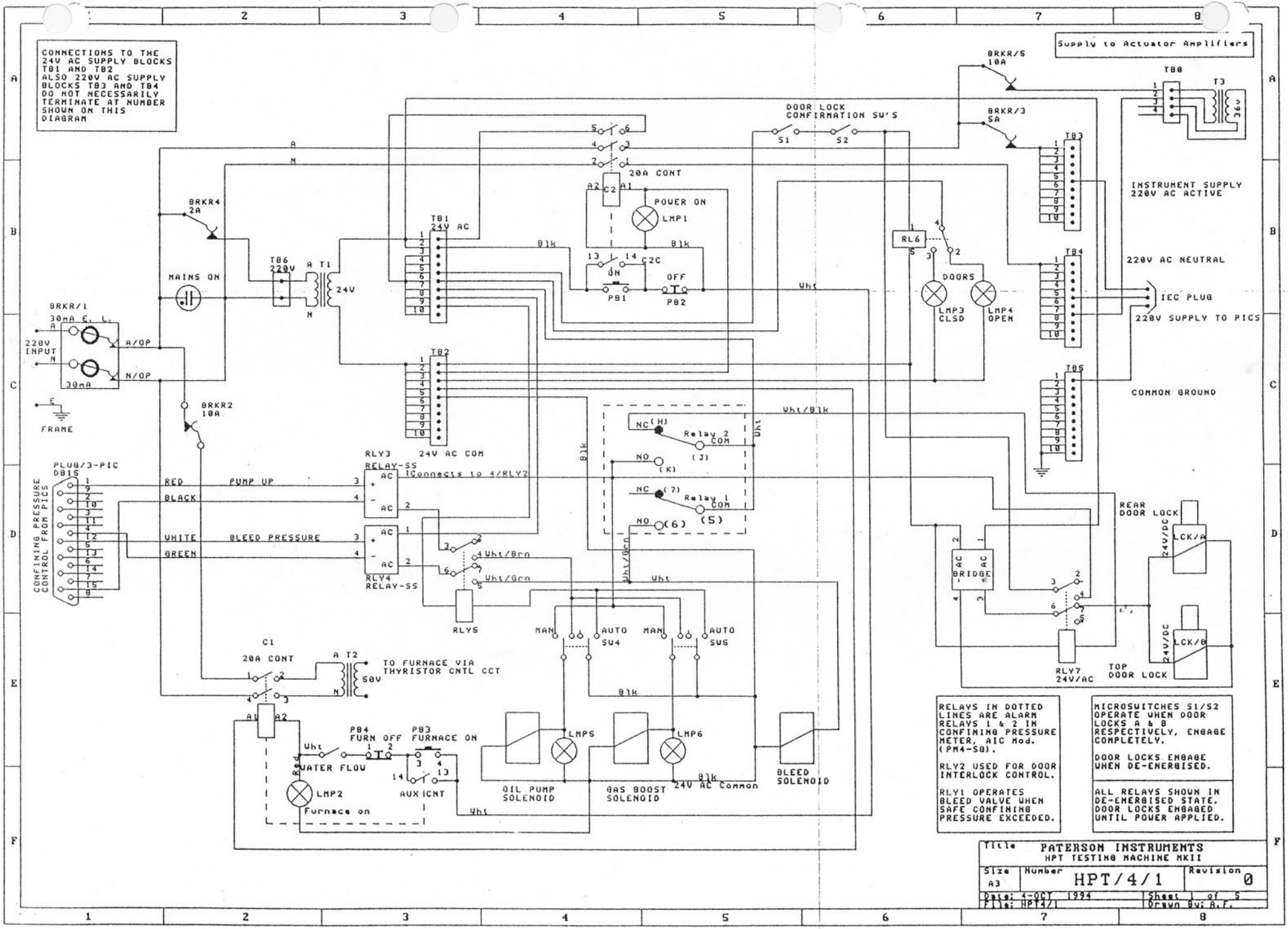
EXCLUSIVELY LICENCED TO PATERSON INSTRUMENTS PTY LTD

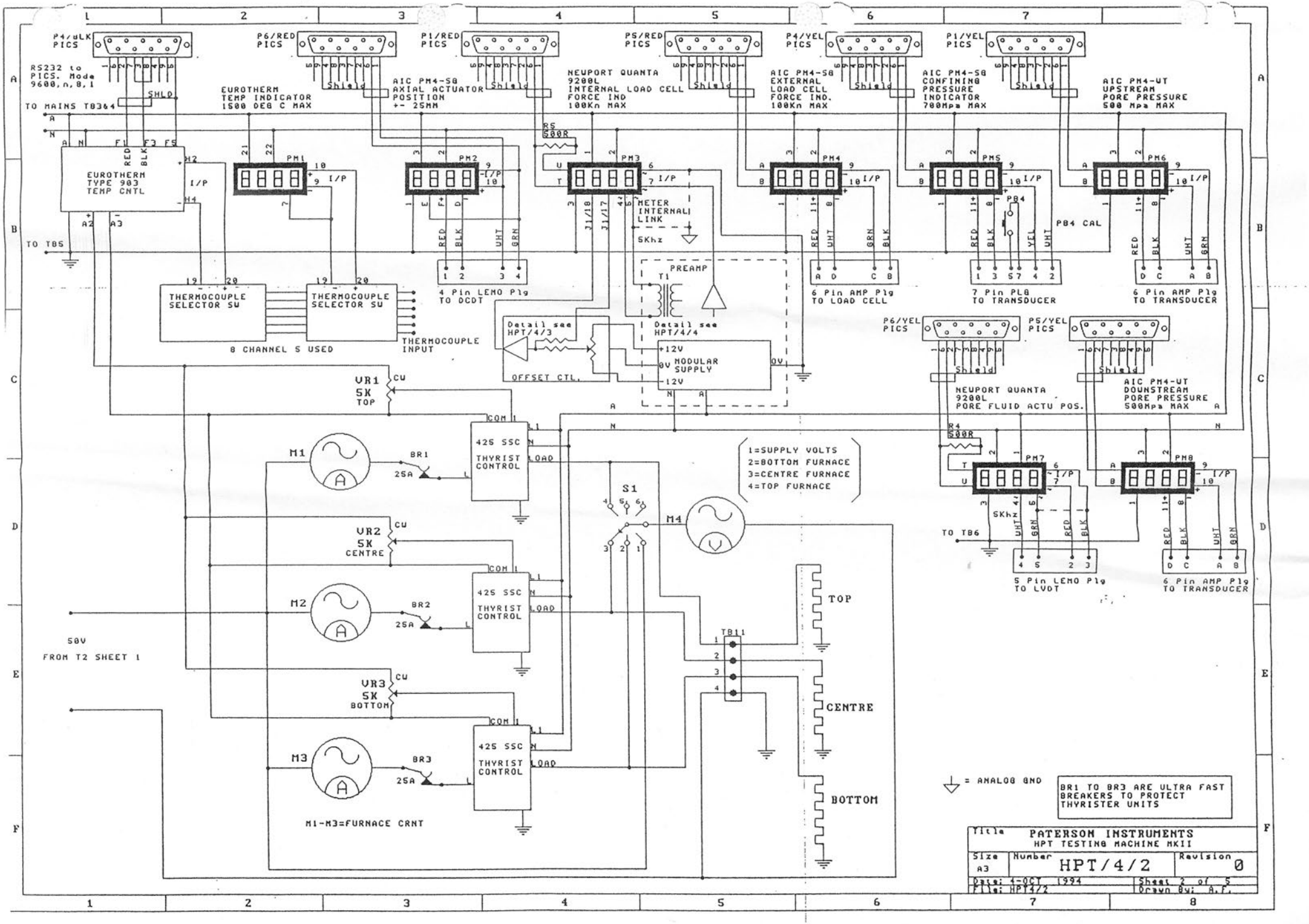
DIMENSIONS IN MILLIMETRES DO NOT SCALE	ANU RESEARCH SCHOOL OF EARTH SCIENCES		
TOLERANCES ±0·3 UNLESS STATED	HIGH PRESSURE/TEMPERATURE TESTING MACHINE PRESSURE VESSEL ASSEMBLY DETAIL (13) - CAP FOR BOTTOM CLOSURE PLUG		
A3	SCALE 2:1	DATE AUG 1989	DRAWING NO 4102

REV MAR 1994


P4/BLK PICS
RS232 to PICS. Mode 9600,n,8,1
SHLD
TO MAINS TB3&4
EUROTHERM TYPE 903 TEMP CNTL
P6/RED PICS
EUROTHERM TEMP INDICATOR 1500 DEG C MAX
Shield
P1/RED PICS
AIC PM4-SB AXIAL ACTUATOR POSITION +- 25MM
PS/RED PICS
NEUPORT QUANTA 9200L INTERNAL LOAD CELL FORCE IND 100Kn MAX
P4/YEL PICS
AIC PM4-SB EXTERNAL LOAD CELL FORCE IND. 100Kn MAX
P1/YEL PICS
AIC PM4-SB CONFINING PRESSURE INDICATOR 700Mpa MAX
AIC PM4-UT UPSTREAM PORE PRESSURE 500 Mpa MAX
TO TB5
METER INTERNAL LINK
5Khz
PREAMP
T1
Detail see HPT/4/3
Detail see HPT/4/4
OFFSET CTL.
+12V
0V MODULAR SUPPLY
-12V
4 Pin LEMO Plg TO OCDT
6 Pin AMP Plg TO LOAD CELL
7 Pin PLG TO TRANSDUCER
PB4 CAL
6 Pin AMP Plg TO TRANSDUCER
THERMOCOUPLE SELECTOR SW
8 CHANNEL S USED
THERMOCOUPLE INPUT
P6/YEL PICS
PS/YEL PICS
NEUPORT QUANTA 9200L PORE FLUID ACTU POS.
AIC PM4-UT DOWNSTREAM PORE PRESSURE 500Mpa MAX.
TO TB6
5 Pin LEMO Plg TO LVDT
6 Pin AMP Plg TO TRANSDUCER
VR1 5K TOP
VR2 5K CENTRE
VR3 BOTTOM
425 SSC THYRIST CONTROL
M1
M2
M3
M4
BR1
BR2
BR3
25A
S1
1=SUPPLY VOLTS
2=BOTTOM FURNACE
3=CENTRE FURNACE
4=TOP FURNACE
50V
FROM T2 SHEET 1
TB11
TOP
CENTRE
BOTTOM
M1-M3=FURNACE CRNT
= ANALOG GND
BR1 TO BR3 ARE ULTRA FAST BREAKERS TO PROTECT THYRISTER UNITS
Title PATERSON INSTRUMENTS
HPT TESTING MACHINE MKII
Size A3
Number HPT/4/2
Revision 0
Date: 4-OCT 1994
Sheet 2 of 5
File: HPT4/2
Drawn By: A.F.

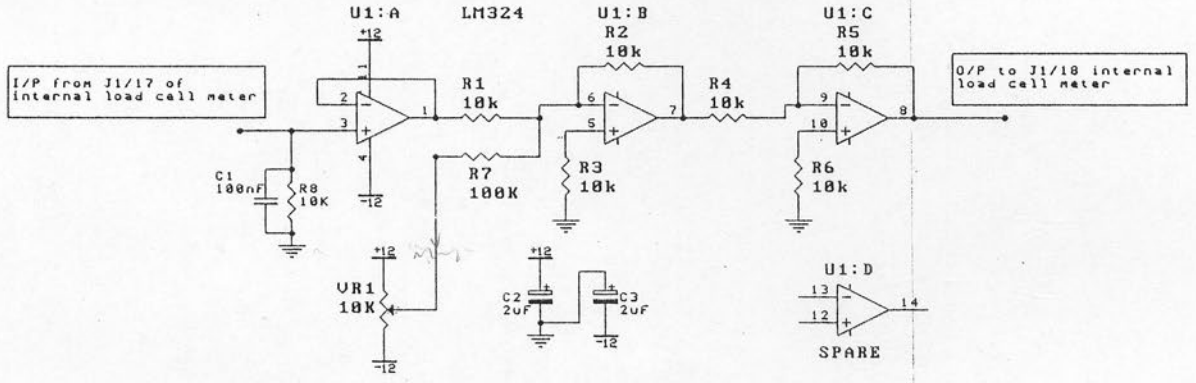

P4/BLK PICS
P6/RED PICS
P1/RED PICS
P5/RED PICS
P4/YEL PICS
P1/YEL PICS
RS232 to PICS. Mode 9600,n,8,1
SHLD
TO MAINS T8364
EUROTHERM TYPE 903 TEMP CNTL
EUROTHERM TEMP INDICATOR 1500 DEG C MAX
AIC PM4-S8 AXIAL ACTUATOR POSITION +- 25MM
NEUPORT QUANTA 9200L INTERNAL LOAD CELL FORCE IND 100Kn MAX
AIC PM4-S8 EXTERNAL LOAD CELL FORCE IND. 100Kn MAX
AIC PM4-S8 CONFINING PRESSURE INDICATOR 70Mpa MAX
AIC PM4-UT UPSTREAM PORE PRESSURE 500 Mpa MAX
RS 500R
PM1
PM2
PM3
PM4
PM5
PM6
PB4
PB4 CAL
METER INTERNAL LINK
5Khz
PREAMP
T1
Detail see HPT/4/3
Detail see HPT/4/4
OFFSET CTL.
+12V
0V MODULAR SUPPLY
-12V
4 Pin LEMO Plg TO OCDT
6 Pin AMP Plg TO LOAD CELL
7 Pin PLG TO TRANSDUCER
6 Pin AMP Plg TO TRANSDUCER
THERMOCOUPLE SELECTOR SW
8 CHANNEL S USED
THERMOCOUPLE INPUT
TO TB5
P6/YEL PICS
P5/YEL PICS
NEUPORT QUANTA 9200L PORE FLUID ACTU POS.
AIC PM4-UT DOWNSTREAM PORE PRESSURE 500Mpa MAX
R4 500R
PM7
PM8
TO TB6
5 Pin LEMO Plg TO LVDT
6 Pin AMP Plg TO TRANSDUCER
VR1 5K TOP
VR2 5K CENTRE
VR3 5K BOTTOM
M1
M2
M3
M4
BR1
BR2
BR3
25A
425 SSC THYRIST CONTROL
S1
1=SUPPLY VOLTS
2=BOTTOM FURNACE
3=CENTRE FURNACE
4=TOP FURNACE
50V
FROM T2 SHEET 1
TB11
TOP
CENTRE
BOTTOM
M1-M3=FURNACE CRNT
= ANALOG GND
BR1 TO BR3 ARE ULTRA FAST BREAKERS TO PROTECT THYRISTER UNITS
Title PATERSON INSTRUMENTS
HPT TESTING MACHINE MKII
Size A3
Number HPT/4/2
Revision 0
Date: 4-OCT 1994
File: HPT4/2
Sheet 2 of 5
Drawn By: A.F.


CONNECTIONS TO THE 24V AC SUPPLY BLOCKS TB1 AND TB2 ALSO 220V AC SUPPLY BLOCKS TB3 AND TB4 DO NOT NECESSARILY TERMINATE AT NUMBER SHOWN ON THIS DIAGRAM
Supply to Actuator Amplifiers
BRKR/S 10A
BRKR/3 5A
TB8
T3
36V
DOOR LOCK CONFIRMATION SW'S
S1
S2
20A CONT
POWER ON
LMP1
INSTRUMENT SUPPLY 220V AC ACTIVE
BRKR4 2A
TB1 24V AC
TB6 220V
A T1
24V
MAINS ON
RL6
DOORS
LMP3 CLSD
LMP4 OPEN
TB3
TB4
220V AC NEUTRAL
IEC PLUG
220V SUPPLY TO PICS
PB1
PB2
ON
OFF
BRKR/1 30mA E. L.
220V INPUT
A/OP
N/OP
30mA
FRAME
BRKR2 10A
TB2
TB5
COMMON GROUND
RLY3 RELAY-SS
24V AC COM
Connects to 4/RLY2
RLY4 RELAY-SS
PLUG/3-PIC D815
CONFINING PRESSURE CONTROL FROM PICS
RED
BLACK
WHITE
GREEN
PUMP UP
BLEED PRESSURE
Relay 2 COM
Relay 1 COM
RLY5
REAR DOOR LOCK
LCK/A
LCK/B
24V/DC
BRIDGE
RLY7 24V/AC
TOP DOOR LOCK
C1
20A CONT
A T2
TO FURNACE VIA THYRISTOR CNTL CCT
50V
MAN
AUTO
SU4
SU5
PB4 FURN OFF
PB3 FURNACE ON
WATER FLOW
LMP2
Furnace on
AUX ICNT
LMP5
LMP6
OIL PUMP SOLENOID
GAS BOOST SOLENOID
BLEED SOLENOID
24V AC Common
Blk
Wht
Wht/Blk
Wht/Grn
Wht/Brn
RELAYS IN DOTTED LINES ARE ALARM RELAYS 1 & 2 IN CONFINING PRESSURE METER, AIC Mod. (PM4-S8).
RLY2 USED FOR DOOR INTERLOCK CONTROL.
RLY1 OPERATES BLEED VALVE WHEN SAFE CONFINING PRESSURE EXCEEDED.
MICROSWITCHES S1/S2 OPERATE WHEN DOOR LOCKS A & B RESPECTIVELY, ENGAGE COMPLETELY.
DOOR LOCKS ENGAGE WHEN DE-ENERGISED.
ALL RELAYS SHOWN IN DE-ENERGISED STATE. DOOR LOCKS ENGAGED UNTIL POWER APPLIED.
Title
PATERSON INSTRUMENTS
HPT TESTING MACHINE MKII
Size A3
Number HPT/4/1
Revision 0
Date: 4-OCT 1994
Sheet of 5
File: HPT4/1
Drawn By: A.F.


P4/BLK PICS
RS232 to PICS. Mode 9600,n,8,1
SHLD
TO MAINS T8364
EUROTHERM TYPE 903 TEMP CNTL
P6/RED PICS
EUROTHERM TEMP INDICATOR 1500 DEG C MAX
P1/RED PICS
AIC PM4-SB AXIAL ACTUATOR POSITION +- 25MM
PS/RED PICS
NEUPORT QUANTA 9200L INTERNAL LOAD CELL FORCE IND 100Kn MAX
P4/YEL PICS
AIC PM4-SB EXTERNAL LOAD CELL FORCE IND. 100Kn MAX
P1/YEL PICS
AIC PM4-SB CONFINING PRESSURE INDICATOR 700Mpa MAX
AIC PM4-UT UPSTREAM PORE PRESSURE 500 Mpa MAX
PM1
PM2
PM3
PM4
PM5
PM6
R5 500R
METER INTERNAL LINK
5Khz
PB4
PB4 CAL
TO TB5
THERMOCOUPLE SELECTOR SW
8 CHANNEL S USED
THERMOCOUPLE INPUT
4 Pin LEMO Plg TO DCDT
PREAMP
T1
Detail see HPT/4/3
OFFSET CTL.
Detail see HPT/4/4
+12V
0V MODULAR SUPPLY
-12V
6 Pin AMP Plg TO LOAD CELL
7 Pin PLG TO TRANSDUCER
6 Pin AMP Plg TO TRANSDUCER
P6/YEL PICS
P5/YEL PICS
NEUPORT QUANTA 9200L PORE FLUID ACTU POS.
AIC PM4-UT DOWNSTREAM PORE PRESSURE 500Mpa MAX
R4 500R
PM7
PM8
TO TB6
5 Pin LEMO Plg TO LVDT
6 Pin AMP Plg TO TRANSDUCER
VR1 5K TOP
VR2 5K CENTRE
VR3 5K BOTTOM
M1
M2
M3
M4
BR1 25A
BR2 25A
BR3 25A
425 SSC THYRIST CONTROL
S1
1=SUPPLY VOLTS
2=BOTTOM FURNACE
3=CENTRE FURNACE
4=TOP FURNACE
TB11
TOP
CENTRE
BOTTOM
50V
FROM T2 SHEET 1
M1-M3=FURNACE CRNT
= ANALOG GND
BR1 TO BR3 ARE ULTRA FAST BREAKERS TO PROTECT THYRISTER UNITS
Title PATERSON INSTRUMENTS
HPT TESTING MACHINE MKII
Size A3
Number HPT/4/2
Revision 0
Date: 4-OCT 1994
Sheet 2 of 5
File: HPT4/2
Drawn By: A.F.

See P1002

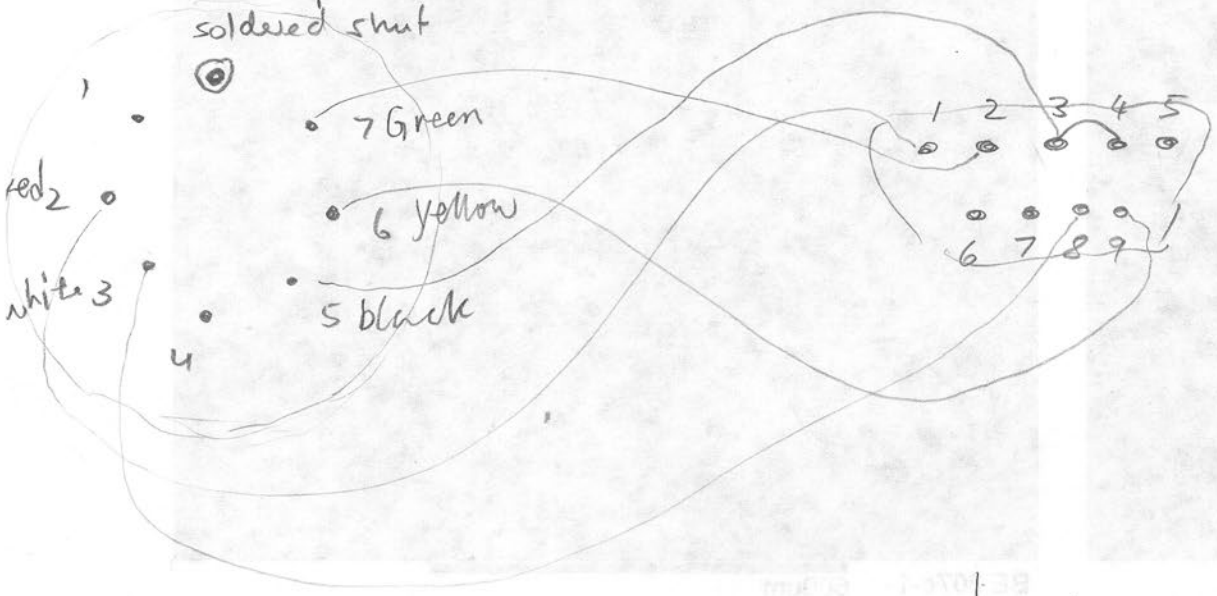
Power to this offset control is supplied from the +&- 12V supply located within the Internal Load Cell Pre-Amp.



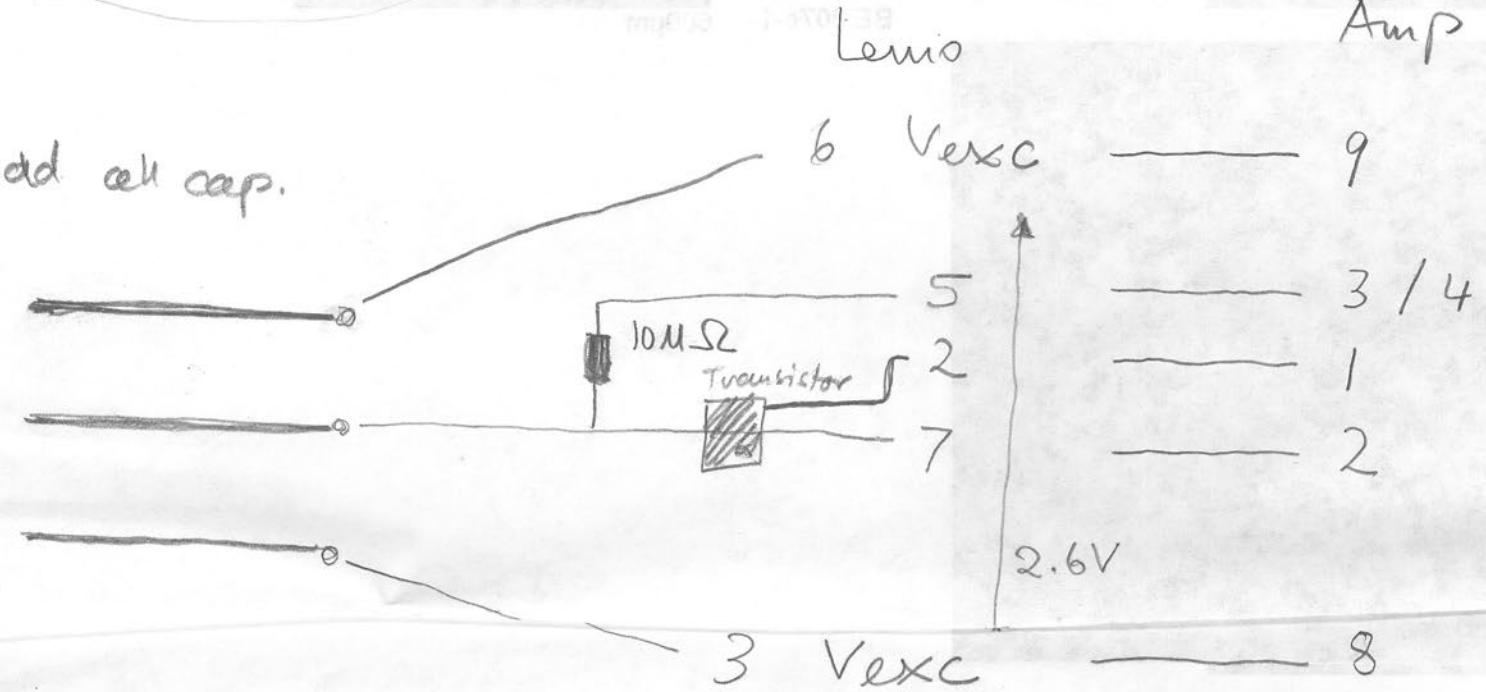
Title	PATERSON INSTRUMENTS	
HPT Machine MKII-Load Cell 0 offset control		
Size A3	Number HPT/4/3	Revision 0
Date: 23-SEP 1994		Sheet 3 of 5
File: HPT4/3		Drawn By:

internal load cell Lemo conn.

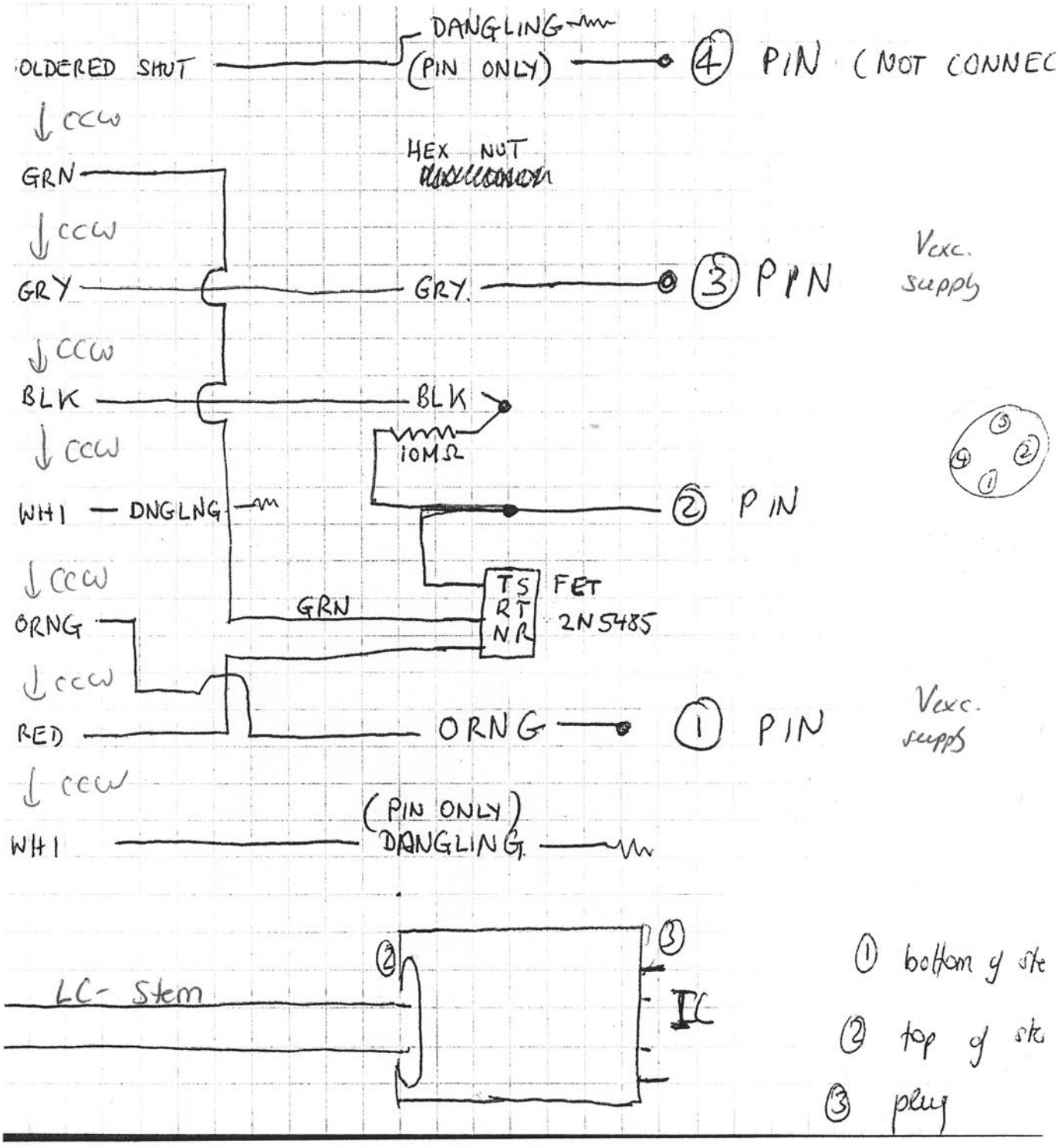
100k on pins soldered shut



load cell cap.

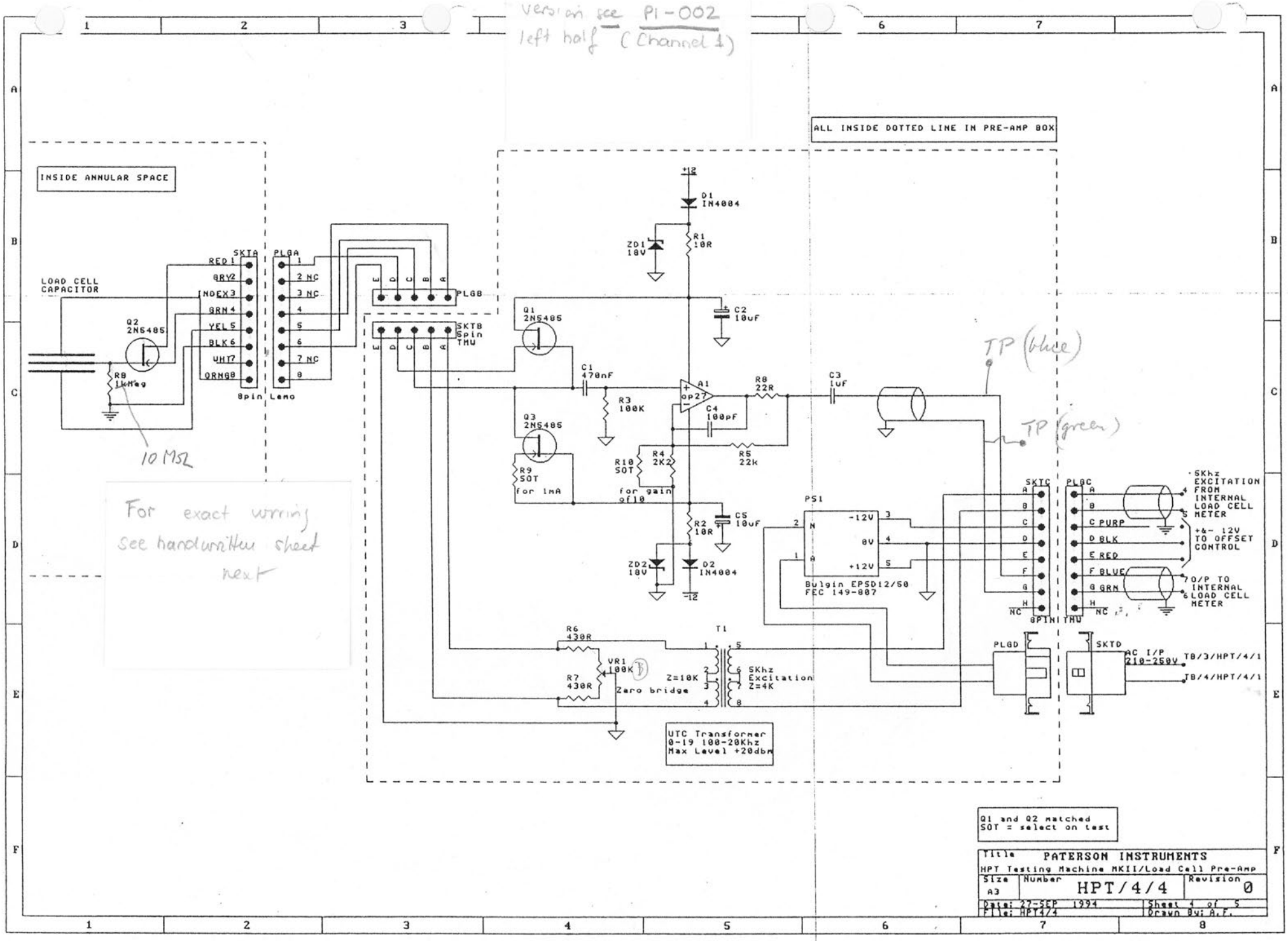


FET 2N5485



Gunter's notebook #5 p49

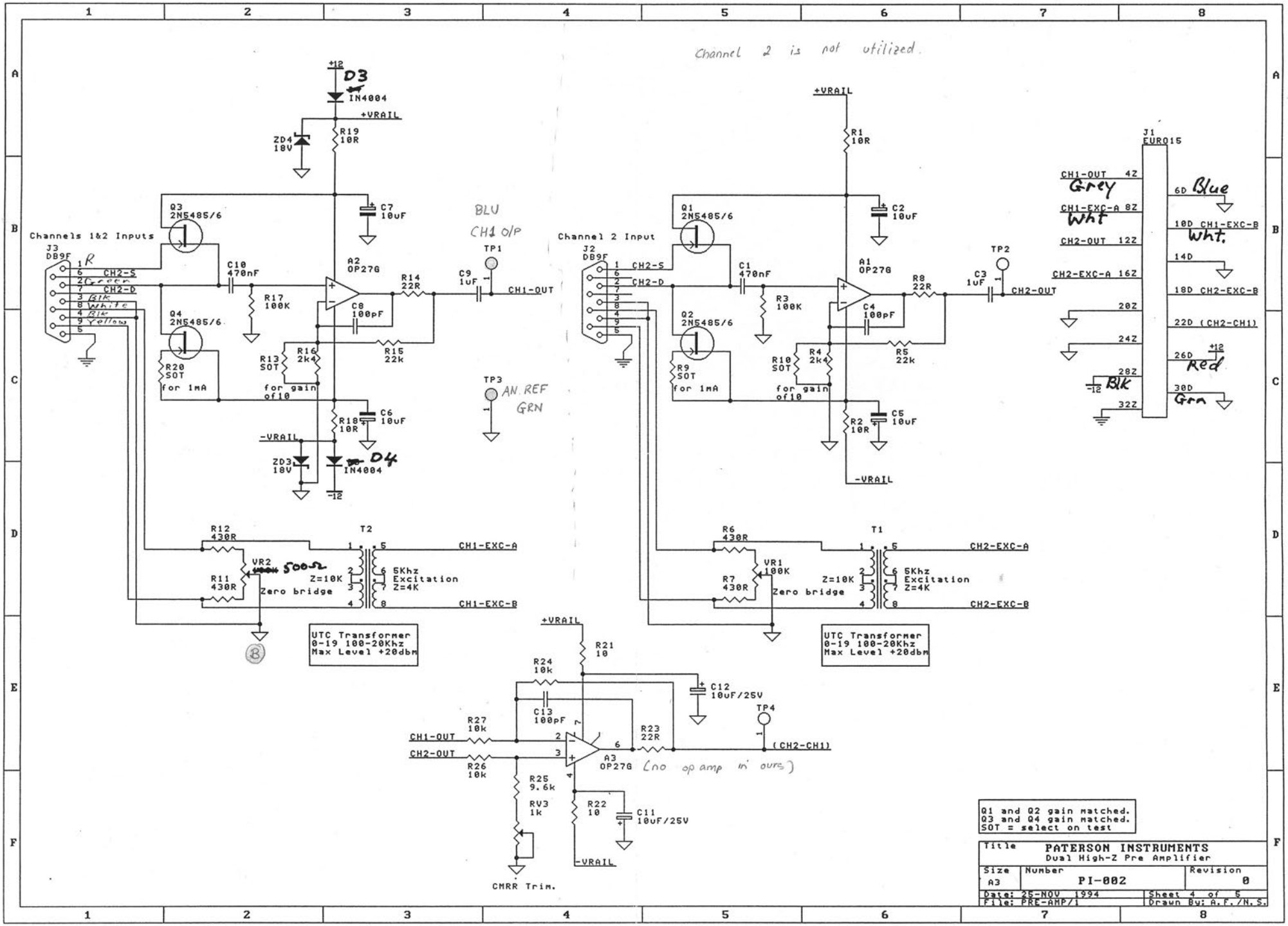
For more updated version see PI-002 left half (Channel 1)

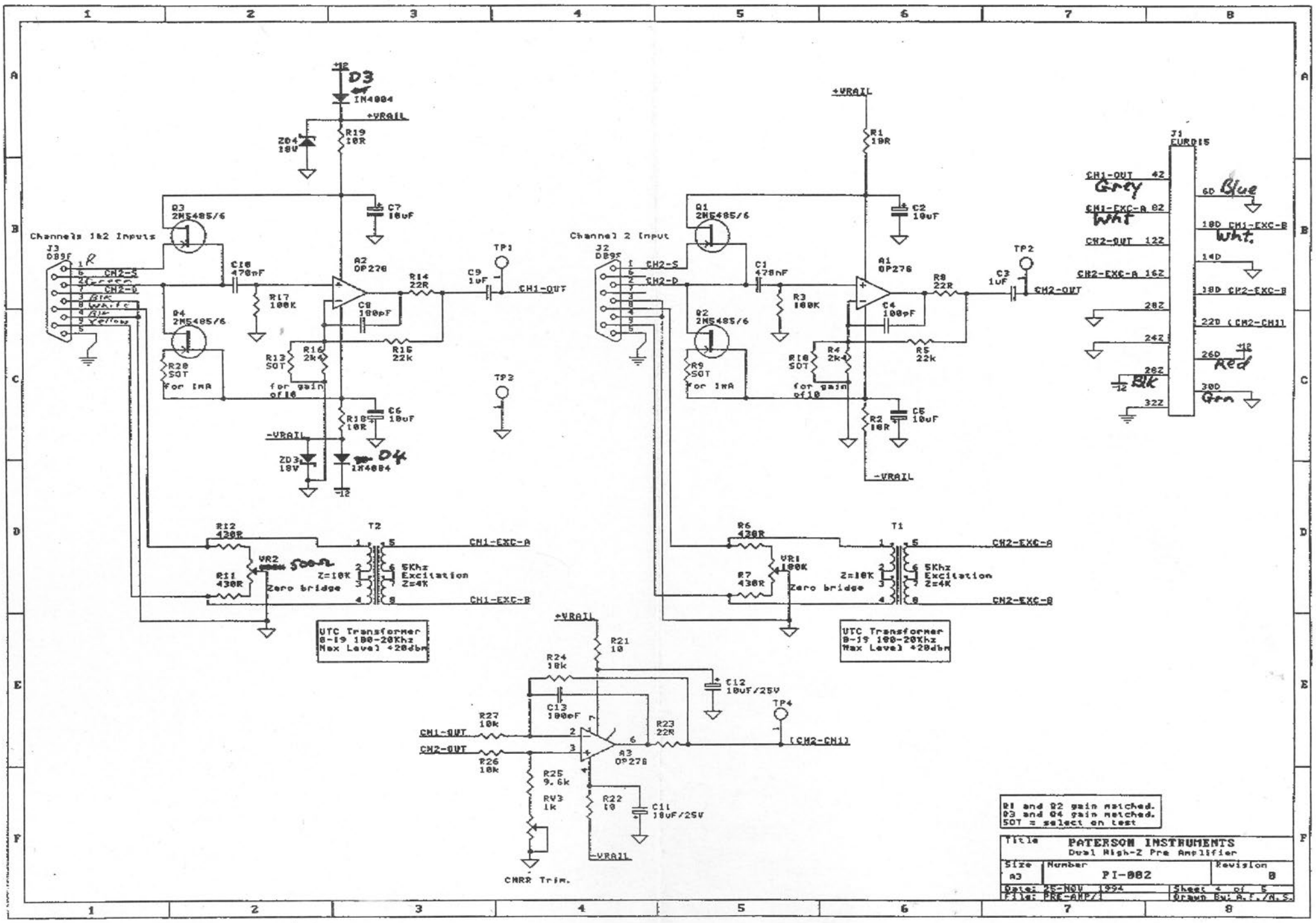


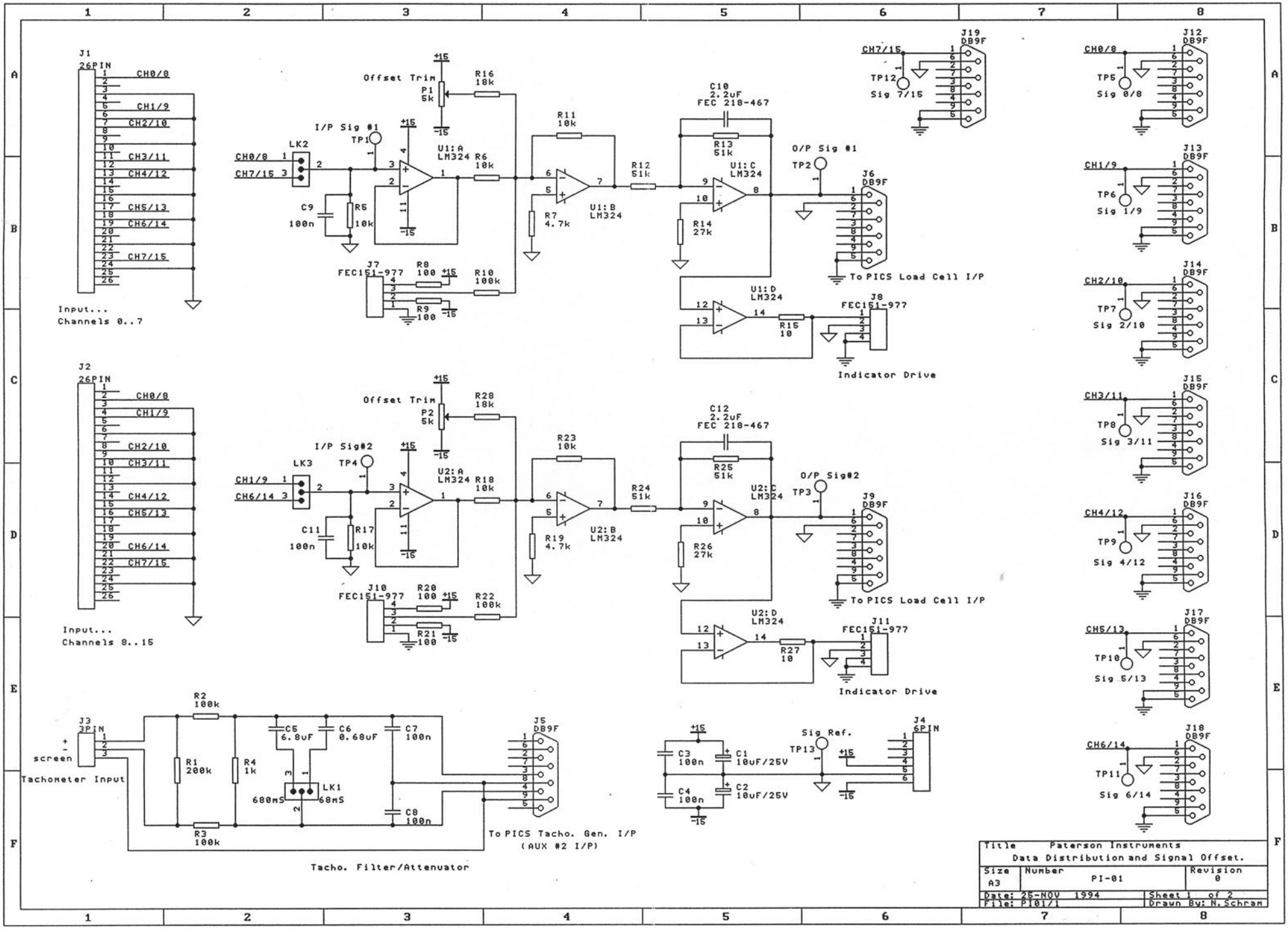
For exact wiring see handwritten sheet next

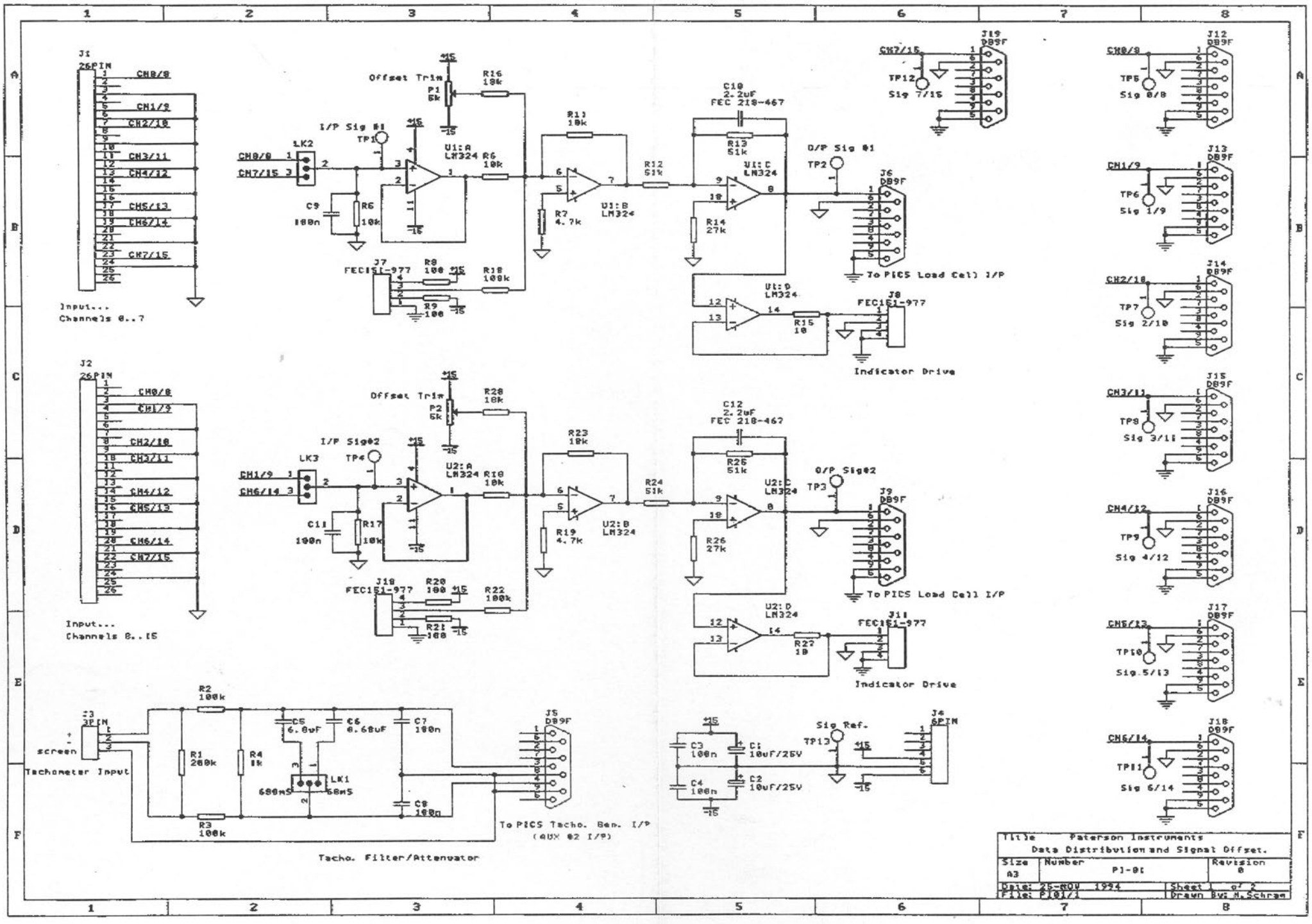
Q1 and Q2 matched
SOT = select on test

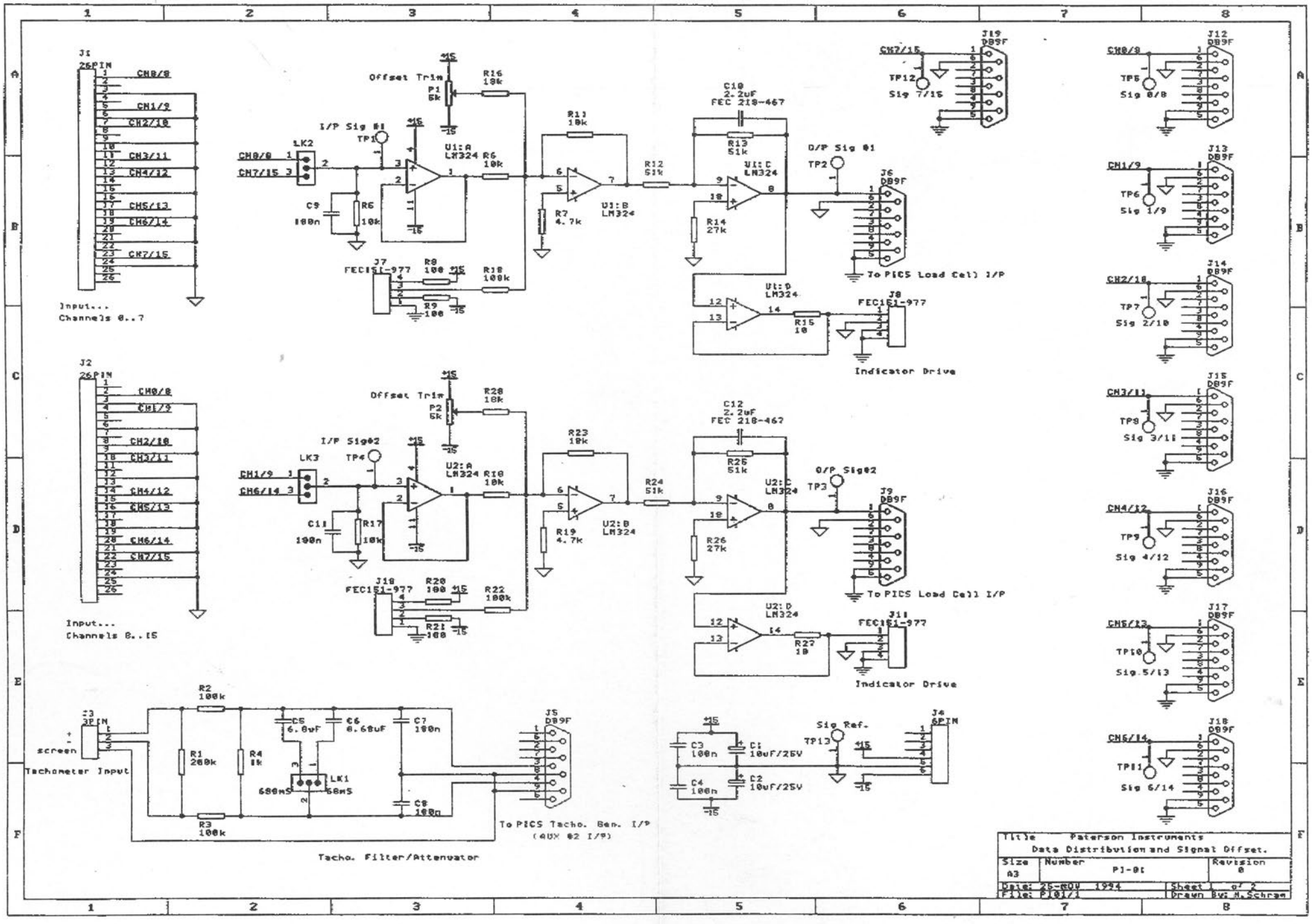
Title	PATERSON INSTRUMENTS	
HPT Testing Machine MKII/Load Cell Pre-Amp		
Size A3	Number HPT/4/4	Revision 0
Date: 27-SEP 1994		Sheet 4 of 5
File: HPT4/4		Drawn By: A.F.


Channel 2 is not utilized.
Channels 1&2 Inputs
Channel 2 Input
CH2-S
CH2-D
Green
Blk
White
Blk
Yellow
D3
IN4004
D4
IN4004
+VRAIL
-VRAIL
ZD4 18V
ZD3 18V
R19 10R
R1 10R
R2 10R
Q3 2N5485/6
Q4 2N5485/6
Q1 2N5485/6
Q2 2N5485/6
A2 OP27G
A1 OP27G
A3 OP27G (no op amp in ours)
C10 470nF
C1 470nF
C7 10uF
C2 10uF
C6 10uF
C5 10uF
C8 100pF
C4 100pF
C9 1uF
C3 1uF
C13 100pF
C12 10uF/25V
C11 10uF/25V
R14 22R
R8 22R
R23 22R
R17 100K
R3 100K
R16 2k4
R4 2k4
R13 SOT
R10 SOT
R20 SOT for 1mA
R9 SOT for 1mA
for gain of10
R15 22k
R5 22k
R18 10R
R21 10
R24 10k
R27 10k
R26 10k
R25 9.6k
RV3 1k
R22 10
R12 430R
R11 430R
R6 430R
R7 430R
VR2 500R
VR1 100K
Zero bridge
T2
T1
Z=10K
5Khz Excitation Z=4K
CH1-EXC-A
CH1-EXC-B
CH2-EXC-A
CH2-EXC-B
UTC Transformer
0-19 100-20Khz
Max Level +20dbm
TP1
TP2
TP3
TP4
AN. REF
GRN
CH1-OUT
CH2-OUT
(CH2-CH1)
CMRR Trim.
BLU
CH1 O/P
J3 DB9F
J2 DB9F
J1 EURO15
CH1-OUT 4Z Grey
CH1-EXC-A 8Z Wht
CH2-OUT 12Z
CH2-EXC-A 16Z
20Z
24Z
28Z
32Z
6D Blue
10D CH1-EXC-B Wht.
14D
18D CH2-EXC-B
22D (CH2-CH1)
26D +12 Red
30D Grn
-12 Blk
Q1 and Q2 gain matched.
Q3 and Q4 gain matched.
SOT = select on test
Title PATERSON INSTRUMENTS
Dual High-Z Pre Amplifier
Size A3
Number PI-002
Revision 0
Date: 25-NOV 1994
Sheet 4 of 5
File: PRE-AMP/1
Drawn By: A.F./N.S.

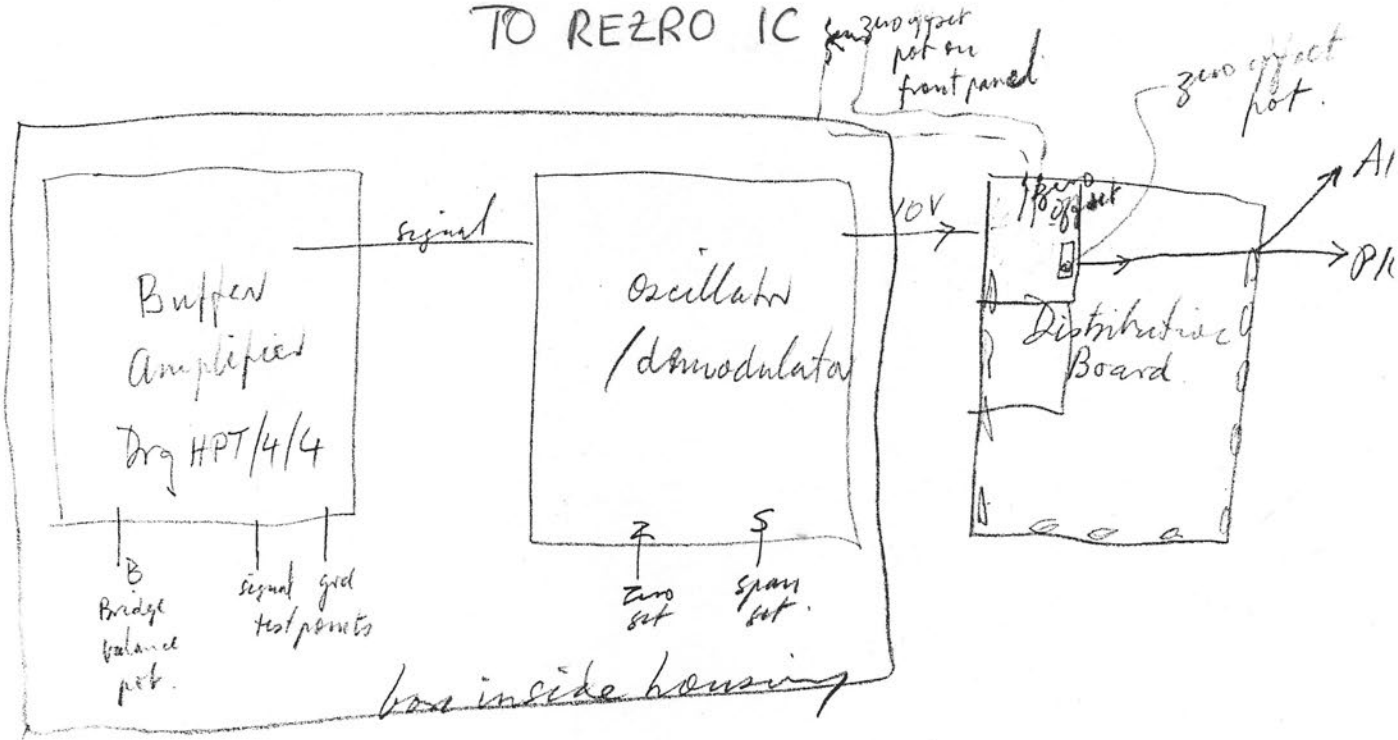

D3
IN4004
+VRAIL
ZD4 18V
R19 10R
C7 10uF
Q3 2N5485/6
Channels 1&2 Inputs
J3 DB9F
CH2-S
CH2-D
C10 470nF
A2 OP270
R14 22R
C9 1uF
TP1
CH1-OUT
Q4 2N5485/6
R17 100K
C8 100pF
R20 SOT For 1mA
R13 SOT
R16 2k
for gain of 10
R15 22k
TP2
C6 10uF
R18 10R
-VRAIL
ZD3 18V
D4
IN4004
+12
-12
R12 430R
T2
CH1-EXC-A
VR2 500R
R11 430R
Z=10K
5Khz Excitation Z=4K
Zero bridge
CH1-EXC-B
UTC Transformer 8-19 100-20Khz Max Level +20dbm
+VRAIL
R1 10R
C2 10uF
Q1 2N5485/6
Channel 2 Input
J2 DB9F
CH2-S
CH2-D
C1 470nF
A1 OP270
R8 22R
TP2
C3 1uF
CH2-OUT
R3 100K
C4 100pF
Q2 2N5485/6
R9 SOT For 1mA
R10 SOT
R4 2k
for gain of 10
R5 22k
R2 10R
C5 10uF
-VRAIL
R6 430R
T1
CH2-EXC-A
VR1 100K
R7 430R
Z=10K
5Khz Excitation Z=4K
Zero bridge
CH2-EXC-B
UTC Transformer 8-19 100-20Khz Max Level +20dbm
J1 CURDIS
CH1-OUT 4Z
Grey
CH1-EXC-A 8Z
Wht
CH2-OUT 12Z
CH2-EXC-A 16Z
28Z
24Z
28Z
32Z
6D Blue
10D CH1-EXC-B
Wht.
14D
18D CH2-EXC-B
22D (CH2-CH1)
26D +12 Red
28Z -12 Blk
30D Grn
+VRAIL
R21 10
R24 18k
C12 10uF/25V
C13 100pF
TP4
R27 10k
CH1-OUT
CH2-OUT
R26 10k
R23 22R
(CH2-CH1)
A3 OP270
R25 9.6k
RV3 1k
R22 10
C11 10uF/25V
-VRAIL
CMRR Trim.
Q1 and Q2 gain matched.
Q3 and Q4 gain matched.
SOT = select on test
Title PATERSON INSTRUMENTS
Dual High-Z Pre Amplifier
Size A3
Number PI-002
Revision B
Date: 25-NOV 1994
File: PRE-AMP/1
Sheet 4 of 5
Drawn By: A.F./N.S.


J1
26PIN
CH0/8
CH1/9
CH2/10
CH3/11
CH4/12
CH5/13
CH6/14
CH7/15
Input...
Channels 0..7
J2
26PIN
CH0/8
CH1/9
CH2/10
CH3/11
CH4/12
CH5/13
CH6/14
CH7/15
Input...
Channels 8..15
Offset Trim
P1
5k
R16
18k
I/P Sig #1
TP1
LK2
CH0/8
CH7/15
U1:A
LM324
R6
10k
C9
100n
R5
10k
J7
FEC151-977
R8
100
R9
100
R10
100k
R11
10k
R7
4.7k
U1:B
LM324
C10
2.2uF
FEC 218-467
R13
51k
R12
51k
U1:C
LM324
R14
27k
O/P Sig #1
TP2
J6
DB9F
To PICS Load Cell I/P
U1:D
LM324
R15
10
J8
FEC151-977
Indicator Drive
Offset Trim
P2
5k
R28
18k
I/P Sig#2
TP4
LK3
CH1/9
CH6/14
U2:A
LM324
R18
10k
C11
100n
R17
10k
J10
FEC151-977
R20
100
R21
100
R22
100k
R23
10k
R19
4.7k
U2:B
LM324
C12
2.2uF
FEC 218-467
R25
51k
R24
51k
U2:C
LM324
R26
27k
O/P Sig#2
TP3
J9
DB9F
To PICS Load Cell I/P
U2:D
LM324
R27
10
J11
FEC151-977
Indicator Drive
J3
3PIN
+
-
screen
Tachometer Input
R2
100k
R1
200k
R4
1k
R3
100k
C5
6.8uF
C6
0.68uF
C7
100n
C8
100n
LK1
680mS
68mS
J5
DB9F
To PICS Tacho. Gen. I/P
(AUX #2 I/P)
Tacho. Filter/Attenuator
C3
100n
C4
100n
C1
10uF/25V
C2
10uF/25V
Sig Ref.
TP13
J4
6PIN
J19
DB9F
CH7/15
TP12
Sig 7/15
J12
DB9F
CH0/8
TP5
Sig 0/8
J13
DB9F
CH1/9
TP6
Sig 1/9
J14
DB9F
CH2/10
TP7
Sig 2/10
J15
DB9F
CH3/11
TP8
Sig 3/11
J16
DB9F
CH4/12
TP9
Sig 4/12
J17
DB9F
CH5/13
TP10
Sig 5/13
J18
DB9F
CH6/14
TP11
Sig 6/14
Title
Paterson Instruments
Data Distribution and Signal Offset.
Size
A3
Number
PI-01
Revision
0
Date: 25-NOV 1994
Sheet 1 of 2
File: PI01/1
Drawn By: N.Schram


J1
26PIN
CH0/8
CH1/9
CH2/10
CH3/11
CH4/12
CH5/13
CH6/14
CH7/15
Input...
Channels 0..7
J2
26PIN
CH0/8
CH1/9
CH2/10
CH3/11
CH4/12
CH5/13
CH6/14
CH7/15
Input...
Channels 8..15
Offset Trim
P1
5k
R16
10k
I/P Sig #1
TP1
LK2
CH0/8
CH7/15
U1:A
LM324
R6
10k
C9
100n
R6
10k
J7
FEC151-977
R8
100
R9
100
R18
100k
R11
10k
R7
4.7k
U1:B
LM324
R12
51k
C10
2.2uF
FEC 218-467
R13
51k
U1:C
LM324
R14
27k
O/P Sig #1
TP2
J6
DB9F
To PICS Load Cell I/P
U1:D
LM324
R15
10
J8
FEC151-977
Indicator Drive
Offset Trim
P2
5k
R28
10k
I/P Sig#2
TP4
LK3
CH1/9
CH6/14
U2:A
LM324
R10
10k
C11
100n
R17
10k
J10
FEC151-977
R20
100
R21
100
R22
100k
R23
10k
R19
4.7k
U2:B
LM324
R24
51k
C12
2.2uF
FEC 218-467
R25
51k
U2:C
LM324
R26
27k
O/P Sig#2
TP3
J9
DB9F
To PICS Load Cell I/P
U2:D
LM324
R27
10
J11
FEC151-977
Indicator Drive
R2
100k
J3
3PIN
screen
Tachometer Input
R1
200k
R4
8k
C5
6.8uF
C6
0.68uF
C7
100n
LK1
680mS
68mS
C8
100n
R3
100k
J5
DB9F
To PICS Tacho. Gen. I/P
(AUX #2 I/P)
Tacho. Filter/Attenuator
C3
100n
C4
100n
C1
10uF/25V
C2
10uF/25V
Sig Ref.
TP13
J4
6PIN
J19
DB9F
CH7/15
TP12
Sig 7/15
J12
DB9F
CH0/8
TP5
Sig 0/8
J13
DB9F
CH1/9
TP6
Sig 1/9
J14
DB9F
CH2/10
TP7
Sig 2/10
J15
DB9F
CH3/11
TP8
Sig 3/11
J16
DB9F
CH4/12
TP9
Sig 4/12
J17
DB9F
CH5/13
TP10
Sig.5/13
J18
DB9F
CH6/14
TP11
Sig 6/14
Title
Paterson Instruments
Data Distribution and Signal Offset.
Size
A3
Number
P1-01
Revision
0
Date: 25-NOV 1994
Sheet 1 of 2
File: P101/1
Drawn By: M.Schram


J1
26PIN
CH0/8
CH1/9
CH2/10
CH3/11
CH4/12
CH5/13
CH6/14
CH7/15
Input...
Channels 0..7
J2
26PIN
CH0/8
CH1/9
CH2/10
CH3/11
CH4/12
CH5/13
CH6/14
CH7/15
Input...
Channels 8..15
Offset Trim
P1
5k
R16
10k
I/P Sig #1
TP1
LK2
U1:A
LM324
R6
10k
C9
100n
R5
10k
J7
FEC151-977
R8
100
R18
100k
R9
100
R11
10k
R7
4.7k
U1:B
LM324
R12
51k
C10
2.2uF
FEC 218-467
R13
51k
U1:C
LM324
R14
27k
O/P Sig #1
TP2
J6
DB9F
To PICS Load Cell I/P
U1:D
LM324
R15
10
J8
FEC151-977
Indicator Drive
CH7/15
TP12
Sig 7/15
J19
DB9F
CH0/8
TP5
Sig 0/8
J12
DB9F
CH1/9
TP6
Sig 1/9
J13
DB9F
CH2/10
TP7
Sig 2/10
J14
DB9F
CH3/11
TP8
Sig 3/11
J15
DB9F
CH4/12
TP9
Sig 4/12
J16
DB9F
CH5/13
TP10
Sig.5/13
J17
DB9F
CH6/14
TP11
Sig 6/14
J18
DB9F
Offset Trim
P2
5k
R20
10k
I/P Sig#2
TP4
LK3
U2:A
LM324
R10
10k
C11
100n
R17
10k
J10
FEC151-977
R20
100
R22
100k
R21
100
R23
10k
R19
4.7k
U2:B
LM324
R24
51k
C12
2.2uF
FEC 218-467
R25
51k
U2:C
LM324
R26
27k
O/P Sig#2
TP3
J9
DB9F
To PICS Load Cell I/P
U2:D
LM324
R27
10
J11
FEC151-977
Indicator Drive
J3
3PIN
screen
Tachometer Input
R2
100k
R1
200k
R4
8k
R3
100k
C5
6.8uF
C6
6.8uF
C7
100n
C8
100n
LK1
68mS
68mS
J5
DB9F
To PICS Tacho. Sen. I/P
(AUX #2 I/P)
Tacho. Filter/Attenuator
+15
C3
100n
C1
10uF/25V
C4
100n
C2
10uF/25V
-15
Sig Ref.
TP13
J4
6PIN
Title
Paterson Instruments
Data Distribution and Signal Offset.
Size
A3
Number
PI-01
Revision
0
Date: 25-NOV 1994
Sheet 1 of 2
File: PI01/1
Drawn By: M.Schram

TO REZRO IC

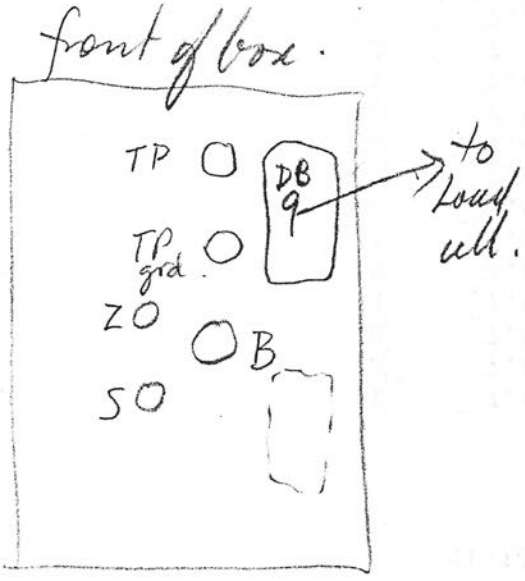


(1) Balance bridge at B, using AC mVmeter & oscilloscope

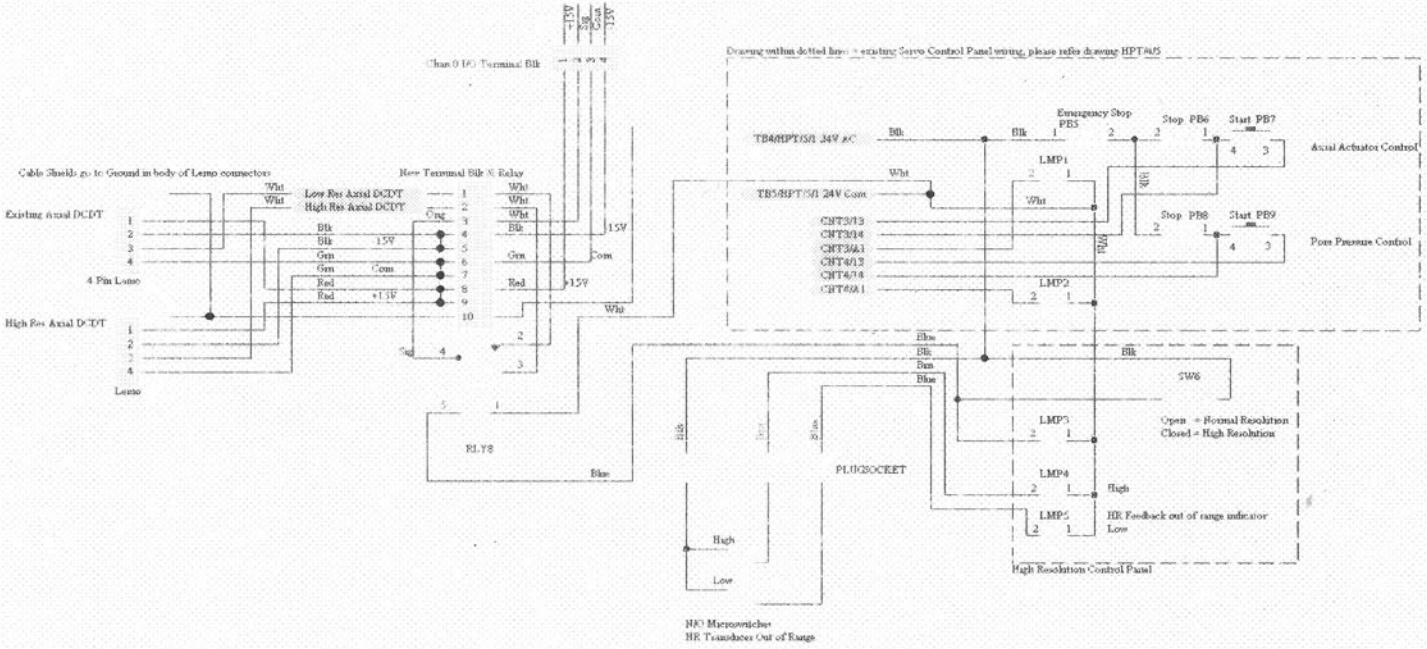
(2) Set front panel offset pot to 500

(3) Adjust offset pot on distribution board to give zero AIC mVmeter reading

(4) Adjust zero offset in PICS to also give zero PICS reading if necessary



Chan 0 Terminal Block is Located on the Analog Devices Signal Conditioning Board and along with Chan's 1 and 2 has the +& -15V hard wired under board to terminals as shown. 4 to 20mA terminals on these chanels have also been straped to Voltage O/P points under board. These terminals are used to repeat signals to front panel Digital Meters



CAUTION

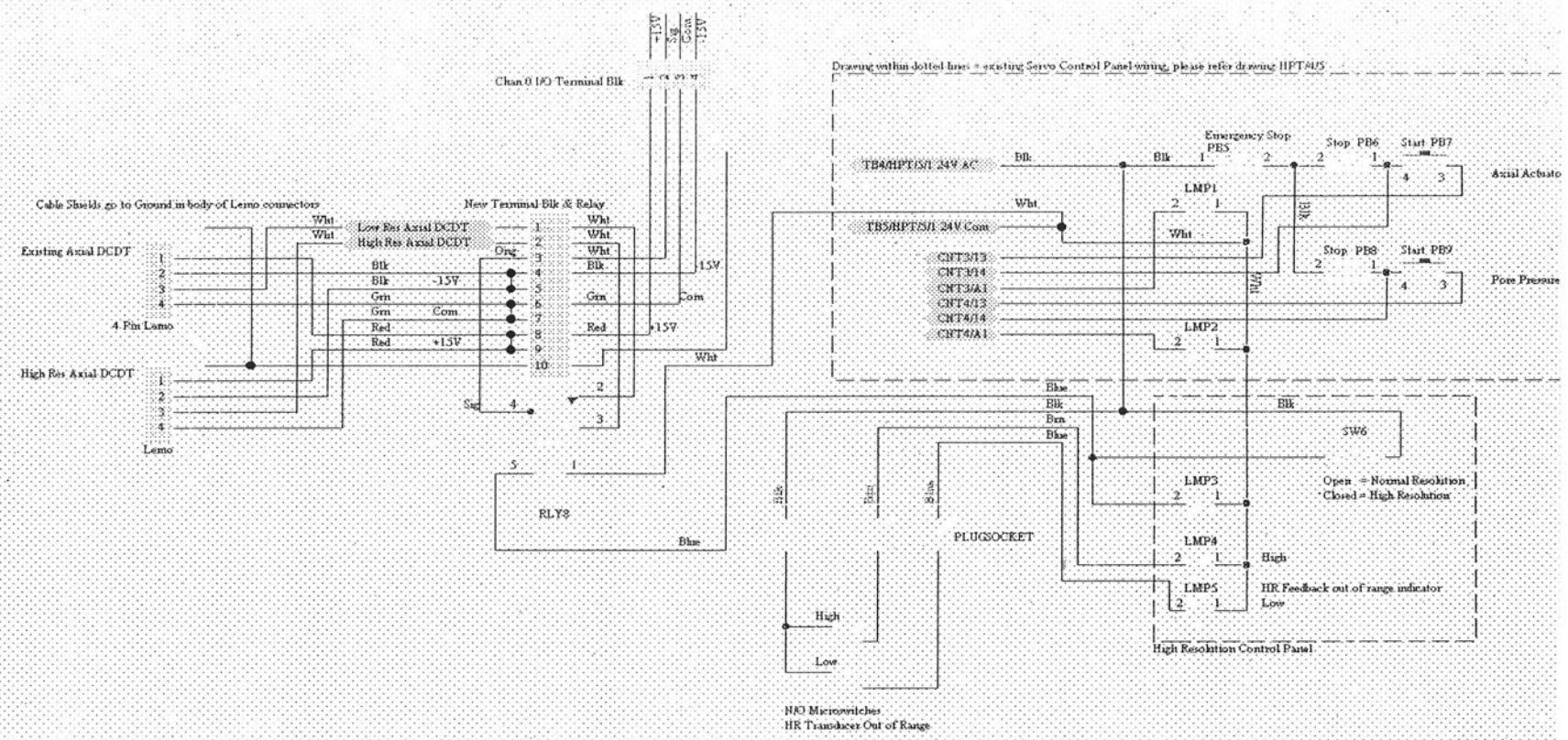
PLEASE TAKE EXTREME CARE WHEN CONNECTING THE +&- 15V TO THE DCDT'S (High and Low Res Axial). MAKE ABSOLUTELY SURE THE +15V IS ON CONNECTIONS 8 & 9 OF THE NEW TERMINAL BLOCK, COM ON 5 & 6 AND -15V ON 4 & 5. THEN CONNECT THE WIRES FROM EACH DCDT RED TO 8 & 9, GREEN TO 6 & 7 AND BLACK TO 4 & 5.

FAILURE TO OBSERVE THESE PRECAUTIONS WILL RESULT IN THE INSTANT DEMISE OF THE DCDT'S, RECOVERABLE ONLY BY LARGE EXTRACTIONS FROM THE HIP POCKET.

The common connection to RLY8 (Wht wire) is taken from a convenient point on existing Servo Control Panel, as is the 24V AC (Blk wire) to SW6 and High Low Microswitches

Title	PATERSON INSTRUMENTS HPT Testing Machine MKII. High Resolution DCDT Wiring	
Size: A3	Number: **HPT/5/6**	Revision:
Date: 26-Sep-1995		Sheet 6 of 6
File: D:\ADVSCH\FILES\HPT5_6.SCH		Drawn By: S F

Chan 0 Terminal Block is Located on the Analog Devices Signal Conditioning Board and along with Chan's 1 and 2 has the +&-15V hard wired under board to terminals as shown. 4 to 20mA terminals on these chanels have also been straped to Voltage O/P points under board. These terminals are used to repeat signals to front panel Digital Meters.



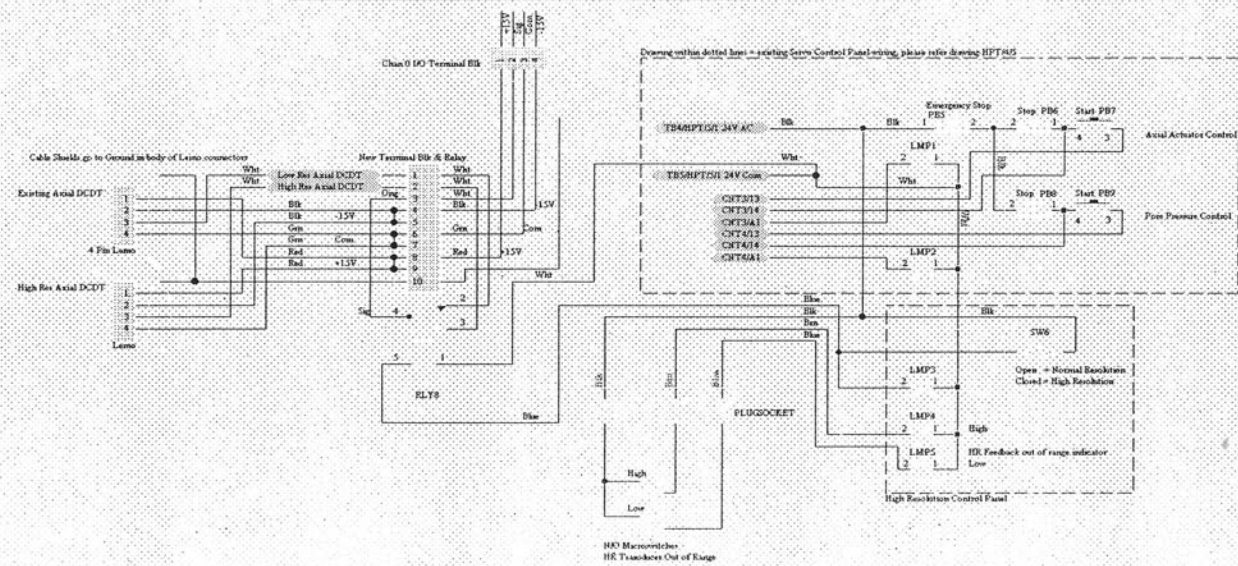
CAUTION

PLEASE TAKE EXTREME CARE WHEN CONNECTING THE +&- 15V TO THE DCDT'S (High and Low Res Axial). MAKE ABSOLUTELY SURE THE +15V IS ON CONNECTIONS 8 & 9 OF THE NEW TERMINAL BLOCK, COM ON 5 & 6 AND -15V ON 4 & 5. THEN CONNECT THE WIRES FROM EACH DCDT RED TO 8 & 9, GREEN TO 6 & 7 AND BLACK TO 4 & 5

FAILURE TO OBSERVE THESE PRECAUTIONS WILL RESULT IN THE INSTANT DEMISE OF THE DCDT'S, RECOVERABLE ONLY BY LARGE EXTRACTIONS FROM THE HIP POCKET

Title PATERS
HPT Testing

Chan 0 Terminal Block is Located on the Analog Devices Signal Conditioning Board and along with Chan's 1 and 2 has the +&-15V hard wired under board to terminals as shown. 4 to 20mA terminals on these chanels have also been straped to Voltage O/P points under board. These terminals are used to repeat signals to front panel Digital Meters.



CAUTION

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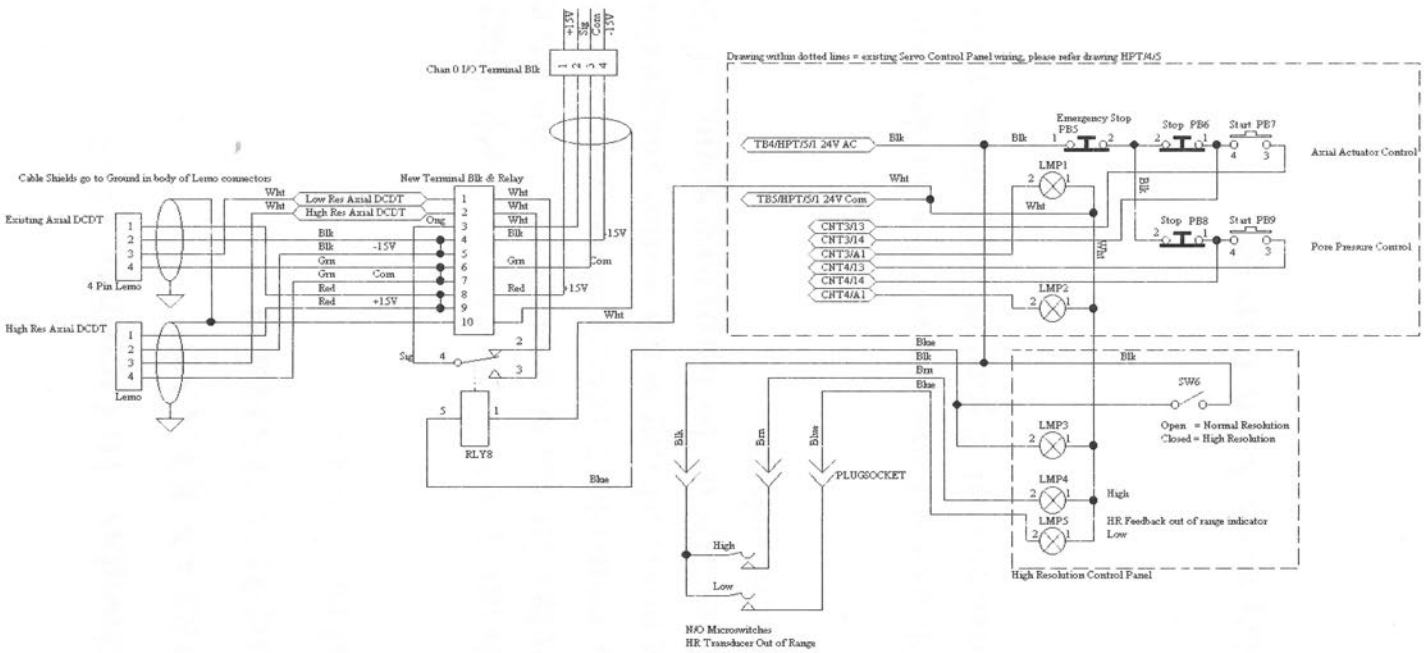
The common connection to RLY8 (Wht wire) is taken from a convenient point on existing Servo Control Panel, as is the 24V AC (Blk wire) to SW6 and High Low Microswitches

Title	PATERSON INSTRUMENTS HPT Testing Machine MKII High Resolution DCDT Wiring
Size: A3	Number: HPT/5/6	Revision:
Date: 26 Sep 1995	Sheet 6 of 6
File: [illegible]	Drawn By: A.F.

Chan 0 Terminal Block is Located on the Analog Devices Signal Conditioning Board and along with Chan's 1 and 2 has the +&-15V hard wired under board to terminals as shown. 4 to 20mA terminals on these channels have also been straped to Voltage O/P points under board. These terminals are used to repeat signals to front panel Digital Meters.



CAUTION

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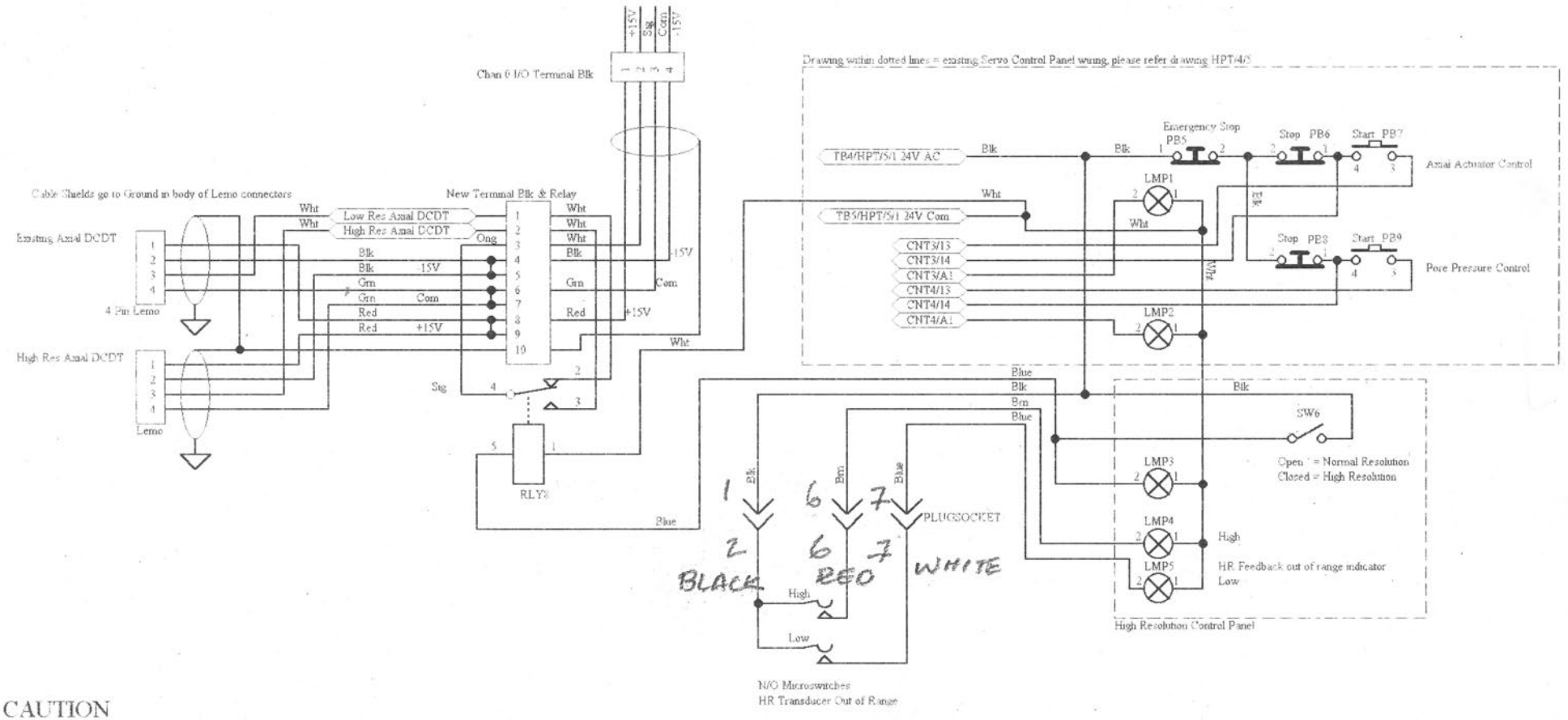
The common connection to RLY8 (Wht wire) is taken from a convenient point on existing Servo Control Panel, as is the 24V AC (Blk wire) to SW6 and High Low Microswitches.

Title	PATERSON INSTRUMENTS HPT Testing Machine MKII High Resolution DCDT Wiring		
Size A3	Number **HPT/5/6**		Revision
Date	16-Oct-1995	Sheet 6 of 6	
File	D:\ADVSCH\FILES\HPT5_6.SCH	Drawn By: A F	

Chan 0 Terminal Block is Located on the Analog Devices Signal Conditioning Board and along with Chan's 1 and 2 has the +&-15V hard wired under board to terminals as shown. 4 to 20mA terminals on these chanels have also been straped to Voltage O/P points under board. These terminals are used to repeat signals to front panel Digital Meters.



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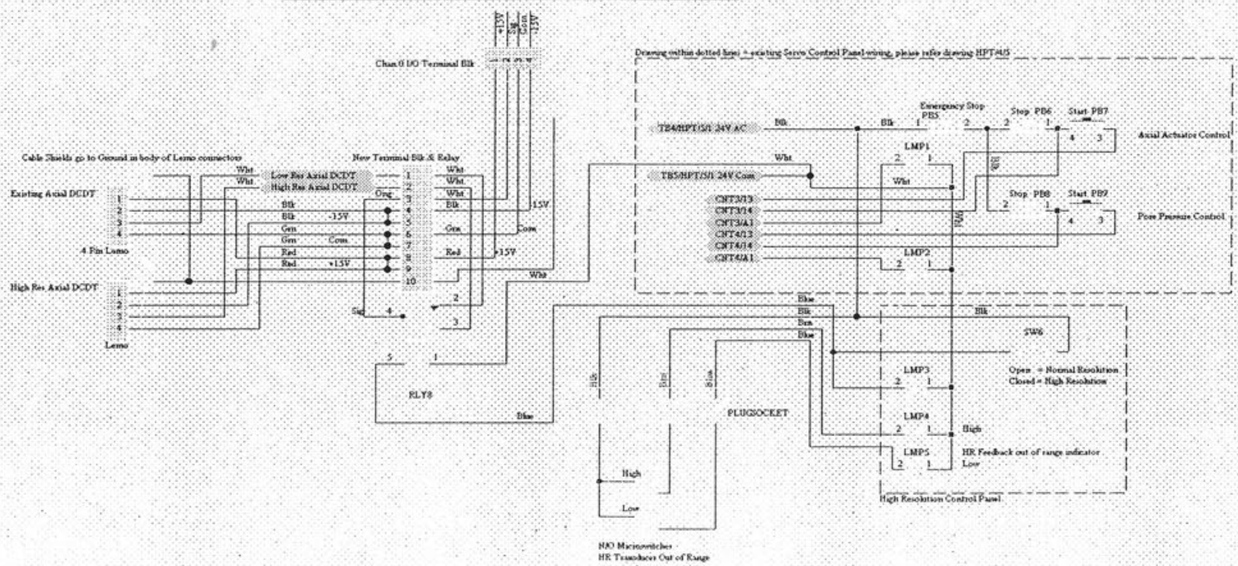
FAILURE TO OBSERVE THESE PRECAUTIONS WILL RESULT IN THE INSTANT DEMISE OF THE DCDT'S, RECOVERABLE ONLY BY LARGE EXTRACTIONS FROM THE HIP POCKET.
The common connection to RLY8 (Wht wire) is taken from a convenient point on existing Servo Control Panel, as is the 24V AC (Blk wire) to SW6 and High Low Microswitches.

Title	PATERSON INSTRUMENTS HPT Testing Machine MKII High Resolution DCDT Wiring		
Size A4	Number **HPT/5/6**		Revision
Date	23-Oct-1995	Sheet 6 of	6
File	D:\ADVSCH\FILES\HPT5_6.SCH	Drawn By	A F

Chan 0 Terminal Block is Located on the Analog Devices Signal Conditioning Board and along with Chan's 1 and 2 has the +&-15V hard wired under board to terminals as shown. 4 to 20mA terminals on these chanels have also been straped to Voltage O/P points under board. These terminals are used to repeat signals to front panel Digital Meters.



CAUTION

PLEASE TAKE EXTREME CARE WHEN CONNECTING THE +& -15V TO THE DCDT'S (High and Low Res Axial). MAKE ABSOLUTELY SURE THE +15V IS ON CONNECTIONS 8 & 9 OF THE NEW TERMINAL BLOCK, COM ON 5 & 6 AND -15V ON 4 & 5. THEN CONNECT THE WIRES FROM EACH DCDT RED TO 8 & 9, GREEN TO 6 & 7 AND BLACK TO 4 & 5

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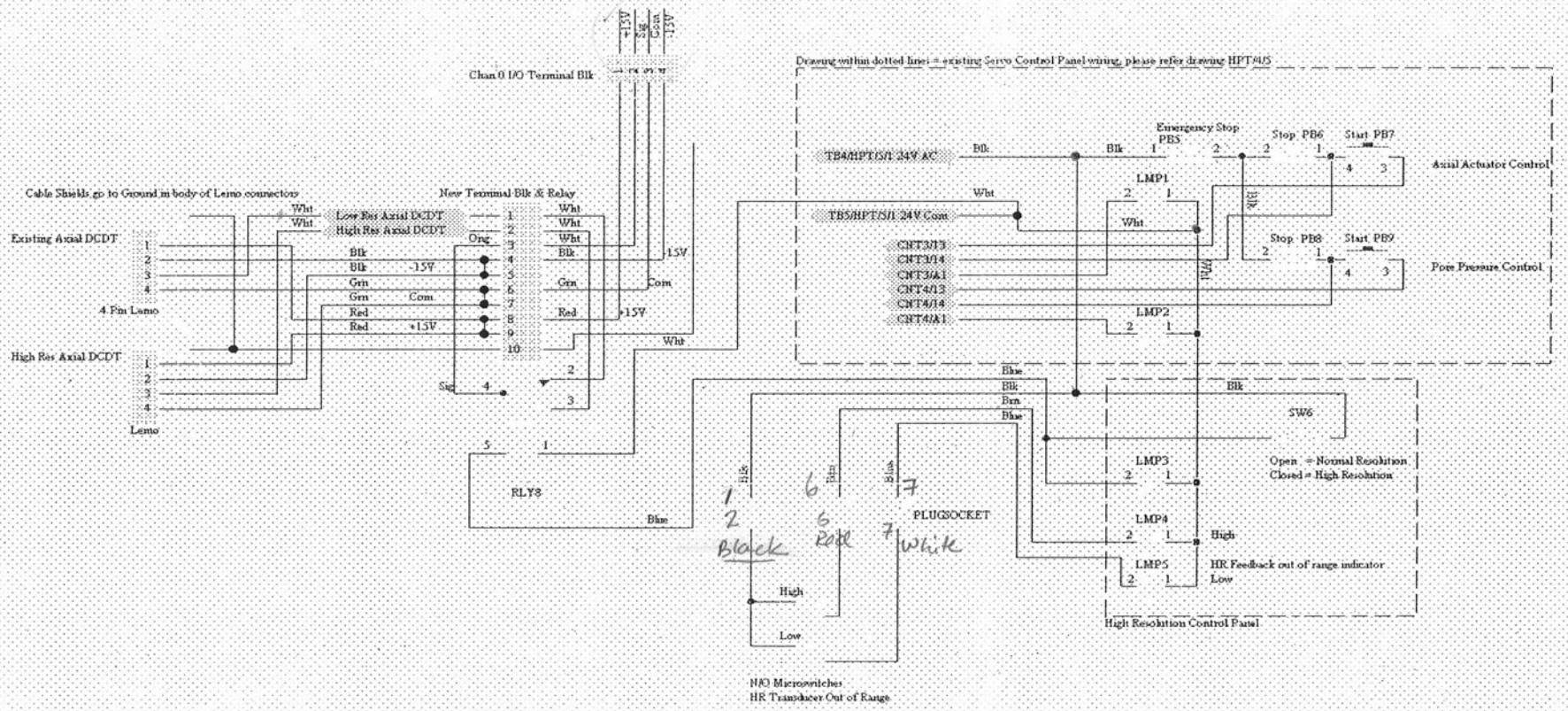
Title	PATERSON INSTRUMENTS HPT Testing Machine MKII High Resolution DCDT Wiring
Size: A3	Number: HPT/5/6	Revision:
Date: 26 Sep 1995	Sheet 6 of 6
File:	Drawn By: A.F.

Chan 0 Terminal Block is Located on the Analog Devices Signal Conditioning Board and along with Chan's 1 and 2 has the +&- 15V hard wired under board to terminals as shown. 4 to 20mA terminals on these chanels have also been straped to Voltage O/P points under board. These terminals are used to repeat signals to front panel Digital Meters.



CAUTION

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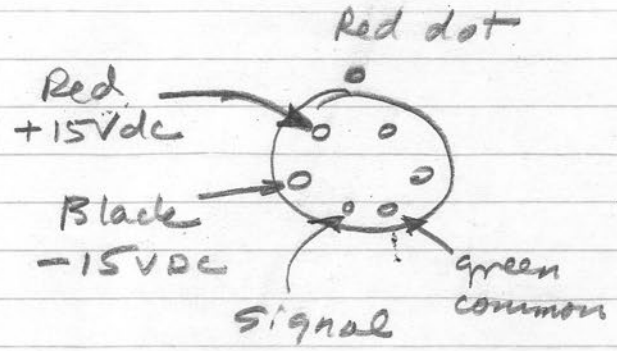
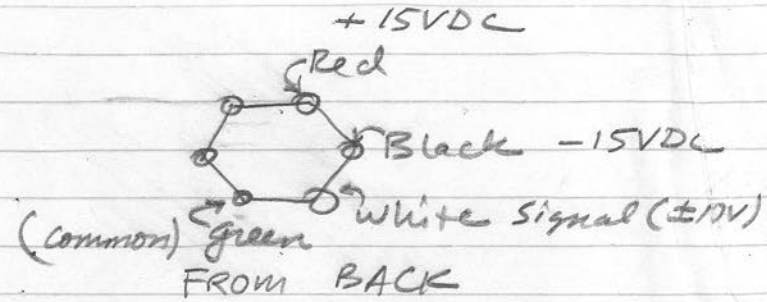




High resolution

DCDT

received from MSP 21SEP95

NOTES ON THE INSTALLATION AND USE OF THE HIGH-RESOLUTION DCDT FOR AXIAL DISPLACEMENT MEASUREMENT AND CONTROL

INSTALLATION

Mount the switch panel on the platform frame immediately above the actuator switch panel and PICS. Mount the relay and connector board in an appropriate place for making the connections to the transducers. In the case of the Potsdam machine, this place will be on the inside wall of the instrument compartment, on the platform side, at the same level as the meters. In the case of the MIT machine, it will be adjacent to the Analog Devices transducer conditioning board, possibly most conveniently on the inside of the back panel underneath the platform.

Mount the unit on the side of the yoke using two M6 screws and remove the retaining pin in the core extension so as to allow the core to register on the bottom side of the pressure vessel. Then attach the flexible drives to the two shafts projecting on the LH side of the unit. The lower drive serves for remote positioning of the unit and the upper one for locking it in position. The other ends of the flexible drives are to be mounted with suitable clamps on the side of the housing just below the level of the desk so that they can be manipulated while observing the positioning lights on the switch panel. It will be necessary to cut a slot in the top of the panel enclosing the lower side of the machine in order to accommodate the flexible drives. The flexible cables will enter the high pressure enclosure through the vent between the intensifier and the wall, and curve around the intensifier.

The leads that at present go from the actuator DCDT to the POSITION meter (in the Potsdam case) or to the Analog Devices board (in the MIT case) have to be redirected to the connector board and new leads run from the connector board to the meter or AD board, respectively, according to the wiring diagram supplied. The other leads from the connector board go to the switch panel. A 24 V ac supply line are shown in the diagram being taken from the existing actuator switch panel to the new switch panel but this can be taken from anywhere convenient. It is very important in connecting up to ensure that the polarity of the supply to the DCDT's be preserved as at present since reversal of the supply to DCDT tends to destroy it (there seems to be no inbuilt protection in the Schaevitz units).

Note that the Schaevitz 050 DC-E DCDT (range ±1.25 mm) is mounted with its leads emerging from the top end in order to give the same output polarity as the output from the actuator DCDT. The mounting unit has been dimensioned so that the next larger sized Schaevitz, the 125 DC-E DCDT with ±3.0 mm range, can alternatively be used if a 6 mm range is desired instead of the 2.5 mm range that the 050 DC-E gives, with corresponding reduction in resolution.

OPERATION

The HR DCDT unit is designed to enable the operation of the testing machine in axial displacement (AD) mode with a step size of axial displacement advance of 1/20 of that obtained using the actuator DCDT ouput as feedback, that is, 0.6 μm instead of 12μm. Finer resolution data logging is then also provided. Further, since the measurement is effectively made where the loading piston emerges from the pressure vessel, the apparatus distortion corrections will be reduced in magnitude. The piston travel available with control from the HR DCDT is 2,5 mm, corresponding to about 12% strain. The experiment is therefore normally limited to this amount of displacement. If more is required, it will be necessary to interrupt the experiment, re-position the HR DCDT unit and repeat the operation, or install a DCDT of 6 mm range. However, it might be expected that with larger-strain experiments the actuator step size will be less critical and that therefore the normal actuator DCDT will be used for feedback and data logging.

In using the HR DCDT facility the following procedures should be followed and precautions observed:

1. Position the actuator where the experiment is to start. This is preferably done with the confining pressure and temperature conditions for the experiment already established and the piston position at or near the touchpoint. Note the absolute actuator position if required.

2. Position the HR DCDT unit so that its core is near the end of its range. This can be done using the flexible drives, first unclamping the unit with the upper drive and then moving it to the required position with the lower drive and finally clamping it again with the upper. The positioning lights on the switch panel, actuated by microswitches on the unit, are used for guidance. The microswitches must be set so that the respective lights are turned on when the core of the HR DCDT is at its upper and lower measuring limits (this setting will need to be done in the first set-up but, once done, will remain valid for other positions of the DCDT). In a compression test, the unit is moved down until the LOW light comes on and then moved back until the light is just extinguished again, ensuring that the whole of the linear range of 2.5 mm is available for the experiment.

3. With the actuator motor switched off (very important):

    (a). Turn the change-over switch on the switch panel to the HR DCDT position.

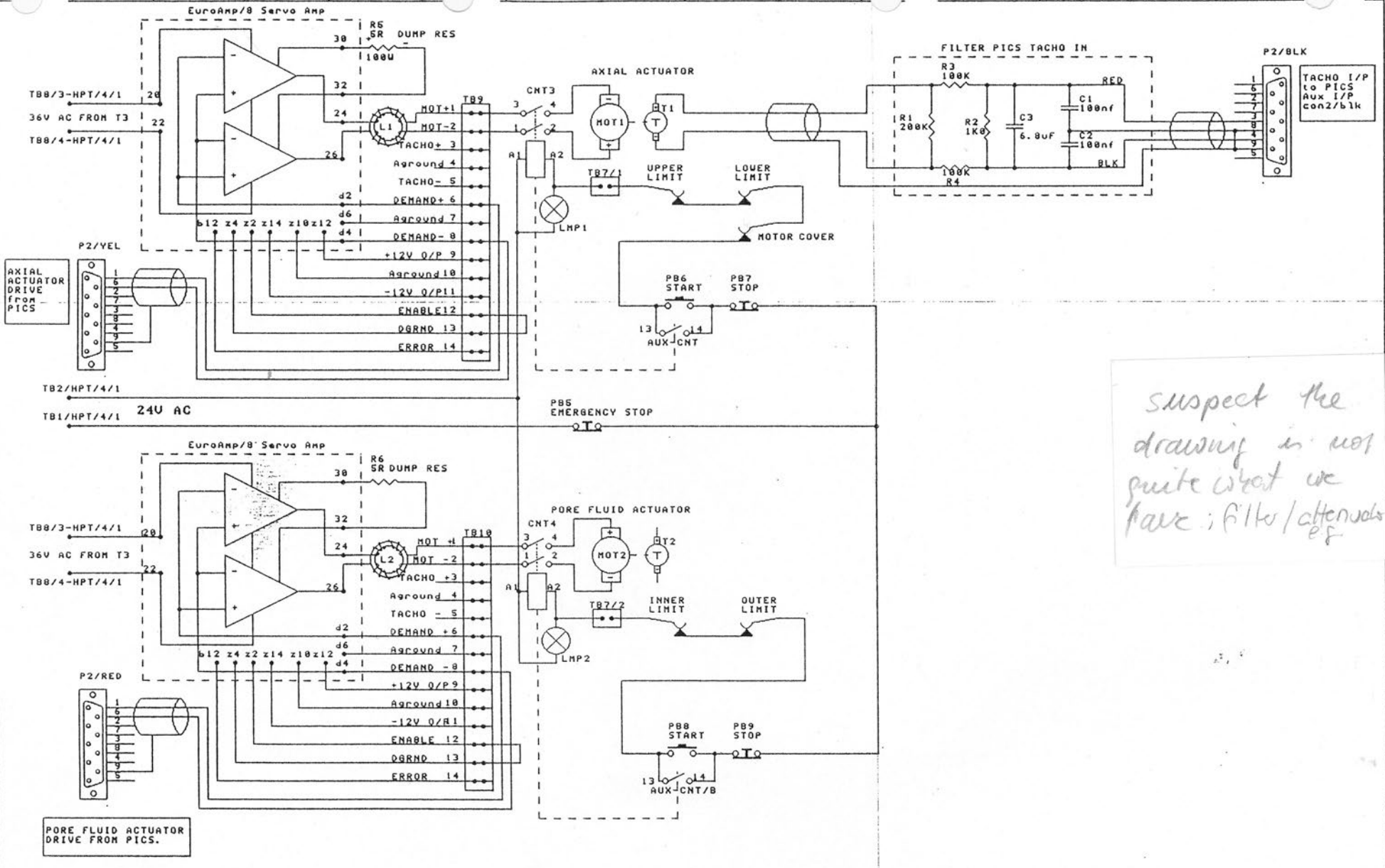
    (b). On the PICS AD status screen, select the CALIBRATION option and set the DCDT calibration to 2.5 mm.

    (c). Set the axial displacement limits as required; probably, 0 and 2.5 will normally be appropriate.

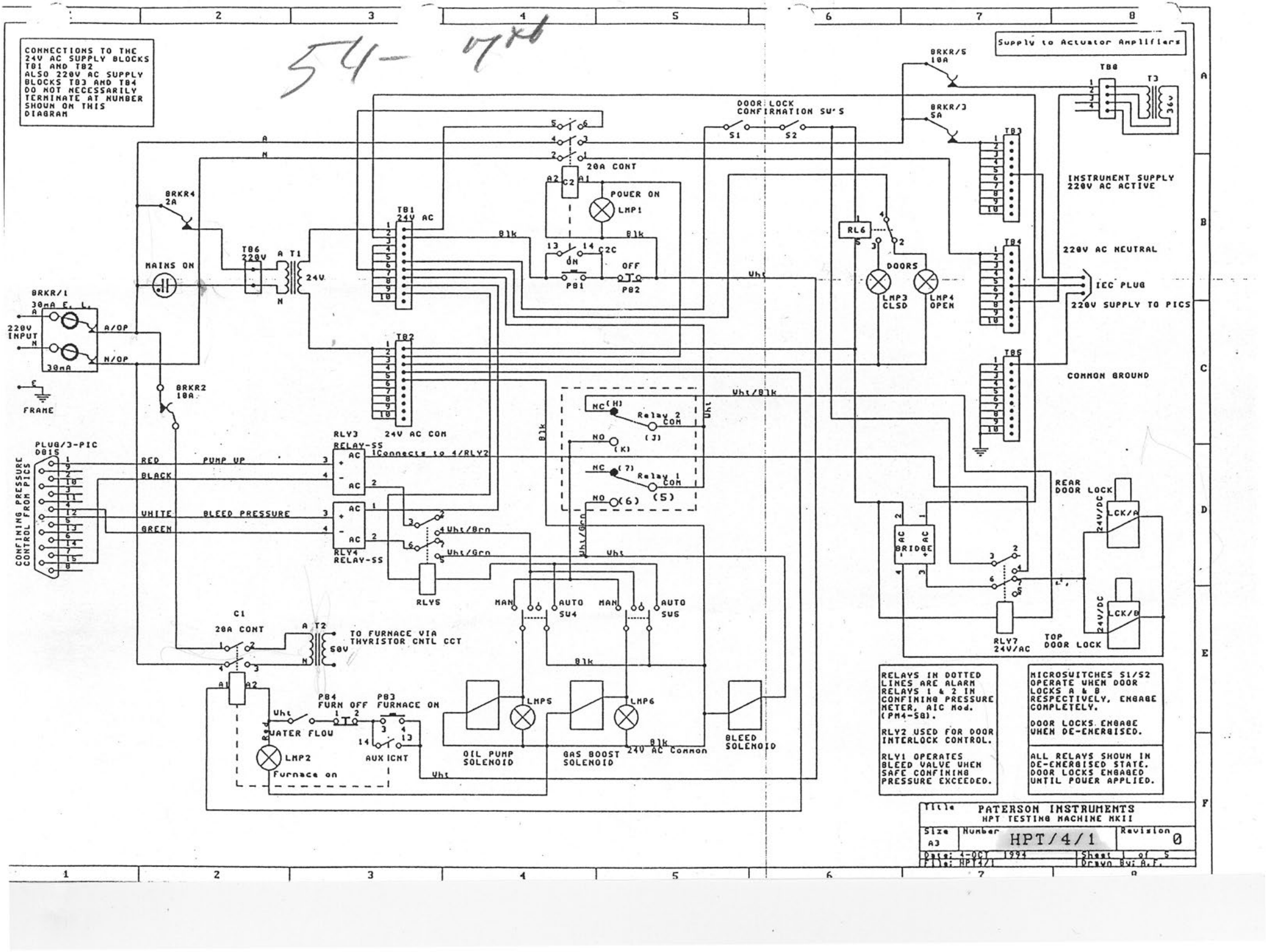
4. Now the actuator can be switched on and the experiment carried out in the normal way.

5. After switching back to the normal DCDT, the calibration setting in the PICS must be reset to 50 mm and new limits set.

Note that, with the HR DCDT switched in, the POSITION digital meter on the main panel will be reading in units of 1/20 mm, that is, the readings have to be divided by 20 to obtain the relative position in millimetres; this position will be relative to the new zero established by the positioning of the HR DCDT unit.



Title	PATERSON INSTRUMENTS HPT Testing Machine MKII/Servo Amps		
Size A3	Number HPT/4/5	Revision 0	
Date: 4-OCT 1994		Sheet 5 of 5	
File: HPT4/5		Drawn By:	


CONNECTIONS TO THE 24V AC SUPPLY BLOCKS TB1 AND TB2 ALSO 220V AC SUPPLY BLOCKS TB3 AND TB4 DO NOT NECESSARILY TERMINATE AT NUMBER SHOWN ON THIS DIAGRAM
54-
Supply to Actuator Amplifiers
BRKR/5 10A
BRKR/3 5A
TB0
T3
36V
DOOR LOCK CONFIRMATION SW'S
S1
S2
20A CONT
POWER ON
LMP1
TB1 24V AC
TB3
INSTRUMENT SUPPLY 220V AC ACTIVE
BRKR4 2A
TB6 220V
T1
24V
MAINS ON
Blk
Wht
RL6
DOORS
LMP3 CLSD
LMP4 OPEN
TB4
220V AC NEUTRAL
IEC PLUG
220V SUPPLY TO PICS
BRKR/1 30mA E. L.
220V INPUT
A/OP
N/OP
30mA
FRAME
TB2
TB5
COMMON GROUND
BRKR2 10A
Wht/Blk
RLY3 RELAY-SS
24V AC COM
(Connects to 4/RLY2)
NC (H)
Relay 2 COM
(J)
NO (K)
NC (7)
Relay 1 COM
(5)
NO (6)
PLUG/3-PIC DB15
CONFINING PRESSURE CONTROL FROM PICS
RED
PUMP UP
BLACK
WHITE
BLEED PRESSURE
GREEN
RLY4 RELAY-SS
Wht/Brn
Wht/Grn
RLY5
REAR DOOR LOCK
LCK/A
24V/DC
BRIDGE
RLY7 24V/AC
TOP DOOR LOCK
LCK/B
C1
20A CONT
T2
50V
TO FURNACE VIA THYRISTOR CNTL CCT
MAN
AUTO SU4
AUTO SU5
PB4 FURN OFF
PB3 FURNACE ON
WATER FLOW
LMP2
Furnace on
AUX ICNT
LMP5
LMP6
OIL PUMP SOLENOID
GAS BOOST SOLENOID
24V AC Common
BLEED SOLENOID
RELAYS IN DOTTED LINES ARE ALARM RELAYS 1 & 2 IN CONFINING PRESSURE METER, AIC Mod. (PM4-S8).
RLY2 USED FOR DOOR INTERLOCK CONTROL.
RLY1 OPERATES BLEED VALVE WHEN SAFE CONFINING PRESSURE EXCEEDED.
MICROSWITCHES S1/S2 OPERATE WHEN DOOR LOCKS A & B RESPECTIVELY, ENGAGE COMPLETELY.
DOOR LOCKS ENGAGE WHEN DE-ENERGISED.
ALL RELAYS SHOWN IN DE-ENERGISED STATE. DOOR LOCKS ENGAGED UNTIL POWER APPLIED.
Title
PATERSON INSTRUMENTS
HPT TESTING MACHINE MKII
Size A3
Number HPT/4/1
Revision 0
Date: 4-OCT 1994
File: HPT4/1
Sheet 1 of 5
Drawn By: A.F.

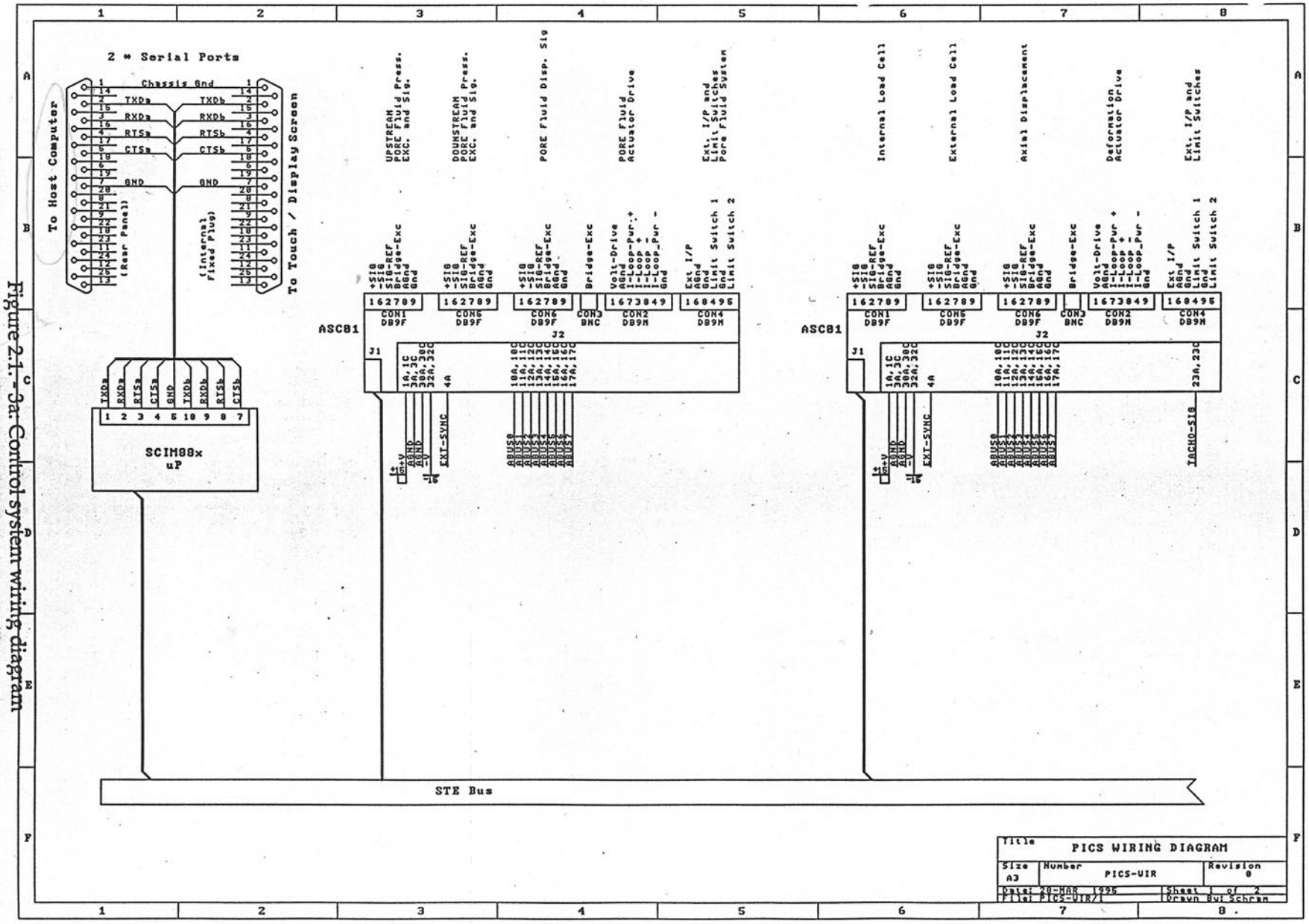


Figure 2.1 - 3a: Control system wiring diagram

MIT VOL MOTOR

Test certificate

Printed Motors

Printed Motors Limited
Bordon Trading Estate, Oakhanger Road, Bordon, Hampshire GU35 9HY
Telephone: 0420 473033. Telex: 858768. Fax: 0420 477640.

DELETE INAPPLICABLE TYPES:-
SERVO MOTOR/MOTOR TACHOGENERATOR/TACHOMETER/GENERAL PURPOSE MOTOR

WORKS ORDER NO. 26758/A
CATALOGUE NO. GM91009T-2244 **SERIAL NO.** 87980 **DATE** 12-7-94

Motor	K_E VOLTS/1000 RPM	C.W.		4·94
		A.C.W.		4·97
	K_D ~~OZ.INS~~ NCM/1000 RPM			1·08
	T_F ~~OZ.INS~~ NCM			2·08
	R_M OHMS			·183
	Direction of Rotation / End Float	Ins	·0001	Sig
			·0001	
	Shaft Runout	B.E. / C.E. INS. T.I.R.		·0004
				·0003
	Mounting Concentricity	INS. T.I.R.		·0008
	Perpendicularity Mounting Face	INS. T.I.R.		·0039
Insp. Stamp Both Copies	Insulation Resistance	⩾ 50 Megohms		Sig
	Insulation Resistance Tach/Motor Armature	⩾ 50 Megohms		Sig
Tacho	K_E Volts/1000 RPM	CW		
		ACW		
	Residual Ripple Peak/Peak Volts at 1000 RPM	CW		
		ACW		
Insp. Stamp Both Copies	Polarity			Sig
	Insulation Resistance	⩾ 50 Megohms		Sig

DEFINITIONS

K_E — Back EMF at 1000 RPM into meter of not less than 20 K OHMS per volt impedance.

K_D — Damping Constant at 1000 RPM.

T_F — Friction torque (at 50 RPM).

R_M — Terminal resistance measured by passing 5 AMPS DC from constant current source through motor and measuring volt drop across terminals at 50 RPM.

RESIDUAL RIPPLE. Measured through filter as specified on outline drawing at 1000 RPM on oscilloscope.

DIRECTION OF ROTATION. As specified on outline drawing.

POLARITY. As specified on outline drawing.

All tests carried out with motor/tacho under test at room ambient conditions.

Top copy — Inspection File.
2nd copy — Customers Inspection
3rd copy — Accounts/Sales

MIT ACTUATOR motor

Test certificate

Printed Motors

Printed Motors Limited
Bordon Trading Estate, Oakhanger Road, Bordon, Hampshire GU35 9HY
Telephone: 0420 473033. Telex: 858768. Fax: 0420 477640.

DELETE INAPPLICABLE TYPES:-
SERVO MOTOR/MOTOR TACHOGENERATOR/TACHOMETER/GENERAL PURPOSE MOTOR

WORKS ORDER NO. 20002 **CATALOGUE NO.** G9T-2 **SERIAL NO.** 86413 **DATE** 20-7-93

Motor	K_E VOLTS/1000 RPM	C.W.		
		A.C.W.		
	K_D OZ.INS/1000 RPM			
	T_F OZ.INS			
	R_M OHMS			
	Direction of Rotation / End Float	Ins		Sig
	Shaft Runout	B.E. / C.E. INS. T.I.R.		
	Mounting Concentricity	INS. T.I.R.		
	Perpendicularity Mounting Face	INS. T.I.R.		
Insp. Stamp Both Copies	Insulation Resistance	⩾ 50 Megohms		Sig
	Insulation Resistance Tach/Motor Armature	⩾ 50 Megohms		Sig
Tacho	K_E Volts/1000 RPM	CW		3.11
		ACW		3.09
	Residual Ripple Peak/Peak Volts at 1000 RPM	CW		.084
		ACW		.088
Insp. Stamp Both Copies	Polarity			Sig
	Insulation Resistance	⩾ 50 Megohms		Sig

DEFINITIONS

K_E — Back EMF at 1000 RPM into meter of not less than 20 K OHMS per volt impedance.

K_D — Damping Constant at 1000 RPM.

T_F — Friction torque (at 50 RPM).

R_M — Terminal resistance measured by passing 5 AMPS DC from constant current source through motor and measuring volt drop across terminals at 50 RPM.

RESIDUAL RIPPLE. Measured through filter as specified on outline drawing at 1000 RPM on oscilloscope.

DIRECTION OF ROTATION. As specified on outline drawing.

POLARITY. As specified on outline drawing.

All tests carried out with motor/tacho under test at room ambient conditions.

Top copy — Inspection File.
2nd copy — Customers Inspection
3rd copy — Accounts/Sales

Form INSP. 2

Motor volumometer ser # on metal 37980 stamped 94.
(82) 7980 (more
cat # GM9 109 T. 2244

tacho generator ser # 87816

cat ~~G9T2~~
G9T

1 psi = 0.0068948 MPa

MIT

CALIBRATION CERTIFICATION

PRECISE SENSORS, INC.
235 WEST CHESTNUT AVENUE
MONROVIA, CALIFORNIA 91016
(818) 358-4578

DOWNSTREAM

MODEL NO. 114-3-60,000-01-G-34-13-BE6

SENSITIVITY 2.984 mV/V
3.607 mV/V for 500 MPa

SERIAL NO. 42094

INPUT RESISTANCE 351 OHMS

EXCITATION 10 VDC

413.7 MPa
~~419.7 MPa~~

OUTPUT RESISTANCE 351 OHMS

PRESSURE RANGE 0-60000 PSIG

MOUNTING TORQUE 25 FT. LBS.

COOLANT INLET PRESSURE N/A

SHUNT CAL 80.75% OF F.S.O.

CERTIFICATION NO. 10-11801

CUSTOMER COLLINS & ASSOCIATES, INC.

CUSTOMER P.O. NO. 21387

INPUT PRESSURE % OF FULL SCALE	OUTPUT IN % INCREASING	DECREASING
0%	0.00	0.09
10%	10.23	10.64
20%	19.82	20.93
40%	39.57	40.12
60%	59.71	60.07
80%	79.82	80.02
100%	100.00	——

WIRING IDENTIFICATION

A	+SIGNAL
B	−SIGNAL
C	−EXCITATION
D	+EXCITATION
E	SHUNT
F	SHUNT

CALIBRATED BY RAUL NAVARRETTE

INSPECTED BY PSI 4

DATE 7-29-94

NOTE: Calibration performed at 72°F ±2°F unless otherwise noted. Calibration data as supplied are based on test performed on the values obtained with N.I.S.T. traceable laboratory standards.

FORM 233

MIT

TOP INDUSTRIE S.A.

INDIVIDUAL TECHNICAL SHEET

SENSOR TYPE : PR 851 C

SERIAL NUMBER : 34

PRESSURE RANGE : 7000 bar

GAUGE : Métallic

CALIBRATION

ALIMENTATION : 10 V TEMPERATURE : 22 °C

	PRESSURE	MESURE
1	0 bar	0 mV
2	3500 bar	5.426 mV
3	7000 bar	10.941 mV
4		
5	CRAN	5.287 mV
6	CRAN	3410 bar
7		
8		
9		

LIN-HYST : 0,40 % ISOLEMENT SOUS 50 V : 1000 M ohms

MANUFACTORING CONTROL :
Date : 16 juin 1994

FINAL QUALITY CONTROL :
Date : 16 juin 1994

PH. LAGRUE

ZAC "Le Plateau de Bière" - 200, avenue Ampère - BP 95 - 77193 DAMMARIE-LES-LYS CEDEX FRANCE
Tél. (1) 64 39 69 69 - Télécopie (1) 64 37 62 08

1 psi = 0.0068948 MPa

MTT

CALIBRATION CERTIFICATION

PRECISE SENSORS, INC.
235 WEST CHESTNUT AVENUE
MONROVIA, CALIFORNIA 91016
(818) 358-4578

MODEL NO. 114-3-60,000-01-G-34-13-BE6

UPSTREAM

SENSITIVITY 2.838 mV/V
3.430 for 500 MPa

SERIAL NO. 42095

INPUT RESISTANCE 351 OHMS

EXCITATION 10 VDC

413.7 MPa

OUTPUT RESISTANCE 351 OHMS

PRESSURE RANGE 0-60000 PSIG ~~413.7 MPa~~

MOUNTING TORQUE 25 FT. LBS.

COOLANT INLET PRESSURE N/A

SHUNT CAL 80.33% OF F.S.O.

CERTIFICATION NO. 10-11801

CUSTOMER COLLINS & ASSOCIATES, INC.

CUSTOMER P.O. NO. 21387

INPUT PRESSURE % OF FULL SCALE	OUTPUT IN % INCREASING	DECREASING
0%	0.00	0.04
10%	10.06	10.51
20%	19.66	20.52
40%	39.06	40.89
60%	59.18	60.83
80%	79.55	80.24
100%	100.00	——

WIRING IDENTIFICATION

A	+SIGNAL
B	−SIGNAL
C	−EXCITATION
D	+EXCITATION
E	SHUNT
F	SHUNT

CALIBRATED BY RAUL NAVARRETTE

INSPECTED BY PSI 4

DATE 7-29-94

NOTE: Calibration performed at 72°F ±2°F unless otherwise noted. Calibration data as supplied are based on test performed on the values obtained with N.I.S.T. traceable laboratory standards.

FORM 233

MIT (recal)

Transducer Techniques

PRECISION MEASUREMENT SYSTEMS

<<< CERTIFICATE OF CALIBRATION >>>

SERIAL NUMBER: 70744
SENSOR MODEL: SWP-20K
JOB NUMBER: 7687
TECHNICIAN: VL

DATE OF CALIBRATION: 05/26/94
DATE OF RECALIBRATION: 05/26/95

COMPRESSION LOAD LBS.	MV/V INC.	MV/V DEC.
0	0	0
10000 44.48 kN	1.2979	1.2976
20000 88.96 kN	2.5989	
100 kN	2.9214	
NON-LINEARITY	.06	PCT FS
NON-REPEATABILITY	-.02	PCT FS
HYSTERESIS	-.02	PCT FS

<< SHUNT CALIBRATION >>

PCT LOAD	LOAD LBS	SIGNAL MV/V	SHUNT K OHMS	SHUNT PINS
38.5	7703.5	1.0011	174.825	(-E.-S)
77.0	15407.0	2.0021	87.325	(-E.-S)

<< DIGITAL PANEL METER MODEL DPM-2 SCALE FACTOR >>

DPM-2 SCALE FACTOR -2.3086

* CALIBRATION COMPUTED FROM THREE (3) RUNS INCREASING AND DECREASING.
* TRACEABLE TO NIST TEST # 56027
* CALIBRATION PERFORMED AT 10 VDC
* MAXIMUM BRIDGE EXCITATION 12 VDC

WIRING COLOR CODE

PINS	CABLE	
A	RED	+EXCITATION
D	BLK	-EXCITATION
C	GRN	+SIGNAL
B	WHT	-SIGNAL
E	BRN	-SIGNAL R-CAL
F	BLU	+SIGNAL R-CAL
	SHD	GROUND

43178 BUSINESS PARK DRIVE, B-101, TEMECULA, CA 92590 • (909) 676-3965 • FAX (909) 676-1200