

**INSTRUCTION MANUAL**

**FOR**

**CHARGE AMPLIFIER 56 CH.**

1. MAIN ASSEMBLY

2. LINE-EQUALITER

3. CHARGE AMPLIFIER

4. SPECIFICATIONS

5. DRAWINGS

LAYOUT DRAWING	FI 113-35
<b>WIRING DIAGRAM</b>	<b>FI 004/118</b>
<b>CIRCUIT DIAGRAM</b>	<b>FI 004/92</b>
<b>PART LIST F.AMPL.</b>	<b>FI 005/562</b>
POWERSUPPLY	TYPE SCHROFF

# 1. MAIN ASSEMBLY

## 1.1 GENERAL

The MAIN ASSEMBLY for the 56 ch CHAMP consist of Line Equalizers, Charge Amplifiers, Power Supplies and a Cooling Fan, all mounted in frames fitted for a standard 19" rack, ref. layout drawing FI 113-35.

## 1.2 POWER

The 220 V Main Power is connected to the rear of the cooling fan. A short power cable routes the 220 V to the 2 power supplies which convert the 220 V AC to 18 V DC.

Each power supply is capable of powering 40 channels of charge amplifiers normally housed in one shelf.

## 1.3 SIGNAL INPUT

The input signal is connected to 2 Elco connectors on the rear side with 30 channels on each plug. Only the Hydrophone Group traces are routed through the CHAMP.

The auxiliaries are divided from the transmission lines in the Patch Panel and connected to the aux. equipment on separate cables.

The wiring through the CHAMP is shown in the wiring diagram FI 004/118.

## 1.4 SIGNAL OUTPUT

The output signal is available on 2 Elco connectors on the rear side, 30 channels on each connector.

The CHAMP is not delivered with any external cables. This have to be ordered separately.

## 2. LINE EQUALIZER

### 2.1 DESCRIPTION

The Line Equalizer is a passive network which normally consist of 4 resistors and 2(1) capacitors for each channel.

(For the special purpose of matching the 50 m IKU section only straps have been used).

Each Line Equalizer PCB contains 12 channels and there are 5 PCB's in the Line Equalizer shelf which gives a total of 60 ch.

This shelf has a capacity of 10 PCB's with totally 120 ch.

The purpose of the Line Equalizer is to compensate for the variation of line resistance and capacitance down the streamer.

The values of the resistance and capacitance will vary depending on the hydrophone group length and the total length of the streamer.

These values may have to be changed or re-arranged following a change to the streamer configuration.

In a 12,5 m streamer configuration the maximum number of sections are 15.

8 groups in every active section x 15 gives 120 channels.

In this configuration the Line Eq. will compensate for the first 112 groups while the last 8 groups only are strapped.

### 2.2 CALCULATED VALUES

The loop resistance for a 100 m active section is 42 ohm for the transmission lines and the capacitance is approx. 8,4 nF in an oilfilled section.

The 8 groups in the first active must have added the line RC from the following 14 sections to have the same RC values as the groups in the last section. This figures will be approx. 590 ohm and 118 nF.

For 6,25 m group configuration the 120 ch active streamer is 750 m long, (i.e 8 x 100 m sections).

Only 50 m of the last section is active (8 ch x 6,25 m).

The line RC to be added to the first 16 groups (section 1) is approx. 294 ohm and 58 nF. The 16 groups in section 2 (ch 17 - 32) will have 252 ohm and 50 nF added.

### 3. CHARGE AMPLIFIER

#### 3.1 DESCRIPTION

Each PCB has 2 charge amplifier channels and there are 20 PCB's in one shelf with totally 40 channels and 8 PCB's in another shelf to a total of 56 ch. The signal inputs are on pin A9 and C9 for channel 1, and A27 and C27 for channel 2.

The signal outputs are on pin A4 and C4 for ch. 1, and A21 and C21 for ch. 2.

The DC power is connected to pins ABC 14 (+), ABC 16 (0) and ABC 18 (-). The IC3 is a voltage regulator of + 15 VDC supplying IC1 and IC2.

IC1 is the charge amplifier which can be adjusted for up to 4 different group lengths by the switch settings on S1 and S2.

Position 1 on S1 and S2 is used for 6,25 m grouplength and pos 1 and 2 together are used for 12,5 m groups. Pos 3 and 4 is not used.

Step 1 in IC2 will add the two outputs from IC1 and run the signal through a network switch S3 where different gain settings on the sensitivity can be selected: 10, 15, 20, 25, 50, 75 and 100 V/Bar.

Step 2 in the IC2 has a gain adjust potmeter and the final steps in the IC2 will split the signal to a differential output.

#### 3.2 THEORY

Charge amplifiers are normally used with piezoelectric sensors on long cables.

The main advantage is that the sensitivity is relatively independent of the capacity of the cable between the sensor and the amplifier.

A disadvantage may be a high cut due to a voltage split between sensor capacity and cable resistance.

The alternative method of signal transfer from an analog streamer, without putting electronics in the water, is the use of a transformer for each group in the streamer. The signals can then be fed directly to a normal voltage amplifier (DFS input).

The disadvantage with this method is a relatively high low-cut frequency, and high sensitivity to leakage and electrical noise.

A charge amp. as used here is actually a charge/voltage converter. The streamer group is connected directly to the negative input of an op-amp. As this is a virtual ground point, the charge generated in the hydrophone will charge up the feedback capacitor. The voltage on the charge amp. output is obviously the same as over the feedback capacitor. This means that the sensitivity can be set by the feedback capacitor.

Normally a resistor is placed in parallel with the capacitor, to obtain a low-cut.

The CHAMP system has got a balanced input. This is done by two similar charge amps with the outputs going to a differential voltage amp.

Unlike a voltage amplifier, this means that the sensitivity is doubled, relative to a single ended amplifier with the same feedback capacitor.

When calibrating, it is important to use a differential source, otherwise one of the charge amps will be grounded, resulting in only half the signal level on the output.

## 4. SPECIFICATIONS

### CHARGE AMPLIFIER FOR MARINE SEISMIC STREAMERS

- No. of seismic channels: 120 or 240 ch. or to client request.
- Power requirement: 220 V 50 Hz (standard version)
- Signal conditioner impedance: Virtually zero
- Channel output impedance: 100 ohm
- Channel output D. C. offset: Less than 10 mV
- Channel output sensitivity: 5 to 100 uV/uBar (+/- 0,10db)  
(selectable in steps of 5/10/15/20/  
25/50/75/100)
- Channel maximum output level: 10 V p-p open circuit
- Channel dynamic range: Greater than 80 db
- Channel output distortion: Less than 0,2% THD to rated output
- Channel low frequency cutoff: 8 hz, user definable
- Common mode rejection  
(balanced input): Greater than 60 db

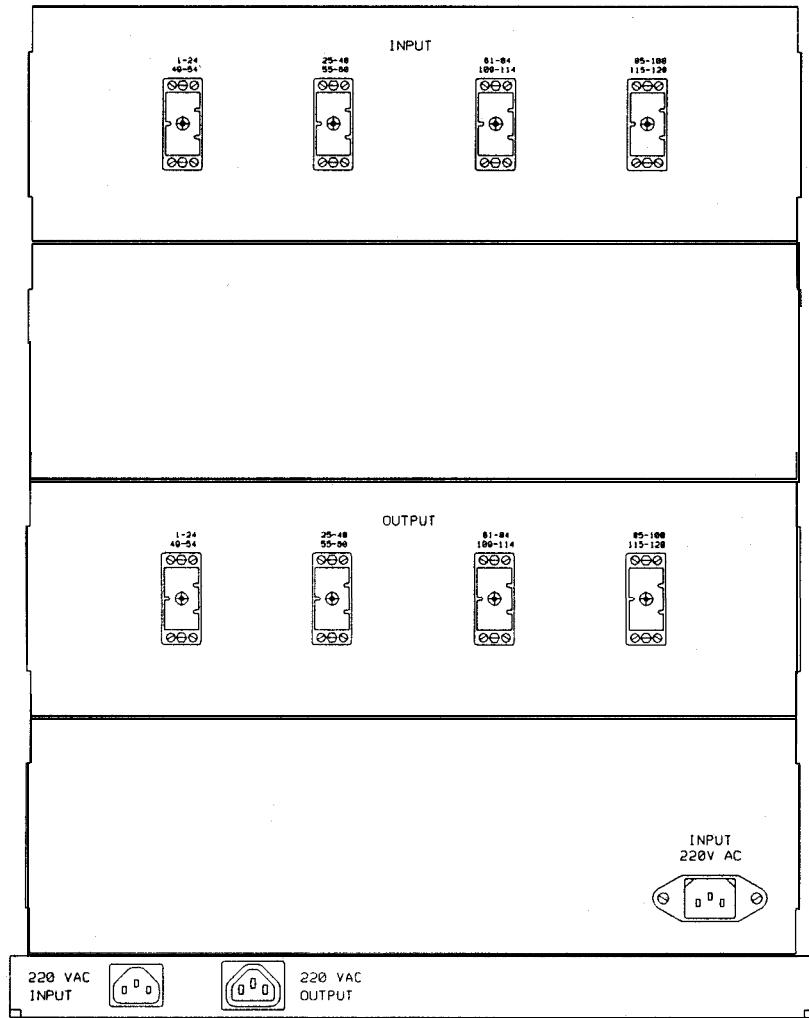
The electrical noise output over normally used gain settings will be more than 20 db below 1 microbar input for the frequency band up to 100 Hz.

The FJORD 120 ch. CHAMP is equipped with line equalizers, and is expandable to full 240 channel capabilities.

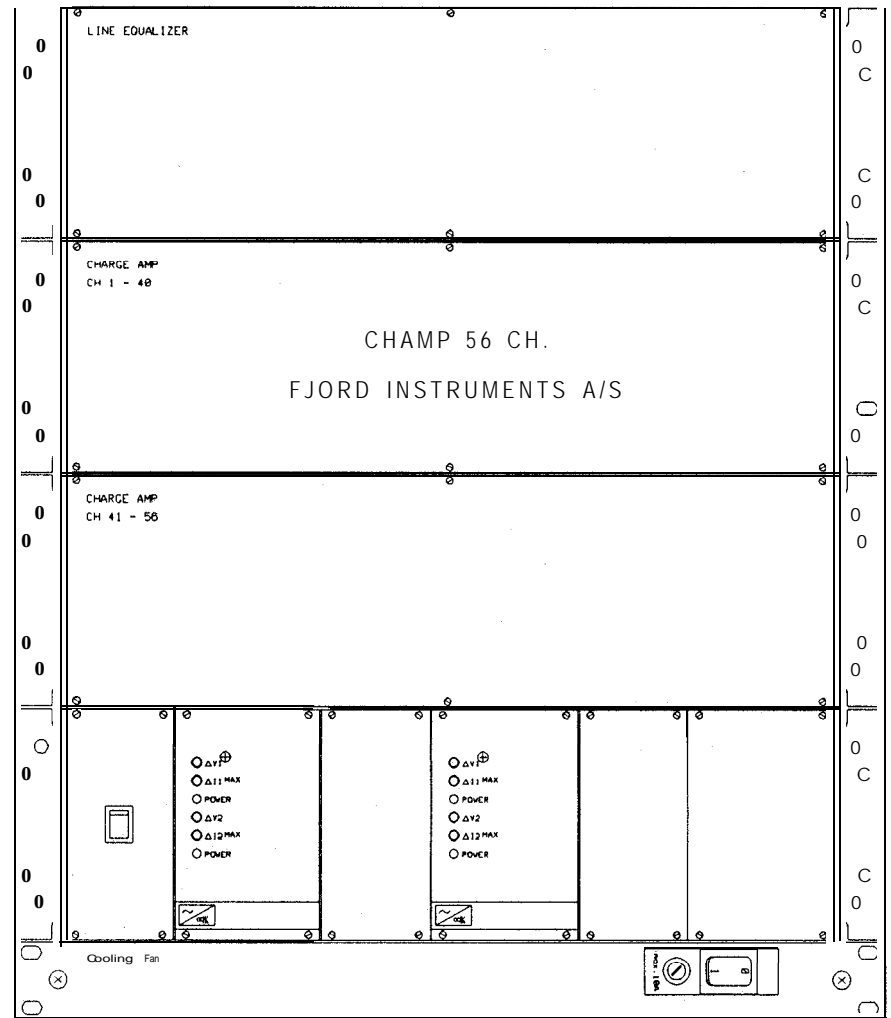
The system is supplied with two sets of user manuals.

The manufacturer reserves the right to change specifications without further notice.


Fjord Instruments A/S, December 6th 1990.



REAR VIEW



FRONT VIEW

				SCALE NA		Material NA		 <b>FJORD INSTRUMENTS A/S</b>		
				Drawing title:						
				CHARGE AMPLIFIER UNIT, 56 ch. BERGEN UNIVERSITY				This drawing is the property of FJORD INSTRUMENTS A/S. It is confidential and must not be copied or reproduced without written consent.		
Ø	030892	ISSUED FOR CONSTRUCTION	E.K.	P.G.	K.A.	FI Part no. 4300009		Replacing	Drwg.no. FI-113-35	Rev. 0
PI	030892	ISSUED FOR REVIEW	E.K.		K.A.	Ref. drwg. no. FI-004/118		Ref. part list:	Page 1 of 1	
Rev.	Date	Reason for issue	Drn.	Chk.	Apr.					

INTERNAL WIRING OF CHAMP 56 CH.

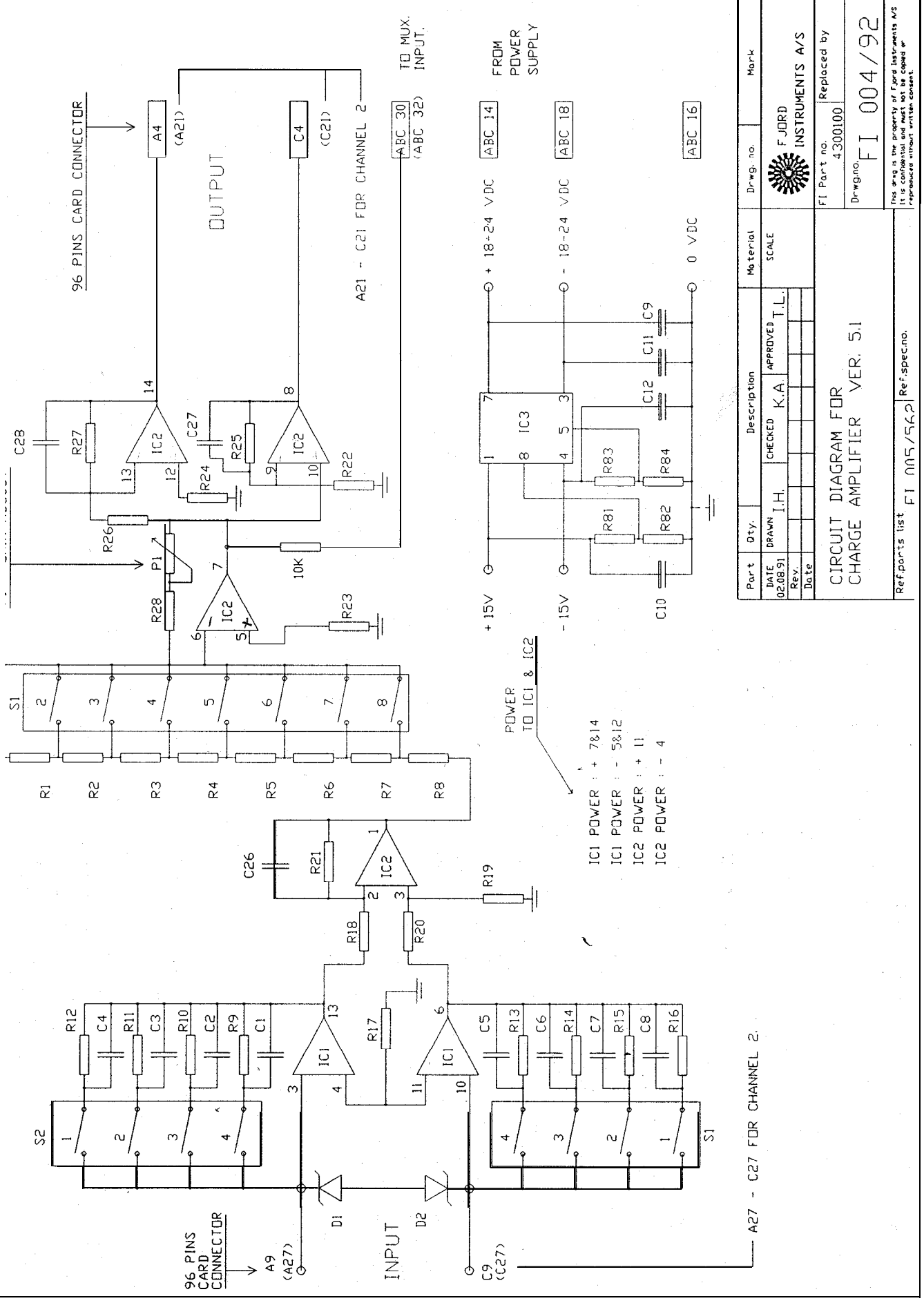
← ← ← OUTPUT TO DFS

INPUT FROM PATCH PANEL → → →

TRACE	ELCO(1-2)	COLOUR CODE	CHAMP out	CHAMP in	COLOUR CODE	LINE EQ.outp	EQ. inp.	COLOUR CODE	ELCO
1	2A - 2B(1)	black - natur	A4 - C4 (1)	A9 - C9	black - natur	A14 - C14 (1)	A1 - C1	black - natur	2A - 2B
2	3A - 3B	brown - "	A21- C21 "	A27- C27	brown - "	A15 - C15 "	A2 - C2	brown - "	3A - 3B
3	4A - 4B	red - "	A4 - C4 (2)	A9 - C9	red - "	A16 - C16 "	A3 - C3	red - "	4A - 4B
4	5A - 5B	orange-	A21- C21 "	A27- C27	orange-	A17 - C17 "	A4 - C4	orange-	5A - 5B
5	6A - 6B	yellow-	A4 - C4 (3)	A9 - C9	yellow-	A18 - C18 "	A5 - C5	yellow-	6A - 6B
6	7B - 7C	green - "	A21- C21 "	A27- C27	green - "	A19 - C19 "	A6 - C6	green - "	7B - 7C
7	1B - 1C	blue - "	A4 - C4 (4)	A9 - C9	blue - "	A20 - C20 "	A7 - C7	blue - "	1B - 1C
8	2C - 2D	violet-	A21- C21 "	A27- C27	violet-	A21 - C21 "	A8 - C8	violet-	2C - 2D
9	3C - 3D	black - natur	A4 - C4 (5)	A9 - C9	black - natur	A22 - C22 "	A9 - C9	black - natur	3C - 3D
10	4C - 4D	brown - "	A21- C21 "	A27- C27	brown - "	A23 - C23 "	A10- C10	brown - "	4C - 4D
11	5C - 5D	red - "	A4 - C4 (6)	A9 - C9	red - "	A24 - C24 "	A11- C11	red - "	5C - 5D
12	6C - 6D	orange-	A21- C21 "	A27- C27	orange-	A25 - C25 "	A12- C12	orange-	6C - 6D
13	7D - 7E	yellow-	A4 - C4 (7)	A9 - C9	yellow-	A14 - C14 (2)	A1 - C1	yellow-	7D - 7E
14	5E - 6F	green - "	A21- C21 "	A27- C27	green - "	A15 - C15 "	A2 - C2	green - "	5E - 6F
15	6E - 7F	blue - "	A4 - C4 (8)	A9 - C9	blue - "	A16 - C16 "	A3 - C3	blue - "	6E - 7F
16	6J - 5K	violet-	A21- C21 "	A27- C27	violet-	A17 - C17 "	A4 - C4	violet-	6J - 5K
17	7J - 6K	black - natur	A4 - C4 (9)	A9 - C9	black - natur	A18 - C18 "	A5 - C5	black - natur	7J - 6K
18	7K - 7L	brown - "	A21- C21 "	A27- C27	brown - "	A19 - C19 "	A6 - C6	brown - "	7K - 7L
19	2L - 2M	red - "	A4 - C4 (10)	A9 - C9	red - "	A20 - C20 "	A7 - C7	red - "	2L - 2M
20	3L - 3M	orange-	A21- C21 "	A27- C27	orange-	A21 - C21 "	A8 - C8	orange-	3L - 3M
21	4L - 4M	yellow-	A4 - C4 (11)	A9 - C9	yellow-	A22 - C22 "	A9 - C9	yellow-	4L - 4M
22	5L - 5M	green - "	A21- C21 "	A27- C27	green - "	A23 - C23 "	A10- C10	green - "	5L - 5M
23	6L - 6M	blue - "	A4 - C4 (12)	A9 - C9	blue - "	A24 - C24 "	A11- C11	blue - "	6L - 6M
24	7M - 7N	violet-	A21- C21 "	A27- C27	violet-	A25 - C25 "	A12- C12	violet-	7M - 7N
	1P + 7P	CHASSIS GROUND					CHASSIS GROUND		1P + 7P
25	2A - 2B(2)	black - natur	A4 - C4 (13)	A9 - C9	black - natur	A14 - C14 (3)	A1 - C1	black - natur	2A - 2B
26	3A - 3B	brown - "	A21- C21 "	A27- C27	brown - "	A15 - C15 "	A2 - C2	brown - "	3A - 3B
27	4A - 4B	red - "	A4 - C4 (14)	A9 - C9	red - "	A16 - C16 "	A3 - C3	red - "	4A - 4B
28	5A - 5B	orange-	A21- C21 "	A27- C27	orange-	A17 - C17 "	A4 - C4	orange-	5A - 5B
29	6A - 6B	yellow-	A4 - C4 (15)	A9 - C9	yellow-	A18 - C18 "	A5 - C5	yellow-	6A - 6B
30	7B - 7C	green - "	A21- C21 "	A27- C27	green - "	A19 - C19 "	A6 - C6	green - "	7B - 7C
31	1B - 1C	blue - "	A4 - C4 (16)	A9 - C9	blue - "	A20 - C20 "	A7 - C7	blue - "	1B - 1C
32	2C - 2D	violet-	A21- C21 "	A27- C27	violet-	A21 - C21 "	A8 - C8	violet-	2C - 2D
33	3C - 3D	black - natur	A4 - C4 (17)	A9 - C9	black - natur	A22 - C22 "	A9 - C9	black - natur	3C - 3D
34	4C - 4D	brown - "	A21- C21 "	A27- C27	brown - "	A23 - C23 "	A10- C10	brown - "	4C - 4D
35	5C - 5D	red - "	A4 - C4 (18)	A9 - C9	red - "	A24 - C24 "	A11- C11	red - "	5C - 5D
36	6C - 6D	orange-	A21- C21 "	A27- C27	orange-	A25 - C25 "	A12- C12	orange-	6C - 6D
37	7D - 7E	yellow-	A4 - C4 (19)	A9 - C9	yellow-	A14 - C14 (4)	A1 - C1	yellow-	7D - 7E
38	5E - 6F	green - "	A21- C21 "	A27- C27	green - "	A15 - C15 "	A2 - C2	green - "	5E - 6F
39	6E - 7F	blue - "	A4 - C4 (20)	A9 - C9	blue - "	A16 - C16 "	A3 - C3	blue - "	6E - 7F
40	6J - 5K	violet-	A21- C21 "	A27- C27	violet-	A17 - C17 "	A4 - C4	violet-	6J - 5K
41	7J - 6K	black - natur	A4 - C4 (21)	A9 - C9	black - natur	A18 - C18 "	A5 - C5	black - natur	7J - 6K
42	7I - 7L	brown - "	A21- C21 "	A27- C27	brown - "	A19 - C19 "	A6 - C6	brown - "	7K - 7L
43	2L - 2M	red - "	A4 - C4 (22)	A9 - C9	red - "	A20 - C20 "	A7 - C7	red - "	2L - 2M
44	3L - 3M	orange-	A21- C21 "	A27- C27	orange-	A21 - C21 "	A8 - C8	orange-	3L - 3M
45	4L - 4M	yellow-	A4 - C4 (23)	A9 - C9	yellow-	A22 - C22 "	A9 - C9	yellow-	4L - 4M
46	5L - 5M	green - "	A21- C21 "	A27- C27	green - "	A23 - C23 "	A10- C10	green - "	5L - 5M
47	6L - 6M	blue - "	A4 - C4 (24)	A9 - C9	blue - "	A24 - C24 "	A11- C11	blue - "	6L - 6M
48	7M - 7N	violet-	A21- C21 "	A27- C27	violet-	A25 - C25 "	A12- C12	violet-	7M - 7N
	1P + 7P	CHASSIS GROUND					CHASSIS GROUND		1P + 7P
49	1M - 1N(1)	black - natur	A4 - C4 (25)	A9 - C9	black - natur	A14 - C14 (5)	A1 - C1	black - natur	1M - 1N
50	2N - 2P	brown - "	A21- C21 "	A27- C27	brown - "	A15 - C15 "	A2 - C2	brown - "	2N - 2P
51	3N - 3P	red - "	A4 - C4 (26)	A9 - C9	red - "	A16 - C16 "	A3 - C3	red - "	3N - 3P
52	4N - 4P	orange-	A21- C21 "	A27- C27	orange-	A17 - C17 "	A4 - C4	orange-	4N - 4P
53	5N - 5P	yellow-	A4 - C4 (27)	A9 - C9	yellow-	A18 - C18 "	A5 - C5	yellow-	5N - 5P
54	6N - 6P	green - "	A21- C21 "	A27- C27	green - "	A19 - C19 "	A6 - C6	green - "	6N - 6P
55	1M - 1N(2)	blue - "	A4 - C4 (28)	A9 - C9	blue - "	A20 - C20 "	A7 - C7	blue - "	1M - 1N
56	2N - 2P	violet-	A21- C21 "	A27- C27	violet-	A21 - C21 "	A8 - C8	violet-	2N - 2P
57	3N - 3P	black - natur	A4 - C4 (29)	A9 - C9	black - natur	A22 - C22 "	A9 - C9	black - natur	3N - 3P
58	4N - 4P	brown - "	A21- C21 "	A27- C27	brown - "	A23 - C23 "	A10- C10	brown - "	4N - 4P
59	5N - 5P	red - "	A4 - C4 (30)	A9 - C9	red - "	A24 - C24 "	A11- C11	red - "	5N - 5P
60	6N - 6P	orange-	A21- C21 "	A27- C27	orange-	A25 - C25 "	A12- C12	orange-	6N - 6P

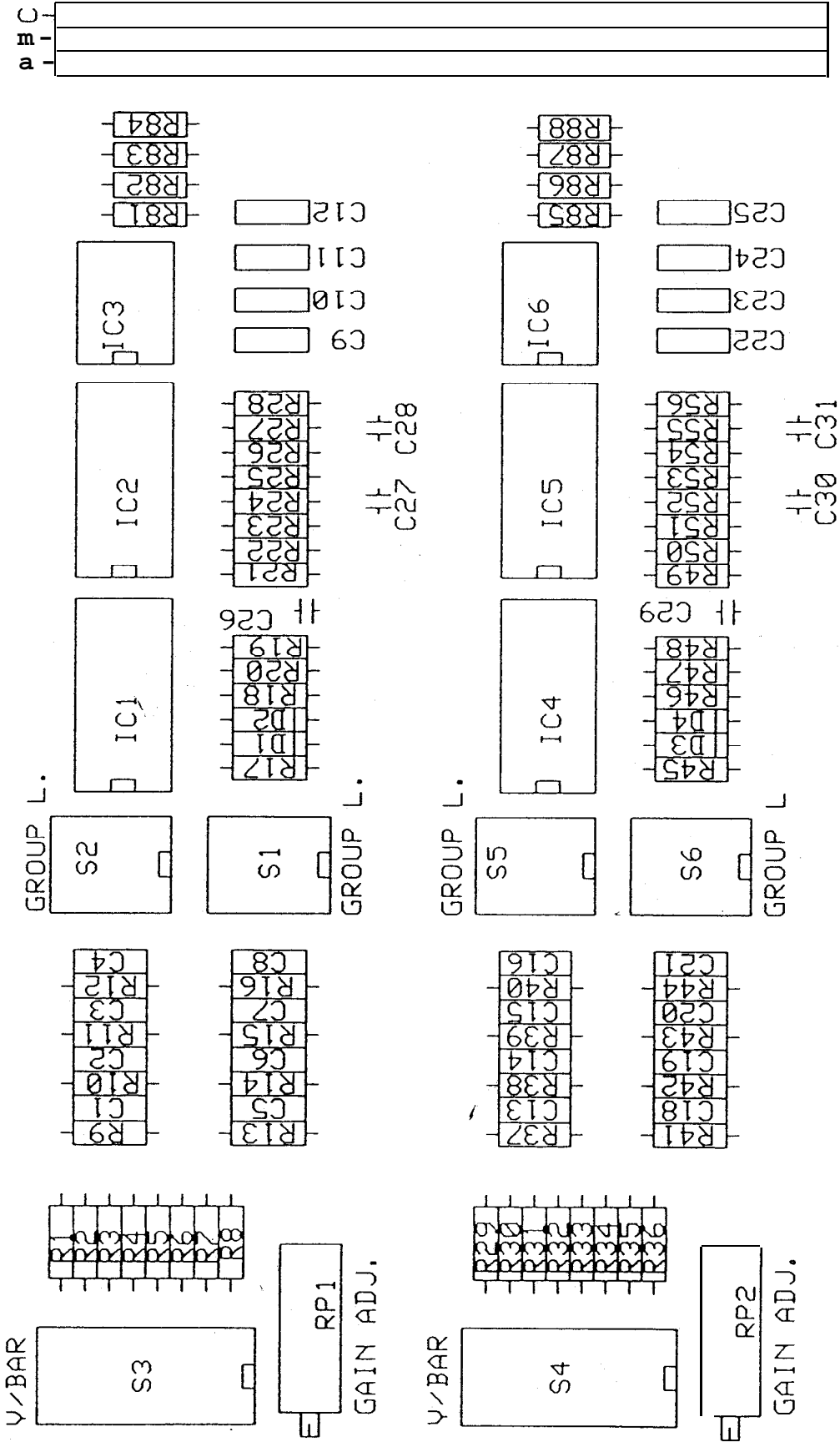
DATE 03.08.91	DRAWN K.A.	APPROVED <i>alb</i>	FJORD INSTRUMENTS A/S	
INTERNAL WIRING DIAGRAM FOR CHARGE AMPLIFIER UNIT 56 CH. "BG. UNIVERSITY"			ISSUE 1	UPDATED
			DRAWING NO: FI 004/118	PAGE 1 OF 1

Ref. Layout drawing FI 113-35



Part	Qty.	Description	Material	Dwg. no.	Mark
DATE	DRAWN	CHECKED	K.A.	APPROVED	T.L.
02/08/91					
Rev.					
Date					
<b>CIRCUIT DIAGRAM FOR CHARGE AMPLIFIER VER. 5.1</b>					
Ref. parts list FT 005/562			Ref. spec. no.		
F JORD INSTRUMENTS A/S FI Part no. 4300100 Replaced by			FI 004/92		
<small>This drawing is the property of Fjord Instruments A/S. It is confidential and must not be copied or reproduced without written consent.</small>					







EQUIPMENT: CHARGE AMPLIFIER CARD

REF:  
FI 004/92ISSUE  
1

UPDATED

TYPE: VER. 5.1  
(FI Part. no. 4300100)PAGE  
1 OF 1DATE/SIGN.  
04.08192. KA

CHECKED

APPROVED  
*AK*

STOCK NO.

DESCRIPTION

CH.1

CH. 2

QTY.

0908074

Printcard type 0890

1 ea

0905070

OP 227 GJ Double op.

IC1 - IC4

2 ea

0903000

OP A 404 KP Linedriver-Burr Brown

IC2 - IC5

2 ea

0904010

LH 7001 CN +/- 15 V Reg.

IC3 - IC6

2 ea

0900270

Resistor 100 k MF 0,6W 1% E-24  
(also R17,18,19,20,21,22,24,26,27 ch. )

R 1 - R29

20 ea

0900270

Resistor 33,3 k MF 0,6W 1% E-24

R 2 - R30

2 ea

0900270

Resistor 16,5 k MF 0,6W 1% E-24

R 3 - R31

2 ea

0900270

Resistor 10 k MF 0,6W 1% E-24

R 4 - R32

8 ea

(also used as R8, R23 and R84 on ch. 1)

0900270

Resistor 20 k MF 0,6W 1% E-24

R 5 - R33

2 ea

0900270

Resistor 6,8 k MF 0,6W 1% E-24

R 6 - R34

2 ea

0900270

Resistor 3,3 k MF 0,6W 1% E-24

R 7 - R35

2 ea

0900270 \*)

Resistors MF 0,6W 1% E-24

R9 - R37

8 ea

(also R10 to R16 and R38 to R44 on ch. 2

Strap

R25 - R53

0900270 \*\*)

Resistors MF 0,6W 1% E-24

R28 - R56

2 ea

0900270

Resistor 820 MF 0,6W 1% E-24

R81 - R85

2 ea

0900270

Resistor 9,1 k MF 0,6W 1% E-24

R82 - R86

2 ea

0900270

Resistor 910 MF 0,6W 1% E-24

R83 - R87

2 ea

0900995

Potmeter 2 K 15 round turn

P 1 - P2

2 ea

0902625 \*)

Capacitors CK 06-serie  
(valid for C2 to C6 and C14 to C21 ch. 2

c 1 - C13

4 ea

0902000

Capacitor 1 uF 35 V tantal  
(also valid for C10, C11, C12/C23, C24, C25

c9 - c22

8 ea

0902420

Capacitor 10 pF CK 05-serie

C26 . . . .C31

6 ea

0906100

Zener diode 10 V, 500 mV

D1/D2 - D3/4

4 ea

09062 13

8 pins DIP switch 725305

S1/2 - S5/6

4 ea

0906215

16 pins DIP switch 725340

s 3 - s4

2 ea

0906255

96 pins card connector

1 ea

\*) Are dependent of hydrophone type and array length.

Comoonents \*)

6, 25m Tl

12, 5mT1

Tl

T2

HDI-A

HDI-E

NOTES

R9, R13, R37, R41

3.3 M

1 M

10 Hz lowcut

R1, R14, R38, R42

1.9 M

100 k

10 Hz "

R11, R15, R39, R43

325 K

8.2 MΩ

2.4 MΩ

3 Hz

R12, R16, R40, R44

325 K

4.4 MΩ

240 K

3 Hz

\*\*) R28, R56

4.3 K

4.3 K

4.3 K

25.5 K

25.5 K

C1, C5, C13, C18

C2, C6, c14, c19

c3, c7, C15, C20

C4, C8, C16, C21

100 nF

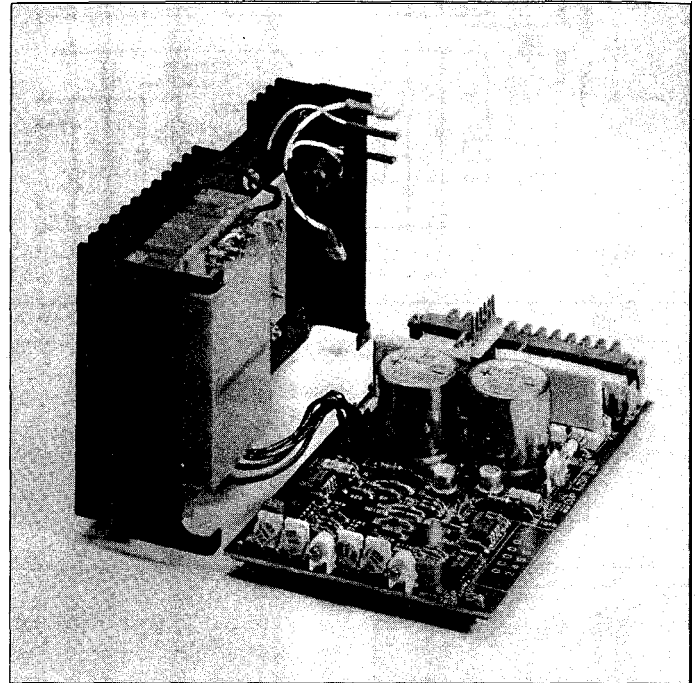
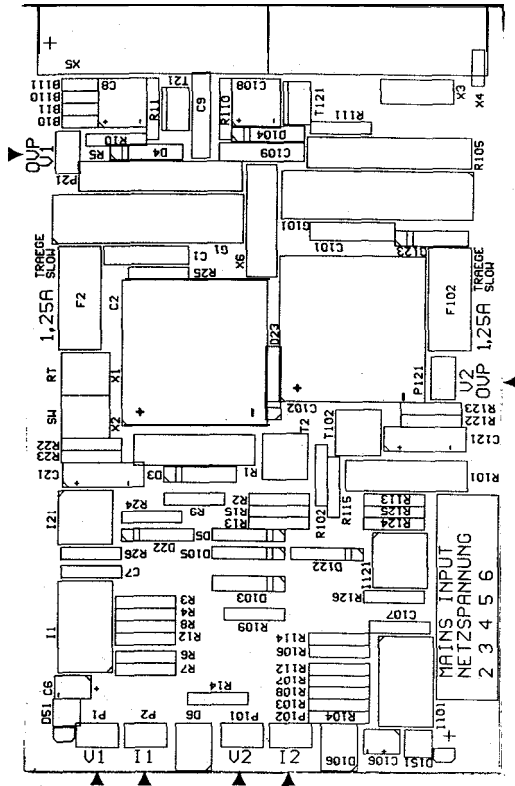
6.4 nF

22 nF

100 nF

12,24n

220 nF



61005-815/ISA

**Codierleisten / Coding strips / Détrompeurs**

Die Geräte sind werksseitig mit Kammleisten bestückt. Das Gegenstück ist die Trägerleiste, die separat zu bestellen ist. Mit 2 Codierstiften sind 66 Codierungen möglich.

The PSU's are fitted prior to despatch with male Strips. The counterpart female strip should be ordered separately together with 2 coding strips, thus providing 66 combinations.

D'origine, un peigne est monté sur alimentation. Le réceptacle avec ses 2 chevilles de codage est à commander séparément. Cet ensemble permet 66 possibilités de codage.

Be Nr. / Order No. / Référence 60800-123

**Bestelltablelle/Ordering details/Tableau de références**

Typ Type Type	Ausgangswerte output voltage Valeurs de sortie	ohne OVP <sup>1)</sup> without OVP <sup>2)</sup> sans OVP <sup>1)</sup>	mit OVP <sup>1)</sup> with OVP <sup>1)</sup> avec OVP <sup>1)</sup>	Frontplatte 12 TE <sup>2)</sup> Frontpanel 12 HP <sup>2)</sup> Plaque frontale 12 F <sup>2)</sup> natur eloxiert RAL 7032 anodised RAL 7032 anodisée RAL 7032		
PSM						
205	2x 5 V/2x 1,2 A		11005-138			
212	2x 12 V/2x 1 A		11005-140			
215	2x 15 V/2x 1 A		11005-142			
218	2x 18 V/2x 0,8 A	11005-143		21005-364	21005-362	
224	2x 24 V/2x 0,6 A	11005-145				
230	2x 30 V/2x 0,5 A	11005-147				
PSG						16 TE <sup>2)</sup>
205	2x 5 V/2x 2 A		11005-150			
212	2x 12 V/2x 1,5 A		11005-152			
215	2x 15 V/2x 1,5 A		11005-154			
	2x 18 V/2x 1,2 A	11005-155		21005-365	21005-363	
	2x 24 V/2x 1,2 A	11005-157				
230	2x 30 V/2x 1 A	11005-159				

<sup>1)</sup> OVP = Überspannungsschutz  
<sup>1)</sup> = Overvoltage protection  
<sup>1)</sup> = Protection contre les surtensions

<sup>2)</sup> Frontplatte incl. Befestigungsteile müssen separat bestellt werden.  
<sup>2)</sup> Front panel incl. fixing parts should be ordered separately.  
<sup>2)</sup> Plaque frontale avec poignée et visserie, à commander en supplément

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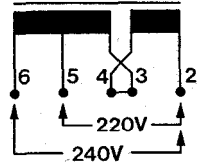
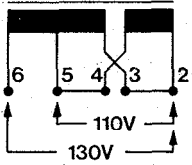
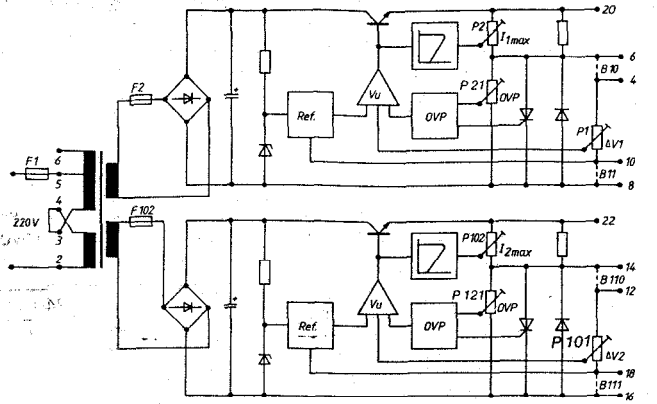
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Prinzipschaltbild,  
Circuit diagram  
Schema de principe



## Funktion

Die Netzspannung wird transformiert, gleichgerichtet und gesiebt. Die Ausgangsspannung wird von einem Kontroll-Verstärker überwacht. Er steuert ein Transistorstellglied, daß bei Laständerung und Schwankungen der Netzeingangsspannung die Ausgangsspannung konstant hält. Durch Vergleich mit einer hochgenauen Referenzspannungsquelle wird hohe Regelgenauigkeit erzielt. Die Strombegrenzung ist mit den Potentiometern P2 bzw. P102 ( $I_{max}$ ) und die Ausgangsspannung mit dem Potentiometer Pi bzw. P101 ( $V_{max}$ ) innerhalb eines bestimmten Bereiches einstellbar (siehe Abb. Einstellwiderstände).

## Netzsischerung

Die Netzsischerung befindet sich im G-Sicherungshalter an der Chassis-Rückseite. Bei Änderung der werkseitig eingestellten Netzspannung muß sie entsprechend der untenstehenden Tabelle gewählt werden.

Typ	110/130 V -	220/240 V -	Typ	110/130 V -	220/240 V ~
PSM	T0,8A'	T0,4A	PSG	T1,6A	T0,8A

## Netzanschluß und Schutzerdung

Das Gerät kann an Wechselstromnetze 110/130/220/240 V  $\pm$  10% angeschlossen werden. Der Schutzleiteranschluß erfolgt über den mit bezeichneten Steckerpin 32 des Steckerverbinders H 15.

Das Einstellen auf die geforderte Netzspannung erfolgt durch entsprechende Beschaltung der Lötanschlüsse am Spulenkörper.

## Strombegrenzung

Die Strombegrenzung ist werkseitig auf 100% des Nennstromes eingestellt. Sie kann mit den Potentiometern P2 ( $I_{max}$ ) bzw. P 102 ( $I_{2max}$ ) für jede Spannungs-karte innerhalb eines bestimmten Bereiches eingestellt werden und weist „Foldback“ Verhalten auf.

## Fühlerleitungsbetrieb

Bei längeren Lastleitungen zum Verbraucher treten Spannungsabfälle auf. Sie können durch Anschluß der Fühlerleitungen direkt am Verbraucher ausgeglichen werden. Pro Lastleitung kann ein maximaler Spannungsabfall von 0,5 V kompensiert werden.

## Betrieb ohne Fühlerleitung

Die Fühlerleitungsanschlüsse sind intern über die Brücken B 10 bzw. B 110 und B 11 bzw. B 111 mit den Ausgangsklemmen verbunden. Die Lastleitungen werden an den Ausgangsklemmen + V und - V angeschlossen.

## Betrieb mit Fühlerleitung

Die Brücken B 10 bzw. B 110 und B 111 sind aufzutrennen. Die Fühlerleitungen müssen zur Vermeidung von Störeinflüssen verdrillt oder abgeschirmt werden (s. Abbildungen). Ein Kondensator von 100-220  $\mu$ F muß parallel zur Last geschaltet werden. Die Ansprechspannung für den Überspannungsschutz muß entsprechend erhöht werden.

## Oberspannungsschutz (OVP)

Bei Überspannung schaltet die Ausgangsspannung ab und gleichzeitig wird durch den Thyristor der Ausgang kurzgeschlossen. Wird an den Ausgangsklemmen eine externe Spannung angelegt (Polarität beachten!), so spricht der Schutz auch dann an, wenn das Netz ausgeschaltet ist. Der Ansprechpunkt läßt sich mit den Potentiometern P21 bzw. P121 (OVP U1 U2) innerhalb eines bestimmten Bereiches einstellen (s. Datentabelle). Nach Ansprechen des Überspannungsschutzes wird das Netzgerät durch Abklemmen der Überspannung und kurzzeitiges Abschalten der Netzspannung in den Normalbetrieb zurückgesetzt.

## Serien und Parallelschaltung

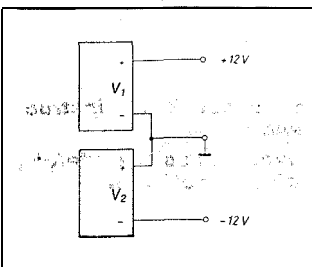
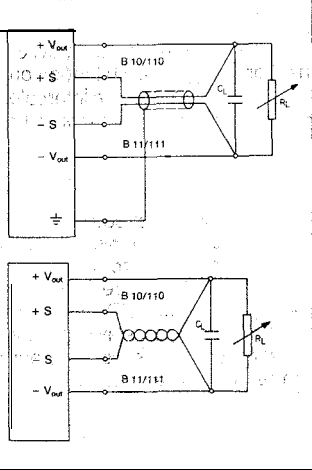
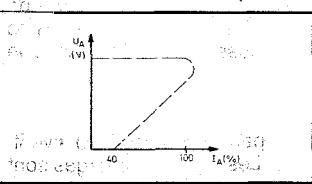
Die Serienschaltung von mehreren Geräten kann bis max. 200 V Ausgangsspannung vorgenommen werden. Spricht bei einem Gerät die Strombegrenzung an, so muß die Lastleitung kurzzeitig unterbrochen werden. Durch Parallelschaltung mehrerer Geräte wird eine höhere Ausgangsleistung erzielt. Alle Ausgänge sind auf die gleiche Spannung einzustellen, damit eine gleichmäßige Aufteilung des Laststromes erreicht wird. (Die Spannungsabfälle zwischen den Anschlußklemmen 6 und 20 bzw. 14 und 22 müssen gleich sein).

## Galvanische Trennung der Ausgangsspannungen

Die Ausgangsspannungen sind voneinander galvanisch getrennt. Sie können auf beliebiges Bezugspotential geschaltet werden (Beispiel s. Abbildung).

Vor Inbetriebnahme diese Bedienungsanleitung sorgfältig lesen! Entstehen durch Nichtbeachtung Schäden, erforschen die Garantieansprüche.

Diese **Dokumentation wurde mit größter Sorgfalt erstellt. Dennoch können wir für die vollständige Richtigkeit keine Garantie übernehmen.**



## Function

The mains voltage is transformed, rectified and filtered. The output voltage is controlled by a control amplifier. It controls a transistor which maintains the output voltage at a constant level when the load changes or the mains input voltage fluctuates. A high control accuracy is obtained by comparison with a highly accurate reference voltage source. The current limitation can be adjusted using potentiometers P2 or P102 ( $I_{max}$ ) and the output voltage with potentiometers P1 or P101 ( $V_{max}$ ) within a specified range (see figure potentiometers).

## Mains fuse

The mains fuse is in the G fuse holder on the rear. The pre-set mains voltage can be changed as shown in the table below.

Type	110/130 V-	220/240 V-	Type	110/130 V-	220/240 V~
PSM	T0,8A	T0,4A	PSG	T1,6A	T0,8A

## Mains connection and protective earthing

The supply can be connected to alternating current 110/130/220/240 V  $\pm 10\%$ . The earth lead is connected via the connector pin 32 of connector H 15 marked  $\perp$ . The mains voltage is adjusted to the required level by switching the solder contacts on the transformer windings accordingly.

## Current limitation

The current limitation is set ex factory at 100% of the nominal current. This can be adjusted using Potentiometer P2 ( $I_{2max}$ ) or P 102 ( $I_{2max}$ ) for any voltage board within a specified range and acts as "foldback".

## Remote sense facility

Where the leads between PSU and user equipment are long, voltage drops occur. They can be compensated by connecting the remote sensor directly to the user equipment. It is possible to compensate for a maximum voltage drop of 0.5 V per load lead.

## Operating without remote sensor

The remote sense connections are connected internally via bridges B 10 or B 110 and B 11 or B 111. The load leads are connected to the + V and - V output terminals.

## Operation with remote sensor

The B 10 or B 110 and B 11 or B 111 bridges should be separated. The remote sense leads should be twisted or screened to prevent interference (see diagrams). A capacitor of 100-220  $\mu$ F should be connected in parallel with the load. The response voltage for the OVP should be increased accordingly.

## Over voltage protection (OVP)

When there is excess voltage the output voltage shuts off and at the same time the output is short-circuited via the thyristor. If an external voltage is connected to the output terminals (check the polarity) the protection responds even if the mains is switched off. The response setting can be adjusted with potentiometers P 21 or P 121 (OVP U1 U2) within a specified range (see table). When the OVP is activated, the PSU function is restored to normal by disconnecting the excess voltage and briefly switching off the mains voltage.

## Series and parallel Operation

Several PSUs can be operated in series up to max. 200 V output voltage. If the current limitation is activated in one PSU, the load lead must be disconnected briefly. By parallel connection of several PSUs higher output power can be achieved. All the outputs should be adjusted to the same voltage to ensure equal distribution of the load current (The voltage drops between connection terminals 6 and 20 and 14 and 22 should be identical.)

## Electric isolation of the output voltages

The output voltages are electrically isolated from each other. They can be switched to any required reference potential (see diagram).

Please read these operating instructions carefully before **switching on. Attention is drawn to the fact that the Company's warranty is subject to the Provision that the powersupply unit has been operated and maintained within the declared specification for use and has not been modified or repaired other than by the Company.**

This documentation was compiled with utmost care, however, we cannot guarantee for its correctness **in every respect.**

## Fonctionnement

La tension secteur est transformée, redressée et filtrée. La tension de sortie est surveillée par un amplificateur de contrôle, lequel pilote un transistor dont le rôle est de maintenir la tension de sortie constante malgré les variations de la charge ou du secteur. Une grande précision de régulation est ainsi atteinte par la comparaison avec une tension de référence très exacte. Selon une plage bien déterminée, le courant de sortie est réglable à l'aide du potentiomètre P 2 ou P 102 ( $I_{max}$ ), la tension de sortie par potentiomètre P 1 ou P 101 ( $V_{max}$ ). (Voir fig. potentiomètres).

## Fusibles

Le fusible pour le circuit entrée secteur est logé à l'arrière du Chassis. En cas de changement de la tension secteur par rapport à celle prévue initialement, il y a lieu de remplacer le fusible par la Valeur ci-dessous.

Type	110/130 V-	220/240 V-	Type	110/130 V-	220/240 V~
PSM	T0,8A	T0,4A	PSG	T1,6A	T0,8A

## Raccordement secteur et mise à la terre

L'alimentation peut être raccordée au secteur 110, 130, 220 ou 240 V;  $\pm 10\%$ .

Le raccordement de sécurité s'effectue par le contact 32 repère  $\perp$  du connecteur H 15. Selon la tension du secteur, le branchement doit être réalisé selon le schéma ci-contre.

## Limitation de courant

Réglage usine à 100% de la Valeur nominale. Possibilité de réglage selon plage prévue, par potentiomètre P 2 ( $I_{max}$ ) ou P 102 ( $I_{max}$ ) conservant le mode de fonctionnement Fold-back.

## Lignes de compensation

Les lignes de charge de grande longueur donnent lieu à une perte de tension. Elles peuvent être compensées par raccordement direct des lignes de compensation vers l'utilisation. Il est possible de compenser une perte de tension de 0,5 V maxi par ligne.

## Utilisation sans lignes de compensation

Les bornes de compensation sont reliées par pontages B 10 event. 110 et B 11 event. 111 aux bornes de sortie. Les lignes de charges sont raccordées aux bornes de sortie + V et - V.

## Utilisation avec lignes de compensation

Supprimer les pontages B 10 event. 110 et B 11 event. 111. Afin d'éviter les effets parasites, les lignes de compensation doivent être blindées ou torsadées (voir dessin). Un condensateur de 100-220  $\mu$ F doit être intercalé en parallèle avec la charge. La tension de réponse de protection surtensions doit être augmentée en conséquence.

## Protection contre les surtensions

En cas de dépassement de tension, la tension de sortie est coupée et la sortie est court-circuitée par le thyristor. Si une tension externe est appliquée aux bornes de sortie (veiller à la polarité!) la protection est également assurée lorsque le secteur est coupé. Le seuil de réponse est réglable selon la plage prévue, à l'aide des potentiomètres P 21 event. P 121 (OVP U1 U2); voir caractéristiques de puissance. Après avoir atteint le seuil de sécurité de surtension, l'alimentation est coupée du secteur pendant un bref laps de temps avant sa remise en service normal.

## Couplage série ou parallèle

Il est possible de coupler plusieurs alimentations en série jusqu'à une tension de sortie de 200 V maxi. Si la limitation de courant déclenche un appareil, la ligne de charge doit être coupée pendant un court instant. Le couplage en parallèle permet d'obtenir une puissance de sortie plus élevée. Toutes les sorties doivent être réglées à la même tension de manière à obtenir un courant de charge également réparti. (les pertes de tension doivent être identiques entre les bornes 6 et 20, event. 14 et 22).

## Séparation galvanique des tensions de sortie

Les tensions de sortie sont galvaniquement séparées les unes des autres. Elles peuvent être branchées sur différentes tensions de référence.

Les dommages consécutifs au non respect de nos instructions entraînent l'annulation de la garantie.

Cette documentation a été rédigée avec tout soin. Toutefois, nous ne pouvons pas garantir son entière exactitude.

**Technische Daten**

**Technical Data**

**Caractéristiques techniques**

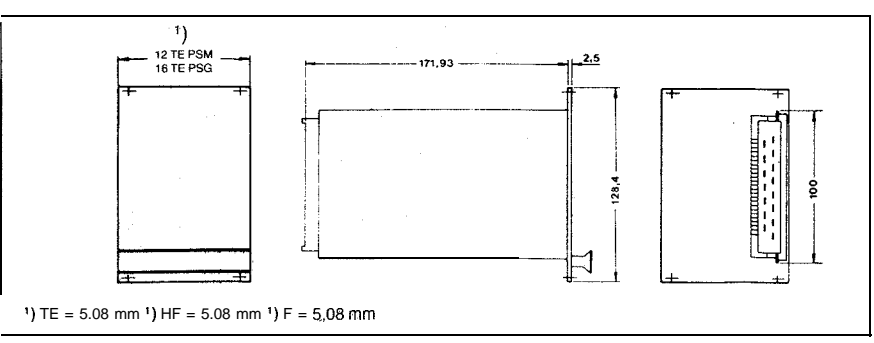
Eingangsgrößen		Input parameters		Valeurs d'entrée	
Netzspannung	Mains voltage	Tension secteur	110/130/220/240 V ~ ± 10%		
Netzfrequenz	Mains frequency	Fréquence secteur	48-62 Hz		
Wirkungsgrad	Efficiency	Rendement	30-60%		
Ausgangsgrößen		Output parameters		Valeurs de sortie	
Ausgangsspannung	Output voltage	Tension de sortie	see Data table		
Ausgangsstrom	Output current	Courant de sortie	see Data table		
Restwelligkeit	Residual ripple	Ondulation résiduelle	≤ 2 mVpp		
Dynamische Ausgangsgrößen		Dyn. output parameters		Valeurs dynamiques at load change 0-100%/1KHz	
Ausregelabweichung	Control deviation	Ecart de régulation	2 mV typ.		
Gesamtausregelzeit	Total settling time	Temps de réponse	typ. 20 μs		
Schutz- und Überwachungseinrichtung		Protection and control adjustment		Dispositif de protection st de Surveillance	
Überspannungsschutz einstellbar	Overvoltage protection, adj.	Protection contre les surtensions	see Data table		
Sonstige Eigenschaften		Other features		Autres propriétés	
Funktstörgrad (nach VDE 0875)	RFI suppression (to VDE 0875)	Antiparasitage (selon VDE 0875)	≤ K		
Fernfühlen kompensiert	Remote sense, compensated	Téledétection, compensée	max. ± 0.5 v		
Netztausfallüberbrückung bei U <sub>E</sub> Nenn U <sub>E</sub> Nenn - 10%	Mains failure bridging at V <sub>IN</sub> nominal' at V <sub>IN</sub> nominal - 10%	Shuntage coupure U <sub>E</sub> Nom. secteur pour U <sub>E</sub> Nom. - 10%	typ. 20 ms typ. 12 ms		
Kühlart	Type of cooling	Type de refroidissement	Convection		
Gewicht	Weight	Poids	1,65 kg PSM 2,35 kg PSG		
Vibration (3 Raumrichtungen)	Vibration (3 directions)	Vibrations 3 directions dans l'espace	2 g		
Schock (3 Raumrichtungen)	Shock (3 directions)	Chocs 3 directions dans l'espace	2 g		
Nbrmen und Sicherheitsbestimmungen	Safety regulations and standards	Prescription de sécurité et normes	VDE 0551 Transformer VDE 0804 Test voltages		
MTBF 80% Belastung bei 50 °C:	MTBF 80% load at T <sub>A</sub> = 50 °C	MTBF Charge de 80%, 50 °C	100.000 h		
Betrieb bei Umgebungstemperatur:	Operation at ambient temp.	Temp. ambiante	0-70 ° C, see Data table		
Lagertemperatur	Storage temperature	Temp. stockage	- 40 ° C to 85 ° C		

**Datentabelle/Data table/Caractéristiques de puissance**

Typ	Ausgangsspannung U <sub>A</sub> werksseitig eingestellt	Ausgangsstrom I <sub>A</sub> (A) bei T <sub>A</sub> <sup>1)</sup> von 0°C bis.			Einstellbereich U <sub>A</sub> (V) bei T <sub>A</sub> <sup>1)</sup> von 0°C bis		Überspannungsschutz <sup>2)</sup> Einst.-Bereich werksseitige Einst.	
		50 °C	60 °C	70 °C	50 °C	70 °C	(V)	(V)
Type	Output voltage V <sub>O</sub> pre-set	Output current I <sub>O</sub> (A) at T <sub>A</sub> <sup>1)</sup> 0°C to			Adjustment range V <sub>O</sub> (V) at T <sub>A</sub> <sup>1)</sup> 0°C to		Overvoltage protection <sup>2)</sup> adj. range pre-set	
Type	Tension de sortie Réglage en usine	Courant de sortie I <sub>A</sub> (A) avec T <sub>A</sub> <sup>1)</sup> de 0° C à			Plage de réglage U <sub>A</sub> (V) avec T <sub>A</sub> <sup>1)</sup> de 0° C à		Protection surtensions <sup>2)</sup> Plage de réglage Réglage en usine	
PSM	(V)	50 °C	60 °C	70 °C	50 °C	70 °C	(V)	(V)
205	2 x 5	2 x 1,2	2 x 1,0	2 x 0,8	4,5-5,5	4,5-5,5	4,5-6,5	6
212	2 x 12	2 x 1,0	2 x 0,8	2 x 0,6	10-13	11-13	11-15	13
215	2 x 15	2 x 1,0	2 x 0,8	2 x 0,6	12-16	14-16	14-19	16
218	2 x 18	2 x 0,8	2 x 0,7	2 x 0,6	15-19	17-19	17-22	19
224	2 x 24	2 x 0,6	2 x 0,5	2 x 0,4	21-25	23-25		
230	2 x 30	2 x 0,5	2 x 0,4	2 x 0,3	26-31	29-31		
PSG								
205	2 x 5	2 x 2,0	2 x 1,5	2 x 1,0	4,5-5,5	4,5-5,5	4,5-6,5	6
212	2 x 12	2 x 1,5	2 x 1,2	2 x 0,8	10-13	11-13	11-15	13
215	2 x 15	2 x 1,5	2 x 1,2	2 x 0,8	12-16	14-16	14-19	16
218	2 x 18	2 x 1,2	2 x 1,0	2 x 0,8	15-19	17-19	17-22	19
224	2 x 24	2 x 1,2	2 x 1,0	2 x 0,8	21-25	23-25		
230	2 x 30	2 x 1,0	2 x 0,8	2 x 0,6	26-31	29-31		

<sup>1)</sup> T<sub>A</sub> = Umgebungstemperatur  
<sup>1)</sup> T<sub>A</sub> = Ambient temperature  
<sup>1)</sup> T<sub>A</sub> = Temp. ambiante  
<sup>2)</sup> Bei Erhöhung U<sub>A</sub> über werks. Einstellung muß OVP entsprechend nachgestellt werden.  
<sup>2)</sup> If the V<sub>O</sub> is increased above the pre-set level, the OVP should be adjusted accordingly.  
<sup>2)</sup> Pour réglage U<sub>A</sub> supérieur au réglage usine, augmenter OVP en proportion.

**Maßbilder/Dimensions/Dimensions**



**Steckerbelegung**

**Connector pin-out**

**Raccordements connecteur**

Messerleiste Bauform H 15	Male connector (Type H 15)	Connecteur mâle (forme H 15)
Fühlerleitung +	Remote sense +	Ligne de compensation +
Ausgangsspannung + U <sub>1</sub>	Output voltage + V <sub>1</sub>	Tension de sortie + U <sub>1</sub>
Ausgangsspannung - U <sub>1</sub>	Output voltage - V <sub>1</sub>	Tension de sortie - U <sub>1</sub>
Fühlerleitung -	Remote sense -	Ligne de compensation -
Fühlerleitung +	Remote sense +	Ligne de compensation +
Ausgangsspannung + U <sub>2</sub>	Output voltage + V <sub>2</sub>	Tension de sortie + U <sub>2</sub>
Ausgangsspannung - U <sub>2</sub>	Output voltage - V <sub>2</sub>	Tension de sortie - U <sub>2</sub>
Fühlerleitung -	Remote sense -	Ligne de compensation -
Netz Eingang <b>N L</b>	Mains input <b>N L</b>	Tension d'entrée <b>N P H</b>
Netz Eingang <b>N N</b>	Mains input <b>N N</b>	Tension d'entrée <b>N A M P</b>
Netz Eingang PE	Mains input Protective earth	Tension d'entrée