At the very beginning was the hydrogen

Then a proposal for BTeV.

Then an invitation for iseg.

Then there was a shock at iseg.

Then we made some work.

And now we are here and

I am nervous.

Good morning.

From dreams to a challenge:

Fermilab

Fermi National Accelerator Laboratory
P.O.Box 500 • Batavia, Illinois • 60510-0500
FAX 630/840-2907 PH 630/840-3528

+

The BTeV collaboration

+

iseg Spezialelektronik GmbH

+

COMMUNICATION

+

GOOD PRODUCTS

=

GOOD JOB

P.S.: wait and see a lot of Higgs, result: Nobelprize

A.)

Good morning
Ladies and Gentlemen and
welcome to the first presentation of iseg in the US.

I shouldn' t talk about the end of this morning before I really start but at the end I hope you will have a certain idea what

iseg Spezialelektronik GmbH

can do for you,

what our products could do (or not) in your application and
what they could be after we have made perhaps modification for you.

First of all I thank you for your invitation.

Especially I would like to thank

Mr. Barsotti and Mr. Orr

who finally convinced us to present our products today.

In fact it is the first time that iseg is personally presenting the company in front of customers in the United States.

We have made some business in the States during the last years but always on ‘ Email communication level ‘.

This has been sufficient because the questions have been easy to clarify and - unfortunately - the orders have been small.

We know that the customers are pleased with the quality they got and this is our main goal , apart from the money which we carefully take.

We know that the American market is about 3 times more than the European, but we wouldn’t penetrate into this market too early.

We started in 95 together with STRUCK and with LeCroy but this unfortunately came to an end in 98 when STRUCK went into bankruptcy and LeCroy was no more interested in working together with us.

We found a new representative in spring last year and with his help we are sure to begin a stable co-operation to work for this immense market.

It is likely to say - in contrary to the past – that this application is extensive and impressive.

We are working on some projects - which could be comparable - the LHC at CERN.

My guide line is - if you agree – to follow your HV requirements and your budget estimate and I will go through step by step.

Please give me your comments if you feel that something is missing.

By the way , my English sounds a little rusty – this is somewhat common to Germans even if they live in the States for years, so please let me know if you do not understand me.

Thank you again for your very warm welcome.

AGENDA

A.) Good Morning

B.) AGENDA

C.) Where is Dresden and how to get there?

D.) Company profile

E.) History: where we come from, what are our goals.

F.) Summary of BTeV High Voltage Requirements

G.) HV estimates requirements:

Budget estimate

H.) Conclusion

I.) How to proceed: modifications, prototyping

J.) Coffee break

C.) Where is Dresden and how to get there?

D.) Company profile:

Name of the company:	**iseg Spezialelektronik GmbH**
Form of the company:	**GmbH (Ltd.)**
Address:	**Bautzner Landstr. 23, D - 01454 Grosserkmannsdorf**
Company capital:	**USD 100,000.**
Partners:	**Dr. Frank Gleisberg, Dr. Joachim Poethig, Ing.(grad) Horst Schultz, Dipl.- Ing. Ludwig Christians**
Managing director:	**Dr. Frank Gleisberg**
Employees:	**18 employees**
Qualification:	**Physicists, Electronic-HW-Engineers, tech. Designer, SW-Engineers (10 of them with university graduation.), etc.**
Competence:	**Development of HV PS, development of computer interfaces related to PS (CAN, VME, CAMAC, RS 232 , IEEE 488.2), design and construction, test – and measurement for quality management, calibration, prototyping, management of production, etc. We co-operate together with an in-house company with regard to their manufacturing facilities (ISO 9000). Our general competence has been proven by the entire product family which has been made since the beginning in 1995. Before that date the founder and some key persons made their experience with electronic design, mainly in HV since many years.**

E.) History

High Voltage Power Supplies

for industry
for Magnetrons, Laser, X Ray, Tube-PS, Ion-Implantation,
Ion-pumps, Capacitor Load, E-beam-systems,
Electrostatics,
electron beam processing etc.

for Labs
for PMTs, APDs, channeltrons, Ion traps, SI Strips, SI Pixel,
Liquid Argon CAL.,Straw Tubes, ECAL,VERTEX, etc.

iseg Spezialelektronik GmbH

a new supplier for High Voltage Power Supplies

founded in 1995

in Rossendorf / Dresden

Germany

Time tabel:

1995 until 1997: Standard Laboratory Product Family

in

- NIM,
- CAMAC,
- VME,
- 3 U /
- 6 U Euroformat

The most comprehensive
High Voltage Modular
Power Supply Family for

Laboratory applications in Physics.

A total redesign of popular
and well known units

- in SMT,
- all remote controllable, with
- RS 232,
- CAN,
- CAMAC-BUS,
- VME - BUS,
- IEEE 488.2

1996 until 1998: Industrial - Products:

DC to DC Converters for industrial applications.
From small ‘bricks‘ for low power 600 mW up to 19“ units for medium power 10 kW, voltage 0...30 kV.

1999: New Depelopments for Physics based on CAN Control and cost effective costs per channel.

2000: Examples: 32 channel module for
Liquid Argon Calorimeters
system of ca. 4000 ch in LHC HEAC ATLAS

2 ∗ 8 channel module for
APD ECAL applications
system of ca. 5000 ch in LHC ECAL CMS

16 channel for SI Vertex applications
system of 800 ch in upgrade of
DESY ZEUS Vertex.

2001: 32 ch module and system for
COMPASS / CERN

16 ch module for ATLAS SI Vertex

Highlights:

1995:	the first HV-System for 280 PMTs for Crystall Ball in MPI Heidelberg
1996:	the first 8 channel floating module dedicated to the SI-Counter HV PS system for the HERA B Vertex Detector.
1997:	the first CAN based 16 channel module and system dedicated to APD Arrays in PETs.
1998:	the first High Voltage integrated Base for PMTs with CAN – interface
1999:	the first CAN based 32 channel module and system for HEC Calorimeter in ATLAS.
2000:	the first CAN based 16 channel module and system for APD arrays in ECAL CMS.
2001:	the first CAN based 16 channel module and system for SI Vertex upgrate in ZEUS
2001:	the first CAN based 16 channel moodule and system for a drift chamber in KOMPASS.
2001:	Invitation from BTeV, Market survey for ATLAS HEC etc.

Customer Reference List, Research

Germany:

MPI Heidelberg
DESY
Univ.Dresden
MPI München
BESSY II
DESY Zeuthen
HASYLAB
Max Born Inst.
Hahn Meitner Inst.
FZ Jülich
FZ Karlsruhe
FZ Rossendorf
FHI Fraunhofer Inst.
GSF
ZAE Bayern
EMBL HH Outstation
IPP Garching
Universities:
- München
- Münster
- Freiburg
- Frankfurt
- Bonn
- Hamburg
- Berlin
- Etc.

Switzerland:

CERN ATLAS
CERN CMS
CERN ROSE
CERN ALICE
PSI Villigen
CERN KOMPASS
CERN ISOLDE
PSI Villigen
ETH Zürich

Netherland:

KVI Groningen

Belgium:

Univ. Brussels

Great Britain

Rutherford Lab.
Oxford
Edinborough
Glasgow

Italy:

Teletra Trieste
INFN Torino
INFN Frascati
INFN Milano
INFN Pisa
INFN Roma
INFN Legnaro
INFN Cagliari

France

ESRF Grenoble
LAPP Annecy
CEN
CRN Strassbourg
ILL
Orsay
Saclay
Ganil
INFN Marseille

USA:

Argonne APS
BNL
Michigan State Univ.
FERMILAB
NIST
Florida
Jefferson Lab.

Canada:

TRIUMF

Japan

KEK Japan

Taiwan:

SRRC

Russia:

Dubna
Protvina
St. Petersburg
Novosibirsk

Austria
Brazil
Spain
Denmark
Sweden
China
Norway
Finnland
Turkey
Hungary

General Remarks:

NIM: NHQxxx: still very popular,
about 80 % of all Laboratory HV-PS.

There are several different product lines in NIM

Precision:

Standard	High Precision opt.100pA Resolution	Low Cost

Interfaces: RS 232 CAN

1 channel or 2 channels

CAMAC: CHQxxx: people like it in a running CAMAC system

All types in NIM are also available in CAMAC

VME: VHQxxx: the solution for pure VME environments

3 U: EHQxxx: if one channel is enough

6 U: 8 channel modules
16 channel module
32 channel modules
Modules dedicated to the customer's specifications, customized , optimized.

MHQxxx: small DC 7 DC converters made for industrial applications and research

SHQxxx: an AC Line powered Bench Top PS and an Instrument.
This is a High Precision HV PS

and it is also a High Precision Test Instrument for use in Labs and Prototye tests.

APS to GPS:

beginning from very small boxes
to 19 ″ medium power,

the new generation of better High Voltage !

PHQxxx:

Integrated High Voltage Power Supplies
and
Active Voltage Dividers
for
Photo Multiplier Tubes

The advantages:

Power Consumption:	10 to 20 times less power consumption compared to a conventional resistance divider.
Ripple & Noise:	Ripple and noise 5 to 10 times less compared to a Standard Cockroft Walton
Signal to Noise Ratio SNR:	Signal to Noise Ratio about 2 to 3 times better then conventional units
CAN:	CAN Interface. Complete control, i.e. full system capabilities

Power Dissipation:	less Power dissipation, i.e. Temperature balance after switch on much faster
Electro Magnetic Interference EMI:	prooven high and low Frequency Interference
Cabling:	No HV - cabling and HV- connector , no mounting of cabling assemblies might save a third or more of your budget
Linearity:	Prooven dynamic linearity etc. through: 1.) Prototyes 2.) Final customer approval
Distortion:	Sinus Generator Patent leads to results of low harmonic distortion
Result:	cost effective Easy to upgrade Easy to handle Easy to maintain System capabilities Low system overhead

END, RESUMEE

Why should you change from one supplier to the other ?

Because you get more performance for less money !

Everybody will tell you this story.

The only way

to find out if this is true

is to try.

iseg Spezialelektronik GmbH
Bautzner Landstr. 23
D - 01454 Grosserkmannsdorf

Email: sales@iseg-hv.de
http://www.iseg-hv.com
Germany

Phone ++ 49 351 / 26 996 - 0
Fax ++ 49 351 / 26 996 - 21

And to try means:

to communicate and to check

and

this is really not very expensive.

Even - if we cannot convince you –

you will get information which might help.

Why should you try with ISEG?

Because you are in contact with people working on

High Voltage

on Bit Level
on µ Volt Level
on pico-Amp. Level,

which means that there is a lot of expertise available.

How can you find out?

You must try !

Why is a mouse when it spins ? The higher, the fewer !

I took this English joke for one of my earlier presentations.

I thought to catch some attention.

Little happened. What does this mean?

Even if I say nonsense

I cannot move somebody to call me,

but

Communication is the only thing that moves our life!

Try with ISEG !

Thank you !

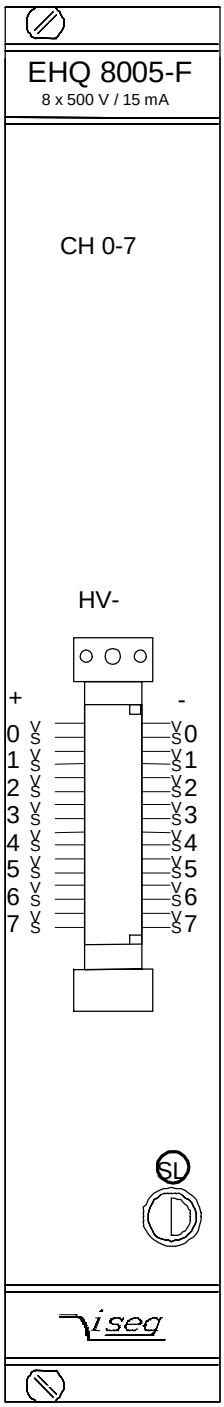
P.S. bad joke: ‘The higher the voltage, the fewer the mices‘.

F.) Summary of BTeV High Voltage Requirements

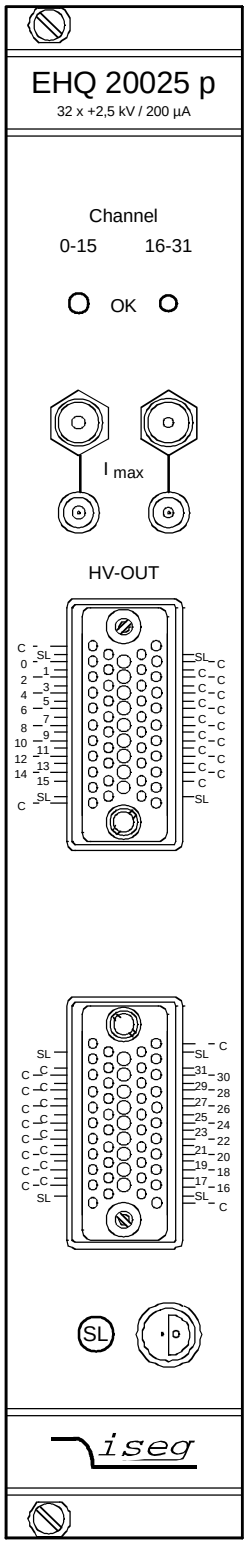
Table 1: Summary of BTeV High Voltage Requirements

Detector Subsystem	Polarity	~ Max. Channels (without spares)	Voltage Range	Current Range	Readback Precision
Pixels	Negative	1426/1500	0-1000	10 nA – 10 mA	0.1% of F.S. V 0.1% of I range
Strips	Positive	870/900	0-1000	10 nA – 10 mA	0.1% of F.S. V 0.02% of I range
Straws	Positive	3700/4000	~ 0-2200	0-10 µA	0.5% of F.S. V 1% of I
RICH	Negative	286/300	15 kV-22 kV	0-100 nA	0.1% of F.S. V, 1% of I
	Negative	143/150	10 kV-17 kV	0-100 nA	0.1% of F.S. V, 1% of I
	Positive	143/100	0-100	0-10 µA	0.1% of F.S. V, 1% of I
EM Cal.	Negative	230/250	400	0-10 mA	0.02% of F.S. V, 0.1% of I
	Negative	230/250	600	0-2 mA	0.02% of F.S. V, 0.1% of I
	Negative	230/250	800	0-0.5 mA	0.01% of F.S. V, 0.1% of I
	Negative	690	1000	0-0.1 mA	0.01% of F.S. V, 0.1% of I
Muon Chambers	Positive	2496/2500	~ 0-2000	0-12 µA	1% of F.S. V 1% of I

Technical data	EHQ 8005 - F
Output current I_O	max. 15 mA (at 300 V)
Output voltage V_O	0 to 500 V
Floating	Connector (V-) to GND: ≤ |63 V| Connector (V+) to GND: ≤ |63 V + V_O|
Ripple and noise	f = 10 Hz to 100 kHz: < 10 mV (at max. load and f > 100 kHz: < 2 mV V_O > 50 V)
Hardware current limit I_{max}	Potentiometer internal
Interface	CAN-Interface
Voltage setting	Via software, resolution 10 mV
Voltage measurement	Via software, resolution 10 mV
Current measurement	Via software, resolution 300 nA
Accuracy of voltage measurement	± 20 mV
Accuracy of current measurement	± (0,005% ∗ I_O + 0,005% ∗ $I_{O\,max}$ + 1 digit)
Temperature coefficient	< 5 ∗ $10^{-5}/_K$
Stability	< 20 mV (no load/load and Δ V_{IN})
Rate of change of output voltage	Via software: 0,2 V/s to 50 V/s resolution 0,5 V
Channel control via software	Status 8 bit: channel error, KILL- enable, channel emergency cut-off, ramp, channel on/off, input error, current trip
8 channels error control via software	Current limit (″Channels 0-7 OK″ is signalled if these limits do not exceed on each.)
Error signal	Green LED at ″Channels 0-7 OK″
Protection loop (I_s) (2 pin Lemo-socket)	5 mA < I_s < 20 mA ⇒ module on I_s < 0,5 mA ⇒ module off
Power requirements V_{IN}	+ 24 V (<4 A) and + 5 V (< 1,3 A)
Packing	8-channels in 6U Euro cassette (40,64 mm wide and 220 mm deep)
Connector	96-pin connector according to DIN 41612
HV connector	32-pin Erni Multipin-Connector



Technical data	EHQ 20 025p_204
Output current I_O	max. 200 µA
per channel at V_O	0 to + 2500 V
Ripple and noise	f = 10 Hz to 100 MHz: < 20 mV (at max. load) under two conditions: - at V_O > 400 V and - the different voltage between the channels must be less than 1400 V_O, e.g. $V_{O\ CH31}$ = 2500 V ⇒ $V_{O\ CHn}$ ≥ 1100 V; (n= 0 to 30)
Current limit I_{max}	Potentiometer (I_{max} is the same for 16 channels)
Interface	CAN-Interface
Voltage setting	via software, resolution 50 mV
Voltage measurement	via software, resolution 50 mV
Current measurement	via software, resolution 4 nA
Accuracy of voltage measurement	± (0,01% ∗ V_O + 0,02% ∗ $V_{O\ max}$ + 1 digit) for one year
Accuracy of current measurement	± (0,1% ∗ I_O + 0,4% ∗ $I_{O\ max}$ + 1 digit) for one year
Temperature coefficient	< 5 ∗ 10^{-5}/K
Stability	< 5 ∗ 10^{-5} (no load/load and Δ V_{IN})
Rate of change of output voltage via softw.	1 V/s to 125 V/s resolution 0,5 V/s 125 V/s to 250 V/s resolution 5 V/s
Channel control via software	Status 8 bit: voltage and current limit, KILL-enable, channel emergency cut-off, ramp, channel on/off, input error, current trip
16 Channels error control via software	voltage limit current limit (″16 Channels OK″ is signalled if these limits do not exceed on each.)
Error signal	Green LED at ″16 Channels OK″
Protection loop (I_s) (2 pin Lemo-socket)	5 mA < I_s < 20 mA ⇒ module on I_s < 0,5 mA ⇒ module off
Power requirements V_{IN}	+ 24 V (<2,4 A) and + 5 V (<0,5 A)
Packing	32-channels in 6U Euro cassette (40,64 mm wide and 220 mm deep)
Connector	96-pin connector according to DIN 41612
HV connector	51-pin Redel Multipin-Connector



EHQ 20 025 : summary of CAN data frames

Following list describes the commands of the DCP made for one 16 channel EHQ sub-module.

EXT_ INSTR	DATA_ DIR	DATA_ID Bit								Command	read/ write/ activ e	DATA - Bytes
ID1	ID0	7	6	5	4	3	2	1	0			
	x	**0**	x	x	x	x	x	x	x	**No DATA_ID**		
x	**x**	**1**	**0**	**C1**	**C0**	**N3**	**N2**	**N1**	**N0**	**Single command CHANNEL:**		
1	1/0	1	0	0	0	N3	N2	N1	N0	Single command CHANNEL: Current trip	r/w	3
0	1	1	0	0	0	N3	N2	N1	N0	Single command CHANNEL: Actual voltage	r	3
0	1	1	0	0	1	N3	N2	N1	N0	Single command CHANNEL: Actual current	r	3
0	1/0	1	0	1	0	N3	N2	N1	N0	Single command CHANNEL: Set voltage	r/w	3
0	1	1	0	1	1	N3	N2	N1	N0	Single command CHANNEL: Status channel	r	3
		1	**1**	**C3**	**C2**	**C1**	**C0**	**G1**	**G0**	**Group command module**		
0	1/0	1	1	0	0	0	0	0	0	Status module	r/w	2
0	1	1	1	0	0	0	1	0	0	Status1 Voltage limit was exceeded at single channel	r	3
0	1	1	1	0	0	1	0	0	0	Status2 Current limit was exceeded at single channel	r	3
0	1/0	1	1	0	0	1	1	0	0	Channel ON / OFF	r/w	3
0	1/0	1	1	0	1	0	0	0	0	Ramp speed	r/w	3
0	0	1	1	0	1	0	1	0	0	Emergency cut-out	w	3
0	1	1	1	0	1	1	0	0	0	Log-on front-end device in superior layer	a	2
0	0	1	1	0	1	1	0	0	0	Log-off superior layer at front-end device	w	2
0	1/0	1	1	0	1	1	1	0	0	Bit rate	r/w	3
0	1	1	1	1	0	0	0	0	0	Serial no. (6 BCD) and software release (3 BCD)	r	6
0	0	1	1	1	0	0	1	0	0	Set voltage for all channels	w	3
0	1	1	1	1	0	1	0	0	0	Read current limit	r	3
0	1/0	1	1	1	0	1	1	0	0	KILL-enable	r/w	3
0	1/0	1	1	1	1	0	0	0	0	ADC filter setting	r/w	3
0	1	1	1	1	1	0	1	0	0	Value ratings module	r	5

0	C_i:		Commands
	N_i	0 to 15:	Channel 0 to 15
	G_i:	0 to 3:	Group 0 to 3 Only needed if group controller (GC) used

CPx[1)] 200 504 24 5

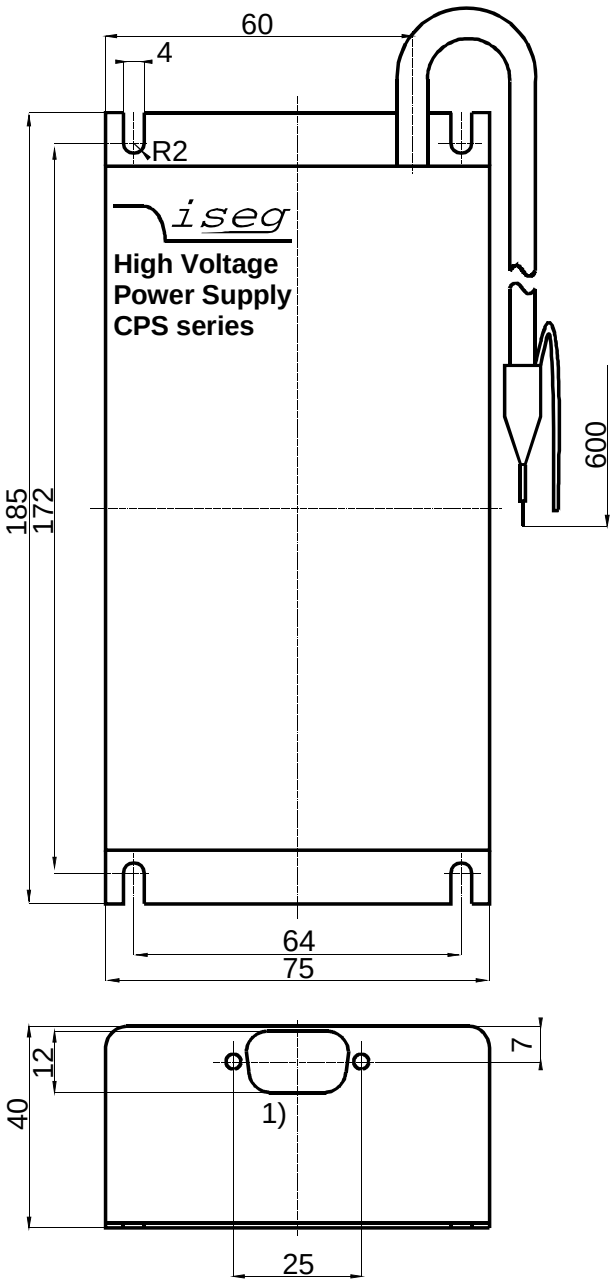
Modular High Voltage Power Supply CPS series

Technical data

V_{OUT}	[)1]: x=p	0 to + 20 kV (related to GND)
	[)1]: x=n	0 to - 20 kV (related to GND)
I_{OUTmax}		500 µA
V_{IN}		24 V - DC / < 800 mA
Ripple and noise		< 500 mV_{P-P}
Stability		$\Delta V_{OUT} / \Delta V_{IN} < 5*10^{-5}$ load to no load: $\Delta V_{OUT} < 2*10^{-4}$
Temperature coeff.		$< 1*10^{-4}$/K
Operating temperature		0 to 50°C
Protection		overload and short circuit

9-pin male D-Sub connector

PIN	Name	Description
1	PWR_0V	Power 0 V (connected to PIN 6, GND and metal box)
2	V_I_{MON}	Monitor voltage corresponding I_{OUT} I_{OUT}= 0 to I_{OUTmax} ⇒ V_{2-6} = 0 to 5 V (R_{OUT} = 10 kΩ)
3	INH	INHIBIT (TTL level, LOW=active ⇒ V_{OUT} = 0)
4	V_I_{SET}	Setting current limit: V_{4-6} = 0 to 5 V (R_{IN} = 10 kΩ) ⇒ I_{OUT} = 0 to I_{OUTmax} n.c.: I_{OUTmax} is possible
5	PWR_+	+ V_{IN}
6	V_{SET}_0V	Signal 0 V (connected to PIN 1, GND and metal box)
7	V_V_{MON}	Monitor voltage corresponding V_{OUT} V_{OUT}= 0 to V_{OUTmax} ⇒ V_{7-6} = 0 to 5 V (R_{OUT} = 10 kΩ)
8	V_V_{SET}	Setting voltage: V_{8-6} = 0 to 5 V (R_{IN} ≈ 300kΩ) ⇒ V_{OUT} = 0 to V_{OUTmax}
9	V_{REF}	V_{9-6}= 5 V (1 mA) Reference volt. for an external poten-tiometer (Sliding contact on V_V_{SET})



1) 9-pin **male** D-Sub connector

We reserve the right to make changes in the product design without reservation and without notification to the user.

Filename CPx200504245.___;
Version 1.03 from 08.12.98

Crates ECH 228 / 328

The crates ECH 228 x or ECH 328 x are able to carry up to 8 HV modules with 220 mm depth. The crates provide the necessary supply voltages and the connections for all remote control capabilities.

Options: - remote control of all supply voltages via CAN BUS and switching.
- Integrated UPS (bridge time min. 1 min), with CAN-Interface only!

During operation enough air flow has to be given to the unit.

2. Technical data

	ECH 228 L / 328 L	ECH 228 M / 328 M
AC supply voltage	230 V / max. 5 A (fuses double sided)	230 V / max.10 A (fuses double sided)
DC supply voltages	+ 24 V (up to 15 A) + 5 V (up to 5 A)	+ 24 V (up to 25 A) + 5 V (up to 12A)
Power total	max. 400 W	max. 700 W *
Floating	Floating = max. difference of voltage between PE and GND: $\Delta V \leq \lvert 30\ V \rvert$, clamped via 2 anti- parallel suppresser-diodes with $V_Z = 56$ V	
Mechanical layout	19“ – Standard BIN 84 TE / ca. 450 mm depth slot depth 220 mm CAN-connector: 9-pin Sub-D	
	ECH 228 L: height 6 U PS forced air cooling Cover – and bottom shield with with air slots	**ECH 228 M:** height 6 U PS forced air cooling Cover – and bottom shield with air slots
	ECH 328 L: height 7 U PS and module slot with forced air cooling.	**ECH 328 M:** height 7 U PS and module slot with forced air cooling
Air cooling	**ECH 228 L** In case of desk operation above and under the unit a free space of 40 mm must be guaranteed. The air flow slot on rear side must be free.	**ECH 228 M** In case of full power operation enough air flow has to be provided. The air flow slot on rear side must be free.
	In case of rack mounting and the use of several crates in stack forced air cooling and the use of special air flow sheets is necessary.	
	ECH 328 L	**ECH 328 M**
	Above and under the unit no extra room is necessary. The air flow slots in front and on rear side must be free.	

H.) Conclusion

Status:	iseg is to 90% ready with almost all hardware which is listed in the BTeV requirements, apart from the 23 kV and 17 kV version. Only small modification are necessary. The packaging of all modules is such that the volume per channel is quite well extended.
Developement Cost:	none.
Cost saving potential:	with $ 27,000 in engineering cost we open a potential of ca. $ 200,000 in savings, if specifications for floating channels and ripple & noise might be changed.
product hygiene:	only 3 different types of modules, a Standard 19” industrial made crate, a Standard crate PS coming from telecommunication industry together with additional UPS and CAN control.
Spares in stock:	low.
Maintenance:	simple, because of failure diagnosis between crate and modules will be easy.
Reliability:	related to components from electronic industry.
Try:	we offer modules for your test procedures in order to build up your confidence.