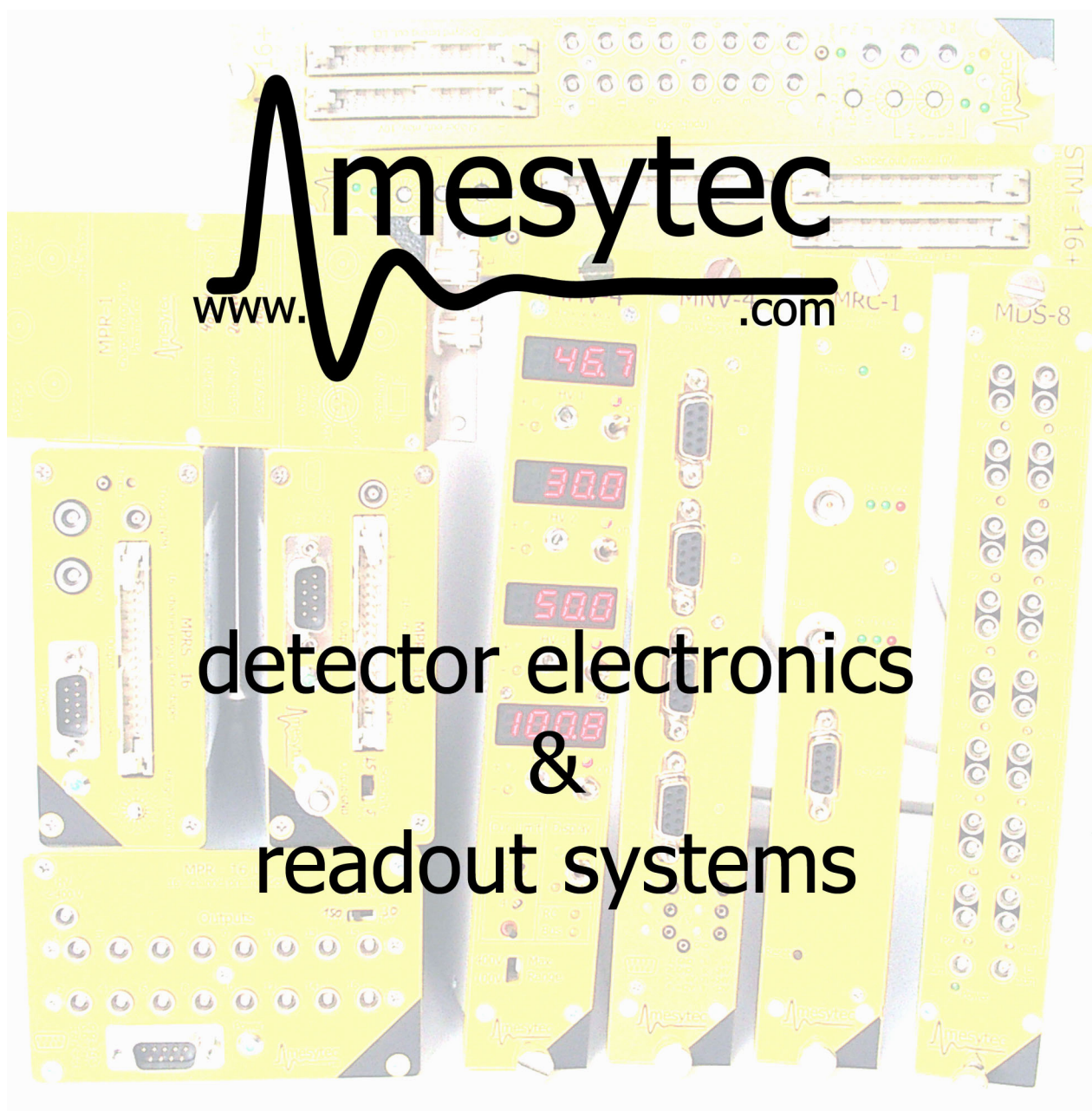
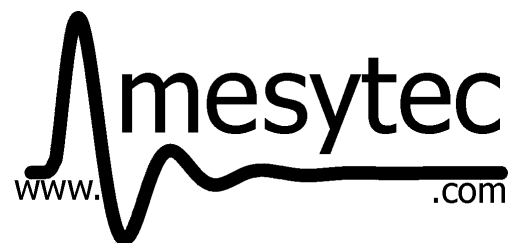




Mesytec
www.**Mesytec**.com

**detector electronics
&
readout systems**

short form catalogue
nuclear physics
2006



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REPRESENTED BY:

mesytec offers a broad range of readout electronics - from single channel preamplifiers to highly integrated, multichannel, multiplexing systems. A set of accessories (Bias supply, remote control, cabling) enables to set up comprehensive systems.

The following table shows the available standard devices and lists some main properties. Each product is presented in detail following this overview.

Device	*	Applications	Description	Page
* : P : preamp, S : shaper, TF : timing filter, LE : leading edge discr., CF : constant fraction discr., RC : remote control				

Single Channel Devices

MPR-1 Single channel charge sensitive preamplifier	P	Universal single channel preamplifier.	Two 10V outputs with selectable polarity, driving terminated lines. One output can be configured to pass a timing filter stage. Pulser input. Switch to increase gain by a factor of 5. Energy ranges: 1 GeV / 200 MeV / photo multiplier type. Lemo, BNC, MHV or SHV connectors.	5
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Multi Channel Devices, Individual Readout

MSI-8 8 channel preamp, shaper, timing outputs	P S	Flexible and handy lab system. All Lemo in- and outputs	8 channel preamplifier with HV bias filter, shaper, timing filter, sum timing, continuous gain adjust. Polarity and additional gain selectable by jumpers. Broad range of preamp and shaper modules. Pulser input. Shaper outputs driving terminated lines, NIM gate output. Lemo in- and outputs. Properties selectable for individual channels.	7
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MPRS-16 16 channel preamp, shaper timing filter, discriminator	P S	DSSSD, multichannel detectors. Compact and cost effective.	16 channel preamplifier with HV bias filter, Pulser input. Shaper with 10V output, driving terminated lines, 34 pole connector for direct interfacing to standard ADCs. Fixed shaping time 1 us FWHM. Pos / neg inputs, sensitivity switchable in 8 steps. 2 timing filter outputs (sum of 8 channels each). NIM timing out from LE-discriminators. Maximum Energy: 50 MeV (unipolar 100 MeV). PCB version for in vacuum use available.	9
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MPR/STM+ Series		DSSSDs, multichannel detectors	Combination of 16 / 32 / 64 channel charge sensitive preamps with 16 channel shaper, timing filter, discriminators, and multiplicity trigger. Available energy ranges up to 5 GeV	
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MPR-16 MPR-16L MPR-32 MPR-64 16 / 32 / 64 channel preamp	P	Multi channel charge integrating preamplifiers Fast, low noise, low power.	16 / 32 / 64 channel preamplifier with HV bias filter and pulser input. designed for combination with STM-16, differential twisted pair output for long distances from preamp to shaper. Good timing and energy resolution. Vacuum feedthrough system available MPR-16 also available with single ended Lemo outputs (MPR-16L).	11
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STM-16+ STM-16L+ 16 channel shaper, timing filter, discriminator, ECL timing output	S TF LE RC	High quality spectroscopy amplifier with integrated leading edge discriminators 1/12 NIM	16 channel shaper, timing filter, leading edge discriminator, ECL outputs, multiplicity trigger. 2 switchable shaping times, Gain range 1 - 600 2 Versions: • differential input (for use with MPR-series) • single ended Lemo 00 input RC for gains and thresholds possible with MRC-1 and extension module.	13
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Device	*	Applications	Description	Page
* : P : preamp, S : shaper, TF : timing filter, LE : leading edge discr., CF : constant fraction discr., RC: remote control				

Multi Channel Devices, Individual Readout - continued

MDS-8 8-channel spectroscopy amplifier	S TF	Spectroscopy amplifier. Lemo in- and outputs 1/12 NIM	8-channel spectroscopy amplifier with integrated timing filter amplifier. Adjustable gain 1 to 200, 3 shaping times. Adjustable gain and PZ at front panel.	15
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NEW Product – available in Q2 / 2006

MSCF-16 16 channel shaper, constant fraction discriminator	S TF CF RC	Compact, cost effective and performant combination of spectroscopy amplifier and CFD. 1/12 NIM	16 channel shaper, constant fraction discriminator, timing filter amplifier switchable shaping times, PZ cancellation, ECL timing. RC with MRC-1 allows individual remote control for all settings.	26
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Multi Channel Devices, Multiplexed Readout

MUX-16 16 channel preamp, shaper	P S LE RC	For detectors in single or dual hit applications (inter strip hits at Si-detectors) Good timing and energy resolution, high rate capability. In vacuum operation reduces cabling.	16 channel preamplifier with HV bias filter. Shaper with Fixed shaping time of 1 us FWHM. Individual leading edge discriminators. Multiplexed output for up to 2 firing channels, chainable for larger setups. Up to 128 channels can be read out with 4 standard peak sensing ADC channels (2 amplitudes and two channel addresses). Optional remote control with MRC-1 allows individual settings (important for in vacuum use). PCB version for in vacuum use.	17
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MMR-XX multiplexed preamps	P	DSSSD readout. For single hit applications. Multiple of 8 channels.	Multi channel individual preamps multiplexed on resistor chain. p and n version available. Energy range from 20 MeV to GeVs. PCB version.	19
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Accessories

MHV-4 4 channel 400 V detector bias supply	RC	Detector bias supply for silicon detectors. 1/12 NIM	4 channel 400V 20uA detector bias supply. 4 large and bright displays for simultaneous voltage or current display of each channel. 1 nA current resolution. Acoustical/optical alarm for current overflow. SHV or BNC outputs, remote controllable (RS232, and optional also via mesytec event bus).	21
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MNV-4 4 channel NIM voltage supervision / distributor		NIM voltage distribution. Supervision of NIM voltages, error display. 1/12 NIM	4 channel NIM voltage controller / distributor for preamp voltage supply	23
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MRC-1 remote control master	RC	RC master for mesytec eventbus control 1/12 NIM	Remote control master module. Serial interface to control STM-16+, MSCF-16, MHV-4	24
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Cable Collection		Connect detectors to preamplifiers	Combination of detector adapters, vacuum signal cables, multipole vacuum feedthroughs, signal cables for best signal quality	25
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mesytec **MPR-1** is a charge integrating preamplifier module. It provides two outputs which can be jumpered to different or same polarity. One can be configured as timing filter output. Both can drive terminated BNC cables. The sensitivity can be changed by a factor of 5 via front panel switch. This helps to get larger signals at low charge deposition. For photo multiplier readout a special version "MPR-1-PMT" is available.

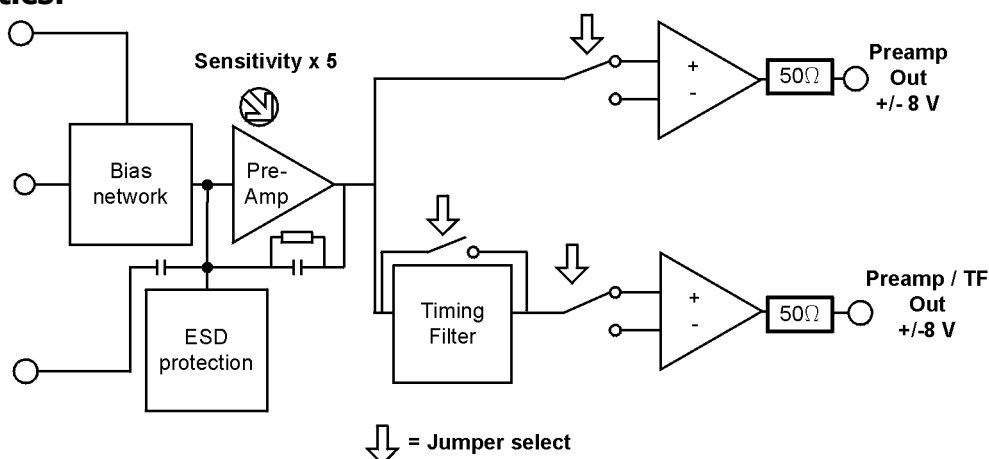
MPR-1 is available with Lemo, BNC, MHV and SHV connectors.

Features:

- Ni-plated, fully shielded case
- ESD input protection
- Positive and negative input charge
- Pulser input
- Bias voltage up to ± 3000 V
- Two outputs (selectable polarity, one can be configured as timing filter output)
- Strong output driver for $50\ \Omega$ (optional $93\ \Omega$) termination
- Fast risetime ($t < 12$ ns)
- Two sensitivities (switch selectable)
- Low power



Schematics:



Technical Data:

Different standard ranges are available:

Range in energy deposition in silicon detectors.
Divide by 3.6 to get number of electrons (1 GeV = $2.8 \cdot 10^8$ electrons)

All values for ± 8 V output, left number for switch position low sensitivity, right number for high sensitivity.

- **200 MeV type:** 200 MeV / 40 MeV
-> low noise
(for energies up to 200 MeV [Si] = 9pC)
- **1 GeV type :** 1 GeV / 200 MeV
-> Si detectors in heavy ion experiments
-> PMTs
(for energies up to 1 GeV = 45pC)

Other ranges on request.

Preamplifier:

- ESD protected
- Positive and negative charge can be amplified equally.
- Open loop gain typ 60000 @ 1 pF integration capacity
- Temperature drift $< \pm 50$ ppm/ $^{\circ}\text{C}$
- Nonlinearity < 50 ppm
- Energy rate capacity:
at 200MeV: $2 \cdot 10^6$ MeV/s, at
40MeV: $4 \cdot 10^5$ MeV/s.
- Risetime of energy and timing output.

detector +cable capacity	signal risetime
0 pF	12ns
100 pF	25ns
330 pF	50ns

Pulser input

- Tail pulse, rise-time TR=0..100 ns, decay time typ. 500 μs
- Terminated with 50 Ω
- Amplitude: max 10 V.
- For 200 MeV type: 1 V corresponds to a charge injection of 10-12C or 22 MeV[Si]
- For 1 GeV type: 1 V corresponds to $4.7 \cdot 10^{-12}$ C or 100 MeV.

Output stage:

- Positive and negative output for single or differential use. Internally switchable: same polarity, or one output with timing filter.
- The timing filter is a single differentiation with time constant $\tau = 33$ ns.
- Output swing: 0 to ± 8 V (not terminated)
- Decay time TD = 100 μs

Input capacity:

- The preamplifier can handle capacities of more than 1000 pF.
- Preamp input capacity typ. 10 nF.

Detector bias (Bias Network):

- Maximum: ± 3000 V
- Bias filter: T-filter (RCR) with
10 M Ω from bias input, 4.7 nF filter capacitor to ground, 50 M Ω resistor to detector input. (others on request)

Amplifier noise

- 200 MeV type
For 1 μs shaping time (=2.3 μs FWHM):
 $N = 2.3 \text{ keV} + 0.021 \text{ keV/pF}$

detector +cable capacity	noise [FWHM] 1 μs shaping time:	0.35 μs Shaping time
0 pF	2.3 keV	2.7 keV
50pF	3.5 keV	4.7 keV
100 pF	4.1 keV	5.9 keV
330 pF	9.1 keV	15 keV

- 1 GeV type

detector +cable capacity	noise [FWHM] for 1 μs shaping time:
0 pF	6 keV
50pF	8.5 keV
100 pF	11 keV
200 pF	16 keV
400 pF	25 keV

Power consumption:

- +12 V, 40 mA + output current
- -12V, 30 mA + output current

Dimensions:

- 60 mm * 143mm * 30mm including connectors.
- Weight: 240 g

mesytec **MSI-8** is a compact 8 channel preamplifier shaper box with integrated timing filter amplifiers. Due to the modular setup, preamplifier and shaper module types can be selected individually for each channel. **MSI-8** is the ideal solution for setups with a mix of different detectors requiring individual bias supply and energy ranges. It is also well suited for moderately segmented strip detectors or as an easy to use and flexible lab system.

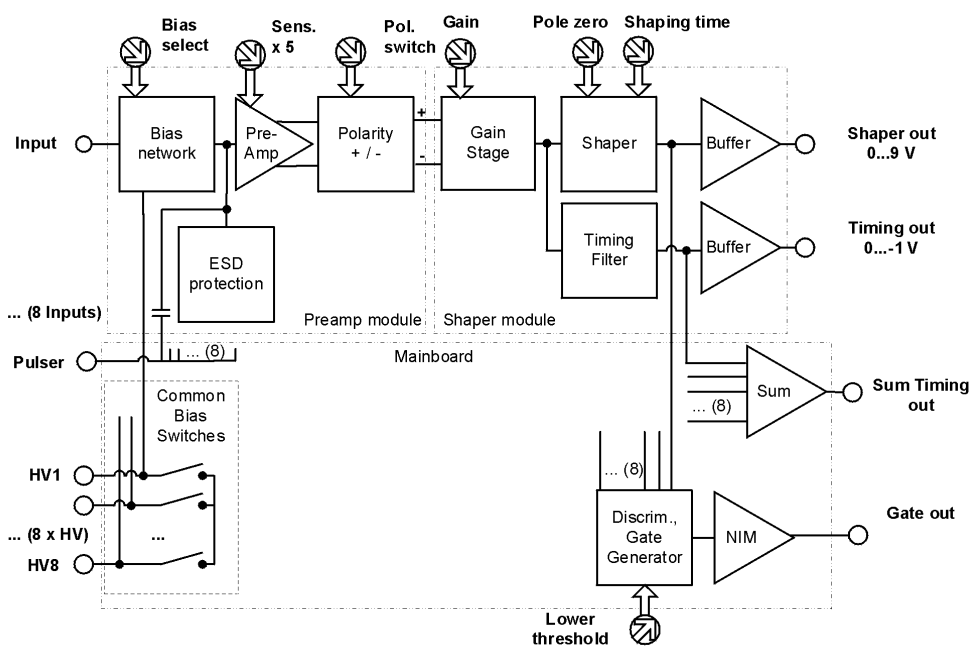
Features:

- 8 channel compact standalone module
- Preamplifier and shaper modules individually selectable
- Shapers with baseline restorers
- Two shaping times, jumper selectable
- Integrated timing filter amplifier
- Individual and common timing output
- Single and common detector bias
- All outputs can be terminated with 50Ω
- Lemo connectors for in- and outputs
- Discriminator gate output for peak sensing ADCs



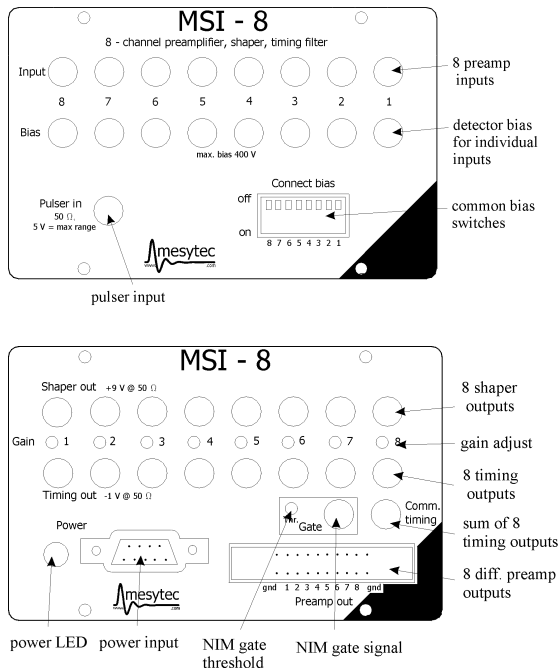
fig. shows open case

Schematics:



Technical Data

MSI-8 has a very flexible modular design. Preamplifiers and shaper, timing filter amplifiers are pcb modules mounted on a common main board. They can be chosen individually for each channel. This gives maximum flexibility for multi channel set-ups with different detectors.



Preamplifier inputs

- Lemo connectors directly situated on the pre-amplifier module.
- Preamplifier modules are available with sensitivities from some MeVs to GeVs.

Detector bias

- Lemo connectors directly situated on the pre-amplifier module

Pulser input

- Tail pulse, or square pulse.
- Internally terminated with 50 Ω .
- 5 V for maximum output voltage at minimum gain.

Common bias switches

bias inputs with switch "on" are connected with each other.

This allows bias supply with a single lemo connector plugged to one of the connected bias inputs.

Shaper outputs

- Lemo connector
- Positive, gaussian pulse
- Max 10V (8 V at 50 Ω).
- Two jumper selectable shaping times (standard is 1 μ s FWHM and 2 μ s FWHM)

Timing output

- Lemo connector
- Fast negative signal
- Max -1V

Common timing

- Analog sum of all timing signals
- Attenuated by a factor of 2
- Maximum peak voltage: -4 V

Gain adjust

- Gain can be adjusted by a factor of 5.
- Another factor 5 by preamp sensitivity switch (at the preamp module)

Differential preamp outputs

- 20 pin standard connector.
- 8 differential preamp signals.
- Can be connected to a twisted pair cable and terminated with 100 Ω .
- Amplitude: +/-1 V for maximum range.

Gate output and gate threshold adjust

- NIM signal output,
- Useful for gating an external peak sensing ADC in lab tests. As long as one of the shaper outputs exceeds the threshold voltage, the NIM-output gets negative.

Power supply

- SUB-D9- female connector.
- Supply voltages (typical currents for box with 8 shapers and 8 preamps):
- +12 V, 250 mA
- +6 V, 50 mA
- -6 V, -170 mA
- total power: 4.3 W

Box size:

- length = 170 mm
- width = 105 mm
- height = 67 mm

mesytec **MPRS-16** includes 16 channels of charge sensitive preamplifiers, shapers, timing filter amplifiers and leading edge discriminators.

It provides two timing filter outputs, where each is the sum of 8 channels. It also provides a NIM trigger output which is the ored signal of the discriminators. It is well suited for high resolution timing and trigger generation.

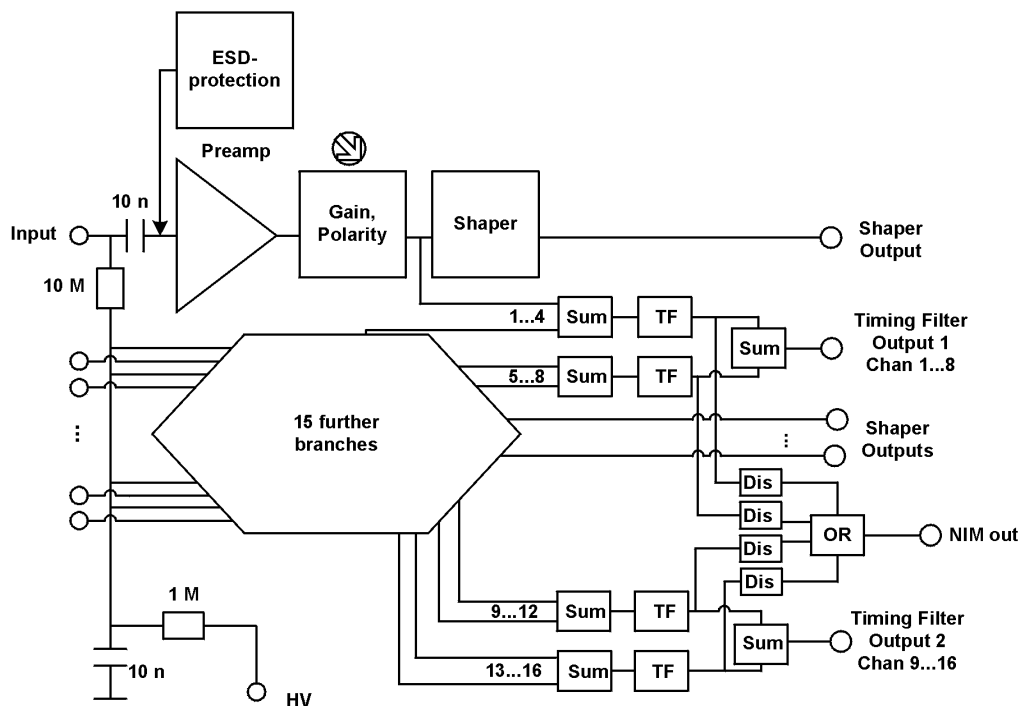
The input polarity and sensitivity can be selected in 8 steps by a rotary switch. The shaper outputs are designed to connect directly to standard 10V peaksensing ADCs. The modules are especially well suited for single or double sided multistrip silicon detectors.

Features:

- 16 channel compact module
- Includes: preamplifier, shaper, timing filter
- High quality discriminator output (NIM) for good timing resolution or trigger generation, adjustable common threshold.
- Sensitivity and polarity selectable with rotary switch in steps: 3.3, 5, 6.7, 10, 17, 25, 33, 50 MeV full range
- Shaper output 10V @ 1k Ω , 1 μ s FWHM
- Pulser input
- Bias voltage up to ± 400 V
- Preamplifier input protection
- PCB module available for in vacuum use



Schematics:



Technical Data:

Input stage

- Input connector(s): SubD 25 female connector
- Positive and negative charge can be amplified equally.
- The guardring output (24) is connected via R-C-R filter (100k Ω , 10nF, 100k Ω) to the common detector bias input.

Noise

- 5.5keV Si + 0.064keV/pF (1200e- FWHM + 18e-/pF)
- maximum input capacity: 1000pF (detector + cable)

Pulser input

- Tail pulse, or square pulse, internally not terminated.
- Amplitude:
Typ. 11 MeV/V $\pm$ 10% (0.5pF couple capacity)

Sensitivity

- Sensitivity can be changed by a rotary switch. The following max ranges (8V output at the shaper module) can be set:
3.3, 5, 6.7, 10, 17, 25, 33, 50 MeV.

Shaper Outputs:

- Unipolar positive gaussian pulse (CR(RC)5). Output amplitude: 0 to 10V, max 50mA
- Peaking time 790ns.
- Crosstalk <3*10⁻³ (-50dB) to neighbour channel, less than -70dB to others.
- Pin assignment of 34 pole output connector:
 - pin 1 channel 1, pin 3 channel 2.....
 - pin 2,4,...32,33,34 output ground
- Option: low power output stage (max 4V output signal). Is useful for in vacuum use.

Timing Filter Outputs

The MPRS provides two timing filter outputs. The signals are generated from the sum of channel 1..8 and 9..16. The signals are negative and are scaled and polarized with the rotary switch setting. Output amplitudes : -1.5V for maximum range in a single channel. The amplitude will vary to some extent with detector capacity and signal risetime.

Discriminators

The MPRS provides a NIM trigger output, which is the or-ed sum of its 4 leading edge discriminators, working each on the analog timing sum of 4 channels. Multiple discriminators are used to provide a high quality low jitter NIM signal. The discriminators have a common threshold, which can be adjusted via 10- turn potentiometer. The threshold value is available at the sense output. 10V of output voltage corresponds to 100% of the chosen sensitivity range. (1V threshold voltage in the 25MeV range means 10% which corresponds to 2.5MeV threshold value)

Detector bias input

- Lemo connector
- Maximum voltage $\pm$ 400V
- When detector side must be on ground level: terminate bias input with 50 Ω

Ground connections

- Ground screws on rear side

Power Supply

Connector:

- SubD9 connector: 1, 2 = gnd, 3 = +6V, 4 = +12V, 5 = -6V

Power consumption:

With 10V output driver = 2.3W

- +12V 100mA
- +6V 130mA
- -6V -100mA

With 4V output driver: 1W

- +6V 140mA
- -6V -20mA

Due to the low power consumption cooling is not necessary.

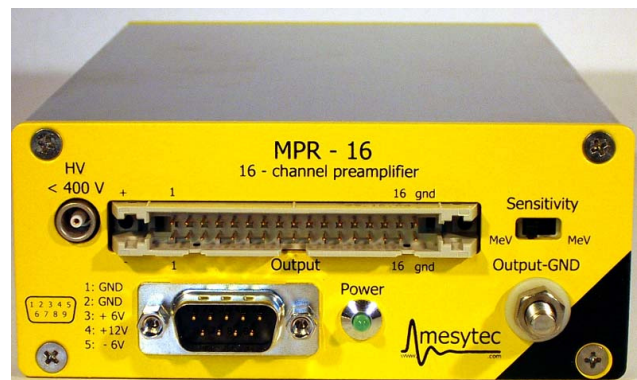
Dimensions:

- Length: 173 mm (without connectors)
- Width: 105 mm
- Height: 46 mm

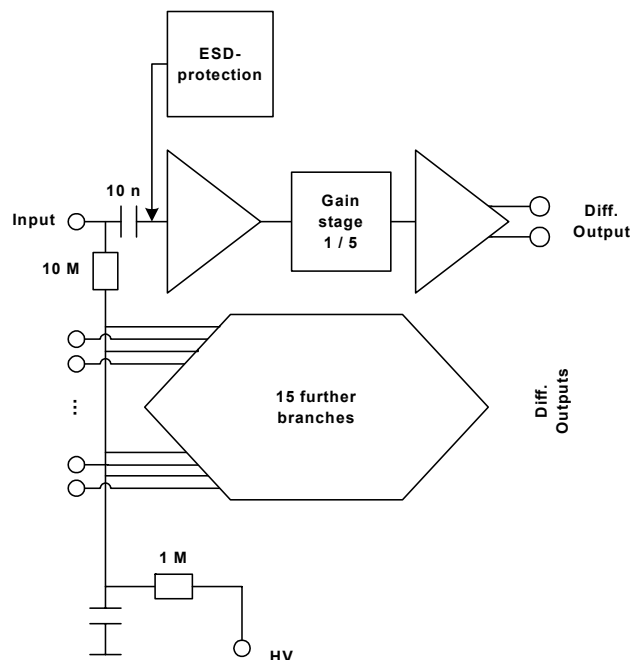
The mesytec MPR-Series provides a set of state of the art multichannel preamplifier modules specially designed for single or double sided multistrip silicon detectors. The MPR series can be used as stand alone modules and can also easily be combined with the mesytec STM-16 shaping-/timing filter/ discriminator module.

Features:

- 16 / 32 / 64 channel compact module
- Sensitivity switch, factor 5
- ESD input protection
- Differential output 100 Ω or
- MPR16L with Lemo output connectors.
- Pulser input
- Bias voltage up to $\pm 400V$
- PCB module available for vacuum use



Schematics: (for MPR-16)



Technical Data

Energy ranges

The MPR series provides a switch to amplify the output signal by a factor of 5. This helps to provide large output signals even at low charge depositions and thus provides good noise immunity.

Sensitivity can be changed by a switch. Together with STM16 the following max ranges (8V output at the shaper module) can be set:

- Type "5GeV" : 0.33, 0.5, 0.65, 1.0, 1.7, 2.5, 3.3, 5.0 GeV
- Type "100MeV" : 6.6, 10, 13, 20, 33, 50, 65, 100 MeV
- Type "25 MeV" : 1.5, 3, 4, 6.0, 7.5, 12, 15, 25 MeV.

Other ranges can be realised on request.

Input stage

- Input connector(s): subD 25 female connector (for a 16 channel unit)
- Positive and negative charge can be amplified equally.
- The guardring output (24) is connected via R-C- R filter (100k Ω , 10nF, 100k Ω) to the common detector bias input.

Output stage:

- Differential output for twisted pair 34 pin male header connector.
- Output amplitude: 0 to ± 1 V (headroom ± 4 V)

Noise

For the MPR-16 series, power modes can be selected by a jumper on the PCB.

High Power mode reduces noise, while low Power mode may be useful for in vacuum use.

power mode	shaping time	MPR16-25 MPR16-100
	σ / FWHM [us]	noise [keV]
LP	0.4 / 1	(5 + 0.06/pF)
	1 / 2.5	(4 + 0.04/pF)
HP	0.4 / 1	(5 + 0.04/pF)
	1 / 2.5	(4 + 0.027/pF)

Pulser input

The pulser is internally distributed to individual charge termination capacities. Tolerances $\pm 10\%$.

MPR16-25	MPR16-100
0.78pF (17 MeV/V)	1.13pF (25 MeV/V)

Detector bias input

- Lemo connector
- Maximum voltage ± 400 V
- When connected detector side must be on ground level: terminate bias input with 50 Ω

Power consumption for 16 channels:

Parameter	MPR16-25 MPR16-100	MPR16-500 MPR16-2500
	current [mA]	
LP/HP +6V	50	50
LP/HP -6V	50	50
LP +12V	40	-
HP +12V	80	40
total power LP-mode	1.1W	-
total power HP-mode	1.6W	1.1W

LP= low power mode, HP = high power mode

Cooling

Due to the low power consumption cooling is not necessary.

For **in vacuum use**, select low power mode if possible. The power of a single PCB can be dissipated without problems. If several PCBs are densely packed, heat conducting metal sheets should be placed in between the PCBs.

Avoid to warm up silicon detectors by the dissipated power.

Dimensions:

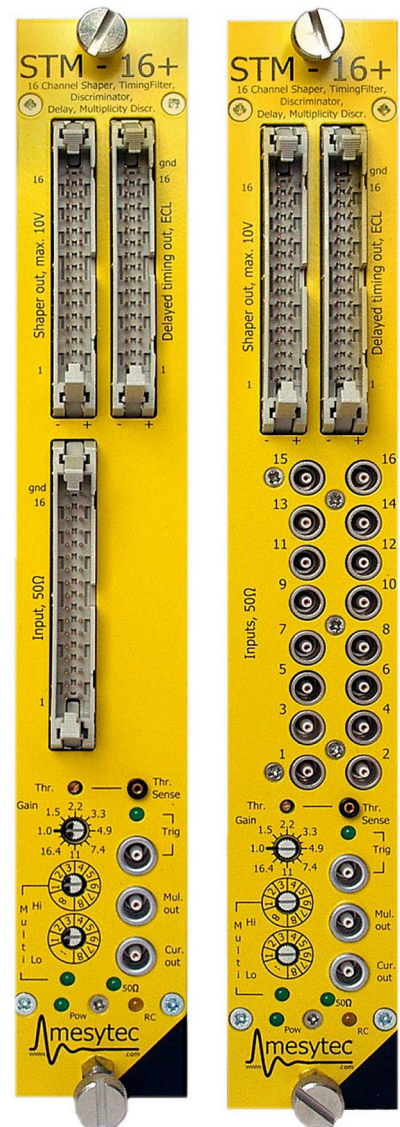
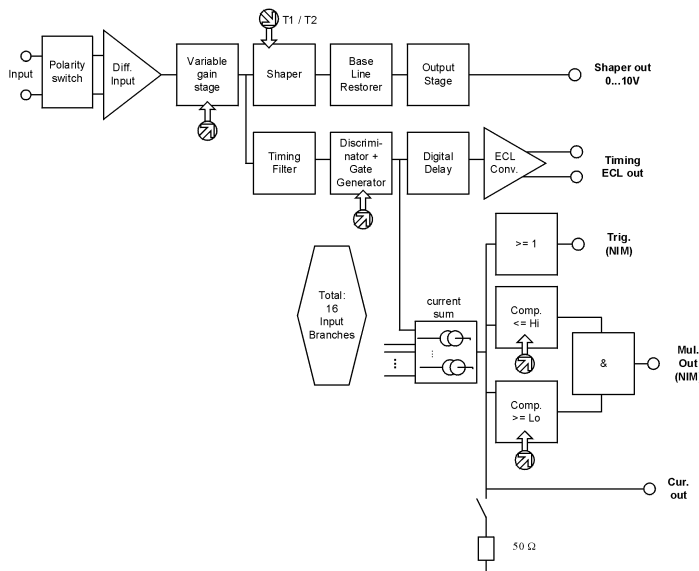
- Length: 173 mm (without connectors)
- Width: 105 mm
- Height: 46 mm (MPR-16),
- 67 mm (MPR-32),
- 92 mm (MPR-64)

mesytec STM-16 is a shaping and timing filter amplifier with discriminator and multiplicity trigger. It is well suited for high quality spectroscopy applications. The differential input version is ideal to combine with the preamplifier family MPR-16 / -32 / -64.

Features STM-16+:

- 16 channel NIM module, low power design
- Shaping amplifiers with baseline restorer
- 2 shaping times: $0.4\mu\text{s}$ / $1\mu\text{s}$ or $2\mu\text{s}$ / $5\mu\text{s}$
(= $1\mu\text{s}$ / $2\mu\text{s}$ or $5\mu\text{s}$ / $12\mu\text{s}$ FWHM)
- Gain adjustable from 1 to 600
- Low noise: $< 7\mu\text{V}$ (gain=100 and shaping time = $2\mu\text{s}$)
- Low integral nonlinearity
- Timing filter amplifiers
- Leading edge discriminators
- Digital delay of 450 ns for timing stop
- ECL timing output
- Trigger output
- Multiplicity trigger
- Remote control of discriminator thresholds and gains
- Unipolar Lemo input option.

Schematics:



Differential Unipolar
Version

Technical Data:

Input stage

- Gain adjust: gain can be set from 1 to 20 in 16 steps with factor 1.22 per step.

Differential version

- Input connector: 34 pin male connector
- Input resistance: terminated with 100 Ω , adapted to twisted pair cables.
- Gain-Polarity jumper with multiplication factor of 2 and 30 are standard. (Gain range from 2 to 600)
- input noise at gain = 100: 10 μ Vrms for 1 μ s shaping time, 7 μ Vrms for 2 μ s shaping time.
- Common mode suppression: 50 dB

Unipolar version

- 16 Lemo 00 input connectors
- Input termination option: 1k and 50 Ohm, coded on the gain-polarity jumper.
- Gain-Polarity jumper with multiplication factor 2 and 30 are standard. Option: multiplication factor 1.
- input noise at gain = 100, 2 μ s shaping time and 50 Ohm input = 7 μ Vrms.

Shaper:

- PZ adjustable with trimmers inside the case from 8 μ s to infinity.
- Two shaping times of 0.4 μ s / 1 μ s or
- 2 μ s / 5 μ s jumper selectable, common for all channels.
- Output amplitude: 0 to 10 V
- Passive baseline restorer
- DC-Offset: VDC $\pm$ 5 mV, common offset adjust.
- Output connector: 34 pin male connector
- Integral nonlinearity < 0.05%
- gain drift < 0.0075% / $^{\circ}$ C
- Offset drift < 50 μ V / $^{\circ}$ C

Timing filter amplifier:

- RC-CR, 7 ns / 100 ns
- 4 monitor outputs for timing filter signals, each providing the sum signal of 4 channels (Amplitude: -1.5 V per channel for 10 V shaper output)

Discriminator:

- Leading edge
- Threshold: adjustable, 0 to 4 V (= 0% to 40% of maximum range)

Gate generator, Timing delay, ECL output

- Pulse width for trigger output: 400 ns
- Timing stop- ECL-Signals:
delay 400 ns from trigger,
width 200 ns
- Output connector: 34 pin male connector
- Typical timing resolution for 5 MeV signals from silicon detector (10 * 10 mm², 500 μ m, 60V bias): dT = 400 ps. If necessary, a walk correction can be easily implemented in software using the shaper amplitude.

Multiplicity trigger:

- Each channel above threshold contributes to multiplicity level, a multiplicity trigger is generated for: lower multiplicity threshold $\leq$ multiplicity level $\leq$ upper multiplicity threshold
- coincidence interval adjustable from 40 ns up to 150 ns (default 100 ns).
- The multiplicity trigger is 100 ns delayed to the trigger signal.
- Lower multiplicity threshold: 1 ... 8, upper multiplicity threshold: 1 ... 8 and ∞
- Multiplicity chaining: multiplicity outputs from several modules can be connected, resulting in a total multiplicity level of all connected modules. Multiplicity trigger windows of the connected modules act independently on the total multiplicity.

Power consumption: (max 7W)

- +6V 280 mA
- -6V -680 mA
- +12V 80 mA

Remote control

The modules are prepared for the mesytec remote control via MRC module. Adjustable parameters:

- individual thresholds
- gains for pairs of channels.

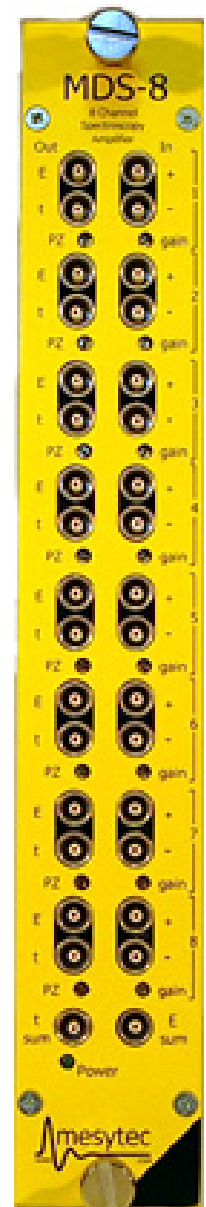
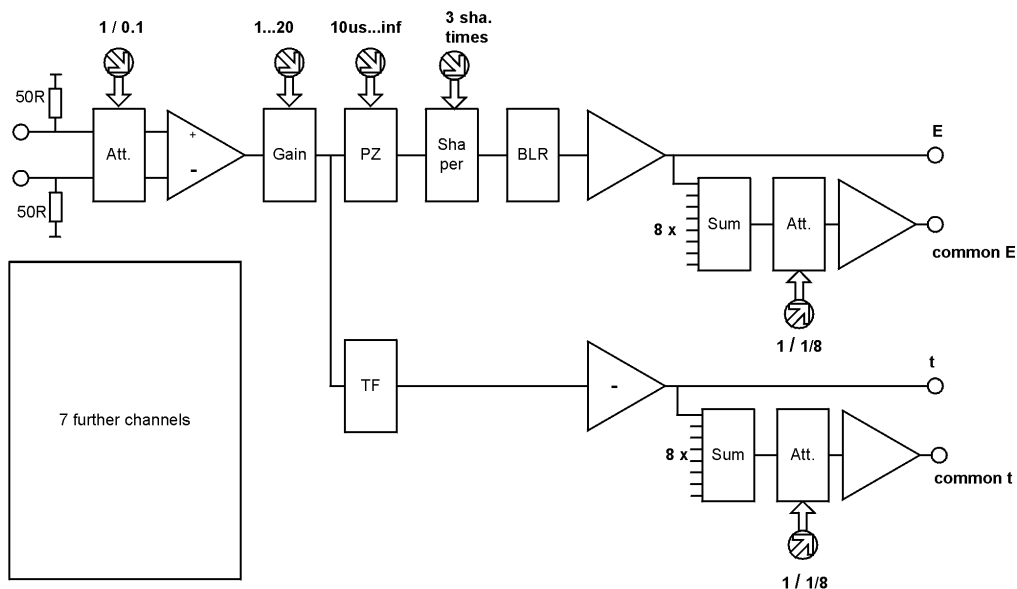
The remote control unit is a plug in module which can also be inserted as an upgrade.

The mesytec **MDS-8** is an 8-channel spectroscopy amplifier with integrated timing filter amplifier in a 1/12 wide NIM module. It provides an adjustable gain of 1 to 160, and 3 shaping times.

Features:

- Eight differential Lemo inputs, can be used single ended.
- Input resistance 50 Ohm (= 100 Ohm differential).
- 3 shaping times: 0.4 us, 1 us, 2.5 us
- Passive baseline restorer
- Adjustable gain and PZ compensation at front panel
- Individual outputs:
 - +10 V shaped pulse
 - -2 V timing filter output
- Common outputs:
 - sum of shaping outputs
 - sum of timing filter outputs

Schematic



Technical Data

Shaper inputs

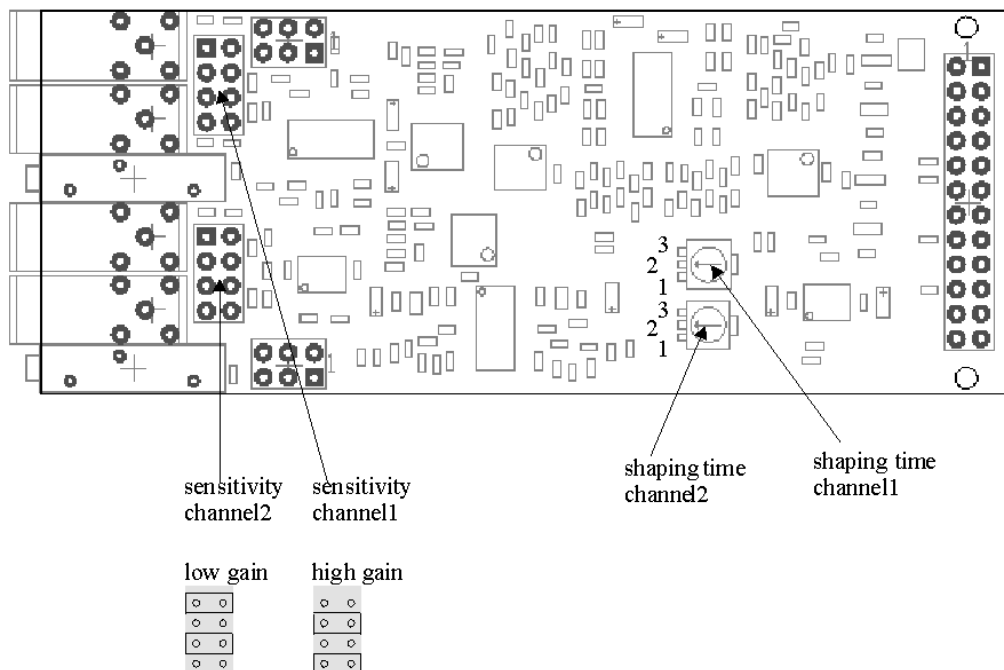
- internally terminated with 50 Ohm (differential use 100 Ohm)
- positive and negative input
- adjustable gain range: 1..160. (Factor 20 with 10 turn potentiometer plus factor 8 by attenuator jumpers.)

Energy outputs

for each channel:

- Shaper output amplitude: max 10 V (into 1 kOhm).
- Shaping time switch selectable for each channel : 0.4 us, 1 us, 2.5 us.
- Integral nonlinearity $< 2 \cdot 10^{-4}$
- Input noise: 20 uVrms @ gain=100 (all shaping times)
- Offset: max 3mV.

Servicable elements inside the module



Timing outputs

for each channel:

- Scaled with gain setting.
- output voltage max -2 V full range.
- integration time = 15 ns.
- differentiation time = 200 ns.
- can be terminated with 50 Ohm.

Common Timing output:

- sum value of all 8 timing outputs,
- max -4 V output amplitude.
- Attenuator for factor of 8 is jumper selectable.
- can be terminated with 50 Ohm.

Common Energy output:

- sum value of all energy outputs (only useful for same shaping time in all channels).
- max 10V output amplitude.
- Attenuator for factor of 8 is jumper selectable.

Pole zero adjustment

Front panel potentiometer. Range 10 us to ∞

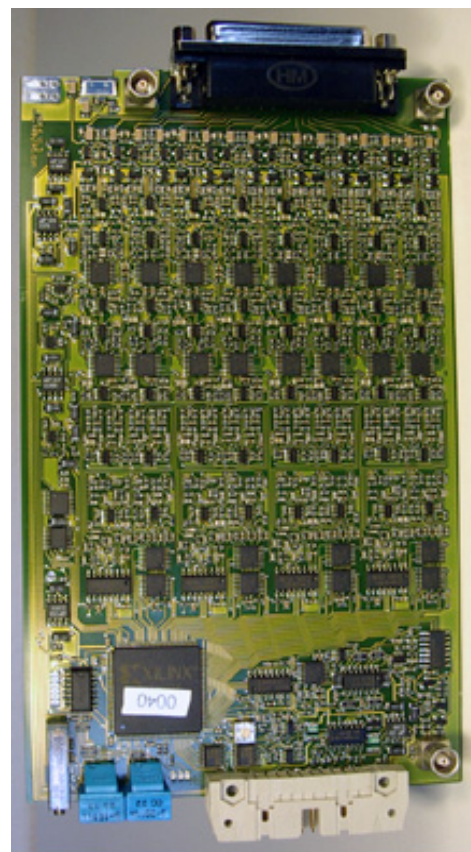
Power consumption:

+12 V +60 mA
+6 V +50 mA
-6 V -110 mA
total power dissipation: 1.7 W

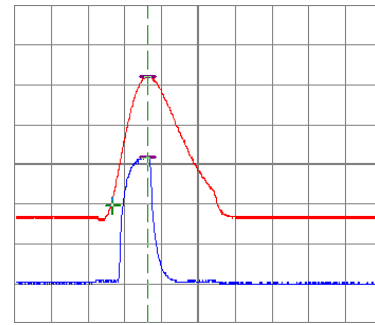
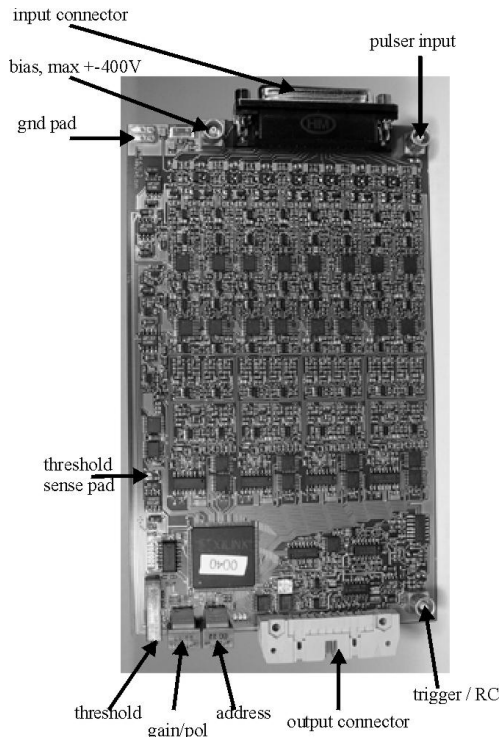
mesytec MUX-16 is a very fast 16 channel multiplexed preamplifier shaper and discriminator combination with very good energy and timing resolution. Up to two simultaneously responding channels are identified and two amplitudes plus the two corresponding amplitude coded addresses are switched to a bus. Up to eight modules (128 channels) can be connected to one bus, so only 4 channels of peak sensing ADCs are needed to digitize energy and position signals. The modules are especially well suited for single hit applications (maximum two hits on one module) with single or double sided multistrip silicon detectors or multiwire proportional chambers. Due to low power consumption the MUX-16 PCB can be used in vacuum without cooling.

Features:

- **High rate:** up to 500 kHz rate capability per bus (1.6 μ s bus dead time per event).
- **Very good timing resolution:** 1 fast leading edge discriminators per channel. Ored NIM timing output
- **Low noise** preamplifiers and 5th order shaping amplifier allow very good energy resolution.
- **Very flexible:** sensitivity and polarity selectable with rotary switch (or RC) from 3.3 MeV to 50 MeV full range
- **Low power:** 1.2W for 16 channels
- **Compact:** 185 x 100 x 16 mm³
- In addition: fully remote controllable for use in vacuum.
- Includes 16 channels of bias filter (and AC coupling) for bias voltages up to ± 400 V
- Processes single and double hits on one 16 channel unit.
- Up to 8 modules = 128 channels on one bus, only 2 or 4 peak sensing ADC channels needed.
- Pulser input
- Preamplifier input protection



Technical Data:



Output amplitude / position , $Y=1V$, $X=500ns$

Power consumption

- +6V 190 mA
- -6V -10 mA

Tot power = 1.2 W

Due to the low power consumption the PCB can be used in vacuum without cooling.

Dimensions:

- Length: 185 mm (with connectors)
- Width: 100 mm
- Height: 16 mm

Input stage

- Positive and negative charge can be amplified equally.

Noise

- 5.5 keV Si + 0.064 keV/pF (1200 e- FWHM + 18 e-/pF)
- maximum input capacity: 1000 pF (detector + cable)

Pulser input

The pulser is distributed to all preamplifier inputs

Sensitivity

- Sensitivity can be changed by a rotary switch. The following max ranges (3.5 V output) can be set:
3.3, 5, 6.7, 10, 17, 25, 33, 50 MeV.

Discriminators

Input for the 16 discriminators are fast timing filter signals. The discriminators have a common threshold, which can be adjusted via 10 turn potentiometer or remote control.

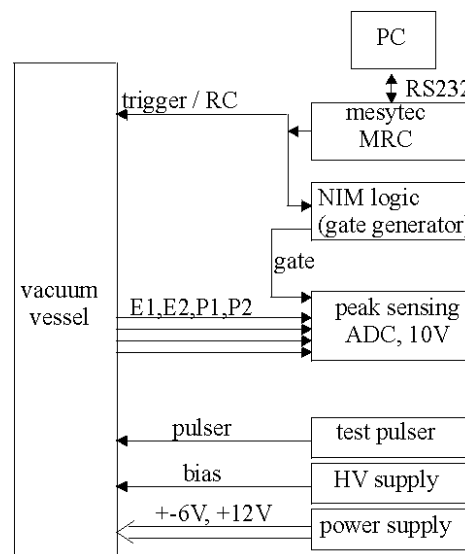
Shaper and Position outputs

- Shaper: Unipolar positive gaussian pulse
- Position: Unipolar positive pulse.

Typical setup for 128 channels. 8 MUX16 devices used in vacuum.

The remote control is useful when system can not be adjusted before evacuation.

A driver PCB is available for in vacuum use to provide 10V output amplitude.

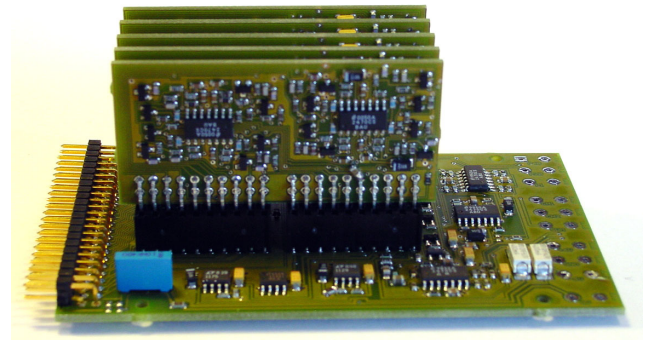


For details read the full datasheet.

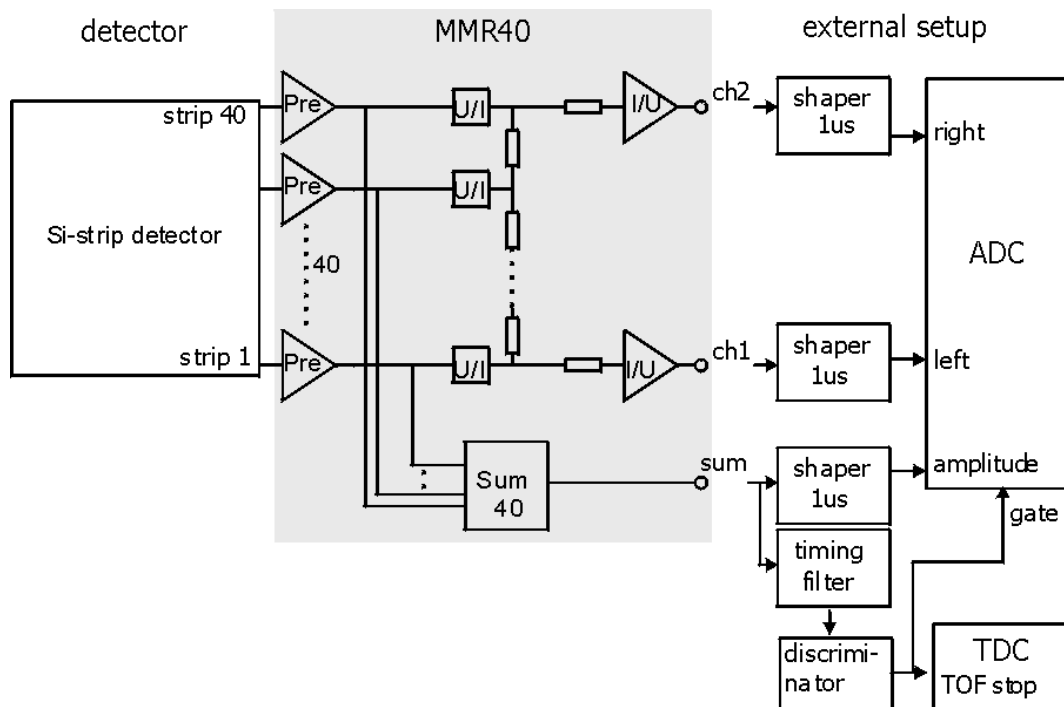
The mesytec **MMR-XX** is a multiple of 8 channel preamplifier array. The sensitivity (20 MeV to 20 GeV) is adapted to high energetic heavy ion detection. The preamplifier outputs are multiplexed on a resistor chain, providing two charge division signals to calculate the center of gravity of an event. In addition all preamplifier outputs are summed up to provide an output for amplitude (disposed charge) and timing measurement.

Features:

- submodules with 8 high range preamplifiers (20 MeV to 2 GeV)
- Two output signals for position calculation
- Sum output for total charge and timing
- All outputs can be terminated with 50 Ω



Schematics (Example MMR-40):



Technical Data (MMR-40):

Input stage

- Input connectors: 44 pin connector, including bias and analog ground
- 40 Charge sensitive preamplifiers, range: $1 \cdot 10^{-13}$ C to $4.5 \cdot 10^{-11}$ C.
- p-side readout (negative input charge).

Bias

- Bias for n-side (positive), filtered by R-C (470 k Ω , 10 nF)
- Maximum bias voltage $U_{\text{bias}} = +200$ V
- Can be operated up to 20 μ A bias current

Sum output:

- 1.5V @ 1 GeV
- Risetime typ. 30 ns, decay time: 10 μ s
- Typical noise with 1 μ s shaper, open inputs: 200 keV FWHM
- Can be terminated with 50 Ω
- Suggested shaping time for shaper: 1 μ s FWHM

Position outputs (ch1, ch2)

- positive tail pulse, rise time 500 ns, decay time 10 μ s
- Output voltage for 1 GeV: ch1+ch2 = 2.2 V = 100%,
- Variation with position, both outputs: 30% to 70% (for 1 GeV: 0.5 V to 1.5 V)
- Suggested shaping time for shaper: 1 μ s FWHM
- Typical noise for ch1+ch2, shaper with 1 μ s, no detector connected: 200 keV FWHM
- All position outputs can be terminated with 50 Ω

Pulser inputs: (P1, P20, P40)

- Charge injection: 1V = 100 MeV (internal coupling capacitor is 4.7 pF)
- Detector-channel 1 = "P1", channel20 = "P20" or channel 40 = "P40"
- All pulser inputs are terminated with 50 Ω

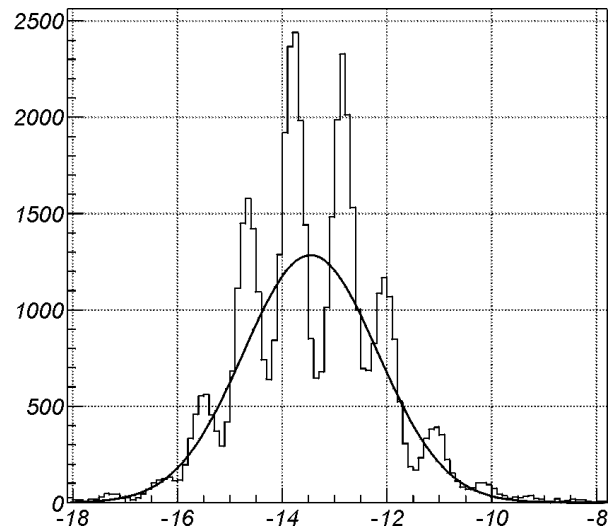
Power consumption: 1W

- Supply range: ± 5.5 V to ± 6.5 V
- +6V, 90 mA
- -6V, -80 mA

Measurement with a heavy Ion beam and a 40 strip DSSSD. The strip pitch was 1mm.

The position spectrum calculated from the two position signals is shown. The energy deposition was about 1GeV. The width of the beam was 4mm FWHM.

The peaks are well separated and correspond to the strip positions.



The mesytec MHV-4 is a modern 4-channel high precision bias supply unit for detector bias voltages up to 400 V. It is designed to supply highly stable bias voltage for all types of silicon detectors. The output current is limited to 20uA.

Several features are added to allow an easy survey of experiments with a large number of high voltage channels. The standard problem with silicon detectors is the rising current which occurs in beamtime with increasing damage in the crystal lattice. The MHV provides adjustable current warning thresholds for the individual channels. When the current goes beyond this threshold the voltage is not shut down (this would interrupt the experiment) but an acoustical and optical warning is emitted. The device can be remote controlled by RS232, by analog voltages and by mesytec event bus.

Features:

- 4 large and bright LED displays allow simultaneous survey of all currents or voltages
- Full 4 digit display
- Output connectors: SHV or BNC
- Current display resolution 1nA
- Adjustable current warning threshold for each channel. Acoustical and optical current warning.
- Individual polarity select for each channel at the rear side.
- Remote control: by external voltage and RS232 serial interface. Optional: via mesytec event bus with MRC-1.
- Noise on high voltage < 1mV at 200V
- Only ± 6 V power supply needed



Technical Data

Voltage Output

- Voltage range: 0 ... +/-100 V or 0 ... +/-400V (selectable with front switch)
- High quality five turn potentiometer for voltage adjust
- Typical noise $N < 1\text{mV}$ (200V, 5Hz to 100MHz)
- Voltage stability: typ 0.015%/0C
- Calibration precision $\pm 0.25\%$
- Output current max. 20uA per channel, limited
- Slow voltage ramp up and down of 5s to protect preamplifiers.
- Slow ramp up after power failure

Display

- Full 4 digit display
- Current display has 1 nA resolution (0.000uA) to 20.00 uA
- Voltage display:
 - 400V range 0.0 to 400.0V (0.2V steps)
 - 100V range 0.0 to 100.0V

Current warning

- Individual warning thresholds adjustable from 10 nA to 20 uA
- thresholds are displayed when pressing the display switch
- when a current exceeds the current warning threshold, an acoustical warning is emitted and the power on LED of the respective channel starts blinking

Remote control with external voltage:

- Remote mode is set when one of the input voltages (ext1... ext4) gets positive.
- Input voltage range: 0 to 4.0 V
- Input resistance: 1kOhm
- 4V corresponds to the maximum voltage which is selected by the range switch (100 or 400V)

Remote control with RS232:

- Can be remote controlled via standard ASCII terminal program.
- Baud rate: 9.600 Bd
- Data Format: 8N1 (8 bit, no parity, 1 stoppbit), input characters are echoed

Power consumption

- +6V +700mA
- -6V -70mA
- due to low power consumption cooling fans are not necessary

Size

- 1/12 NIM

The mesytec MNV-4 is a 4-channel NIM power distribution and control module. The individual Voltage outputs (+-6V, +-12V and +-24V) are protected by electronic fuses which automatically recover after short circuit. All six voltages are surveyed within +-5% of the nominal voltage for each of the four outputs. The status is displayed by LEDs switching from green to red in error case. The module also helps to check the correct voltage levels of a NIM-bin. If a NIM-bin without +- 24 Volts is used, the corresponding LEDs get off, and the voltage survey of those voltages is skipped.

Features:

- Four output connectors with $\pm 6V$, $\pm 12V$, $\pm 24V$ each
- Survey of all 6 voltages on each output
- Protection of all voltages by self recovering electronical fuses
- Standard voltage output compatible to mesytec electronics and to some other manufacturers.
- Visual indication for all input voltages and all power outlets
- Size: 1/12 NIM



The mesytec MRC-1 is the central controlling module for all remote controllable mesytec devices. The 1/12 NIM module provides a serial (RS-232) data input and two event bus branches for up to 16 remote controlled devices each, resulting in max. 32 devices per controller.

Additionally, a LINUX program is available which allows to send text files containing a complete set of experiment parameters for all connected devices.

An optional digital/analog I/O module extends usability.

Features:

- Easy connection to any computer type via RS-232
- Script memory for standalone operation
- Up to 32 devices on two event bus branches

Optional: I/O module with:

2 digital outputs (TTL), 2 digital inputs (TTL),

2 12 bit ADC inputs, 2 12 bit DAC outputs



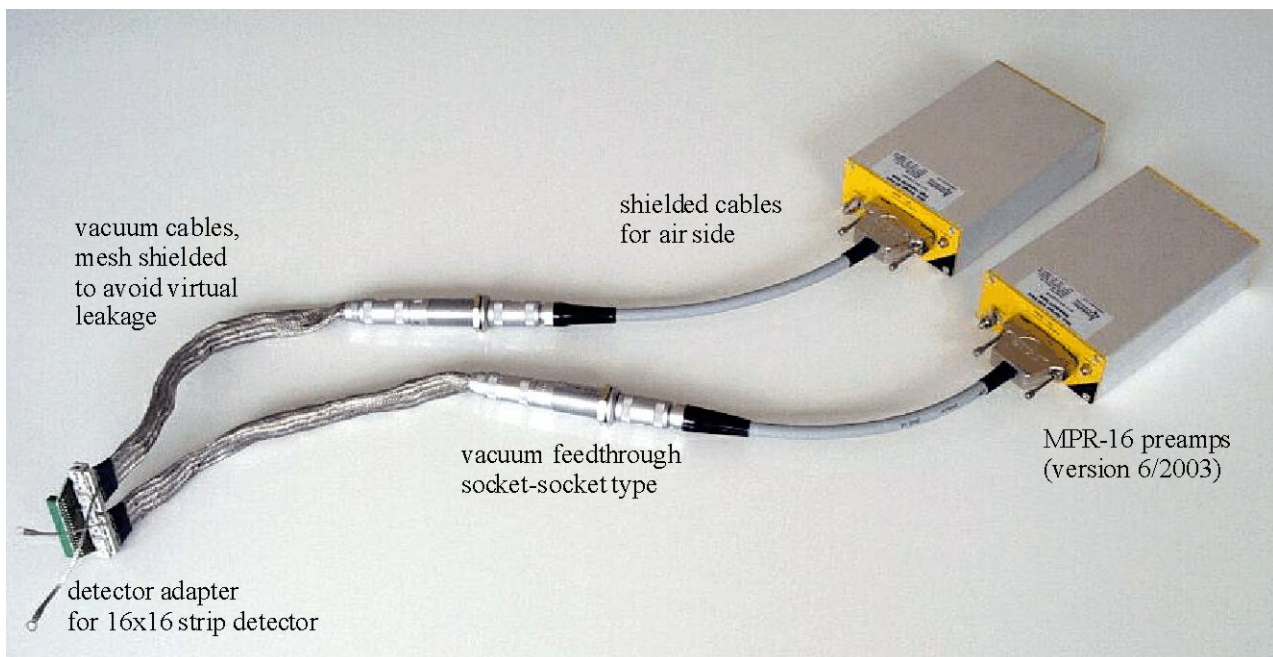
When using silicon (strip) detectors in an accelerator environment, a sophisticated cabling system is necessary to achieve minimum noise and optimum signal quality. The mesytec cabling collection for silicon (strip) detectors provides an easy to use, "plug and play" cable system.

Features:

- Shielded multipole cables for in- and outside the vacuum vessel
- Several types of selected vacuum feedthroughs
- Individually designed detector adapters.

Example cable setup for readout of a micron type "W" detector with two MPR-16:

- Individual detector adapter
- 2 x 16 channel vacuum suitable, shielded signal cables
- 2 x multipole vacuum tight feedthroughs
- 2 x 16 channel shielded signal cables



The mesytec MSCF-16 is a shaping / timing filter amplifier with constant fraction discriminators. Its differential input is optimised for mesytec MPR-16 preamplifiers, but can also be used single ended for other preamplifier types.

Expected release date: Q2 / 2006

Features:

General

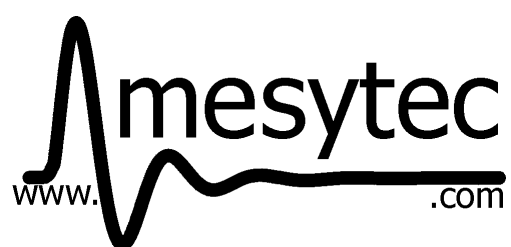
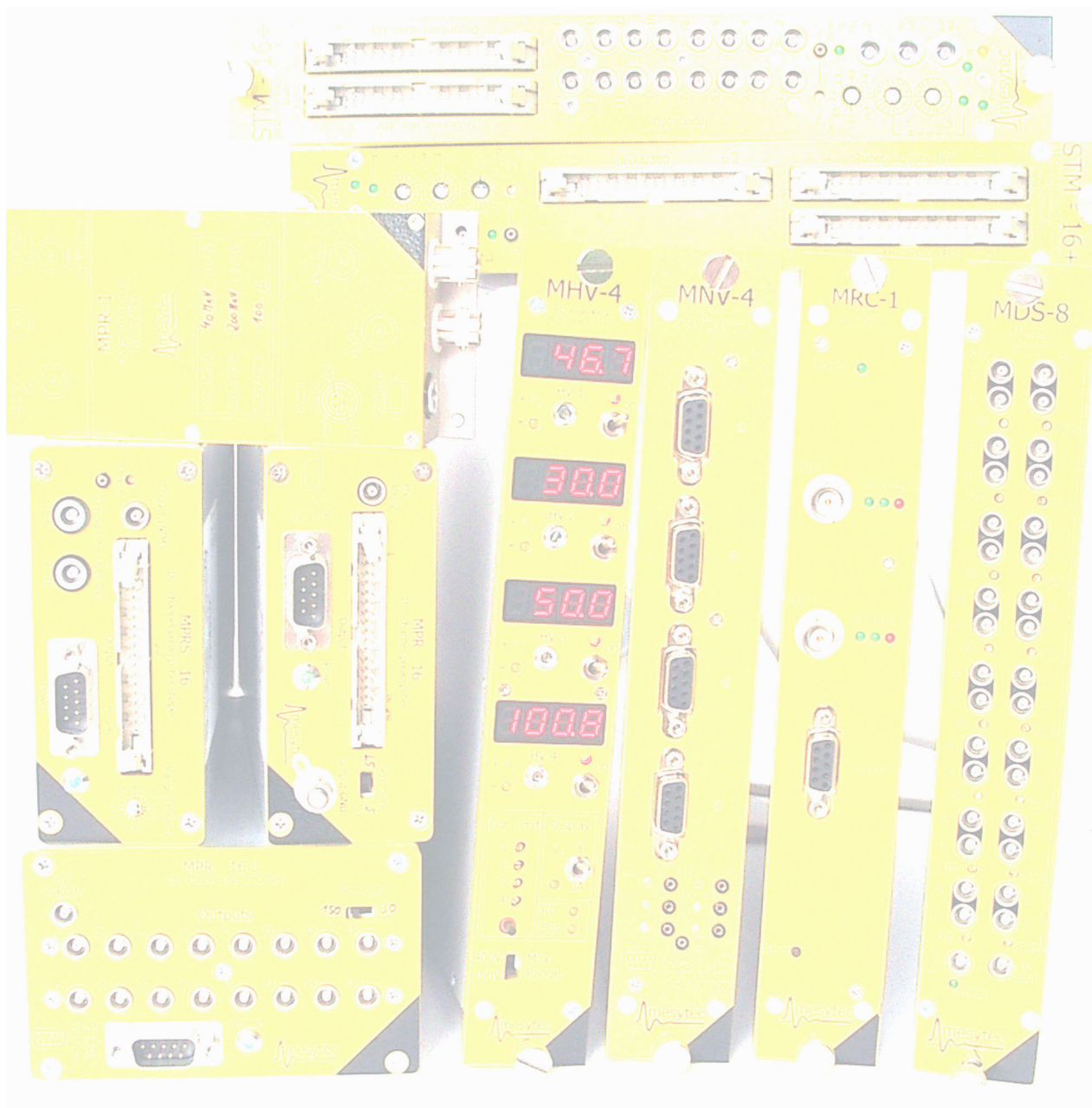
- 16 channel NIM module (1/12 width)
- Low power consumption (max 10W): 12 modules can be used in a standard NIM bin
- Front panel- and remote control of discriminator thresholds, polarity and gains
- All parameters can be set as common values (for all channels) from front panel (-> for most DSSD applications no RC is needed)
- Differential or Lemo input

Spectroscopy amplifier

- Shaper amplifier with baseline restorer, +8V or 10V output signal
- 3 shaping times
- Gain adjustable from 1 to 600
- Common offset adjust
- PZ can be adjusted as common value at front panel and individually via RC.
- Noise 7uV rms for gain = 100 and 2us shaping time
- INL 0.05%

Timing

- Constant fraction discriminator with 4 delays, ECL output
- Digital delay of 400ns for timing outputs. Can directly be used as stop signals for standard TDCs with ECL input.
- Gain adjusted simultaneous with shaper gain
- Trigger output
- 4 Timing filter monitor outputs for timing sum of 4 channels each
- Multiplicity current output (-100mV/channel @ 50Ω)



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