Welcome to the 2010 issue of our Digitimes newsletter, bringing you the latest news relating to the Digitimer research and clinical product ranges, including our NeuroLog System.

As an established world leader in the design and manufacture of biological signal amplifiers, electrical stimulators and other electronic instruments for the life science and clinical markets, we hope our current product range will be of interest to existing and future customers.

**Digitimer D360 8 Channel Amplifier**
Learn more about the features of our popular 8-channel isolated amplifier and filter system. CE marked to the medical devices directive, the low noise D360 is perfect for EMG, EEG or EP recordings in research or clinical settings.

**New Digitimer D175 Electrode Impedance Meter**
Having a quality amplifier like our D360 is crucial, but without good electrode placements, your recordings will suffer. Our new D175 Electrode Impedance Meter provides you with an easy way to check that your electrode placements are good enough to allow high quality recordings or facilitate electrical stimulation.

**Thorlabs ScienceDesk Partnership**
Earlier this year, Digitimer entered into an agreement with Thorlabs allowing us to offer their new ScienceDesk™ range of anti-vibration workstations within the UK and mainland Europe. These desks offer high performance at a competitive price and are available in alternative configurations for different applications.

**Digitimer Research Products**
Our research products include a range of stimulators for a variety of applications, as well as our renowned modular electrophysiology system, the NeuroLog System, which can be used to make extracellular or intracellular recordings, generate timing protocols and much much more.
D360 8-Channel Patient Amplifier System
for EMG, EEG and Evoked Potential Recordings

CE Certified for Human Use
Certified to the EU Medical Devices Directive, the D360 is an 8-channel isolated amplifier specifically designed for human electro-encephalography (EEG), electro-myography (EMG) or evoked potential (EP) studies. The system comprises a main amplifier unit with a remote active headbox and dedicated Microsoft Windows™ compatible control software.

Daisy Chain Multiple D360 for Greater Channel Number
Multiple D360 amplifier systems can be connected to a single PC allowing multiples of 8 channels to be controlled by one PC system. Electrode connection is via touch-proof 1.5mm (DIN 42 802) sockets on the headbox and signal output to your chosen acquisition device is possible either through the eight BNC connectors on the front panel or a pair of "D" connectors at the rear of the main unit.

Software Control Program Runs in the Background During Acquisition
Because the Windows™ compatible D360 Control Software can run in parallel with your data acquisition program, adjustments to the amplifier settings or tasks such as impedance checking and deblocking can be made while still monitoring data collection.

External TTL Controlled De-block [NEW Optional Feature]
D360 Amplifiers can include an external de-block BNC input, which allows the operator to "gate" the de-block function of the amplifier with a TTL-high command. This special modification is particularly useful for D360 operators who need the amplifier to detect responses with short latency responses following a magnetic stimulus.

Impedance Checking Function
Electrode impedance checking allows the D360 operator to instantly identify electrodes exhibiting unacceptable resistances. Impedance levels are indicated by green, yellow and red bars within the Impedance View Window (right), or by eight tri-colour LEDs visible on the electrode connection headbox. The resistance values at which the colours change can be custom set by the operator.

Accessories
The D360 can be supplied with optional accessories such as a USB to Serial Adaptor (for use with computers that lack Serial ports) or the D360 Audio Interface (Switched), pictured opposite, which allows the operator to listen to the output from individual channels (one at a time), via the PC sound card.

Publications
The D360 Amplifier has now been cited in over 100 peer reviewed papers. A few example publications are given below. Their inclusion here is not intended to reflect any endorsement by the authors.


For a complete list of publications, please visit www.digitimer.com/clinical
Digitimer Ltd recently acquired Gaeltec Ltd, a UK based medical device manufacturer which specialises in the design and manufacture of physiological pressure monitoring, catheter-mounted transducers, data-loggers and software. The acquisition of Gaeltec, following a brief period in administration, means that most of their former staff will now be re-employed, allowing this high-tech business, vital to the local economy, to continue operations from Dunvegan, Isle of Skye, Scotland.

Gaeltec has been manufacturing miniature catheter tip pressure transducers and associated medical and research pressure measurement equipment since 1971. The company designs and produces thin film resistive strain gauge sensors, housings and catheters at their Dunvegan premises. Gaeltec also developed a range of catheter-mounted electrodes for electrocardiography (ECG), electromyography (EMG) and stimulation. Collaboration with researchers in many fields has led to successful products for clinical and research applications, e.g. gastrointestinal, oesophageal, anorectal and urodynamic pressure transducers, as well as ambulatory data recorders and software. Other medical experimental and research applications include sleep, speech and high-voltage transcranial stimulation to the motor cortex in order to facilitate intraoperative monitoring of the spinal motor pathways during spinal or aortic surgery.

Digitimer’s Managing Director, John Smale said “I am particularly excited by this opportunity to re-vitalize a business that is important to us and our customers, as well as making use of the expertise that exists within Gaeltec. We have plans to develop the Gaeltec product range and increase marketing, thereby strengthening the position of the company. In return, Digitimer will have access to new skill sets in the design, manufacture and assembly of miniature medical electronics, which can be transferred to our own products and into our sub-contract manufacturing business.”

You can find out more about Gaeltec by visiting the Gaeltec website (www.gaeltec.com).

D175 Electrode Impedance Meter - Are Your Electrode Impedances Up to Scratch?

The NEW D175 Impedance Meter is an inexpensive, compact battery powered device designed to allow checking of electrode impedances prior to recording or stimulating through surface electrodes attached to the skin.

In the case of electrical stimulation, high electrode impedance can reduce the amount of current that can pass through the target tissue, resulting in lower than expected stimulation and a poor evoked response. Likewise, high impedances can reduce the quality of recordings, such as ECG, EEG and EMG that rely on surface electrodes.

The unit features a pair of electrode sockets and an LED array which indicates the approximate total impedance. The LEDs can be set to illuminate red or green depending upon the impedance via a “good/bad” threshold setting selected by the user.

Clinical Electrical Stimulators from Digitimer - CE (MDD) Approved and FDA* Cleared

Digitimer manufactures a range of electrical stimulators designed for specific applications or for more general purpose roles. Our stimulators include the D185 MultiPulse which was specifically designed to deliver high-voltage transcranial stimulation to the motor cortex in order to facilitate intraoperative monitoring of the spinal motor pathways during spinal or aortic surgery.

The DS7A and DS7AH are high voltage constant current stimulators favoured worldwide for general purpose stimulation of nerves and muscles in human subjects. The DS7A has a maximum output of 100mA, while the DS7AH version, more suited to quadriceps or spinal root stimulation has the output increased to 1A, with a reduction in the maximum pulse duration.

More recently, Digitimer introduced the DSS Bipolar Constant Current Stimulator which was developed in collaboration with Prof Hugh Bostock at University College London. Unlike the D185 and DS7A/AH, the DSS delivers a stimulus that follows the shape of an analogue voltage input, supplied by the user from a computer or signal generator. The DSS was designed for use with Prof Bostock’s QtracW software, which enables threshold tracking studies of nerve excitability. However, the DSS has also become popular with researchers who wish to apply an arbitrary “computer controlled” stimulus or even square pulses with computer control of the stimulus amplitude.

Finally, a variant of the DS7A which we have named the DS7A-PSARP is popular in hospitals that routinely carry out posterior sagittal anorectoplasty (PSARP) or the "Peña Procedure" on children born with an imperforate anus. The DS7A-PSARP has a built in frequency generator that delivers a stimulus (0-100mA) at 50Hz, allowing the surgeon to identify regions of striated muscle and correct the malformation.

* FDA Clearance only applies to D185 and DS7A/DS7AH at this time
A new product from SSD is the **BSK4 Brain Slice Keeper**, which has been designed to pre-incubate a large number of brain slices prior to transfer into SSD recording chambers or for the incubation of preparations in experimental test media. Based on the BSK1, it consists of four closely fitting acrylic rings, located in a circular manifold, between which is wedged a sheet of nylon netting.

**FEATURES**

- Slices maintained for many hours in incubating media
- Four separate rings allow separation of different types of preparations
- Slices supported on a quick change nylon net
- Modular design simple to set up and maintain

In operation, the four rings located on a manifold with netting are totally immersed in an ACSF-filled purpose designed holding vessel into which a 95% O₂, 5% CO₂ gas mixture is supplied through a ceramic bubbler. The ceramic bubbler is located in a central tube chamber connected to the upper manifold. The bubbles rising from the base saturate the ACSF and provide constant circulation of medium to the slices which rest on the nylon nets. Bubbles are restricted to rising in the central chamber and are prevented from being trapped under the slices, thereby ensuring a continuous circulation of medium. Slices remain viable for many hours in these conditions. The BSK4 together with the holding vessel can be easily placed into a water bath for regulating the incubating temperature as desired. A conical lid profile ensures that drops do not fall directly above the slices. When in place, the fluid level is maintained at least 3mm above the upper ring. This ensures circulation of fluid over the top and downwards towards the slices. The typical fluid volume with BSK4 is 500ml but can be reduced by adding glass spheres into the base. The BSK-4 is now available from Digitimer along with the rest of the SSD range of chambers and temperature controllers.

**New Range of Anti-vibration Workstations from Thorlabs**

Early in 2010 Digitimer agreed to distribute the **ScienceDesk** range manufactured in the UK by Thorlabs. These desks are a series of high-quality, ergonomic and modular workstations that are designed to reduce vibrations common in a lab, which often cause complications with an experiment. This makes the ScienceDesk ideally suited to microscopy users’ vibration-sensitive applications such as high resolution microscopy, confocal microscopy, scanning probe microscopy, electrophysiology and many more. Four different sizes of workstations are available, all at a comfortable, ergonomic height. Each ScienceDesk is assembled from a tabletop and a frame, which encloses the tabletop preventing it from being accidentally jarred. The combination of each determines the total vibration isolation of the workstation. We offer three frames with different isolation properties and either the Performance or PerformancePlus tabletop breadboards. Most microscopy users prefer a work surface without holes, however we also offer tabletops with regularly spaced, tapped holes. As we go to print, a ScienceDesk compatible Faraday cage is being developed by Thorlabs and we look forward to being able to offer that very soon.

- Variety of Sizes and Work Surfaces Available.
- Optional Heavy Duty Castors for Easy Movement.
- Patented Ergonomic Design Allows for Maximum Comfort and Leg Room.
- Range of Accessories Allows Easy Customization and Maximization of Work Space.

**Our Partners**

**BSK4 Multi-chamber Brain Slice Keeper**  
*It's more space for your tissue, however you slice it!*

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**Make Mains/Line Noise a Thing of the Past**

Too good to be true... No, just a **Hum Bug**

Please Contact Us to Arrange a No Obligation Evaluation Loan
EPC 800 USB and iTEV 90 - Two New Amplifiers Enhance the HEKA Range

For any researcher wanting to control their amplifier with knobs and dials, while at the same time, having a degree of computer communication and automatic control, HEKA is excited to release the **EPC 800 USB**. This amplifier is a unique hybrid patch-clamp amplifier with its design and feature-set primarily based on the manually controlled EPC 8. The EPC 800 USB can be controlled by any data acquisition interface and is supported by HEKA and third-party software programs.

The EPC 800 USB can be operated in three modes: Telegraphing Local, Local and Remote. The mode of choice depends upon user preference over whether or not to use knobs and switches for control, but also upon what data acquisition software and interface the EPC-800 USB is going to be used with.

HEKA is also pleased to release its first fully computer controlled multi-electrode clamp amplifier. The **iTEV 90** amplifier is a complete two-electrode voltage and current clamp amplifier providing the option to add a third electrode.

Two-electrode voltage-clamp (TEV) of *Xenopus laevis* oocytes is often used for rapid screening of ion channel function, in particular in pharmacological experiments. However, skilled operators are required for conventional TEV hardware, as adjustment of the amplifier settings requires considerable practical experience. Moreover, the quality of experimental data can be compromised by incomplete control of the physical parameters during clamping. HEKA therefore designed and implemented a hardware/software combination with HEKA’s new LIH 8+8 AD/DA interface built-in. This arrangement minimizes total recording noise, eliminates compatibility problems and reduces additional equipment expenditure and set-up times. The built-in interface utilizes the latest USB 2.0 and high speed processing technologies without the need for a peripheral PCI card.

The iTEV 90 provides complete software control featuring full digital calibration and tuning as well as automatic operation via the electrophysiological data acquisition software PATCHMASTER.

The iTEV 90 combines automation with a facility for detailed interrogation of the measurement configurations and recording itself. Many operations can be automated in order to speed up the experiment as well as guarantee reproducible operation of the amplifier. All amplifier and data acquisition system parameters are stored with the data for later review. The iTEV 90 even allows for monitoring of raw signals at various points within the amplifier circuitry.

With the iTEV 90, HEKA introduce a method for automated clamp parameter adjustment, based on a network analysis of the individual parameters being monitored. This assures stable and reproducible settings of clamp gain and integrator time constant.

The iTEV 90 provides an option for the use of a third current electrode, which can have several roles:

- As an extracellular field compensation by injecting a fraction of the cell’s membrane current at a point outside the cell into the bath solution.
- As an additional intracellular current injecting electrode.

NEW MM-80 Motorized Micro-manipulator - Precision Manipulation You Can Afford

Built specifically for patch-clamp recording, this motor-driven micro-manipulator has been designed to provide electrophysiologists with as fine a movement as possible at a very competitive price. By developing a manipulator that lacks the “bells and whistles” features found on many more expensive models, Narishige has managed to produce a micro-manipulator that offers good movement and stability characteristics along with a very reasonable price tag.

The MM-80 satisfies the competing needs for "stability" and "compactness", both of which are essential for electrophysiology research. Generally, the higher the stability, the less compact a manipulator becomes. Not so with the MM-80, which maintains stability, but has a compact space-saving drive unit which provides a long working distance (20mm for fine travel and 30mm for coarse travel).

In addition, the MM-80 incorporates an electrode holder with an angle gauge that enables you to read the angle of a patch clamp pipette. A rotation mechanism has also been incorporated, allowing the motorized fine drive unit to rotate towards you and facilitating microelectrode replacement.

The drive unit can be securely mounted onto an optional Narishige mounting adaptor suitable for your microscope model or onto an optional isolation table.

If you are based in the UK and would like to trial the MM-80, please get in touch with us as we have one available for short term evaluation loans.
One of the problems with stimulators that make use of an external voltage source to define a stimulus waveform is that small offsets or noisy baseline with each DS4 being digitally enabled, separately. Addition, the DS4 has a GATE input which allows multiple DS4’s to be connected to a single analogue voltage source, stimulus output in 4 overlapping ranges (±10µA, ±100µA, ±1mA and ±10mA) from a compliance voltage of ±48V. In

The DS4 accepts a variety of voltage input ranges (±1V, ±2.5V, ±5V and ±10V) and produces a constant current output, allowing DS4 users to deliver stimuli of any shape with external control of the stimulus parameters. DS4 accepts a biphasic analogue “command” voltage and uses this to define the shape of a biphasic constant current output, allowing DS4 users to deliver stimuli of any shape with external control of the stimulus parameters.

Timing modules are available to generate pulses, variable in frequency and duration, which can be controlled as trains using a gating waveform, variable in repetition rate and duration or pulse count. Sockets are fitted to allow full external control and synchronisation if required. The DS30 MultiStim System comes as a 19” rack-mountable unit that can house up to ten stimulation channels - along with the pulse train generator, gating and meter modules. In order to help with module selection, a number of application diagrams are downloadable from the Support section of our website.

The Digitimer DS2A (constant voltage) and DS3 (constant current) Isolated Stimulators are popular in electrophysiology laboratories all over the world. Their compact and user friendly design has generated a loyal following amongst researchers wishing to precisely stimulate nerve or muscle from an isolated power source. They can be triggered manually using the front panel single-shot button or automatically in response to TTL compatible trigger pulses. In addition, pulse duration can be defined by (i) the settings of the front panel control dials (ii) the duration of the incoming trigger pulse or (iii) the length of time that the single-shot button is held down. Power for both stimulators is derived from eleven standard 9V batteries, which offer low noise and long life. Power is only drawn from the batteries when a stimulation pulse is given. The DS2A, DS3 or DG2A Trigger Generator (see above) can be 19” rack mounted using our D121-11 mounting frame which will support one or two of these instruments.

If you want greater control over stimulus shape than the DS2A or DS3 allow, perhaps the DS4 is what you need. The DS4 accepts a biphasic analogue “command” voltage and uses this to define the shape of a biphasic constant current output, allowing DS4 users to deliver stimuli of any shape with external control of the stimulus parameters.

The DS4 accepts a variety of voltage input ranges (±1V, ±2.5V, ±5V and ±10V) and produces a constant current stimulus output in 4 overlapping ranges (±10µA, ±100µA, ±1mA and ±10mA) from a compliance voltage of ±48V. In addition, the DS4 has a GATE input which allows multiple DS4’s to be connected to a single analogue voltage source, with each DS4 being digitally enabled, separately.

One of the problems with stimulators that make use of an external voltage source to define a stimulus waveform is that small offsets or noisy baseline signals from the DAC’s used to drive them can result in unwanted battery drain or perhaps worse, low amplitude stimulation. The DS4 uses a special “inactivity sensor” to monitor the input voltage and disable the DS4 output if this voltage falls below 0.15% of the full scale value (in +ve or -ve directions) for a user selectable time period of 100ms, 200ms, 1s or 2s. Unlike other devices which only produce an output when the input voltage exceeds a threshold value, this “inactivity sensor” reduces battery usage and damaging “leak currents” during infrequent stimulation, while at the same time maintaining low levels of zero crossing distortion for repetitive waveforms. The DS4 uses an external power supply for the control circuitry and readily available/inexpensive batteries to provide the opto-isolated stimulus voltage source.

To request more information on anything you have seen in this issue, just contact us or visit www.digitimer.com/digitimes10

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