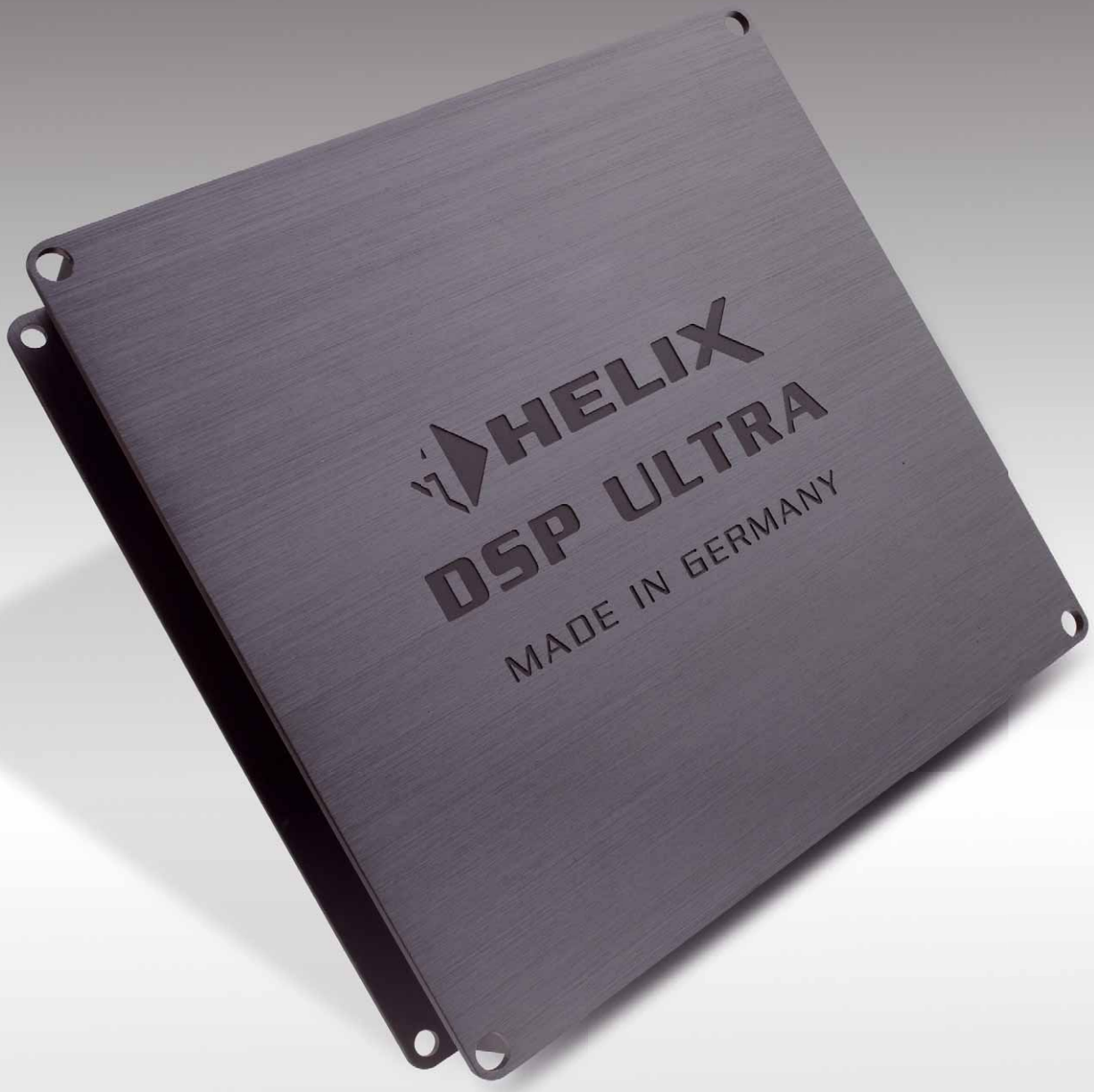
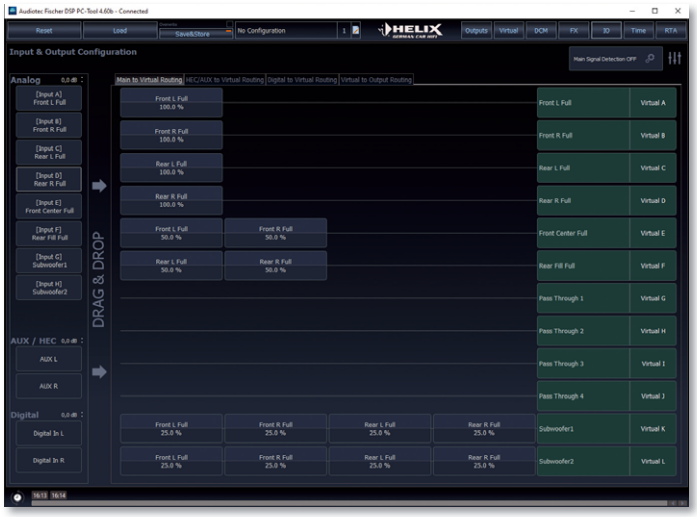
DSP Ultra – 12 channel sound processor from Helix



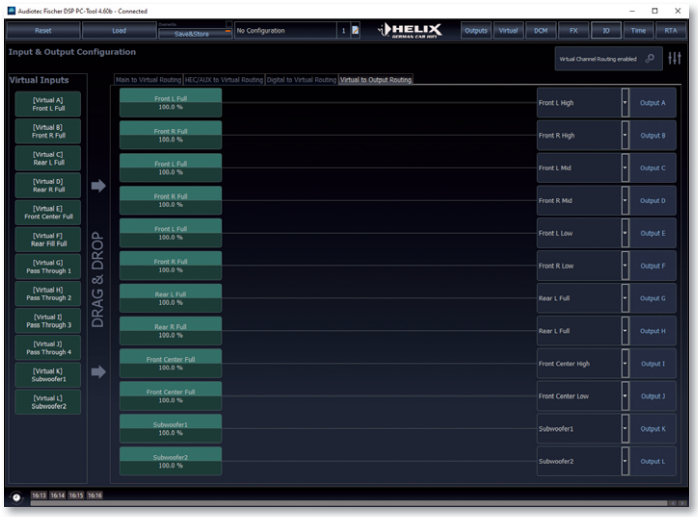
Twin Power

After Helix continued to evolve with the DSP.3 last year, some revolutionary traits are showing in the DSP Ultra. We explain the Ultra in every detail.

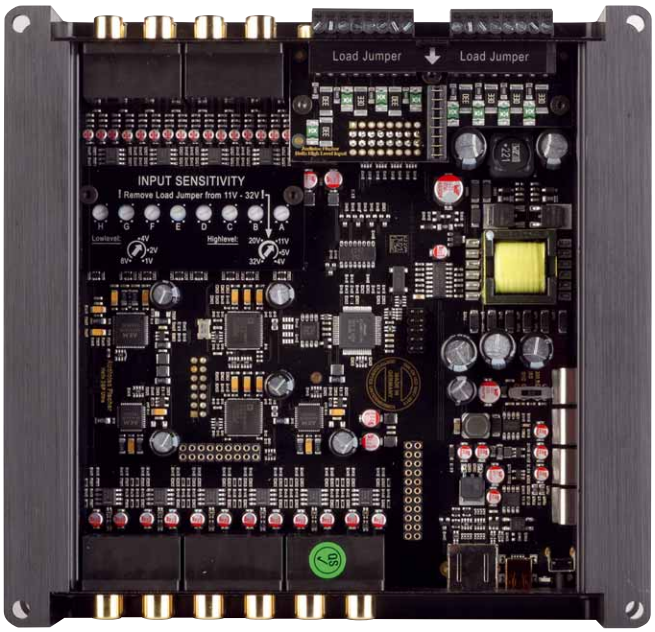
With DSP Ultra, Helix sets an ambitious goal to revolutionize the DSP programming. First of all, we have a noble DSP in front of us, which offers just two additional outputs compared to the previous top model DSP PRO MK2 (8 inputs, 10 outputs). However, we already anticipated this; a whole lot of updates has happened since the appearance of the DSP PRO, so that the performance of the two similar DSPs is almost no longer comparable. Since the introduction of the DSP Mini, the new coprocessor has been released along with the powerful ACO platform, and for the DSP Ultra, the developmer team has come up with the VCP (Virtual Channel Processing), a brand new solution that makes other DSPs look obsolete. But first of all, the construction of DSP Ultra, which is by the way no cheap deal considering it's price of



Routing Step 1: The inputs are routed to the virtual channels, as usual for main/analog, HEC and digital inputs. The virtual channels are subtly highlighted in green



Routing Step 2: Now the 8 virtual channels are routed to the 12 outputs, e.g. virtual front channel on tweeter, midrange, woofer and virtual center channel on center woofer and center tweeter



The DSP Ultra is a beautiful device with a clean cut design and quality components

1,300 euros. When you take look inside, you can see that this pricing is set for a good reason: every part at it's finest, in fact, we have rarely encountered a device more beautiful than the DSP Ultra. The layout is clean and logical, with the 8-channel ADC and the two 6-channel DACs, the finest premium converter chips from AKM, that consistently shine with a 32-bit resolution and first-class SNR. In between, we find the ADAU1452 DSP chip from Analog Devices in duplicate. The inputs and outputs feature high-class Texas Instruments' operational amplifiers, indeed, everything is at it's finest here. The complex processing of low and high level inputs is striking. Helix relies on hardware solutions in the form of a gain pot and a jumper that ensures the correct adjustment at more than 11 volts at the high level input (up to 32 V are allowed). The proven ADEP.3 for diagnostic head units is of course also on board. This is impossible or almost impossible to achieve with pure software solutions.

Virtual Channels

Typically, a DSP works in such a way that the inputs are routed to the outputs depending on the system configuration. At the inputs, the better equipped models offer nice features such as equalizer, time alignment and other functions. In routing, the inputs can be merged and summed up to obtain a useful signal even with more complex original systems. Everything else happens at the output channels. Here, the speakers are applied with crossovers, the time alignment compensates for different distances of the individual speakers, and each channel can be smoothed and shaped with an equalizer. So why go for virtual channels? This can be explained clearly by two examples. Case 1 is an active three-way front system. Of course, this can be adjusted perfectly with 6 output channels as described. But what happens if the equalizing is to be changed in the course of the adjustment work? Then you have to go to the EQs on all 6 individual channels. And worse, even the crossover settings are in there. Wouldn't it be great, for example, if you could equalise and time align the entire front right as a group? That's exactly what our VCP does. The DSP Ultra has 8 virtual channels that are routed between inputs and outputs. Now arbitrary inputs can be routed e.g. to a (virtual) front channel, the same is done for rear channels, centers, subwoofers. The DSP Ultra also includes a rear-fill that can be used for a second audio zone such as rear-seat entertainment, and there are universal pass-through channels. In the next step, the virtual channels are placed on the outputs,

It's 8 inputs, also usable for high level, and 12 outputs are able to cope with complex sound systems. Digital input is optical or coaxial

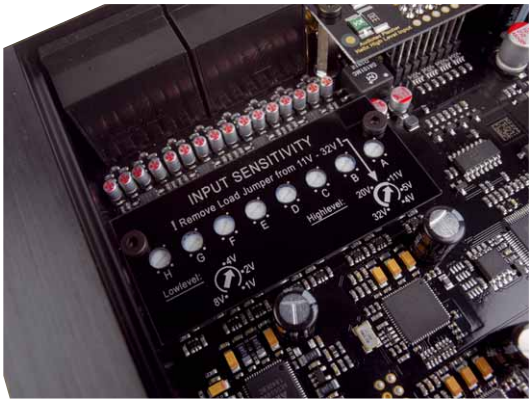
A 32-bit signal path with two DSPs, one 8-channel ADC and two 6-channel DACs by AKM

so the front right goes to the tweeter, midrange and woofer on the right side. These are applied with crossovers, EQ and time at the outputs as usual. Now the VCP comes into play. Each of the 8 virtual channels, like the output channels, has 30 parametric EQ bands and a time alignment. Here in the virtual channels, the entire right front system can be adjusted at the three outputs of the high- and midrange, and also of the woofer, by editing the virtual front-right channel. It is therefore possible to place a "global" equalizer over the entire multi-way system without negatively affecting the crossover tuning.

The second big advantage is the FX sound effects center-processing, bass-processing and front-processing that Helix introduced last year with the ACO platform. These are now assigned to virtual channels instead of output channels like before. As a result, the enabled free routing from the virtual to the outputs gives the possibility to distribute the FX processing to arbitrary channels. As a result, for example, the multi-way center speakers get a common center processing from their virtual channel, the same goes for front processing and subwoofers. For example, more complex hi-fi systems with two-way centers can benefit from a sophisticated center channel generated by it's own algorithm. In front processing, another interesting feature has been added with the Stage EQ. There is a mid-EQ and a side-EQ, each affecting the stage center and margins. This has a prototype in studio equipment, where voices and percussion (middle), as well as instruments such as guitars (side) can be influenced separately. Slowly but surely it becomes clear what kind of complex sound systems can perfectly cooperate with the DSP Ultra. And it becomes clear why it has two DSP cores: Since the 8 virtual channels are calculated exactly as the physical ones, we have to deal with 8 + 8 + 12, i.e. 28 channels, which the DSP Ultra calculates with high resolution 96 kHz sampling rate and generous time reserves.

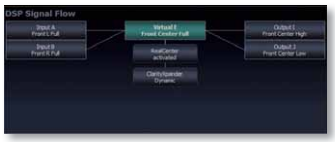
Installer Tools

Since the DSP.3, Helix DSPs are made to blend in a retrofit system in a remarkably easy way, even under adverse conditions. This is made possible by the ACO-platform with a 32-bit controller, which is significantly more powerful than the predecessor systems. The aforementioned FX-Processing goes to the ACO's account as well as the fast switching between 10 setups, and some other goodies above that. Also we mentioned the extensive sensitivity adjustment to all possible sources including the factory sound packages and the ADEP.3. The expansion of the measurement functions is showing a significant progress. While the RTA measurement with a microphone has been on board all DSP components for a long time, the ISA function has been added just recently. This Input Signal Analyzer can perform a frequency response measurement on any inputs as well as any sums of inputs. In this way, bent signals can be detected as well as factory all-pass filters. The input EQ is then applied for compensation, which can also set the all-passes. To compensate factory time alignment, the DSP also includes a time alignment. Overall, the DSP Ultra offers a comprehensive package of tools for the integration of a retrofit system. Of course, the DSP Ultra also offers extensive adaptation possibilities to various sources and of course it comes with digital



Input sensitivity adjustment with 8 pots for the analog inputs

In the routing diagram of the virtual channels you can immediately see the used inputs and outputs. Our virtual front center is mixed up from front right and left, then there is center processing, then outputs I and J are actively driven as two-way center



The setup of the virtual channels is similar to that of the output channels, only without crossovers. The virtual front EQ and FX front processing then affect all output channels routed from there

In the ISA, any inputs and their sums can be measured. EQ (with Allpass) and time alignment are adjusting the incoming signal

As usual, an extensive arsenal of crossovers, equalizers and time alignment is available for all output channels

The front processing now includes a mid/side EQ, which can be used to control the stage centre and stage edges separately

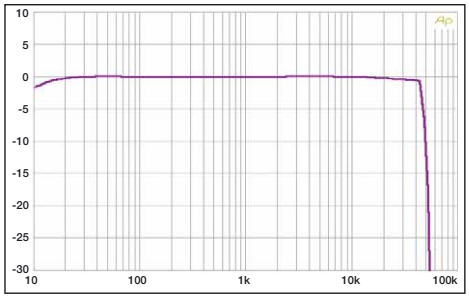
inputs and a HEC expansion port for various modules. The control port also provides an interface for various programmable remote controls including the WIFI Control app.

Conclusion

Sound tools such as crossovers, equalizers or time alignment are on the feature list of any DSP. Much more impressive is the immense amount of innovations that Helix has packed into the DSP Ultra. Following the new 32-bit architecture of ACO and the outstanding ISA input measurement function, the DSP Ultra comes with the Virtual Channel Processing VCP, which opens completely new possibilities and sets new standards.

Elmar Michels

Jumper for optimal adaptation to factory radios and amplifiers up to 32 volts



The DSP Ultra is ideally prepared for HiRes music thanks to it's 96 kHz sampling rate, it can handle a frequency range up to 44 kHz

HIGHLIGHT
Soundprocessor
CAR&HiFi 2/2020

Helix DSP Ultra

Distributor	Audiotec Fischer, Schmallenberg
Hotline	02972 9788 0
Internet	www.audiotec-fischer.com
Price	**1.300 Euro**

Specifications

Dimensions 177 x 170 x 40 mm

Inputs
- 8-channel high level
- 8-channel RCA
- 1 x digital S/PDIF (optical and coaxial)

Outputs
- 12-channel RCA (8 V)
- Remote-out

DSP-Software (V 4.60b im Test)

Equalizer

Inputs:
- param., 5 bands per channel

Virtuelle Kanäle:
- param., 30 Band pro Kanal
- Mid/Side-EQ (front): param., 5 bands per channel

Outputs:
- parametric, 30 bands per channel, +6 – -15 dB
- 20 – 20k Hz, 1 Hz increments, Q 0,5 – 15
- Shelf 25 – 10k Hz, Q 0,1 – 2
- Allpass filters 1st or 2nd order, f and Q adjustable

Crossovers

Outputs:
- 20 – 20k Hz, 1 Hz increments
- Bessel, Butterworth, Chebychev, Linkwitz, User, 6 – 42 dB/Oct.

Time and level

Samplerate 96 kHz, 3,5 mm increments (0,01 ms)

Inputs:
- 0 – 10,41 ms, 1024 Samples

Virtual channels:
- 0 – 708 cm (20,82 ms), 2048 Samples
- Phase 0, 180° (fullrange), 0 – 360° (22,5° increments)
- Adjustable level increments 0,1 – 1 dB

Outputs:
- 0 – 708 cm (20,82 ms), 2048 Samples
- Phase 0, 180° (fullrange), 0 – 360° (22,5° increments)
- Adjustable level increments 0,1 – 1 dB

Features
- 10 Setups with fast switchover
- User-defined routing of in- and output ports
- Control connector for programmable remote controls and accessories
- Start-stop capability up to 6V
- Signal-dependent switching to digital or Aux inputs
- Automatic putting through of all vehicle tones
- Power save mode
- (configurable) ADEP.3 error protection circuit for factory radios with speaker recognition
- RTA real-time frequency curve measurement (with optional microphone)
- FX menu with dynamic bass, center and front processing
- FX-Menü mit dynamischem Bass-, Center und Front-Processing
- ISA for measuring, summing and correcting inputs
- Time Machine for taking back and restoring adjustments
- Standard programming or VCP, 8 virtual channels, user-defined routing, EQ, time alignment and FX-Processing

Optional accessories
- In- and output ports HD-AUDIO USB-INTERFACE (HiRes audio up to 32 bits/192 kHz), BT (Bluetooth aptX audio streaming + add. S/PDIF out), Aux-in (3.5 mm jack input + add. S/PDIF out), Optical-in (optical S/PDIF input)
- Wired remote control (programmable)
- Display remote control director with memory, USB, etc.
- WIFI Control for wireless programming
- Measurement microphone MTK1