Practical Guide for mSD3, mLD3, mDT3:

An Overview of the Most Important Information about the New Generation of Retrofit Decoders

A new era is beginning in the fall of 2015: Märklin is making available to all model railroaders a new generation of retrofit decoders that offer a large variety of additional possibilities for settings, improved sound, and even more ease in programming. A previously unattainable world of operation and adventure is thus opening up for model railroaders – they have never been closer to the prototype.

This practical guide gives an overview of the individual products and shows how the different decoders and the new mDP decoder programmer can best be used.

1) Why a new decoder?

Microprocessors double their performance within several years constantly. A factor with which everyone is very familiar from the area of computer technology and Smartphones. Märklin also makes use of this technological progress. The new decoders thus work with a modern 32-bit architecture (previously, 8-bit technology) and are thereby considerably faster and more powerful. In addition, the new generation offers more memory and a clearly more powerful audio processor (digital signal processor) that drives the speaker in a more specific manner. All of this in the same size circuit board.

2) Which components/decoders are available?

A wide variety of decoders including the new programmer is available for retrofitting and programming. This new generation of decoders includes the following components:

Programming:
- 60971 mDP decoder programmer, stick with USB and decoder interface
- programming tool, software for fast programming at a PC of the new LokDecoder3 and SoundDecoder3

Retrofit Decoders with a 21-pin Interface:
- 60972 mLD3 decoder (without a sound module)
- 60975 mSD3 sound decoder with preset steam locomotive sound
- 60976 mSD3 sound decoder with preset diesel locomotive sound
- 60977 mSD3 sound decoder with preset electric locomotive sound

Retrofit Decoders for Hobby Locomotives with a 21-pin Interface:
- 60978 mSD3 sound decoder for the 36000 series and preset diesel locomotive sound (Hercules)
- 60979 mSD3 sound decoder for the 36000 series and preset electric locomotive sound (TRAXX)

Retrofit Decoders with Wiring Harness Soldered to them for 8-pin
NEM Interface Plugs:
- 60982 mLD3 decoder (without a sound module)
- 60985 mSD3 sound decoder with preset steam locomotive sound
- 60986 mSD3 sound decoder with preset diesel locomotive sound
- 60987 mSD3 sound decoder with preset electric locomotive sound

3) What else can the new generation of decoders do?

With their more powerful performance, these decoders offer a wide variety of new features:
- They support all currently available digital formats (fx, mfx, DCC) and can be used in Märklin as well as
  Trix H0 locomotives.
- They are ready for up to 32 controllable functions.
- They automatically set the optimal motor parameters during a test run.
- They offer individually controllable sounds and improved sound depth.
- Individual sounds can be loaded easily.
- Internally the decoder works with 4,096 instead of the previous 126 speed levels.
- The slow speed running characteristics have been clearly improved again.
- Each decoder can be loaded with projects as desired.
- Complex activity processes (such as switching operations or coupler maneuvers during switching
  operations) can be done thanks to advanced mapping.

In addition, a new programming tool definitely facilitates operations. The decoder can be set directly and
quickly at a PC with the mDP decoder programmer (Item Number 60971) – a stick with a USB interface and
an interface for the decoder. Additional advantage: Settings cannot only be programmed simply by means
of the mDT3 decoder tool software and sound files can be loaded very quickly, but they can also be mana-
ged, changed and called up again completely as projects (see Section IV, Programming with mDP).

4) Which advantages does programming with mDP provide?

These retrofit decoders can be programmed directly by means of a PC in a few minutes with the new mDP
decoder programmer.

The programming set consists of two components:
- A stick with a USB interface and an interface for the decoder (see Figure 1);
- The mDT3 decoder tool software that you can download easily and free of charge (!) from the
  Märklin homepage.

This is how you start the decoder programmer:
- Install the downloaded software on the computer. Open the file with a double click and follow the instructions for installation.
- Click on the mDT3 icon (on the desktop or in the menu program) after successful installation.
- There will be a reference note that the sound library can be updated if desired.
- The overview screen for the tools will appear (see Figure 2).
- Plug the stick into the USB port on the PC.
- Connect the decoder to the stick using the interface adapter.

The decoder is automatically recognized and you can now access the decoder directly. The decoder data can be taken into the existing project or can be stored under a new project.

Figure 1: Programmer Stick

Stick with USB interface

Decoder plugged in here
(Variants of the 21-pin interface)

Figure 2: Overview Screen

Dashboard for the mDT3
programming software

You can choose: Transfer
data directly to the decoder
or make it available to the
locomotive via the Central
Station.

mSD/3   mLD/3   mDT/3

5) What does the new motor control offer?

The third generation of retrofit decoders have a completely new feature in the form of „automatic calibration". Model railroaders without a great deal of previous technical knowledge can determine automatically optimal parameters by means of a calibration test run. Technically versed model railroaders have as in the past the possibility of making custom settings (see Section 7) by setting configuration variables (CVs).

The developers have constructed a comprehensive test program in order to identify optimal setting values for individual motors, whereby the decoder „calibrates" the motor. The decoder controls the motor and then evaluates the motor's behavior. The optimal parameters are set by means of algorithms resulting from the values that have been determined. This process also allows you to control „difficult" motors satisfactorily with new filters and algorithms. Even simple motors can be improved in their running characteristics. During the development of the control parameters, attention was paid to suppressing step-like running characteristics effectively (due to resonating windings in the motor) or unfavorable commutator designs.

The new controller is in a position to provide the decoder with distance data, current speed, and the load situation in order to maintain precise running characteristics such as a constant braking path or synchronous steam chuffing on steam locomotives. With the new controller, it is also possible to have model locomotives and powered units run slower as well as faster than was previously the case. Here emphasis is placed chiefly on quiet, smooth running at the lowest speeds.

6) How do I execute automatic calibration?

After installing the decoder, place the locomotive on as large an oval of track as is possible. You can use a Central Station or a Mobile Station as a digital central controller. Put the locomotive into motion and let it run about one to two minutes. Important: The locomotive should reach its maximum speed several times. Therefore, make sure in every case that the oval is large enough so that the locomotive reaches its maximum speed without derailing.

After the test run, the decoder will store the optimal motor parameters. They are the basis for additional control of the motor. The corresponding CV values can be read out easily by means of the mDT3 programming tool or the Central Station and they can be changed individually (to do this see Section 7).

mSD/3   mLD/3   mDT/3

7) How can I set the CVs on my own?

The easiest way to change configuration variables (CVs) is to use the mDT3 programming tool. In addition to the programming tool, the values in the decoder can of course be changed with the digital central controller.

Settings using the mDT3 programming tool:

After the decoder has been read, click on the rider „motor" and you will receive the current data with which the decoder is currently working (based on the test run or set manually).

Now you can set or adjust different variables individually such as minimum or maximum speed, acceleration and braking delay, different control parameters, trim, etc.

The advantages of the programming tool:
- The individual values are presented graphically (see image) so that you are doing the changes with visual support.

- The individual value combinations can be stored as a project and can always be called up again.

- You can choose whether to store the settings directly on the decoder using mDP or program the decoder in the locomotive by means of the Central Station.
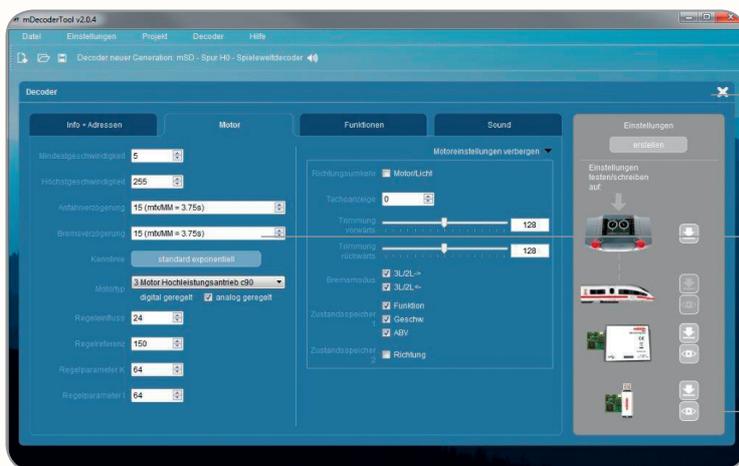
Call up the menu point „Motor" to set the CVs.

The different variables can be changed individually.

CS2 or directly with the stick: You can decide how you transfer the values.

Important Note: The values obtained from the test run are as a rule optimally matched to the motor in question. In this instance, the result is fully satisfactory parameters for the majority of operators. In any event, you should check to make sure whether the values obtained must be changed in the first place.

mSD/3   mLD/3   mDT/3

8) What advantages does the decoder have for sound?

Model railroaders have never been closer to the prototype: This claim applies in particular to the sound enabled by the new generation of decoders. Individual sounds that can be controlled separately, more playback channels, and an improved sound power amplifier are increasing the sound quality markedly. The new decoders thus work with a sampling depth of 16 bits (compared to the previous 12 bits). Up to 28 sound files can also be loaded (with appropriate sized files and a maximum sound memory of 64 MB).

The individual advantages:
- Several sounds can be played independently of each other (example: station announcements and whistle). Eight (previously six) playback channels are available.

- Individually adjustable volumes: Sounds that are played at the same time can be set individually for loud or soft playback (example: station announcements played loudly, whistle sounded softly, whistle/horn still audible when the locomotive/train is running fast).

- Sounds you have recorded yourself (example: whistle from a prototype locomotive) or station announcements (example: in dialect) can be loaded individually.

- Anyone can expand the sound library with sounds created on your own.
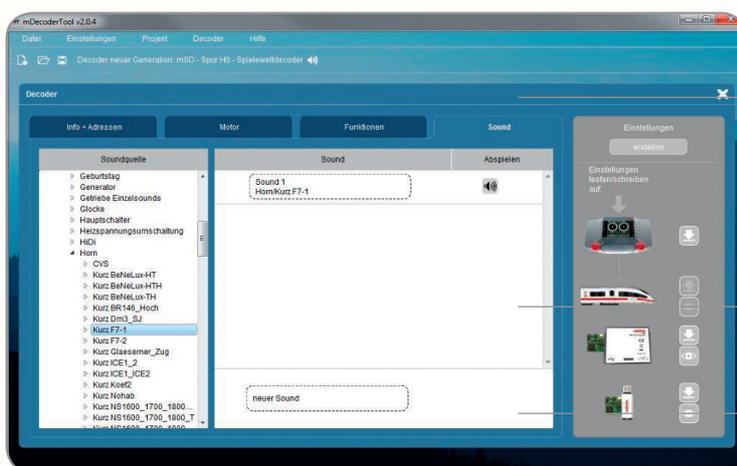
Start screen in the menu point Sound.

Compilations: Drawing sounds from the library easily into a current project.

Your own sounds can be integrated into the decoder with no problem.

You can access the sound library from Märklin at any time and load appropriate sounds on the decoder. Loading and managing sounds and entire sound projects can be done simply and quickly with the decoder programmer.

mSD/3   mLD/3   mDT/3

9) How do I set up extensive activity processes?

Advanced mapping allows you to assemble complex activity processes with the new retrofit decoders and call them up at the press of a button. Processes can be generated by combining functions and sounds. Functions can also be activated reciprocally at the same time. Separate combinations can be generated for each of the 32 functions. All total 80 mapping locations and about 90 activities in the decoder are available.

The function processes can be combined simply and quickly with the mDT3 programmer tool. Call up the rider „Functions" to do this. In the program window on the left side there is an overview of the individual function buttons and the functions to which they are assigned. On the right side are the functions that have been set.

Processes of your own creation can be assigned to one of the function buttons and stored there. A certain existing function can be expanded for this or a button can have a completely new assignment. Here an ongoing activity can activate in turn another activity by acting as a trigger. A wide variety of activities is available from the menu Logical Functions, Sounds, Timer, Exit, or Special Functions.

Call up the menu point „Function" to program activity processes.

Assign the individual activity processes to the function buttons.

Examples of combined processes on a function button:
- Combining the functions „shoveling coal" and „firebox flickering" on a steam
  locomotive. The activity process synchronizes the shoveling of coal with the
  firebox. The firebox flickering is not shut off until the sound is through playing.

- Complete switching operations with all of the locomotive movements belonging to
  them including sounds and other functions in one process: The back and forth
  coupler maneuver for uncoupling and pushing a car further down the track
  without the couplers reengaging can be activated thus with the press of a button.

mSD/3   mLD/3   mDT/3

10) How can I access prepared decoder projects?

The decoder projects on the homepage can be downloaded easily and quickly. The decoder setting and sounds are already preset in the decoder projects for many prototype locomotives. All you still have to do is the setting for the motor.

11) How do I go about doing an installation?

The retrofit decoders have the exact same dimensions as their predecessor models. This means: You can replace existing decoders quite easily with the new generation of decoders. Please make sure that you use as much as possible the identical variants of the decoders. With decoders having the 21-pin interface, you only have to remove the old decoder and plug the new 21-pin decoder into the interface.

With decoders in the NEM variant having an eight-pin interface, the existing wires must be unsoldered. Then the new decoder is soldered in place with the exact same arrangement of the wires. The NEM variants are installed chiefly where there is not very much space available.

When converting previously analog locomotives or locomotives with the first generation decoders, you can choose between both decoder variants depending on the amount of available space. The variant with the 21-pin interface is recommended due to its greater flexibility. You can do the installation or conversion on your own or contract with a Märklin or Trix service station to do it.

12) Where do I find additional information about the new generation of decoders?

In the Märklin and Trix internet sites, you will find extensive additional information all about the new retro-fit decoders.
You can call up specific menu points either directly by means of the start pages (www.maerklin.de or www.trix.de) or you can enter the internet address with direct access.

The following additional information is available:

- A short film about the decoders.

- Technical data.

- Operating instructions by item (You can find these with an advanced product search).

Märklin updates the information about the new generation of decoders continuously. It is worth the time to look at our internet sites regularly.

mSD/3   mLD/3   mDT/3