



**user manual**

# **LokPilot** mfx<sup>®</sup>

**Item.No.61600**

**user manual Version 1.0**

**April 2005**



**Lok** ***Pilot***<sup>®</sup>

## General Features:

The LokPilot mfx is specifically designed for use with Märklin® central units: it can be operated with the known central units such as Delta or control unit 6020 resp. 6021, but also with the new Märklin® systems command stations working with the mfx-data format. Of course it can also be operated with conventional AC. The LokPilot mfx automatically detects the required operating mode. It can control DC motors, coreless motors (e.g. Faulhaber) or universal motors with HAMO-magnets.

Due to its unique features LokPilot mfx offers you flexibility and reliability that you have come to expect from a digital decoder. Due to its flash-technology it can be updated at any time.

- Multi-protocol operation Motorola / mfx
- Suitable for analogue AC layouts
- Fully automatic change to all 3 operating modes „on-the-fly“ (AC analogue, mfx digital, Motorola digital)
- 4<sup>th</sup> generation load control: adjustable with 3 CVs to the motor characteristics
- Smooth and silent tact frequency of 40 kHz
- Supports Märklin® brake sector
- 128 speed steps in mfx-mode, 14 speed steps in Motorola®-mode
- 100% compatible to Märklin® systems
- Supports the directional control bit when changing from analogue to digital
- Permanent storage of speed and status of all functions
- Comfortable modification of settings: the engine does not have to be opened
- 2 directional light outputs with ca. 180 mA each, over-current protected
- 2 freely available function outputs (F1 and F2), with ca .180 mA each, over-current protected
- Maximum current of all 4 outputs: ca. 350 mA
- Shunting speed can be switched with F3
- Acceleration and deceleration can be switched off with F4
- Freely selectable speed curve (\*)
- All outputs can be assigned to outputs as desired (\*)
- Lighting effects: Strobe, Double strobe, Mars- und Gyro light, firebox, Zoom. Brightness of each output can be separately dimmed.
- Motor output: maximum 1.1 A, over-current protected

- Maximum current of decoder: 1.2 Amperes
- Dimensions: 22.5 x 15.5 x 4.5 mm
- Future proof: Firmware upgrades due to Flash-Memory possible

### Important note:

- The LokPilot mfx is designed for use with model railways only
- Avoid mechanical force and impact on the decoder
- Do not expose to wet and humid conditions
- Do not remove the heat shrink sleeve around the decoder
- Never solder on the circuit board, extend cables if necessary
- Never wrap the decoder in insulation tape, since this may prevent heat diffusion and cause overheating
- Always disconnect the circuit when installing the decoder
- Make sure that no blank wire ends come into contact with any metal parts of the locomotive
- Make sure that no wires are squeezed or cut by the model's transmission parts when reassembling the locomotive.

### Prior to installation

The locomotive must be in perfect technical condition prior to installation. Only a locomotive with a trouble-free mechanism and smooth running properties in analogue mode should be converted for digital mode.

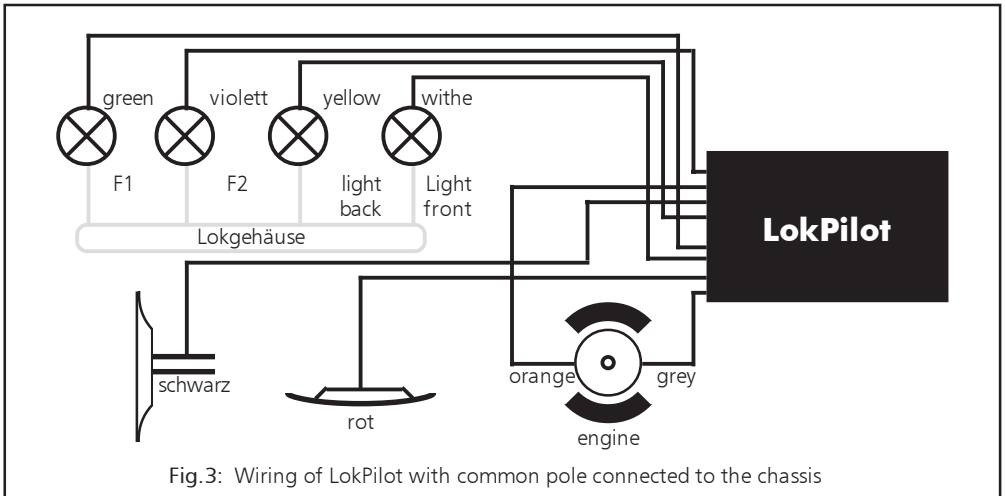
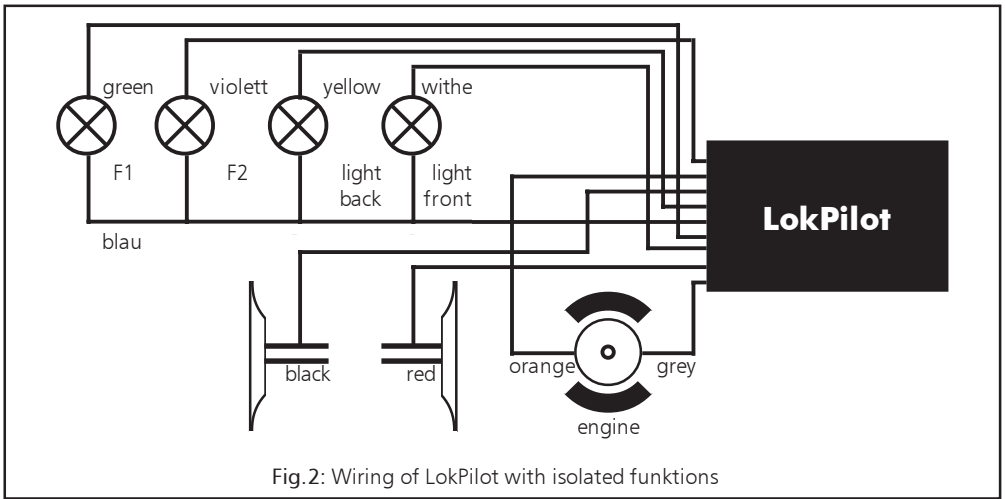
Stift	Description	colour
1	motor connections right	Orange
2	back up light	yellow
3	function F1	green
4	track connection 1	black
5	motor connections	grey
6	light front	with the
7	common (+ pole )	blue
8	track connection 2	red

1 = orange



5 = grey

Fig.1: Interface as per NEM650/652



Wear and tear parts, such as motor brushes, wheel contacts, light bulbs, etc. must be inspected and cleaned or replaced if necessary.

All work has to be carried out with the locomotive placed on a suitable base (not the track) and definitely un-powered. Make sure there can never be any electrical power applied to the loco during the conversion – even inadvertently.

### Locomotives with NEM Interface

The LokPilot mfx is equipped with an interface as per NEM 650/652 (NMRA page 9.1/9.2 - see fig. 1). Installation in locomotives with interface is therefore particularly easy:

- Remove the body from the chassis. Please refer to the instructions provided with your locomotive!
- Remove the plug or the analogue directional relay from the interface socket. Please keep it for later use.
- Insert the plug in such a way that pin 1 of the plug (near the red / orange wires) is located next to the point marked \*, +, . or 1. Please take care to avoid bending the pins. Do not rely on the assumption that the wires have to lead from the socket in a certain direction: only the position of pin 1 determines which way the plug has to be inserted.

- Locate the decoder at a suitable position within the locomotive. Most modern models have sufficient space for a decoder. Use double sided adhesive tape or a small amount of hot glue.

### Locomotives without interface

First separate all wires in the locomotive and make sure there is no hidden connection from one of the motor terminals to the chassis or the wheel contacts. The motor terminals definitely must be insulated. Fleischmann models often have such a connection, which can easily be overlooked. Check all connections using an Ohmmeter and make sure there are no short circuits between the motor terminals and the wheel contacts.

How to proceed depends on how the headlights and auxiliary functions are wired:

- a) If directional headlights and functions are isolated from the locomotive body proceed as per figure 2.
- b) Directional headlights and functions may be connected with their common to the track voltage (e.g. almost all Märklin® -locomotives and older Fleischmann or ROCO locomotives are wired like that) as per figure 3.

- Connect the red wire to the right rail pickup (or centre pick up in AC models)
- the black wire to the left rail pickup (wheels in AC models).
- Connect the orange wire with the motor terminal, which was previously wired to the right wheel pick up (centre pick up in AC models).
- The grey wire goes to the terminal, which was originally connected to the left rail (common rails for AC models).
- Solder the back-up lights to the yellow wire, the front headlights to the white wire.
- Connect the green wire to the function output, which you want to switch with function button F1.
- Connect the purple wire with the function output, which you want to switch with the function button F2.

If your locomotive is wired as per b) above, then wiring is completed.

In the case as per fig. 2 you have to connect the second pole of all light bulbs or other loads to the blue wire. The blue wire must not be connected to the chassis!

### Connecting Auxiliary Functions

Any load may be connected to the light and function outputs as long as it doesn't exceed the maximum current. Please note that the overload protection of the decoder responds very quickly and will switch off all functions immediately in case of overload or short circuit.

Therefore use only 16 V bulbs or higher and a maximum nominal current of 50 mA: Incandescent lamps have a high starting current and this may activate the overload protection of the decoder when the lights are switched on.

Use only digital smoke generators (e.g. Seuthe No. 11) for locomotives whose light and function outputs are connected as shown in figure 2. All other smoke generators may draw too much current. Some commercially available smoke generators have a higher nominal current than 250 mA!

In locomotives connected as shown in figure 3 an analogue smoke generator e.g. Seuthe No. 10 is required.

Make sure that the total current for all function outputs does not exceed the permitted current rating and avoid short circuits between outputs. Although outputs of LokPilot mfx decoders are protected, high voltage on the terminals or a short circuit may damage the decoder!

### Set-up and initial operation

Before replacing the body and reconnecting the engine it is recommended to carry out a function test.

The factory pre-set Motorola address is 03. The decoder must „report“ automatically to mfx central units.

- Does the locomotive move in either direction?
- Turn the lights on: are they operating correctly? If the LokPilot mfx V2.0 decoder is used in a locomotive with NEM interface: check if the NEM connector is plugged in correctly.

## Motorola-Mode

The LokPilot can be operated with all previously or currently available Märklin® devices resp. with compatible systems. The functions F1 to F4 can only be used with the so called „New Motorola®-format“. In order to activate this you must set the DIP-switches 1 and 2 of the 6021 in the upper position („On“).

## mfX-mode

The LokPilot mfx is automatically detected by all central units compatible to Märklin® systems such as mobile station or central station. After registration of the decoder it can be operated immediately.

## Adjusting decoder parameters

The LokPilot mfx supports many parameters. Depending on the type of central unit it may not be possible to modify all parameters.

### With Märklin® 6020 / 6021

In conjunction with all previous Märklin® central units 6020 resp. 6021 the most important parameters are available. They are sorted in CVs as listed in table 1. In order to adjust these CVs proceed as follows:

(The throttle must be set to 0.

No other engines may be on the layout.

Take note of the blinking lights of the engine!)

- Press the „Stop“- and „Go“-buttons of the 6021 at the same time (simultaneously), until a Reset is triggered. (Alternately pull the mains plug and re-insert afterwards)
- Press the „Stop“-button in order to turn off the track voltage
- Enter the current decoder address (alternative: „80“)
- Activate change of direction with the throttle (turn the knob left beyond the „Stop“-position until you hear a click), hold the knob there and press the „Go“-button
- The LokPilot mfx is now in programming mode (headlights are blinking)
- Enter the number of the parameter (CV) you want to change (two digits).
- Confirm by pressing „change of direction“ (now the headlights blink in double mode)
- Enter the new value for the register (two digits)
- Confirm by pressing „change of direction“ (headlights are on for 1 second and then start

blinking)

- Then you can change other registers in the same manner
- To exit the programming mode select register „80“ or turn off the track voltage for a moment (press „Stop“-button on 6021, then „Go“-button)

### With Märklin® mobile station

With the Märklin® mobile station it is child's play to enter the name of the engine, the maximum speed as well as acceleration and deceleration. Even a decoder reset is easily possible. Other parameters cannot be activated with the mobile station.

### With Märklin® central station or ESU Lok-Programmer

The LokPilot mfx has a large number of adjustable parameters. They can be adjusted comfortably with the aid of a graphic display either with the central station or the ESU LokProgrammer 53450. Besides the parameters described above the following parameters are also available:

- Freely selectable speed curve
- Parameters for load control
- Function mapping: you determine which function button triggers which function and which symbol is displayed.
- Assigning lighting effects to the various function outputs: The LokSound mfx decoder offers a large choice of lighting effects such as dimming, flash, blinking or simulating the firebox. You determine which output operates with which effect and how bright the lamps should be.
- Selection and settings of parameters in analogue modes resp. brake sectors
- Setting of maximum speed in analogue mode
- Various other settings

### Tips und Tricks

#### Adjusting Load control

The load control of the LokPilot mfx can be adapted to different types of motors. The standard settings match most motors very well but may have to be adjusted for other models. This is particularly true for coreless motors (Faulhaber, Maxxon) where we recommend setting the K-value (CV 54) to a lower value.

## Decoder-Reset

You can easily reset the decoder if you do not know how to proceed:

Simply write the value 08 in CV 08 with the aid of the 6021 or select the reset option of the mobile station resp. the central station.

## Support and Assistance

Your first port of call with any questions is the dealer where you purchased the LokPilot mfx decoder. He is your competent partner for all your questions related to the model train hobby.

You may also contact us directly. For enquiries please use either email or fax (don't forget to provide your own fax-no.) and we will reply within a few days.

Please call our hotline only in case of complex enquiries that can't be dealt with by email or fax. The hotline is often very busy and you may encounter delays. Also check our website for more information. You will probably find a few answers to your questions and some hints under „Tips & Tricks“ that will assist you.

Of course we will be pleased to assist you. You can contact us at:

By telephone: ++49 (0)700 – LOKSOUND  
                  ++49 (0)700 – 56576863  
                  Tuesdays: from 10.00 am to 12.00  
noon  
                  Wednesdays:  
                  from 10.00 am to 12.00 noon  
Per Fax:       ++49 (0)700 - 37872538  
Per email:     support@loksound.de  
By Mail:       ESU GmbH & Co. KG  
                  - Technical Support -  
                  Industriestraße 5/2  
                  D-89081 Ulm  
Internet:      <http://www.loksound.de>

CV	Name	Description	Range	Factory value
1	Address	address of locomotive	01 – 80	03
2	Starting voltage	determines the starting speed	01 – 63	18
3	Acceleration	This value multiplied by 0.25 gives the time from stop to maximum speed	01 – 63	16
4	Deceleration	This value multiplied by 0.869 gives the time from maximum speed to stop	01 – 63	12
5	Maximum speed	maximum speed of locomotive	01 – 63	63
6	Medium speed	Speed of locomotive at medium speed step	0 - 64	22
7	Version number	Internal software version of LokPilotDCC (read only)		- -
8	Factory reset	Resets decoder to default settings Writing value 8 triggers a reset of all CVs to factory values		8
53	Load control parameter 1	Parameter 1 (control reference) Determines the back EMF voltage that the motor should supply at maximum speed. The more efficient the motor, the higher this value may be. Reduce this value if the engine does not reach its designed maximum speed.	01 - 63	35
54	Load control parameter 2	Parameter 2 („K“-component) of the internal PI-controller Determines how strongly load control effects. The higher the value, the stronger the decoder controls the motor.	01 - 63	24
55	Load control	Parameter 3 („I“-component) The momentum of the motor determines parameter 3. Motors with large flywheels or large diameter require a smaller value.	10 - 63	24
56	Load control influence	Determines how strongly load control is active.	01 - 63	63
78		Starting voltage in analogue AC mode	01 - 63	25
79		Maximum speed in analogue AC mode	01 - 63	63

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