märklin
digital

60942 Conversion Decoder Set
60962 Conversion Decoder Set

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Using the Product as Intended

The 60942/60969 decoders are for converting Märklin/Trix H0 locomotives to digital.

! Not suitable for motors with field-wound coils. Locomotives with these motors must be converted with the appropriate motor retrofit kits, item numbers 60942 or 60962.

! Important: The following locomotives (locomotive-specific decoder) cannot be converted with this decoder.

Items:

26410	37346	37777	39340
26453	37403	37786	39343
26490	37404	37787	39390
26557	37435	37790	39392
26561	37485	37791	39393
26562	37501	37867	39399
29094 (only E 94)	37504	37940	39404
29440 (only E 10)	37505	37941	39441
29500 (only E 50)	37530	37993	39563
37010	37542	39014	39564
37011	37573	39022	39565
37044	37574	39051	39643
37226	37575	39081	39836
37227	37580	39110	39837
37239	37581	39123	39838
37274	37607	39140	39896
37275	37733	39185	39972
37321	37734	39303	39986

Contents as Delivered

   1 decoder
   1 circuit board with a 21-pin connector
   1 NEM 8-pole connector
   1 circuit board retainer (only 60942)
   1 screw (only 60942
   1 adhesive pad (only 60962)
   Installation instructions
   Warranty card

Tools also needed for the installation procedure include: regular and cross-point screwdrivers, tweezers, and soldering station with a maximum soldering temperature of up to 30 watts / 300˚Celsius / 572˚Fahrenheit with a fine tip, soldering flux for electronics (0.5 - 1 mm / 0.02" – 0.04" diameter), de-soldering braid or a de-soldering pump.

Safety Notes

- **WARNING!** Sharp edges and points required for operation.
- Do wiring and assembly work only on a voltage-free or grounded work mat. Failure to do this can lead to dangerous static charge from your body and to damage to the components.
- **Operate the decoder only with the authorized voltage** (see technical data).

   There is a danger of **burning yourself** when working with a soldering station.

Technical Information
- Continuous current load at the motor output ≤ 1.1 amps
- Current load at the light outputs ≤ 250 milliamps
- Current load at AUX 1 – AUX 4 each ≤ 250 milliamps
- Current load at AUX + lights (total) ≤ 300 milliamps
- Current load for motor and AUX 5/6 ≤ 1.1 amps
- Maximum total load ≤ 1.6 amps
- Maximum voltage ≤ 40 volts
- Sound performance (at $4\,\Omega$ /$8\,\Omega$) 2.3 watts / 1.2 watts
- Short circuit and overload protection at the outputs lights front (LV), lights rear (LH), AUX 1 – AUX 4 and at the motor outputs.

Functions
The mSD SoundDecoder is a sound decoder with very extensive setting and adaptation possibilities. Additional sound functions are available. This decoder can be updated. The requirement for this is an appropriate controller (60213/60214/60215 Central Station, software Version 2.0, track format processor GFP 2.0 or higher).

The settings and digital functions can only be used in digital operation. However, the same possibilities are not available in all protocols.

These instructions describe the installation and the possible settings for the 60942 and 60962 decoders. Unless otherwise stated, the functions refer to both decoders.
- Capable of multi-protocols (fx (MM), mfx, DCC, and AC/DC).
- Automatic system recognition. The address assigned to each system must be used for operation.

- Acceleration and braking delay can be set separately from each other. Any function button desired can be assigned using the function mapping.
- Typical sound backdrops for diesel and electric locomotives are included.
- Variable motor feedback control is available in digital as well as in analog operation.
- 6090, 60901, DC, Sinus and can motors with bell-shaped armatures are supported. See **necessarily** this table on page 3.
- Function mapping included.
- Can be updated with the CS2 (Software 2.0, track format processor GFP 2.0 or higher).
- Programming on the Main (PoM) this type of programming must be supported by the controller. Please note the instructions for your controller when doing this.
- Switching range can be set.
- Braking / signal stopping block recognition is available in digital operation.

Decoder Installation

The locomotive must be checked before installing the decoder to make sure that it (locomotive) is in good mechanical and electrical condition. There are situations when the locomotive will have to be repaired before installing the decoder.

Locomotives / Powered Rail Cars with a Connector

First unsolder the wires to the current pickups (pickup shoe(s)), motor, and the lights. After that remove the old decoder or reverse unit. Position the new decoder and solder the wires according to the diagram nearby.

If the lights are grounded to the locomotive's or powered rail car's ground on the frame, we recommend that the lights be insulated from the locomotive ground. To do this, use the E604180 plug-in bulb holder(s) and E610080 light bulb(s). This will give you flicker-free lighting.

If your locomotive or powered rail car is equipped with LED lighting, then series resistors must absolutely be installed. Series resistors differ according to the current the design. Find out the correct values for your LEDs. You may have to ask your specialty dealer about this.

If you want to retrofit your locomotive or powered rail car with LEDs, the cathodes (-) on the LED are connected to the light output on the decoder. **Don't forget** series resistors! The anodes (+) are connected to the common wire (blue).

The common ground return (blue) must not be connected to the ground for the locomotive or powered rail car.

This procedure is identical for the 60962 decoder and for the connector board from the 60942 set. Make sure that you pay absolute attention to the **notes** for the **colors of the wires** for each decoder.

60962

Please note that the colors for the wires conform to the European NEM standard. A cross reference of the Marklin color scheme can be found page 6.

gray	Motor Connection 2
black	Conductor Current Pickup, Left
white	Front Lights
green	Function 1
blue	Common Wire for Lights
yellow	Rear Lights
red	Conductor Current Pickup, Right / Center
orange	Motor Connection 1
violet	Function 2

Solder pads above

4 black
3 green
2 yellow
1 orange

Solder pads below

8 red
7 blue
6 white
5 gray
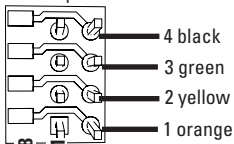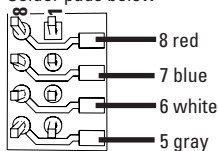
Locomotives or powered rail cars with NEM 8-pin connector. Solder the wires to the correct solder pads according to the diagram above. Insert the plug into the connector while paying attention to the positioning.
Information on lighting see Dceoder 60942

Cross Referencing the Colors for the Wires

Description	Wire Color	
	NEM	Märklin
Motor Connection 2	gray	blue
2- Conductor Current Pickup, Track, Left 3- Conductor Current Pickup, Track, Outer	black	brown
Front Lights	white	gray
Function 1	green	brown/red
Common Wire for Lights	blue	orange
Rear Lights	yellow	yellow
2- Conductor Current Pickup, Track, Right 3- Conductor Current Pickup, Track, Center	red	red
Motor Connection 1	orange	green
Aux 2 (physical output)	violet	brown/green
Aux 3 (physical output)		brown/Yellow
Aux 4 (physical output)		brown/white

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60942

Screw down the mounting plate and solder the wires to the motor connections, pickup(s), and any functions.

The **colors for the wires** correspond to the **Märklin Standard;** for a comparison table for NEM.
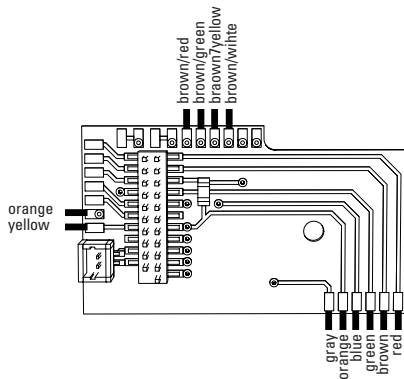
If the lighting is grounded to the locomotive or powered rail car's frame, this may cause flickering. If you don't want this, then the lighting must be insulated. We recommend replacing the light bulb(s) with the 604180 plug-in socket(s) and the 610080 light bulb(s). The ground is then connected to the orange wire.

Plug the decoder into the circuit board and make sure you have plugged it in correctly. Place the model, with the body left off, on the programming track and test it. If the decoder works with no problems, the body can be put on the locomotive.
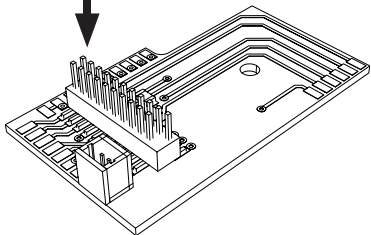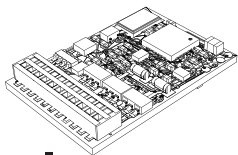
Multi-Protocol Operation

Analog Operation
This decoder can also be operated on analog layouts or areas of track that are analog. The decoder recognizes alternating current or direct current voltage (AC/DC) and automatically adapts to the analog track voltage. All functions that were set under mfx or DCC for analog operation are active (see Digital Operation).

Digital Operation
The mSD sound decoders are multi-protocol decoders. These decoders can be used under the following digital protocols: mfx, DCC, fx (MM).

The digital protocol with the most possibilities is the highest order digital protocol. The sequence of digital protocols in descending order is:

> Priority 1: mfx
> Priority 2: DCC
> Priority 3: fx (MM)

Note: Digital protocols can influence each other. For trouble-free operation, we recommend deactivating those digital protocols not needed by using CV 50. Deactivate unneeded digital protocols at this CV if your controller supports this function.

If two or more digital protocols are recognized in the track, the decoder automatically takes on the highest order digital protocol, example: mfx/DCC; the decoder takes on the mfx digital protocol (see previous table).

Note: Please note that not all functions are possible in all digital protocols. Several settings for functions, which are supposed to be active in analog operation, can be done under mfx and DCC.

Braking / Signal Stopping Block (MM, fx, mfx)

The braking module essentially applies DC voltage to the track. If the decoder recognizes a DC voltage of this kind in the track, it brakes with the delay that has been set. If the decoder recognizes a digital protocol again, it accelerates at the speed that has been set.

If automatic recognition in braking areas is to be used, we recommend shutting the DC operation off (see CV description).

mfx Protocol

Addresses
- No address is required; each decoder is given a one-time, unique identifier (UID).
- The decoder automatically registers itself on a Central Station or a Mobile Station with its UID.

Programming
- The characteristics can be programmed using the graphic screen on the Central Station or also partially with the Mobile Station.
- All of the Configuration Variables (CV) can be read and programmed repeatedly.
- The programming can be done either on the main track or the programming track.

- The default settings (factory settings) can be produced repeatedly.
- Function mapping: Functions can be assigned to any of the function buttons with the help of the 60212 Central Station (with limitations) and with the 60213/60214/60215 Central Station (See help section in the Central Station).

fx (Motorola) Protocol

Addresses
- 4 addresses (a main address and 3 consecutive addresses)
- Address range:
  1 - 255 depending on the controller / central controller
- The main address can be programmed manually.
- The consecutive addresses can be turned on, turned off, set and can be programmed manually or automatically.
- All 16 functions can be controlled by means of the four addresses.

Programming
- The characteristics can be programmed for the decoder can be programmed repeatedly using the programming for the Configuration Variables (CV). Reading the CVs is not possible.
- The CV numbers and the CV values are entered directly.
- Program the CVs only on the programming track.
- The default settings (factory settings) can be produced repeatedly.
- 14 or 27 speed levels can be programmed.

- The first four functions and the lights can always be controlled by means of the first address; additional functions can be used, depending on the consecutive addresses.
- All of the settings from the function mapping for mfx or DCC programming are taken on for fx (Motorola).
- Automatic recognition corresponding to the active additional or consecutive addresses. What is recognized is whether the function can be turned on or off continuously by means of a consecutive address. This function mapping can only be determined in the mfx or DCC protocol.
- See the CV description for the fx protocol for additional information.

DCC Protocol

Addresses
- Short address – long address – multiple unit address
- Address range:
  1 - 127 for short address and multiple unit address,
  1 - 9999 for long address
- Every address can be programmed manually.
- A short or a long address is selected using the CVs.
- A multiple unit address that is being used deactivates the standard address.

Programming
- The characteristics can be changed repeatedly using the Configuration Variables (CV).
- The CV numbers and the CV values are entered directly.
- The CVs can be read and programmed repeatedly. (Programming is done on the programming track).

- The CVs can be programmed in any order desired. (Programming can be done on the main track PoM). The PoM can only be done with those designated in the CV table. Programming on the main track PoM must be supported by your central controller (Please see the description for this unit).
- The default settings (factory settings) can be produced repeatedly.
- 14/28 or 126 speed levels can be set.
- All of the functions can be controlled according to the function mapping (see CV description).
- See the CV description for the DCC protocol for additional information.

We recommend that in general programming should be done on the programming track.

Physical Functions

Each of these functions must be connected externally to the circuit board. We therefore speak of physical functions. A unique mode/effect can be assigned to each physical output (AUX / lights) in digital operation. Three CVs are available for each output for this purpose. Only one mode/effect can be set for each output. A complete table for this can be found on the Internet at:
www.maerklin.de/de/produkte/tools_downloads/technische_infos.html

Logic Functions

Since these functions are only executed by software, no physical output is required for them. We therefore speak here of a logic function.

Acceleration/Braking Delay
• The acceleration and braking time can be set separately from each other.
• The logic function ABV can be assigned to any function button by using the function mapping.

Switching Range (RG)
• The switching range causes a reduction in the current speed of the locomotive. This allows a fine touch in the controlling the locomotive. The switching range can be assigned in mfx and DCC to any function button by using the function mapping. See table on page 18 for setting CV 137 or mfx menu for the Central Station.

Controllable Functions				F0 F4	f0 f8 f8 f0 Digital/Systems
Headlights	function/off	🔆	❄	Function f0	Function f0
Aux 1	f1	Function 1	Function *	Function f1	Function f1
Aux 2	f2	Function 2	Function *	Function f2	Function f2
Switching Range	f3	Function 3	Function *	Function f3	Function f3
ABV out	f4	Function 4	Function *	Function f4	Function f4
Aux 3 (only 60942)	—	—	Function *	Function f5	Function f5
Aux 4 (only 60942)	—	—	Function *	Function f6	Function f6

* Function symbols may be displayed in different order.

Decoder functions and CV settings

The following pages have the functions and the CVs presented in tabular form. These CVs can be given a number of settings and can be assigned to a number of function buttons.

You'll find the CVs and their applications for the track formats fx (MM) and DCC in separate tables.

The track format mfx can be easily set by using the display on the CS 2 with Software Version 2.0 and higher. You or your dealer may have to install an update on your 60213/60214/60215 Central Station.

CV Table for fx (MM)

CV	Explanation	Values	Default	Notes
1	Address 1 (main address)	1-255 (1 - 80)*	78	Address is always active and is not subject to CV 49.
2	Minimum speed (Vmin)	1-255 (1 - 80)*	5	Speed at the smallest speed level. Value must be smaller than Vmax, CV 5.
3	Acceleration delay (AV)	1-255 (1 - 80)* [0,00s - 20,00sec.]	25	CV value multiplied by 0.25 gives the time from complete stop to maximum speed.
4	Braking delay (BV)	1-255 (1 - 80)* [0,00s - 20,00s]	16	CV value multiplied by 0.25 gives the time from the maximum speed to absolute stop
5	Maximum speed (Vmax)	1-255 (1 - 63)* {x4}	255	Speed at the highest speed level. Value must be greater than CV 2.
8	Decoder reset (default or factory setting)	8	-	Value is not written.
17	Address 3 (2nd consecutive address)	1-255 (1 - 80)*	254	Address can be deactivated/activated subject to CV 49.
18	Address 4 (3rd consecutive address)	1-255 (1 - 80)*	253	Address can be deactivated/activated subject to CV 49.

* () = 6021 Control Unit   {} = the values entered are multiplied times "x" (factor).

CV Table for fx (MM)

CV	Explanation	Values	Default	Notes
27	Braking mode: Bit 0 - 3 : always 0, Bit 4 : DC voltage, polarity against the direction of travel Bit 5 : DC voltage, polarity with the direction of travel Bit 6 - 7 : always 0	0 - 48 0 0 / 16 0 / 32 0	48	Braking subject to direction: - 16 normal DCC properties - 32 inverse DCC properties Braking not subject to direction: - 48: fx/mfx properties

29	Configuration:
	Bit 0: Reverse the locomotive's direction properties
	    0 = normal direction
	    1 = invert direction
	Bit 1: number of speed levels
	    half levels 14 or 27
	    0 = 14 speed levels
	    1 = 27 speed levels / half levels
	Bit 2: turn analog operation on/off
	    0 = analog off, 1 = analog on
		0 - 7	6	The direction properties refer to the direction of travel and the lights.
				
				The number of speed levels and half levels depend on the locomotive controller.
				
				Only digital operation or also conventional operation. Flipping back and forth between the modes is possible during operation.

49	Expanded configuration: Bit 0: number of addresses, LSB Bit 1: number of addresses, MSB Bit 2: automatic consecutive addressing (on / 1=off)	0 - 7	5	0 = one | 1 = two | 0 = three | 1 = four 0 Add. | 0 Add. | 1 Add. | 1 Add. 0 = auto. sequence on / 1 = auto. sequence off
50	Alternative formats: Bit 0: analog AC off = 0 / analog AC on = 1 Bit 1: analog DC off = 0 / analog DC on = 1 Bit 2: DCC off = 0 / DCC on = 1 Bit 3: mfx off = 0 / mfx on = 1	0 - 15	15	Note: fx (Motorola) cannot deactivate itself

* ( ) = 6021 Control Unit   { } = the values entered are multiplied times "x" (factor).

CV Table for fx (MM)

CV	Explanation	Values	Default	Notes
52	Motor type ... (Bit 0-4) ... Auxiliary function outputs 5 and 6 ... Motor – Softdrive Sine ... Motor – without feedback control ... Motor – High efficiency propulsion C90 ... Motor – Bell armature ... Motor – direct current DC soft ... Motor – direct current DC hard ... Motor – direct current DC 1 Gauge also analog with feedback control ... (Bit 5) ... 0: with analog with feedback control ... 1: without analog with feedback control	0 - 63 0 1 2 3 4 5 6 7 0	5	Selection of a motor type for additional settings for motor feedback control. or Selection of additional function outputs on an H0 decoder. See extra table[1] for how motor outputs work as additional auxiliary functions.
53	Motor feedback control – feedback control reference	1 - 255 (0 - 63)* {x4}	60949=160 60948=195	Absolute Vmax for motor characteristic
54	Motor feedback control – feedback control parameter K	1 - 255 (0 - 63)* {x4}	64	Feedback control portion P
55	Motor feedback control – feedback control parameter I	1 - 255 (0 - 63)* {x4}	64	Feedback control portion I
56	Motor feedback control – feedback control influence	1 - 255 (0 - 63)* {x4}	24	0 = PWM without feedback control for Sine (see also CV 52 motor type)

* () = 6021 Control Unit   {} = the values entered are multiplied times "x" (factor).

[1] An extensive table for function mapping can be found on the Internet at:
www.maerklin.de/de/produkte/tools_downloads/technische_infos.html

CV Table for fx (MM)

CV	Explanation	Values	Default	Notes
73	Storing different states: (misc. persistence) Bit 0: storing function states Bit 1: storing speed Bit 2: starting up with/without ABV after a reset	0 - 7 0 / 1 0 / 2 0 / 4	7	0 = do not store / 1 = store 0 = do not store / 2 = store 0 = without ABV / 4 = with ABV
74	Storing different states: (misc. preserve) Bit 0: storing direction of travel	0 - 1	1	0 = do not store / 1 = store
75	Address 2 (1st consecutive address)	1 - 80	60949=25 60948=73	Address can be activated/deactivated subject to CV 49.
76	Analog DC startup voltage	1 - 63 {x4}	100	Note for CS1: (140) The CS1 shows this value inverted.
77	Analog DC maximum speed	1 - 63 {x4}	60949=215 60948=230	
78	Analog AC startup voltage	1 - 63 {x4}	100	Note for CS1: (140) The CS1 shows this value inverted.
79	Analog AC maximum speed	1 - 63 {x4}	60949=215 60948=230	

* ( ) = 6021 Control Unit   { } = the values entered are multiplied times "x" (factor).

CV Table for DCC

CV	Explanation	Values	Default	Notes
1	Main address	1 - 127	3	Short address 1 - 127 If CV 29 / Bit 5 = 0
2^{PoM}	Minimum speed (Vmin)	0 - 255	5	Value must be lower than Vmax, CV 5. (see CV 67)
3^{PoM}	Acceleration delay (AV)	0 - 255	25	CV value multiplied by 0.9 gives the time from being stopped to maximum speed.
4^{PoM}	Braking delay (BV)	0 - 255	16	CV value multiplied by 0.9 gives the time from maximum speed to being stopped.
5^{PoM}	Maximum speed (Vmax)	0 - 255	255	Speed at the highest speed level. Value must be higher than Vmin, CV 2. (see also CV 94)
7	Manufacturer's version number (software version)		–	Read only
8	Manufacturer identification / ID Decoder reset (default or factory setting)	– 8	131 –	Read only Value cannot be read
13^{PoM}	Functions F1 - F8 with an alternative track signal	0 - 255	0	altern. track signal = MM, analog 0 = func. # off, 1 = Func. # on [F8 F7 F6 F5 F4 F3 F2 F1]
14^{PoM}	Functions FL, F9 - F15 with an alternative track signal	0 - 255	1	altern. track signal = MM, analog 0 = func. / off, 1 = Func. / on [F15 F14 F13 F12 F11 F10 F9 FL]
17	Expanded address, higher value byte	192 - 231	192	Long address 1 - 10239 (128)
18	Expanded address, lower value byte	0 - 255	128	If CV 29 / Bit 5 = 1

PoM ("Programming on Main") must be supported by the locomotive controller / central controller.

CV Table for DCC

CV	Explanation	Values	Default	Notes
19	Multiple unit address	0 - 255	0	1 - 127 = multiple unit address 0 = no multiple unit +128, Bit 7 = reverse polarity for direction when using multiple unit

21[PoM]	Functions F1 - F8 when using multiple unit	0 - 255	0	0 = func. # only for locomotive address
				1 = func. # also for multiple unit address
				Bit 7-0 = [F8 F7 F6 F5 F4 F3 F2 F1]

22[PoM]	Functions FL, F9 - F15 when using multiple unit	0 - 255	0	0 = func. # only for locomotive address
				1 = func. # also for multiple unit address
				Bit 7-0 = [F15 F14 F13 F12 F11 F10 F9 FL]

27[PoM]	Braking mode: Bit 0 - 3: always 0, Bit 4: DC voltage, polarity against the direction of travel Bit 5: DC voltage, polarity with the direction of travel Bit 6 - 7:	0 - 48 0 0 / 16 0 / 32 0	48	Braking subject to direction: - only Bit 4: normal DC properties - only Bit 5: inverse DC properties Braking not subject to direction: - Bit 4 + 5: 3 rail properties
29[PoM]	Configuration: Bit 0: reverses direction properties of the locomotive 0 = normal direction, 1 = inverse direction Bit 1: speed level 14 or select 28/128 0 = 14 speed levels, 1 = 28/128 speed levels Bit 2: turn analog operation off/on 0 = analog off, 1 = analog on Bit 5: select short / long address 0 = short address, 1 = long address	0 - 39 0 / 1 0 / 2 0 / 4 0 / 32	6	The direction properties refer to the direction of travel and the lights. The number of speed levels and the light bit depend on the locomotive controller. Either the short main address or the long expanded address as a locomotive address.

PoM must be supported by the locomotive controller / central controller.

CV Table for DCC

CV	Explanation	Values	Default	Notes
50[PoM]	Alternative formats: Bit 0: Analog AC off = 0 / Analog AC on = 1 Bit 1: Analog DC off = 0 / Analog DC on = 1 Bit 2: fx (MM) off = 0 / fx (MM) on = 1 Bit 3: mfx off = 0 / mfx on = 1	0 - 15 0 / 1 0 / 2 0 / 4 0 / 8	15	Note: DCC cannot deactivate itself.
52[PoM]	Motor type ... (Bit 0-4) ... Auxiliary – function outputs 5 and 6 ... Motor – Softdrive Sine ... Motor – without feedback control ... Motor – high-efficiency C90 ... Motor – bell armature ... Motor – direct current DC soft ... Motor – direct current DC hard ... Motor – direct current DC 1 Gauge also analog with feedback control ... (Bit 5) ... 0: with analog with feedback control ... 1: without analog feedback control	0 - 63 0 1 2 3 4 5 6 7 0	3	Selection of a motor type for additional settings for motor feedback control or Selection of additional function outputs on an H0 decoder. See extra table for how motor outputs work as additional auxiliary functions.
53[PoM]	Motor feedback control – feedback control reference	0 - 255	150	Absolute Vmax for motor characteristic
54[PoM]	Motor feedback control – feedback control parameter K	0 - 255	64	Feedback control portion P
55[PoM]	Motor feedback control – feedback control parameter I	0 - 255	64	Feedback control portion I
56[PoM]	Motor feedback control – feedback control influence	0 - 255	24	0 = PWM without feedback control for Sine (see also CV 52 motor type)
66[PoM]	Forward trim	0 - 255	128	The CV value divided by 128 gives the factor with the speed level is multiplied when the locomotive is running forward.

PoM must be supported by the locomotive controller / central controller.

CV Table for DCC

CV	Explanation	Values	Default	Notes
67^{PoM} - 94^{PoM}	Speed table speed level 1 (Vmin) to speed table speed level 28 (Vmax)	0 - 255		
95^{PoM}	Reverse trim	0 - 255	128	The CV value divided by 128 gives the factor with the speed level is multiplied when the locomotive is running in reverse.
112^{PoM} 113^{PoM} 114^{PoM}	Physical output (mapping): front light mode Physical output (mapping): front light dimmer Physical output (mapping): front light period	0 - 16 0 - 255 0 - 255	1 255 20	See table*
bis 135^{PoM}	Physical output (mapping): rear light, Aux 1 to Aux 6 (each one in the 3rd block)			See table*
137^{PoM}	Switching range	0 - 128	128	128 = 50% of speed level, 64 = 25% of speed level
173^{PoM}	Storing different states: Storing function states Storing speed After a reset starting up with/without ABV	0 / 1 0 / 2 0 / 4	7	0 = do not store, value = store Individual values must be added.
174^{PoM}	Storing different states: storing direction of travel	0 / 1	1	0 = do not store 1 = store
176^{PoM}	Vmin Analog DC	0 - 255	100	Must be smaller than CV 177

PoM must be supported by the locomotive controller / central controller.

* An extensive table for function mapping can be found on the Internet at: www.maerklin.de/de/produkte/tools_downloads/technische_infos.html

CV Table for DCC

CV	Explanation	Values	Default	Notes
177^{PoM}	Vmax Analog DC	0 - 255	255	Must be larger than CV 176
178^{PoM}	Vmin Analog AC	0 - 255	100	Must be smaller than CV 179
179^{PoM}	Vmax Analog AC	0 - 255	255	Must be larger than CV 178
257^{PoM}	Function assignment (mapping): Function FL forward A	0 - 255	1	
258^{PoM}	Function assignment (mapping): Function FL forward B	0 - 255	0	See table*
259^{PoM}	Function assignment (mapping): Function FL forward C	0 - 255	0	
260^{PoM}	Function assignment (mapping): Function FL forward D	0 - 255	0	
to 445	Function assignment (mapping): Function driving backward D	—	—	See table*

PoM must be supported by the locomotive controller / central controller.

* An extensive table for function mapping can be found on the Internet at: www.maerklin.de/de/produkte/tools_downloads/technische_infos.html

Troubleshooting

When operating with different protocols you may have problems in each mode at the same time. – We recommend reducing the number of protocols. Deactivate protocols in the locomotive decoder that are not needed and also deactivate if possible protocols in the central controller that are not needed.

The locomotive jerks and falters – Check the CV setting for motor variations, change if necessary, or carry out a reset to the factory settings.

The locomotive does not run in analog. – The automatic analog recognition is deactivated and must be activated again (see CV table).

The locomotive (decoder) does not react. – Check the wiring and the solder joints, redo if necessary. Check the connector for the decoder to make sure it has permanent contact and check the way it was installed.

mfx/DCC operation: Locomotives standing on the layout start running suddenly during mfx registration. – Deactivate the automatic analog recognition on these locomotives.

The locomotive does not run. – The function "open doors / close doors" is still active. Turn off the function "close doors"; after the sound ends the locomotive will run according to the ABV that has been set.

Disposing

Products marked with a trash container with a line through it may not be disposed of at the end of their useful life in the normal household trash. They must be taken to a collection point for the recycling of electrical and electronic devices. There is a symbol on the product, the operating instructions, or the packaging to this effect. The materials in these items can be used again according to this marking. By reusing old devices, materially recycling, or recycling in some other form of old devices such as these you make an important contribution to the protection of our environment. Please ask your city, town, community, or county authorities for the location of the appropriate disposal site.

Warranty

The warranty card included with this product specifies the warranty conditions.

• Please contact your authorized Märklin dealer for repairs or contact:

U.S. only:
Wm. K. Walthers Inc.
5601 W. Florist Ave.
Milwaukee, WI 53218

GB only
Gebr. Märklin & Cie. GmbH
Reparaturservice
Stuttgarter Str. 55 - 57
73033 Göppingen
Deutschland
Tel: +49 7161 608 222
E-Mail: Service@maerklin.de

My personal decoder settings Locomotive:			
Address		**CV -**	
CV -		**CV -**	
CV -		**CV -**	
CV -		**CV -**	
CV -		**CV -**	
CV -		**CV -**	
CV -		**CV -**	
CV -		**CV -**	
CV -		**CV -**	
CV -		**CV -**	

This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1)   This device may not cause harmful interference, and
(2)   this device must accept any interference received, including
        interference that may cause undesired operation.