Uhlenbrock digital

Rail Com — by Lenz Elektronik GmbH

SUSI

IntelliDrive Deluxe 76425

Multi-Protocol decoder with Load Regulation with RailCom® for DC and Faulhaber motors

Features

- Multi-protocol Load regulated decoder for DCC and Motorola
- Suitable for DC and bell armature motors to 1 A
- Quiet motor running by using 18.75 kHz control frequency
- 14, 27, 28, 128 speed steps, depending on data format
- Short addresses (1-127) and long addresses (for 128-9999)
- NMRA compliant
- RailCom
- Adjustable minimum, maximum and medium speeds
- Speed step tables for 14 and 28 speed step mode
- Main track programming (DCC)
- Shunting mode (half speed) toggled using F3
- Starting/brake inertia switched using F4
- Headlights switched using F0, dimmable
- 2 special function outputs switched using F1 and F2, dimmable or time restricted
- With SUSI sound interface (4 pole mini socket) for the connection of sound modules or other modules, controllable using auxiliary functions (f1 to f12)
- Produces the address identification for the control of the LISSY of mini transmitter 68 400
- Reacts to DCC conforming brake signal or brake sections with DC voltage
- Overheating protection, all output are short circuit protected
- Conventional DC or AC operation with automatic change
- All CV's are programmable with digital devices using DCC and/or Motorola formats

Description

The locomotive decoder 76 425 is a small, efficient multi-protocol decoder. It can be used in DCC and Motorola systems and operates equally well in analog mode with DC or AC power and direction of travel change-over using high voltage pulse (Märklin system).

The decoder works with a frequency of 18.75 kHz and is not only suitable for DC motors, but also for bell armature motors (e.g. Faulhaber, Maxon, Escap) up to a continuous power of 1 A. Short term higher switching on current are tolerated well.

The motor characteristics are setup either by means of the minimum, middle and maximum speeds or by different CV's for the individual speeds. The load control can be individually adapted to different locomotive motors by setting these control parameters.

The decoder has two travel direction dependent lighting outputs, as well as two additional special function outputs, which are switched using function keys f1 and f2. Function keys f3 and f4 can be used to switch a shunting mode with extended low-speed operating range and the starting/brake inertia. The allocation of the switching tasks as lighting, special function outputs, shunting mode and adjustable starting/brake inertia can be freely assigned to the function keys of the digital center (Function Mapping). For operating e.g. electric couplers, the special function outputs can be time limited and if desired the motor can be activated for a short time (shunting tango).

Head and tail lighting can be switched off, depending on the direction, via the special function outputs (Train switchable lighting).

The decoder is programmable with the Intellibox, DCC and Märklin controllers. All CV's are programmable with these devices.

Ex-Factory Setting

Ex-factory the decoder is configured in DCC/Motorola operating mode. It switches between the two formats automatically. Additionally the decoder can be controlled with a DC device or AC transformer (Märklin System) in analogue 2-rail or 3-rail installations.

Installation of the decoder 76 425
Connection of the decoder

Remove the strapping plug from the locomotive and put the decoder's interface plug into the vacated socket.

If the lighting does not operate in the correct direction, then you must rotate the plug 180 degrees.

Plug's pin assignment according to NEM 652 for DCC decoder

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1 ● ● 8
2 ● ● 7
3 ● ● 6
4 ● ● 5
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1 Motor (orange)
2 Rear light (yellow)
3 Auxillary (green)
4 Left power pickup (black)
5 Motor (grey)
6 Front lights (white)
7 Lighting common (blue)
8 Right power pickup (red)

Connection of special functions

Besides lamps for lighting you can also use different items on the special functions outputs, such as smoke generator or Telex-coupling. For travel direction independent switching the outputs can be paralleled.
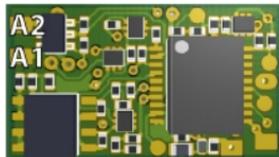
Additional special functions such as smoke generator, telex coupling or driver compartment lighting can be connected to the special function outputs A1 and A2. The feed to the device is soldered directly to the decoder circuit board. The return line is connected either to the blue wire of the decoder or the locomotive chassis.

Connection of an IntelliSound module or a LISSY mini transmitter 68 400

Alternatively a plug from an IntelliSound module or a LISSY mini transmitter can be inserted into the SUSI interface socket on the under side of the decoder. For controlling a LISST mini transmitter program Bit 1 in CV49 to 1 so that the decoder sends the identification address for the control of the LISSY mini transmitter to the SUSI interface. For operating a sound module on the SUSI-interface, Bit 1 in CV49 must be set to 0 (Factory setting).

Mounting the decoder in the locomotive

Use the enclosed double-sided tape to fasten the decoder to any place in the locomotive. The sticking pad protects the decoder against conductive connections and holds it in place reliably. Ensure that even after re-assembly of the locomotive no short-circuits occur from jammed wires.

> **A short-circuit in the area of the motor, lighting, pick-up and wheel contacts can possibly destroy the component and electronics of the locomotive!**

Switch off train lighting front and rear

In CV107 (front) and CV108 (rear) the special function number 1-12, which will turn off the white and the red light front and rear, can be entered. It can also be programmed here which function output has the red end of the train light connected to it.

The function entered here must be configured in the Function-Mapping so that it switches no other outputs. Further, the Function-Mapping must configured so that the outputs for the red lights are not switched off or on by other function keys, i.e. the Function-Mapping CV for f-key which is entered here must be set to zero. So that the switching off of the lights functions correctly both CV's 107 and 108 must always be programmed. If one of CV's 107 or 108 is programmed with the value 0 the function is considered to be deactivated.

The value programmed into CVs 107 and 108 consists of two parts.

Firstly, to which of the outputs A1 to A7, the light to be turned off is connected and secondly with which function key f1 to f12 the lighting is to be switched. Because a CV can only contain value the operation value is calculated according to the follow schema:

Light allocation: A0v = white light front, A0h = white light rear
CV107 for red light front
CV108 for red light rear

Calculation: Output * 16 + function key
Example: the red front light is to be connected to A1 and controlled by f5.
CV 107 = 1 * 16 + 5 = 21
The red front light is to be connected to A2 and controlled by f6.
CV 108 = 2 * 16 + 6 = 38

Configuring Function Outputs A1 and A2 timed operation and "Shunting tango"

A1 and A2 can have an electric coupling connected to them. If the corresponding output is switched on it stays on for the time specified in CV 99. If additionally the locomotive's motor is to operate for this time then "Shunting tango" must be activated in CV100.

RailCom
If the locomotive decoder is to operate with RailCom, Bit 3 of CV 29 must be set. Additionally the Motorola Format in CV 12 must be switched off.

Märklin braking section

The decoder reacts to a Märklin brake section (brakes with analog power on the track), if CV29 bit 2 and CV49 bit 7 are set to 1 (factory setting 1 and 0).

Programming

The Configuration variables (CV's) form the basis of all possible operations of the decoder in accordance with the DCC standard. The decoder can be programmed with the Intellibox, DCC controllers and Motorola controllers.

Programming with the Intellibox

We recommend that, irrespective of the data format that will eventually be used, the decoder be programmed using the menu for DCC decoders.

The Intellibox supports DCC programming with a user friendly input menu. Long addresses do not have to be calculated laboriously, as they can be entered directly. The Intellibox calculates the values for CV 17 and CV 18 automatically.

Besides this the Intellibox sets Bit 5 of CV29 to 1 so the decoder uses the long address.

Special case locomotive addresses 80 to 255 in Motorola format

In Motorola format the Intellibox supports an address range to 255. Addresses 1 to 80 can also be programmed freely using DCC programming. However if locomotive addresses higher than 80 are to be used, the locomotive address must be programmed according to the chapter "Programming with a Märklin controller".

After programming is complete CV 1 has a value of 0 and the decoder uses the Motorola address larger than 80.

Programming with DCC devices

Use the programming menu of its DCC controller to select and program the decoder's CV's by register, CV directly or page mode programming. With a DCC controller it is also possible to program the decoder using main line programming. For the exact procedure refer to the controller user manual.

Programming of long addresses without programming menu

If programming is to be done with controllers that do not support programming with an input menu, the values for CV 17 and CV 18 must be calculated. Here is a guide for programming of address 2000.

- Divide the address by 256 (2000/256 = 7 remainder of 208).
- Take the integer result (7) and add 192
- Program the result (199) into CV 17
- Program the remainder (208) into CV 18

Important: Set bit 5 of CV 29 to 1, so that the decoder uses the long address.

Values for calculating the CV value

CV's 29 and 49 can be used to set the decoder into different modes. The value to be programmed is calculated by using the CV and adding the values of the desired functions.

Example

			Bit	CV 29 function	Value
Normal driving direction	Value = 0		0	Normal driving direction	0
				Reverse driving direction	1
28 speed steps	Value = 2		1	14/27 speed steps	0
				28/128 speed steps	2
Auto Analog/digital change over	Value = 4		2	Only digital operation	0
				Automatic analog/digital change over	4
RailCom switched off	Value = 0		3	RailCom switched off	0
				RailCom switched on	8
Speed steps using CV 2, 5, 6	Value = 0		4	Speed steps using CV2, CV5 and CV6	0
Short address	Value = 0			Characteristics using CV67-CV94	16
The sum of all values is 6.			5	Short address (CV1, register 1)	0
CV 29 preset to this value ex factory.				Long address (CV17 and CV18)	32

Programming with a Märklin Center (not CS2, MS2 see DCC)

With a Märklin center all CV's can be programmed, but not read.

1. Switch Center off and on.
2. Select the address of the decoder and switch the light on.
3. Operate the direction change-over 5 times in quick succession with the stationary locomotive (speed step 0), until the light turns off.
4. Enter the number of the CV that is to be programmed.
5. Enter the locomotive address on the center that is program the CVs.
6. Briefly operate the direction change-over. The rear light flashes fast 4 times.

7. Enter the desired value for CV e.g. a locomotive address.

8. Briefly operate the direction change-over. The rear light flashes slowly 4 times.

If further CVs are to be programmed, repeat points 5-8.

If programming is to be terminated switch the center to "STOP" or set the address to 80 and briefly operate the direction change-over.

Note: Since programming with a Märklin Motorola digital center accepts only inputs of 01 to 80, the value "0" must be entered by entering the address as "80".

Page-Register for inputting CV-Numbers greater than 79

CV addresses larger than 79 can only be programmed with the help of the page register, CV66. If CV66 has a value higher than 0, then the contents of CV66 times 64 will be added to every address entered. The entered value must lie in the range 1 to 64. When leaving Motorola programming mode the page register (CV66) is automatically reset to zero.

Offset-Register for entering CV values greater than 79

CV values larger 79 can be programmed only with the help of the offset register. The offset register is CV65. If CV65 contains a value > 0, then all following programmed values are calculated by multiplying the contents of CV65 by 4 and adding the result to the entered value. When leaving Motorola programming mode the offset register (CV65) is automatically reset to zero.

Note: When programming CV65 and CV66 the contents of the offset and page registers have no effect.

Programming with a Mobile Station 1

The Programming Menu is available in the Mobile Station's Loco Menu, only for certain locomotives. A locomotive which is equipped with a programmable decoder must be selected from the Database. Proceed as follows:

1. Add a new locomotive and select Part No. 36330. The Display then shows locomotive Ee 3/3.

2. Press the "MENU/ESC" button and select the "LOK Change" ("LOK ÄNDERN") column. Here you will find the last function of Register Programming indicated by "REG". Use this function to change the decoder's CV's. You can only write to the CV's with this function.

3. Enter the number of the CV and confirm this with the reversing knob.

4. Enter the value for the CV and confirm this with the reversing knob. The Mobile Station then programs the CV with the desired value.

Attention: Before programming, remove all locomotives that are not to be programmed from the track!

Motor Regulation

The motor's load regulation can be adapted to suit the locomotive with CVs 53 to 58.

Guide for changing the controller parameters P,I,D:

1.) Set CV54, 55 and 57 with factory setting of the decoders CV2, 5 und 6 (min., max. and middle Speed).
2.) Set CV55 and 57 to zero
3.) Set CV54 so that the locomotive just moves on speed step 2.
4.) Increase CV55 so that the locomotive moves off quickly, as desired, when changing the speed step from 0 to 1. (The step size should be 1.)
5.) Jerky behaviour with the change of speed step can be compensated for in CV57. (The step size should be 1.)
6.) If necessary adapt CV2, 5, 6 from step 2.) and start over with the adjustments.

If no satisfactory result can be obtained then you must
a) change the regulation repetition rate in CV53.
b) Increase the measuring time for the back EMF voltage in CV58. (With some motors smooth running can only be achieved at low speed in this way.)
c) reduce the regulation frequency in CV56. (this is valid when the locomotive already runs at top speed at a speed step lower than the maximum and after no further change in speed occurs)

Make the respective changes to CV53, 56, 58 in small increments and if necessary repeat the PID regulation in points 1.) to 6.).

Table of CVs (Configuration Variables)

CV	Description	Value range	Default value
1	**Locomotive address**	DCC 1-127 Mot 1-80	3
2	**Minimum Speed**	1-63	1
3	**Acceleration** 1 means that every 5 ms the actual speed is increased by 1 If the internal maximum speed is set to 200 (CV5=50 or CV94 = 200), then acceleration time from 0 to Fmax is 1sec.	1-63	2
4	**Braking inertia** (time factor CV3)	1-63	2
5	**Maximum speed** (must be greater than CV2)	1-63	48
6	**Middle speed** (must be greater than CV2 and less than CV5)	1-63	24
7	**Software version** (The processor can be updated)	-	varies
8	**Manufacturer ID**	-	85
17	**Long locomotive address**	1-9999	2000
18	17 = high byte / 18 = low byte	199-231/0-255	199/208
19	**Consist address** (double traction) 0 = Consist address inactive When bit 7=1 the driving direction is reversed The desired speed CADR + 128 = reverse direction	1-127	0
28	**RailCom Configuration** Bit 0=0 Channel 1 not free for address broadcast 0 * Bit 0=1 Channel 1 free for address broadcast 1 Bit 1=0 Channel 2 no data transmission 0 Bit 1=1 Channel 2 data transmission allowed 2 *		3
29	**Configuration for DCC** Value Bit 0=0 Normal direction 0 * Bit 0=1 reversed travel 1 Bit 1=0 14 speed steps 0 Bit 1=1 28 speed steps 2 * Bit 2=0 Only digital operation 0 Bit 2=1 automatic analog/digital switching 4 * Bit 3=0 RailCom Off 0 * Bit 3=1 RailCom On 8 Bit 4=0 Speed steps using CV 2, CV 5, and CV 6 0 * Bit 4=1 Characteristics using CV 67 to CV 94 16 Bit 5=0 Short address (CV 1) 0 * Bit 5=1 Long address (CV 17/18) 32	0-255	6
33-46	**Allocation of the function outputs, which are to be activated with function keys like light and special functions** CV33 Light operation forwards CV34 Light operation backwards CV35 Function key f1 CV36 Function key f2 CV37 Function key f3 CV38 Function key f4 CV39 Function key f5 CV40 Function key f6 CV41 Function key f7 CV42 Function key f8 CV43 Function key f9 CV44 Function key f10 CV45 Function key f11 CV46 Function key f12 **Assignment of the individual Bits** Value Bit 0 Light output front 1 Bit 1 Light output back 2 Bit 2 Special function A1 4 Bit 3 Special function A2 8 Bit 4 Shunting mode 16 Bit 5 Start/brake inertia 32	0-63	1 2 4 8 16 32 0 0 0 0 0 0 0 0
47	**Speed correction forwards**	0-63	32
48	**Speed correction reverse**	0-63	32
49	**Locomotive decoder configuration** Value Bit 0=0 Motor load regulation On 0 * Bit 0=1 Motor load regulation Off 1 Bit 1=0 SUSI configured for Sound module 0 * Bit 1=1 SUSI configured for LISSY Mini transmitter 2 Bit 2=0 brakes to 0 in brake section 0 * Bit 2=1 brakes to speed step in CV52 4 Bit 3=0 Data format DCC and Motorola 0 * Bit 3=1 Data format only DCC 8 Bit 4=0 Data format DCC and Motorola 0 * Bit 4=1 Data format only Motorola 16 Bit 5=0 Dimming for A1 and A2 Off 0 * Bit 5=1 Dimming for A1 and A2 On 32 Bit 6=0 Light outputs not swapped 0 * Bit 6=1 Light outputs swapped 64 Bit 7=0 Brake only with brake signal 0 * Bit 7=1 Brake with analog potential 128	0-255	32

CV	Description	Value range	Default value
50	**Dimming of Function outputs A1, A2 and Light outputs**	0-63	32
51	**Final speed in a braking section** 1 = only AC operation, 2 = only DC operation 3 = AC and DC operation with automatic recognition	1-3	3
53	**Motor regulation repetition rate**	0-63	35
54	**Motor regulation P Constant**	0-63	20
56	**Motor regulation I Constant**	0-63	10
56	**Regulation Frequency**	0-63	32
57	**Motor regulation D Constant**	0-63	12
58	**Time slot for AD transducer measurement**	0-63	2
59	**Reset to factory defaults** If this CV is set to 1, the decoder will be returned to factory setting.	0, 1	0
60	**Monitoring of Outputs switching off** 0=All on, 1=Motor off, 2 Light, A1, A2 off, 4=Temperature	0, 7	0
61	**Shutdown temperature in °C** 0 = Temperature monitoring off (do not change)	0-2	2
62	**Error Buffer for Short Circuit reporting, temperature monitoring** 0 = no reporting, 1 = Motor, 2 = Light, A1, A2, 4 = Temperature	0-7	0
64	**Speed at the end of the Braking section** Applies if CV49 Bit 2=1 and Bit 7=1	0-255	30
65	**Offset-Register** For CV Programming with a Motorola center	0-255	0
66	**Page Register** For CV Programming with a Motorola center	0-255	0
67-94	**Characteristic curve for speed steps 1-28**	0-255	varies
98	**Timed switching of Outputs A1 and A2** 0 = A1 and A2 have timed restriction 1 = A1 has timed switching 2 = A2 has timed switching 3 = A1 and A2 have timed switching	0-3	0
99	**Length of the time switching** In 100ms: A value of 10 represents 1 second	0-255	0
100	**Coupling repeats for electric couplings on A1 and A2**	0-255	0
107	**Switch front light off**	0-44	0
108	**Switch rear light on**	0-44	0
115	**LISSY Train catagory**	1-4	1

Technical Data

Addresses:	1-9999 (long DCC address)
Max. current consumption/loading:	1.4 A*
Function outputs:	1 A each
Size:	22 x 12.5 x 5.5 mm

* The constant loading capacity may vary after installation.

Guarantee declaration

RJ Uhlenbrock —————— digital

Our contact Details:

We are available if you have any questions!

Internet: FAQs are found at www.uhlenbrock.de

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Service: In the event of a defect or failure send the unit together with the invoice and a short description of the fault back to us for repair.

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