

Qdecoder

Overview of Configuration Variables

This list of CVs is valid for all Qdecoder operating with software version 8.

CVs only valid for all-in-one decoder are marked accordingly.

- 27** Default values of configuration variables are colored.
- Configuration variables only valid for decoder with 16 function outputs (or Z2-8+) are printed on light red background.
- CV values with grey background are read only.

The setup of a Qdecoder is stored in so called configuration variables (in short: CVs). Many digital control units allow writing and reading of CVs stored inside the decoder.

Configuration variables can be changed on the programming track as well as on the main track. The latter is abbreviated as **PoM** („Programming on the Main“). The **PoM** address is either the first locomotive address (short or long) or the accessory address. The latter is not always supported by digital controls. The decoder address is derived from the first accessory address stored in CV9 and CV1:

Accessory address	Decoder address	Accessory address	Decoder address
1 to 4	1	9 to 12	3
5 to 8	2

! To program the decoder on the programming track some digital controls require to connect both terminals named **Trafo** and **Gleis** to the programming track.

→ Doubled addresses of important CVs

Using some digital systems it is not possible to program configuration variables at addresses above 255. Important configuration variables CV400 to CV403 and CV550 to CV571 can be programmed also at unused lower addresses.

Original CV address	Optional CV address	CV content
400	51	Signal specific configuration variables
...	...	
403	54	
550	70	Mode of 1 st accessory address (for A0)
551	71	Accessory address for A1
552	72	
553	73	Mode of 2 nd accessory address
...	...	
571	91	Mode of 8 th accessory address

→ Configuration Variable for Address Offset

CV99 is used to define an offset value that adds to the CV address for accesses above address 99. For addresses below 100 no offset is added which allows changing CV99 as well. A few examples illustrate the calculation of the final CV address:

CV99	Offset	CV address of command	Access to CV
0	0	1	1
		99	99
		100	100
		255	255
1	100	1	1
		99	99
		100	200
		255	255
2	200	100	300
...			

CVs marked **bold** inside the table belong to the first function output of an accessory device and have to be programmed. The other ones will be set automatically to the correct values.

Accessory commands will be evaluated by the decoder if bit 2 of CV60 is set (factory setting). When setting up the decoder using the programming button configuration variables CV1, CV9, CV60, CV112 to CV270 and CV550 to CV595 will be set automatically.

→ CV600 to CV999: Signal Aspect Generator

Using the decoder as a signal aspect generator the CVs from CV600 to CV999 are programmed in a special coding mechanism. CVs are interpreted by the decoder one after the other and offer the possibility to change nearly any property of the decoder depending on the current sequence, connected switches or commands sent by the digital control.

The signal aspect generator is enabled if Bit 1 in CV60 is set. It is disabled by default. Please find more information on programming the signal aspect generator in a separate brochure.

→ CV1001 ... : General Information

CV	CV value								Description
	7	6	5	4	3	2	1	0	
1001									Hardware revision
1002									Identification number of decoder type
1008									Software release day
1009									Software release month
1010									Software release year
1011									Software main revision number
1012									Software subversion number

CVs 1003 to 1007 contain information about production date and location.

Lokmaus Systems

→ Accessory Addresses

Attention: *Lokmaus* and *Multimaus* from **ROCO** as well as some digital controls from **Lenz** submit accessory addresses reduced by 4. If the decoder is set-up e.g. to address 1 it reacts on accessory commands for address 5.

When configuring the decoder using the programming button this different addressing method must not be considered, because the address is defined by the programming command.

→ CV550 to CV595 (and CV1, 9): Accessory addresses and modes

		CV addresses per function output											
		A0	A1	A2	A3	...	A6	A7	A8	A9	...	A14	A15
Address	MSB	9	551	554	557	+3	566	569	572	575	+3	590	593
	LSB	1	552	555	558	+3	567	570	573	576	+3	591	594
Mode		550	553	556	559	+3	568	571	574	577	+3	592	595
		Default values											
Address		1	0	2	0	...	4	0	5	0	...	8	0
Mode		2	0	2	0	...	2	0	2	0	...	2	0

For each accessory device two configurations are required: The accessory address to switch the device is configured using two CVs. Furthermore the number of function outputs (called **mode**) is defined using the mode CV of the first output.

Accessory addresses are stored within two CVs called LSB and MSB. The address is split as follows:

- MSB value : address / 256
- LSB value : address - (MSB * 256)

Some Examples of accessory devices and required CV values:

	Accessory device	Accessory address	CV value			Mode
A0	Turnout	1	CV9 = 0	CV1 = 1	CV550 = 2	
A1			CV551 = 0	CV552 = 0	CV553 = 0	
A2	Turnout	255	CV554 = 0	CV555 = 255	CV556 = 2	
A3			CV557 = 0	CV558 = 0	CV559 = 0	
A4	Turnout	10	CV560 = 0	CV561 = 10	CV562 = 2	
A5			CV563 = 0	CV564 = 0	CV565 = 0	
A6	Turnout	1000	CV566 = 3	CV567 = 232	CV568 = 2	
A7			CV569 = 0	CV570 = 0	CV571 = 0	
A8	Light bulb	300	CV572 = 1	CV573 = 44	CV574 = 1	
A9	Light bulb	301	CV575 = 1	CV576 = 45	CV577 = 1	
A10	String of lights (1 out of 4 bulbs glows)	536	CV578 = 2	CV579 = 24	CV580 = 4	
A11			CV581 = 0	CV582 = 0	CV583 = 0	
A12			CV584 = 0	CV585 = 0	CV586 = 0	
A13			CV587 = 0	CV588 = 0	CV589 = 0	
A14	Turnout	11	CV590 = 0	CV591 = 11	CV592 = 2	
A15			CV593 = 0	CV594 = 0	CV595 = 0	

→ CV300 to CV549: CVs for the sequence generator

Qdecoder of the all-in-one class provide a programmable sequence generator (state machine) with up to 50 states (e.g. steps of a sequence). These states are numbered from 1 to 50 and configured via 5 CVs each.

			CV addresses for state				
			1	2	3	...	50
Duration	t _{on}	MSB	300	302	304	+2	398
		LSB	301	303	305	+2	399
Function outputs	A15 ... A8		400	402	404	+2	498
	A7 ... A0		401	403	405	+2	499
Successor state			500	501	502	+1	549

The duration after entering a state is configured using two CVs (MSB, LSB; t_{on} = 256 * MSB + LSB). If this duration in time has passed, the sequence continues with the configured successor state. If the duration CVs of one state are both set to “0” the sequence will not leave this state automatically.

The sequence generator can be controlled as well by interactions from the signal aspect generator. Thus complex automatoms of various types can be realized.

CV address	CV value								Description
	7	6	5	4	3	2	1	0	
3xx	100								Duration of the state in 1/100 seconds
4xx	A7	A6	A5	A4	A3	A2	A1	A0	If a bit is set the corresponding function output is switched while the state is active. (default values: 0)
	A15	A14	A13	A12	A11	A10	A9	A8	
5xx		n ¹⁾							Index of successor within sequence
	0 ₂₎								0: off after decoder power-on 1: on after decoder power-on

¹⁾ Default values configure all sequence steps to run one after the other, after state 50 continuing with state 1

The sequence is finished if the CV does not contain a valid successor value (either n > 50 or n = 0).

²⁾ If Bit 7 is set in more than one CV, several sequences run in parallel.

List of Configuration Variables

→ CV1 to CV29

CV	CV value								Description
	7	6	5	4	3	2	1	0	
1	1								1st accessory address (see text overleaf) ⁴⁾
3	Via CV addresses 3 to 6 access to CVs 117, 127, ..., 187 is realized. (assures compatibility to other decoder)								on-time for A0 and A1 .
4									on-time for A2 and A3 .
5									on-time for A4 and A5 .
6									on-time for A6 and A7 .
7	8 or above								software version
8	55								supplier identification ¹⁾
9	0								1st accessory address (MSB)
13	F8	F7	F6	F5	F4	F3	F2	F1	active function outputs in analog mode (255)
14		F12	F11	F10	F9	F0r	F0v		active function outputs in analog mode (63)
15	0								decoder lock: compare value ²⁾
16	0								decoder lock: configuration value ³⁾
17	0								long locomotive address
18	0								(locomotive address = 256 * CV17 + CV18)
19	0								consist address
21	F8	F7	F6	F5	F4	F3	F2	F1	direction change in consist
22		F12	F11	F10	F9	F0r	F0v		activation of function keys of consist address (0)
28	0								decoder controlled transmission
	0								asymmetric DCC broadcast transmission
	0								broadcast signal controlled Influence
29	0								direction of main address
	1								28 step speed control
	1								analogue mode
	0								bidirectional communication
	0								user defined speed table
	0								long locomotive address
	0								decoder type

¹⁾ Writing value "8" into CV8 restores factory settings of the decoder. Writing value "7" into CV8 clears any over current events.

²⁾ Setting CV15 to value "255" deactivates the programming button as well as writing and reading of configuration variables except CV15.

³⁾ If CV15 and CV16 contain different values, CV access commands are ignored. CV15 and CV16 remain accessible.

⁴⁾ CV1 is used as short locomotive address in F class decoder. Write 1st accessory address in CV50/51 in these decoder.

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→ CV33 to CV46: NMRA Mapping for Function Keys

The NMRA-Mapping is turned on or off by using bit 0 of CV 60. It is turned off by default. When activated the decoder reacts on function keys of the first (short or long) locomotive address. The configuration variables 33 to 46 define up to eight switchable function outputs. The following table shows which function output corresponds to which function key:

CV	Key	Function output switched on with CV value															
		A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
33	Light (front)								256	128	64	32	16	8	4	2	1
34	Light (rear)								256	128	64	32	16	8	4	2	1
35	F1								256	128	64	32	16	8	4	2	1
36	F2								256	128	64	32	16	8	4	2	1
37	F3								256	128	64	32	16	8	4	2	1
38	F4						256	128	64	32	16	8	4	2	1		
39	F5						256	128	64	32	16	8	4	2	1		
40	F6						256	128	64	32	16	8	4	2	1		
41	F7						256	128	64	32	16	8	4	2	1		
42	F8						256	128	64	32	16	8	4	2	1		
43	F9		256	128	64	32	16	8	4	2	1						
44	F10		256	128	64	32	16	8	4	2	1						
45	F11		256	128	64	32	16	8	4	2	1						
46	F12		256	128	64	32	16	8	4	2	1						

To switch more than one output using one single function key the values in each line have to be added correspondingly. Example: a value of 12 for CV42 defines function key F8 to switch function outputs **A5** and **A6**.

→ CV50 to CV99

CV	CV value								Description
	7	6	5	4	3	2	1	0	
50	3								short locomotive address
54	A7	A6	A5	A4	A3	A2	A1	A0	switching version change (Z1) Z2 only
55	A7	A6	A5	A4	A3	A2	A1	A0	switching version (ZH1/Z2+) default: 0
57	1								DCC protocol
¹⁾	0								Märklin/Motorola protocol
	0								Executing accessory switch-off commands
58	0								Only one function output can be activated at the same time. ²⁾

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60	0								Decoder reacts on function keys
	0								Signal aspect generator enabled
	1								Decoder reacts on accessory commands
	0								Sequence programming enabled
61	1023								MSB Accessory address for choosing day/night mode ($A_{\text{nacht}} = 256 * CV61 + CV62$)
62									LSB
63	50 (%)								Additional dimming factor for night mode
99	0								CV address offset (for Lokmaus - see text overleaf)

¹⁾ Just one protocol is supported at the same time. If different protocols are enabled, DCC is used. If Motorola is enabled, DCC commands are used to write and read CVs.

²⁾ The bit is activated if pulse mode was configured by use of the programming button. Just one output is activated at the same time to avoid excessive current consumption. To perform several switching accesses simultaneously (e.g. set of points), function outputs are switched one after another after the setup switching time. The bit is set back if continuous operation is enabled using the programming button.

³⁾ In CV60 several bits may be set in parallel, so the function outputs are switched on or off using any activated source (e.g. accessory commands and signal aspect generator).

→ CV111 ... CV271: Properties of Function Outputs

The following table shows configuration variables which are used to setup general properties of function outputs:

		CV addresses per function output								
		A0	A1	A2	...	A7	A8	...	A15	
dimming factor	d _{off}	111	121	131	+10	181	191	+10	261	
	d _{on}	112	122	132	+10	182	192	+10	262	
switching delay	Δt	113	123	133	+10	183	193	+10	263	
fade in time	t _r	114	124	134	+10	184	194	+10	264	
fade out time	t _r	115	125	135	+10	185	195	+10	265	
on time	t _{on}	MSB	116	126	136	+10	186	196	+10	266
		LSB	117	127	137	+10	187	197	+10	267
off time	t _{off}	MSB	118	128	138	+10	188	198	+10	268
		LSB	119	129	139	+10	189	199	+10	269
number of pulses	n _{puls}	120	130	140	+10	190	200	+10	270	
light effect ¹⁾²⁾	E _i	100	101	102	+1	107	108	+1	98	
light parameter ¹⁾	P _i	280	281	282	+1	287	288	+1	295	

¹⁾ Light effects are available in all-in-one decoder.

²⁾ CV addresses are 100 ... 110 for A0 ... A10 and 94 ... 98 for A11 ... A15.

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Fade in and fade out times may be set to a maximum value of 2 minutes and 7 seconds. (CV = 255: Bit 7 set - 127 seconds).

On and off times are stored in two CVs called LSB and MSB. The MSB stores the time value divided by 256, the LSB stores the remainder of the division.

Example for splitting the values: 1 minute to be set up.

- 1 minute = 60 seconds = 6000 * 1/100 seconds.

- Required MSB value : 6000 / 256 = 23

- Required LSB value : 6000 - (MSB * 256) = 112

The maximum value is 10 minutes and 55.35 seconds (MSB = LSB = 255).

Description of the CVs per Function Output

CV	CV value								Description	
	7	6	5	4	3	2	1	0		
xx1	0								Dimming factor in % (1 : 100)	in the "off" phase while flashing
	0									0: An inactive output is "really" switched off 1: the dimming factor for the "off" phase is applied while "inactive"
xx2	100									for active output
xx3	0								0	Switching delay time
	0									0: Switching on delay 1: Switching off delay
xx4	25								0	Fading in time
	0									0: ... in 1/100 seconds 1: ... in seconds
xx5	25								0	Fading out time
	0									0: ... in 1/100 seconds 1: ... in seconds
xx6 / xx7	0									On time in 1/100 seconds
xx8 / xx9	0									Off time in 1/100 seconds
xx0	0								0	Number of pulses
	0									0: normal flashing 1: alternately flashing

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Operating Modes of Function Outputs

The operating mode for each function output is defined by CVs storing the on and off times as well as the number of pulses.

on time	off time	number of pulses	operating mode
0	no influence	no influence	continuous operation
t _{on}	0	no influence	pulse operation
t _{on}	t _{off}	0	continuous flashing operation
t _{on}	t _{off}	n _{pulse}	flashing operation

Continuous operation is the simplest mode of operation and is used e.g. for light signals. To set up a function output to continuous operation the on time has to be set to zero. Values of other configuration variables belonging to the output are ignored.

At **pulse operation** (e.g. for switching turnouts) the function output will be switched on for the on time t_{on}. Afterwards it remains switched off until it is switched on again using a switching command.

To operate a function output in **continuous flashing mode** the on time t_{on} (light on) and the off time t_{off} (light is off) have to be defined. The number of pulses must be set to zero. The output flashes until it is switched off.

The **flashing operation** ends after a determined number of pulses. The maximum number of pulses is 127. The output remains switched off after n_{pulse} pulses until it is switched on again by a command.

For function outputs operating in **alternately flashing** mode, on time and off time change their meaning. During on time the output is switched off whereas it is switched on during off time.

→ CV271 to CV276: Additional Locomotive Addresses

CV	CV value								Description
	7	6	5	4	3	2	1	0	
271	0								second locomotive address
272	0								(locomotive address = 256 * CV271 + CV272)
273	0								third locomotive address
274	0								(locomotive address = 256 * CV273 + CV274)
275	0								fourth locomotive address
276	0								(locomotive address = 256 * CV275 + CV276)

Locomotive addresses are required for usage with the signal aspect generator only. All 29 function keys (F1 to F28 and light function key F0) of all four locomotive addresses can be evaluated by the signal aspect generator.

→ CV280 to CV295: see on left-hand side (CV94 ff)

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