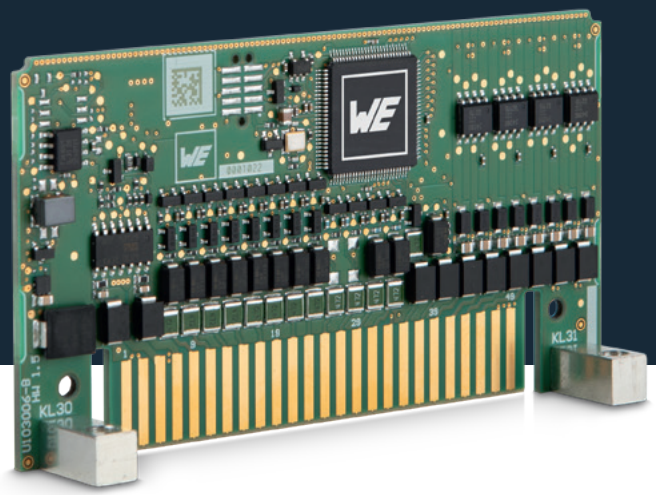
CDM-A16

Control & Diagnostic Module



The **CDM-A16 module** is a slot-in controller for power distribution systems in vehicles and extends them with programmable control and diagnostic functions. The module provides up to **16 channels** for fuse status monitoring and relay activation. The peak-and-hold function reduces heat generation in the relay coil, thus extending the possible operating time. **The vertical design** of the module reduces the required space and thus allowing the integration of additional relays and fuses into the power distribution system.

Functions

- Fuse status monitoring and relay control with peak-and-hold function
- CAN communication with multiple buses, enabling gateway functionality (J1939, RAW CAN bus protocols)
- Logic processing of vehicle functions, programmed with WEcontrol Designer, an IEC61131-3 programming environment (FBD, ST, SFC, etc.)
- Sensor management (current, temperature, etc.) with 5 V supply and sensor acquisition via 8 analogue inputs
- Direct load control via 4 digital outputs (2 A / PWM)

Technical data

General information	
Housing	Standard CDM-A16
Connectors	EDAC slide in 50 pins 2 x Powerelements
Dimensions	97.7 x 25.3 x 52 mm (incl. mounting material)
Weight	~68g
Operating temperature	-30°C to 85°C
Storage temperature	-40°C to 85°C
Ingress protection	IP20
Operating voltage	9 to 32V
Pre-fusing (recommended)	10 A main supply
Current consumption	active (no output) < 70 mA
	sleep mode < 2 mA
Processor type	NXP S 32K Cortex M4 32 bit
Clock frequency	80 MHz
Flash memory	2 MB
RAM	256 kB
FRAM	2 kB

Inputs / Outputs overview		
1	Vref 5 V	max 400 mA / switchable
8	Analogue inputs	0 – 5 V, 0 – 10 V, 0 – 16 V or 0 – 30 V (depending on variant)
2	CAN interface	CAN 2.0 high speed
16	Digital inputs	0 – Vbat (disconnected in off state)
16	Digital outputs LS	Low side 300 mA (PWM) With diagnosis
4	Digital outputs HS	High side 2 A (PWM) with current sense

Analogue input configuration depending on module variant (see order information)	
Analogue inputs	**5 V**
Input range	0 – 5.5 V
Resolution	12 bit
Input impedance	200 KΩ (within range)
Analogue inputs	**10 V**
Input range	0 – 11.8 V
Resolution	12 bit
Input impedance	230 KΩ (within range)
Analogue inputs	**16 V**
Input range	0 – 17.5 V
Resolution	12 bit
Input impedance	200 KΩ (within range)
Analogue inputs	**32 V**
Input range	0 – 35.7 V
Resolution	12 bit
Input impedance	170 KΩ (within range)

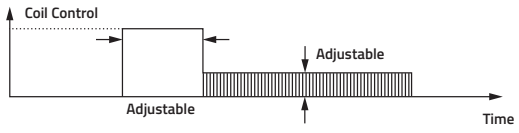
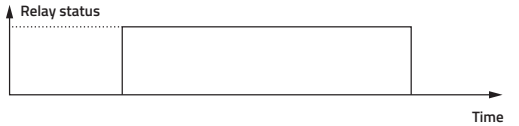
Built-in sensors	
Analogue inputs	**Vsupply**
Input range	0 – 32V
Temperature	**On-board sensor**
Input range	-40°C to 150 °C (operating limit -30°C)
Analogue inputs	**5 V sensor supply output**
Input range	5.9 V
Current limitation	660 mA

Electrical schematic

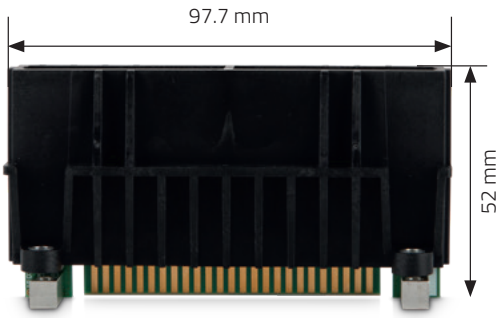
Digital inputs	
Digital input	16 x high active digital input
Max. acceptable voltage	32 V
Threshold levels	Lo Hi: ≥ 6.5 V Hi Lo: ≤ 2.5 V
Impedance	on- & off- state) Operating: ≥ 38 kΩ Standby: disconnected by MOSFET
Digital input KL15	1 x high active digital input
Max acceptable voltage	32 V
Threshold levels wake-up from standby	Lo->Hi: ≥ 5.5 V (wake up) Hi->Lo: ≤ 3.5 V (go to sleep)
Threshold levels input state by MCU	Lo ® Hi: ≥ 7.0 V (high) Hi ® Lo: ≤ 3.0 V (low)
Impedance	≥ 40 kΩ

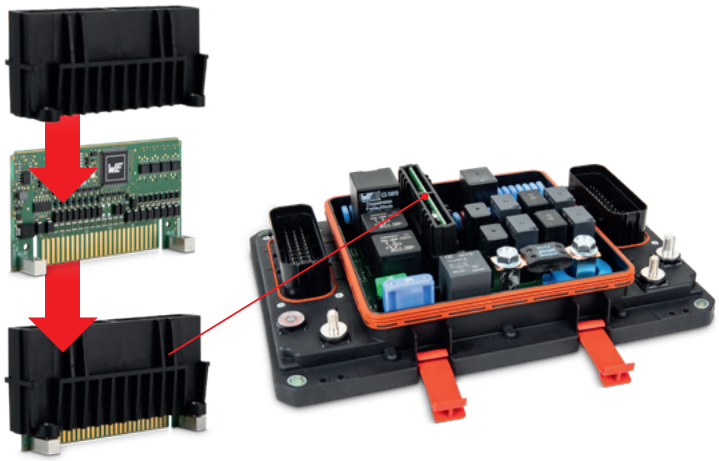
Digital outputs	
High side outputs	4 x 2 A
Current	2 A digital / 1 A PWM
Current sense max	5 A
Diagnosis	Overload detection A fault state sets max current to current measurement
Frequency	2 A at 500 Hz / 1 A at 1 KHz
Low side outputs	16 x
Diagnosis	Open load detection Overload detection 2 channels share one diagnosis signal
Max. current	single channel: 700 mA dual channel: 400 mA each depending on loads of system
Frequency	15 KHz recommended, up to 30 KHz possible

Intend of use and disclaimer	
Temperature sensors	The temperature sensor is only an indication and is here to give a rough idea about the status of the product, no specific behaviour has been designed in regarding this sensor value. The final application is free to define some behaviours based on the temperature. The sensor is placed next to the low-side component of pins 36 and 38.
PWM outputs	**High side outputs** 4 independent frequencies and duty cycles for each of the 4 outputs. Current feedback in PWM mode can only be used possibly for open load detection and not for current sensing.
	Low side output channel 1 frequency settable for outputs in group 0 – 7 1 frequency settable for outputs in group 8 – 15
	If different frequencies are set, the first activated output will set the frequency for the whole output group, until they are all switched off again. The frequency for a group can only be changed if none, or only one output is activated. The duty cycle can be freely set at any time for each output, independently.
	For EMC reasons it is not recommended to use PWM signals outside of the system (e.g. outside of the REDline Power Box Twin or any other power board to which the CDM-A16 is connected.).
High side	On the high side, the current feedback information can be used to detect short circuits or overloads. Actions can then be programmed in the main application.
UDS and CAN bus communication	
CAN speed	The allowed CAN speed are 100 / 125 / 250 / 500/ 1000 kbits/s (500 kb/s default)
UDS / CAN 0 port	CAN 0 port is used for the WEcontrol Designer debugging interface and for UDS programming. The following IDs are reserved by default for our purposes: 0 x 100 / 0 x 7E0 / 0 x 7DF / 0 x 7E8

Peak and hold drive	
Peak and hold technology is a method of driving relays by applying a high current to the relay for a short time to quickly energise it, then reducing the current to a lower level to hold the relay in its energised state. This approach reduces heat generation and power consumption while maintaining fast response times. Peak and hold uses pulse width modulation (PWM) to reduce the average voltage and is compensated based on the supply voltage.	
Recommended: min. 500 ms pick-up time (based on relay manufacturer's recommendation). The peak time and voltage reduction can be configured in our dedicated function block in WEcontrol Designer.	

Dimensions & Mounting





Hardware map

25	AI_00	Analogue input 12 bit Variant depending* 0 – 5 V / 0– 10V / 0 – 16 V / 0 – 30 V	8 x
27	AI_01		
29	AI_02		
31	AI_03		
26	AI_04		
28	AI_05		
30	AI_06		
32	AI_07		

33	DI_KL15_IGN	Wake up	1 x
9	DI_00	Digital input 0 – Vsupply On: 6.5 V Off: 2.5 V	16 x
11	DI_01		
13	DI_02		
15	DI_03		
17	DI_04		
19	DI_05		
21	DI_06		
23	DI_07		
10	DI_08		
12	DI_09		
14	DI_10		
16	DI_11		
18	DI_12		
20	DI_13		
22	DI_14		
24	DI_15		

1	CAN High 0	CAN bus 0	2 x
3	CAN Low 0		
8	CAN High 1	CAN bus 1	
6	CAN Low 1		

NXP S32K148

FLASH	2 MB
RAM	256 kB
FRAM	2 kB

Power supply 9 – 32 V		AI_VLOAD (32 V)	X201
		GND	X202

1 x	Temperature sensor	-30 °C to 105 °C	

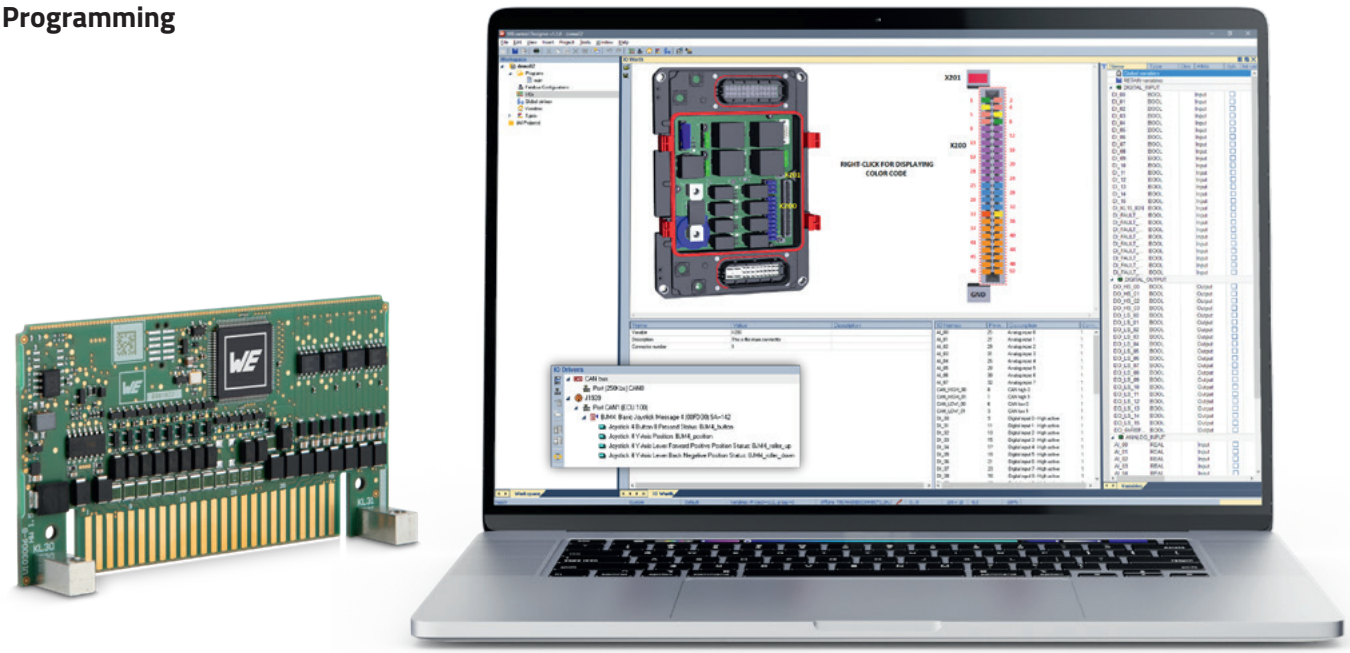
16 x	Digital output Low side 300 mA Bank1 PWM up to 15 KHz	DO_LSD_00	37
		DO_LSD_01	35
		DO_LSD_02	36
		DO_LSD_03	38
		DO_LSD_04	41
		DO_LSD_05	39
		DO_LSD_06	40
		DO_LSD_07	42
	Digital output Low side 300 mA Bank2 PWM up to 15 KHz	DO_LSD_08	45
		DO_LSD_09	43
		DO_LSD_10	44
		DO_LSD_11	46
		DO_LSD_12	49
		DO_LSD_13	47
		DO_LSD_14	48
		DO_LSD_15	50

4 x	Digital output High side 2 A PWM up to 500 Hz With current sense	DO_HS_00	7
		DO_HS_01	5
		DO_HS_02	2
		DO_HS_03	4

1 x	5 V Vref 400 mA	Vref_5V	34
		AI_5Vref	
		DO_5V_ref_activation	

Analogue inputs								
Connector pin number	**ICS-104558**	**ICS-104559**	**ICS-104560**	**ICS-104561**	**ICS-104562**	**ICS-104563**		**WEcontrol Designer I/O**
25	5 V	5 V	32 V	10 V	5 V	10 V	CH1	AI_00 / Analog input 0
27	5 V	5 V	32 V	10 V	5 V	10 V	CH2	AI_01 / Analog input 1
29	5 V	5 V	32 V	10 V	32 V	10 V	CH3	AI_02 / Analog input 2
31	5 V	5 V	32 V	10 V	32 V	10 V	CH4	AI_03 / Analog input 3
26	5 V	32 V	32 V	10 V	32 V	32 V	CH5	AI_04 / Analog input 4
28	5 V	32 V	32 V	10 V	32 V	32 V	CH6	AI_05 / Analog input 5
30	5 V	32 V	32 V	10 V	32 V	32 V	CH7	AI_06 / Analog input 6
23	5 V	32 V	32 V	10 V	32 V	32 V	CH8	AI_07 / Analog input 0
34	5 V-REF	5 V-REF	NA	NA	5 V-REF	NA	NA	DO_5VREF_ACT (and AI_5V-REF)

Programming



CDM-A16 is supported by the WEcontrol Designer programming environment and by the complementary WE Flasher Tool. The set of powerful text and graphical editors for IEC-61131-3 languages supports the following programming types:

- Sequential Flow Chart (SFC)
- Function Block Diagram (FBD)
- Ladder Diagram (LD)
- Structured Text (ST)

The WEcontrol Designer also offers a wide range of features such as:

- Optimised application creation
- Simulation and online data access / modification via CAN bus
- Automated language conversion
- User Defined Function Blocks (UDFB) for specific / repetitive functions
- Graphical I/O mapping and configuration
- Automated HTML project documentation
- Import of CAN communication database from Vector and Peak systems
- Easy creation of graphical debug interfaces (based on the application)

We will also be happy to create your application, based on your requirements.

Order information	
ICS-104558	CDM-A16 (1) 8x5V_5Vref
ICS-104559	CDM-A16 (2) 4x5V_4x32V_5Vref
ICS-104560	CDM-A16 (3) 8x32V_no5Vref
ICS-104561	CDM-A16 (4) 8x10V_no5Vref
ICS-104562	CDM-A16 (5) 2x5V_6x32V_5Vref
ICS-104563	CDM-A16 (6) 4x10V_4x32V_no5Vref

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