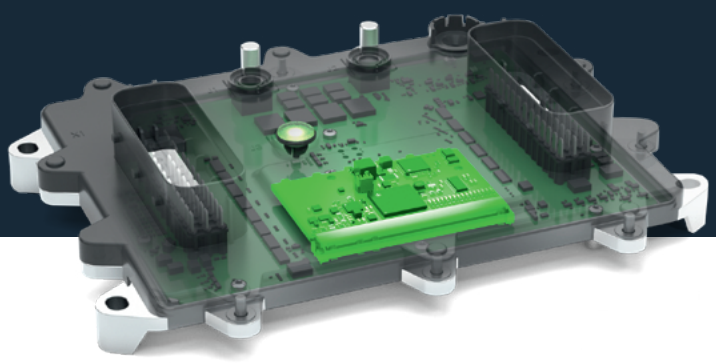
SC M-48

Safety Controller



The **SC M-48** is a freely programmable safety controller designed for demanding safety-relevant applications. It meets the normative requirements for SIL 2 in accordance with IEC 61508 and PL-d in accordance with EN ISO 13849.

Features and benefits

- **Unrestricted full power output:** The SC M-48 delivers simultaneous full current output across all outputs, with no limitations.
- **Extensive connectivity:** Offers up to 26 inputs and 22 outputs, along with multiple communication interfaces such as Ethernet, LIN and CAN.
- **Advanced CAN functionality:** Equipped with CAN interfaces that offer extended filter, gateway and wake up functions.
- **Rugged design:** Encased in a durable housing designed to withstand harsh environmental conditions.

Applications:

- Machine status monitoring and control for safety-relevant applications
- CAN communication with multiple communication stacks, including J1939, RAW CAN, and CAN safety protocols

Programming:

- Flexible programming in PLC or C-Tool-qualified integrated development environment WEsafety Control Designer

Compatibility:

- Compatible with a wide range of sensors and actuators
- Supports various communication interfaces such as Ethernet, LIN and CAN
- Engineered for seamless integration into existing vehicle architectures

Technical Data

General information	
Dimensions	240 x 180 x 50 mm
Connector	2 x Powerelement M8 1 x LeavySeal 31 pins, Coding E 1 x LeavySeal 39 pins, Coding F 2 x M12 Connector (optional)
Weight	~ 1 kg
Operating temperature	-40°C to +85 °C
Ingress protection	IP6K7 / IP6K9K
Operating voltage	12 – 32 V DC (according ISO 16750-2)
Max. current	max. 80 A

Functional overview		
8	Analogue inputs	5 V / 10 V / 20 mA
16	Digital inputs	0 – 40 V
2	Digital wake up inputs	2 x Wake up inputs: ▪ 1x High active (ignition) ▪ 1x Low active (door contact)
8	Outputs LS 500 mA	500 mA – PWM / digital
10	Outputs HS 4 A	4 A – PWM / digital
2	Outputs HS 6 A	HS max. load 6 A (optional)
2	Outputs HS 9 A	HS max. load 9 A (optional)
2	CAN interface	baud rate up to 1 Mbit/s 1x CAN wake up function
1	LIN 2.x	master/slave selectable pull-up baud rate up to 115.300 bps voltage range 12 V & 24 V
2	Sensor supplies	5 V / 150 mA
1	Status LED	tri-color LED (R/G/B) for internal system status
2	Ethernet (optional)	4 - wire 100 Mbit/s 100 BASE-TX

Inputs / Outputs overview	
Analogue inputs	
Input voltage range	0 – 5 V
Resolution at 5 V / at 10 V	2 % ± 0.16 V
Cut-off frequency of the filter	1000 Hz ± 10 %
Input voltage range	0 – 10 V
Resolution	2 % ± 0.16 V
Analogue input signal bandwidth	430 Hz ± 10 %
Input current range	0 – 20 mA
Resolution	1.5 % ± 0.1 mA
Analogue input signal bandwidth	1000 Hz ± 10 %
Digital inputs	High- / low-side
Input voltage range	0 – 40 V
Frequency measurement range	20 kHz ± 10 %
Outputs LS	max. 0,5 A
Outputs HS 4 A	4 A
PWM frequency	20 Hz – 1000 Hz
PWM scaling	0 %, 5 % ... 95 %, 100 %
Dlagnostic current sense	
Outputs HS 6 A	2 x high side
Load current	max. 6 A
Diagnostic current sense	
Outputs HS 9 A	2 x high side
Load current	max. 9 A
Diagnostic current sense	

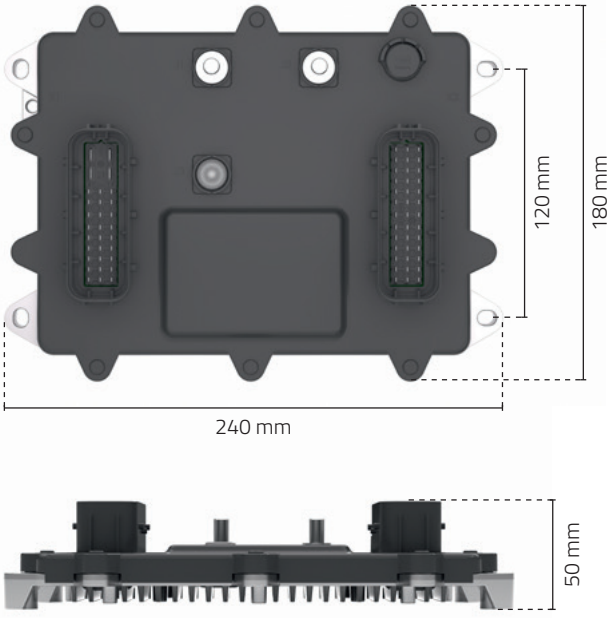
Controller	
ARM	ISO EN 13849 PL-d
Processor type	ARM Cortex-M4 & ARM Cortex-A7
Clock frequency	M4: 168 MHz / A7: 500 MHz
Flash memory	2 MB / extern 32 MBit flash
RAM	2 MB
FRAM	2 MB

Functional safety	
ISO EN 13849	PL-d; cat. 3
ISO EN 25119	AgPL-d
IEC 61508	SIL 2

Test standards and regulations*	
E1	UN / ECE-R10
Agricultural and forest machines	ISO 14982
Earth-moving and building construction machinery	ISO 13766
Electrical tests	ISO 7637-2
	ISO 16750-2
	ISO 11452-2/-4 ISO 10605 EN 55025 (CISPR 25)
Environmental tests	EN 60068-2-30 EN 60068-2-78 EN 60068-2-52
Mechanical tests	ISO 16750-3 EN 60068-2-6 ISO 16750-3

*preliminary

Dimensions



Mounting

Max. torque	
M8 power supply	9 Nm max.
M6 x 4 fixing screws	11 Nm max.

Vertical mounting recommended but not mandatory
Connectors facing down (see left picture)

Hardware map*

X1-08/09/11	AGND	**Ground**	**3x**
X2-33/35/36/38	AGND	**Ground**	**4x**
X1-19	DI_KL_15	**Ignition**	**1x**
X1-05	B_KL_30	**KL30 Bridge**	**1x**
X1-06	AI_V_CPU	**Power supply CPU**	**1x**
J1	AI_VLOAD	**Power supply**	**1x**
J2	GND	**GND**	**1x**

X1-13	AI_MF_0	**Analogue input** 0 - 5 V 0 - 10 V 0 - 20 mA	**8x**
X1-14	AI_MF_1		
X1-15	AI_MF_2		
X1-16	AI_MF_3		
X2-11	AI_MF_4		
X2-10	AI_MF_5		
X2-15	AI_MF_6		
X2-14	AI_MF_7		

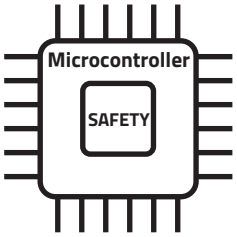
X1-07	DI_Wake	**Digital wake up input**	**1x**

X2-21	DI_HL_0	**Digital input** < 40 V_{DC} Switch-on 7 V Switch-off 3 V	**16x**
X2-19	DI_HL_1		
X2-16	DI_HL_2		
X2-17	DI_HL_3		
X2-20	DI_HL_4		
X2-13	DI_HL_5		
X2-18	DI_HL_6		
X2-27	DI_HL_7		
X2-24	DI_HL_8		
X2-30	DI_HL_9		
X1-31	DI_HL_10		
X1-30	DI_HL_11		
X1-27	DI_HL_12		
X1-28	DI_HL_13		
X1-24	DI_HL_14		
X1-25	DI_HL_15		

X1-10	LIN_0	**LIN BUS 2.x**	

X100	1	ETH_0_TD+	**Ethernet 0**	**2x**
	2	ETH_0_RD+		
	3	EHT_0_TD-		
	4	ETH_0_RD-		
X101	1	ETH_1_TD+	**Ethernet 1**	
	2	ETH_1_RD+		
	3	EHT_1_TD-		
	4	ETH_1_RD-		

J3 LED-Status	
LED_RED	3-color LED
LED_BLUE	
LED_GREEN	



Flash	2 MB
RAM	2 MB
FRAM	2 MB
Acceleration	3G

8x	**Output LS 500 mA** PWM/digital	DO_LSD_0	X2-09
		DO_LSD_1	X2-05
		DO_LSD_2	X2-07
		DO_LSD_3	X2-03
		DO_LSD_4	X2-12
		DO_LSD_5	X2-08
		DO_LSD_6	X2-06
		DO_LSD_7	X2-04

6x	**Output HS 4 A** PWM/digital Diagnostic current	DO_HSD_4A_0	X1-18
		DO_HSD_4A_1	X1-17
		DO_HSD_4A_2	X1-20
		DO_HSD_4A_3	X1-23
		DO_HSD_4A_4	X1-26
		DO_HSD_4A_5	X1-29

4x	**Safe output HS 4 A** PWM/digital Diagnostic current	SDO_HSD_4A_0	X2-39
		SDO_HSD_4A_1	X2-37
		SDO_HSD_4A_2	X2-02
		SDO_HSD_4A_3	X2-01

2x	**Output HS 6 A** Diagnostic current	PHM6_1	X1-01
		PHM6_2	X1-02

2x	**Output HS 9 A** Diagnostic current	PHM9_1	X1-03
		PHM9_2	X1-04

2x	**CAN BUS 0** High speed wake up	CAN_0H	X2-28
		CAN_0L	X2-31
	CAN BUS 0 Termination bridge	B_CAN_0H	X2-29
		B_CAN_0L	X2-32
	CAN BUS 1 High speed	CAN_1H	X2-22
		CAN_1L	X2-25
	CAN BUS 1 Termination bridge	B_CAN_1H	X2-23
		B_CAN_1L	X2-26

X1-21	5V_REF_0	**Sensor supply** 5 V / 150 mA	**2x**
X1-22	5V_REF_1	**Sensor supply** 5 V /150 mA	

*preliminary

Pin assignement

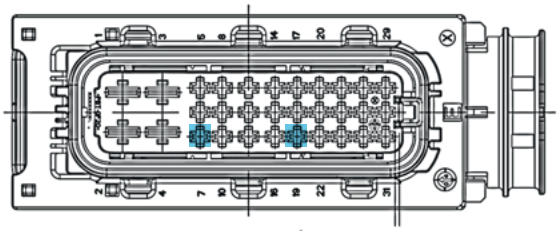
Pin assignement*		
X1-01	DO_HSD_6A_0	**Output HS 6 A**
X1-02	DO_HSD_6A_1	**Output HS 6 A**
X1-03	DO_HSD_9A_0	**Output HS 9 A**
X1-04	DO_HSD_9A_1	**Output HS 9 A**
X1-05	B_KL30	**KL30 bridge**
X1-06	AI_VLOAD	**Power supply battery power**
X1-07	DI_WAKE	**Digital wake up input**
X1-08	AGND	**Ground**
X1-09	AGND	**Ground**
X1-10	LIN_0	**LIN_2.x**
X1-11	AGND	**Ground**
X1-12	DI_LIN_M	**LIN master configuration** (to VBAT)
X1-13	AI_MF_0	**Analogue input**
X1-14	AI_MF_1	**Analogue input**
X1-15	AI_MF_2	**Analogue input**
X1-16	AI_MF_3	**Analogue input**
X1-17	DO_HSD_4A_1	**Output HS 4 A**
X1-18	DO_HSD_4A_0	**Output HS 4 A**
X1-19	DI_KL_15	**Ignition**
X1-20	DO_HSD_4A_2	**Output HS 4 A**
X1-21	5V_Ref_0	**Sensor supply 5 V /** 150 mA
X1-22	5V_Ref_1	**Sensor supply 5 V /** 150 mA
X1-23	DO_HSD_4A_3	**Output HS 4 A**
X1-24	DI_HL_14	**Digital input**
X1-25	DI_HL_15	**Digital input**
X1-26	DO_HSD_4A_4	**Output HS 4 A**
X1-27	DI_HL_12	**Digital input**
X1-28	DI_HL_13	**Digital input**
X1-29	DO_HSD_4A_5	**Output HS 4 A**
X1-30	DI_HL_11	**Digital input**
X1-31	DI_HL_10	**Digital input**
X100	Eth_4W_0	M12 Connector
X101	Eth_4W_1	M12 Connector
J1	AI_VLOAD	**Power supply**
J2	GND	**GND**

*preliminary

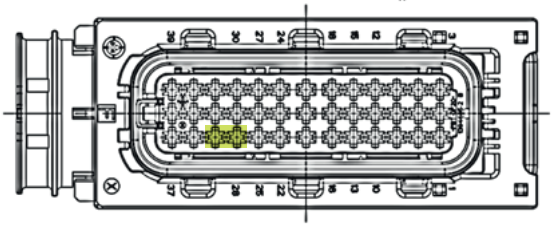
Pin assignement*		
X2-01	SDO_HSD_4A_3	**Safe output HS 4 A**
X2-02	SDO_HSD_4A_2	**Safe output HS 4 A**
X2-03	DO_LSD_3	**Outputs LS 500 mA**
X2-04	DO_LSD_7	**Outputs LS 500 mA**
X2-05	DO_LSD_1	**Outputs LS 500 mA**
X2-06	DO_LSD_6	**Outputs LS 500 mA**
X2-07	DO_LSD_2	**Outputs LS 500 mA**
X2-08	DO_LSD_5	**Outputs LS 500 mA**
X2-09	DO_LSD_0	**Outputs LS 500 mA**
X2-10	AI_MF_5	**Analogue input**
X2-11	AI_MF_4	**Analogue input**
X2-12	DO_LSD_4	**Outputs LS 500 mA**
X2-13	DI_HL_5	**Digital input**
X2-14	AI_MF_7	**Analogue input**
X2-15	AI_MF_6	**Analogue input**
X2-16	DI_HL_2	**Digital input**
X2-17	DI_HL_3	**Digital input**
X2-18	DI_HL_6	**Digital input**
X2-19	DI_HL_1	**Digital input**
X2-20	DI_HL_4	**Digital input**
X2-21	DI_HL_0	**Digital input**
X2-22	CAN_1H	**CAN 1** high speed (11898-2)
X2-23	B_CAN_1H	**CAN 1 termination 120 R**
X2-24	DI_HL_8	**Digital input**
X2-25	CAN_1L	**CAN 1** high speed (11898-2)
X2-26	B_CAN_1L	**CAN 1** termination 120R
X2-27	DI_HL_7	**Digital input**
X2-28	CAN_0H	**CAN 0** wake up (11898-5)
X2-29	B_CAN_0H	**CAN 0 termination 120 R**
X2-30	DI_HL_9	**Digital input**
X2-31	CAN_0L	**CAN 0** wake up (11898-5)
X2-32	B_CAN_0L	**CAN 0 termination 120 R**
X2-33	AGND	**Ground**
X2-34	AGND	**Ground**
X2-35	AGND	**Ground**
X2-36	AGND	**Ground**
X2-37	SDO_HSD_4A_1	**Safe output HS 4 A**
X2-38	AGND	**Ground**
X2-39	SDO_HSD_4A_0	**Safe output HS 4 A**

*preliminary

X1



X2



Wake up input
CAN 0: UDS programming interface

The user is responsible for the product's functionality in its purposed system environment. Technical content may be modified and changed by Wurth Elektronik ICS GmbH & Co. KG without any notice.

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