1 Installer manual

1.1 General instructions

This manual aims at providing information to install the ARM receiving unit of Autec Dynamic series radio remote controls.


ARM receiving unit

Information about transmitting unit's actuators has been provided in this manual for reference and/or applicative purposes. This does not authorise any modification of the transmitting unit.

Instructions regarding the use of the radio remote control are contained in the “user manual” (provided together with the radio remote control).
This manual and the “user manual” must be read and understood in all their parts by those who decide and/or carry out the radio remote control installation.

Always remember that:
- photos and drawings contained in this manual are useful examples that help understand its instructions and warnings
- if necessary, contact Autec if any of the instructions and/or warnings given in this manual are not clear.

No part of this manual may be reproduced, in any form or by any means, without written permission of Autec (including recording and photocopying).
If this manual is lost or damaged, ask Autec for a copy. Please specify the serial number of the related radio remote control.

All installation operations can only be carried out by qualified technicians who are suitably trained with respect to the relevant norms and laws.

This manual integrates instructions provided by the manufacturer of the machine where the radio remote control is to be installed.
As for instructions and warnings regarding the machine where the radio remote control is to be installed, follow the instructions given in the machine's manual.

1.2 Symbol conventions

Three symbols are employed in this manual, which are used to highlight specific safety-related issues. They are classified according to the hazardous situation that may arise and on the possible consequences:

Symbol	**If the highlighted instructions are not respected ...**		
	... a dangerous situation will occur …	**... consequences for people may be …**	**... consequences for property may be …**
DANGER	… very likely.	… critical (death or physical damage).	… critical.
WARNING	… probably.	… critical (death or physical damage).	… critical.
CAUTION	… probably.	… moderate (non-severe physical damage).	… moderate.

This symbol is also used, and it identifies texts to be read carefully.

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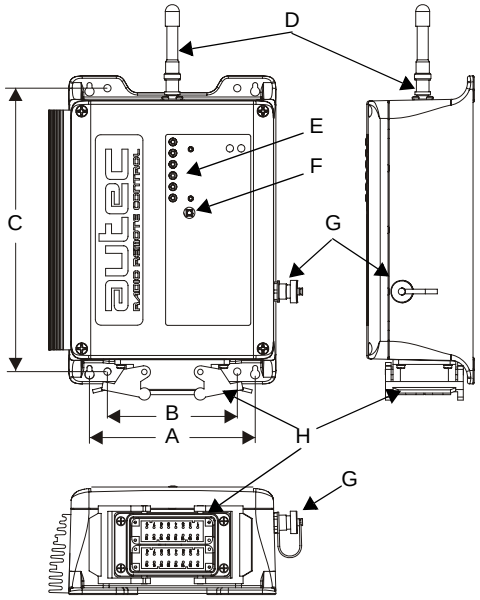
2 ARM receiving unit

2.1 Description

The receiving unit communicates with the machine through digital and analogue outputs or over CANopen® communication protocol, that allows communication in a CAN bus network. The receiving unit acts as a slave node within this network.
All commands, including STOP and SAFETY, are sent via CAN network and also activate their corresponding outputs.

DANGER **It is not possible to only rely on the CAN communication status to maintain or bring the remote controlled machine to a safe condition. Messages sent by the radio remote control via CAN network do not in fact ensure the same safety features as the corresponding commands that are directly carried out by the receiving unit's safety outputs. Please refer to chapters 12 and 11 for instructions to correctly wire such outputs.**

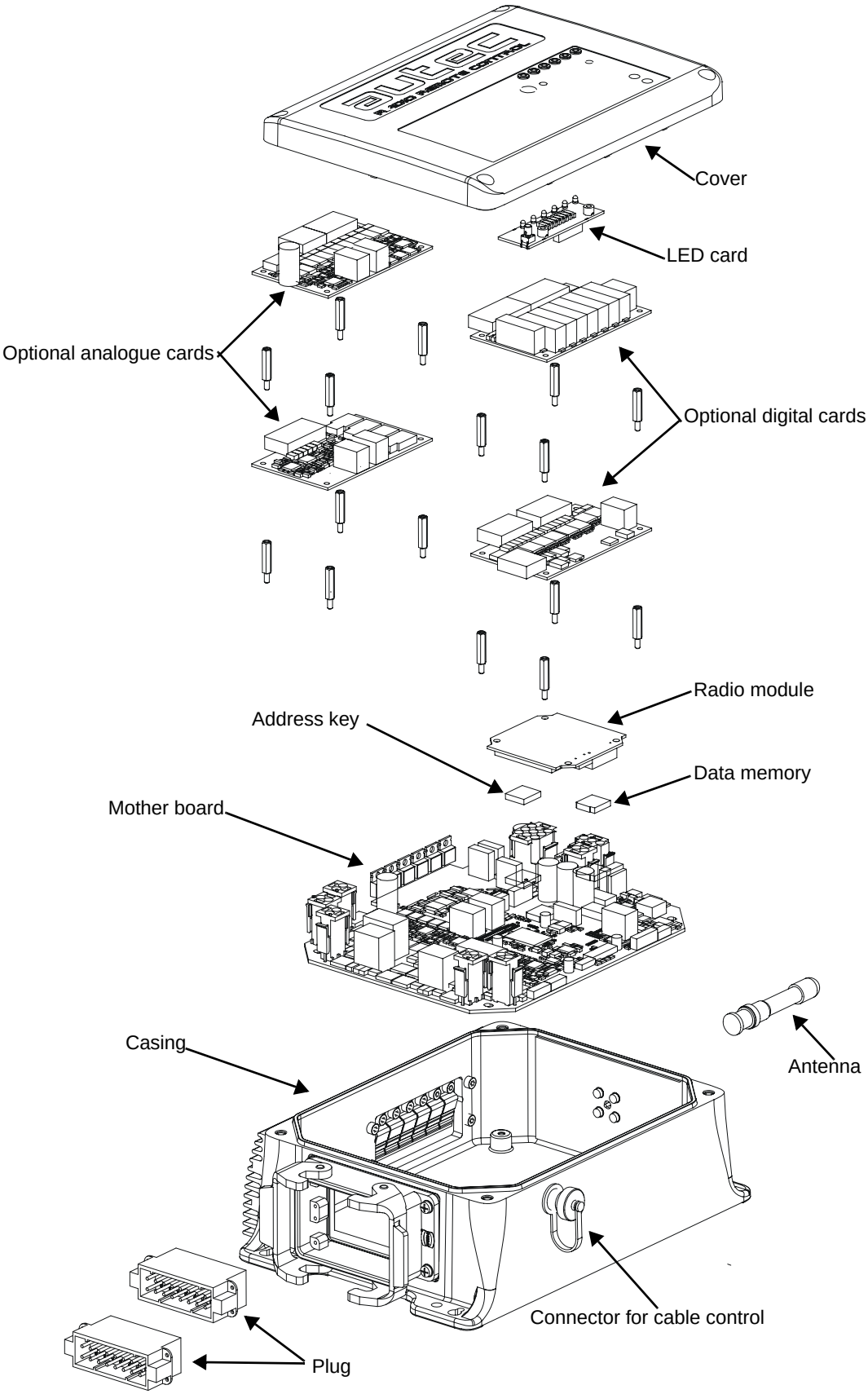


A	148 mm (5.82 In)
B	116 mm (4.57 In)
C	253 mm (9.96 In)
D	antenna
E	LEDs
F	TEACH pushbutton
G	connector for cable control
H	plug

2.2 Technical data

Housing material ..... PA6 (20% fg)
Antenna..... dedicated
Protection degree..... IP65
Dimensions ..... 200 x 230 x 95 mm (7.9 x 9.1 x 3.8 In)
Weight ..... 3 kg (6.6 Lb)

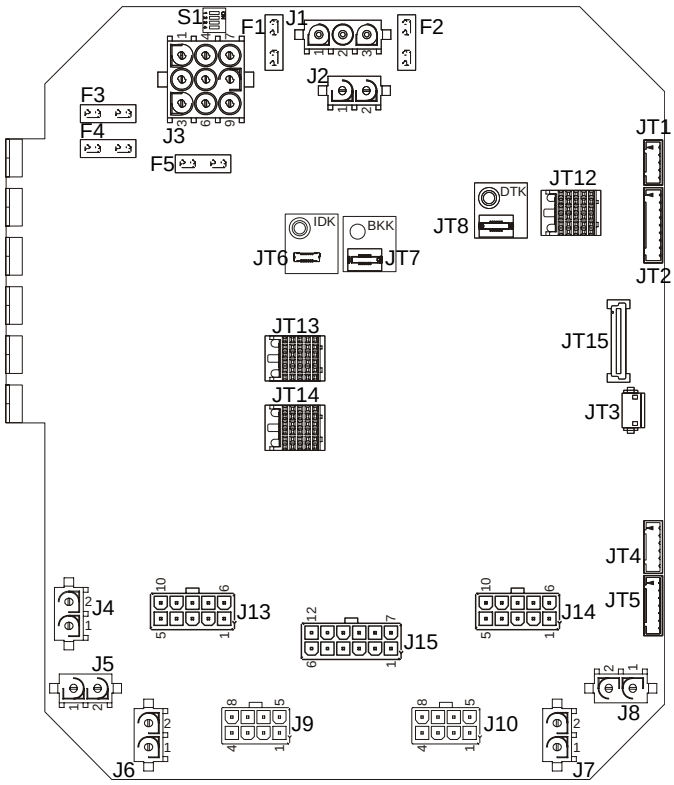
2.3 Exploded view



3 Mother boards

3.1 FSAADV01A (voltage) - voltage-driven analogue outputs

3.1.1 Description



CONNECTORS	
J1	Power supply
J2	Fused PWR+
J3	STOP and SAFETY outputs
J4 **J13** **J14**	Digital outputs HO1-8 and LO1-8
J5 **J6** **J9**	Digital outputs DO1-8
J7 **J8** **J10**	Digital outputs DO9-16
J15	Voltage-driven analogue outputs AO1-AO10 Digital outputs DO47-DO48
JT1	CAN BUS
JT2	LEDs on cover
JT3 **JT15**	Radio module
JT4	Cable control
JT5	Programming
JT6	IDK (address key)
JT7	BKK (backup data memory)
JT8	DTK (data memory)
JT12	Optional digital cards
JT13 **JT14**	Optional analogue cards

FUSES	
F1	SAF_2
F2	power supply
F3	STP_1
F4	STP_2
F5	SAF_1

DIP SWITCHES	
S1	Group of 4 DIPs

3.1.2 Technical data

Power supply ..... 8-30 V⎓
Absorbed power ..... 5 W
Protection of power supply (fuse F2) ..... 7.5 A (32 V⎓, autofuse)

Outputs' maximum switching voltage ..... 30 V⎓

Rated current of STP_1 and STP_2 ..... 7.5 A (30 V⎓)
Protection of STP_1 (fuse F3) ..... 7.5 A (32 V⎓, autofuse)
Protection of STP_2 (fuse F4) ..... 7.5 A (32 V⎓, autofuse)

Rated current of SAF_1 ..... 7.5 A (30 V⎓)
Protection SAF_1 (fuse F5) ..... 7.5 A (32 V⎓, autofuse)
Rated current of SAF_2 ..... 3 A (30 V⎓)
Protection SAF_2 (fuse F1) ..... 3 A (32 V⎓, autofuse)

Rated current of digital outputs ..... 4 A (30 V⎓)
Rated current of analogue outputs ..... 10 mA (28 V⎓)

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3.1.3 Pin layout

Connector	Pin	Name	Description	Function
J1	**1, 2**	PWR-	negative	Power supply
	3	PWR+	positive	
Plug	**PE1, PE2**	PWR-	negative	
J2	**1, 2**	PWR+	protected positive	Fused PWR+
J3	**1**	STP_1 IN	power supply positive terminal of STP_1	STOP (see chapter 11) SAFETY (see chapter 12)
	2	STP_1 OUT	output of STP_1	
	3	STP_2 IN	power supply positive terminal of STP_2	
	4	SAF_2 OUT	output of SAF_2	
	5, 6	STP_2 OUT	output of STP_2	
	7, 8	SAF_1 OUT	output of SAF_1	
	9	SAF_1 IN	power supply positive terminal of SAF_1	
J4	**1, 2**	COM HO-LO	common wire	digital outputs HO1-8 and LO1-8
J5	**1, 2**	COM DO5-8	common wire	digital outputs DO5-8
J6	**1, 2**	COM DO1-4	common wire	digital outputs DO1-4
J7	**1, 2**	COM DO9-12	common wire	digital outputs DO9-12
J8	**1, 2**	COM DO13-16	common wire	digital outputs DO13-16
J9	**1**	DO1	output DO1	digital outputs DO1-8
	2	DO2	output DO2	
	3	DO3	output DO3	
	4	DO4	output DO4	
	5	DO5	output DO5	
	6	DO6	output DO6	
	7	DO7	output DO7	
	8	DO8	output DO8	
J10	**1**	DO9	output DO9	digital outputs DO9-16
	2	DO10	output DO10	
	3	DO11	output DO11	
	4	DO12	output DO12	
	5	DO13	output DO13	
	6	DO14	output DO14	
	7	DO15	output DO15	
	8	DO16	output DO16	
J13	**1**	HO1	output HO1	digital outputs HO1-4 and LO1-4
	2	LO1	output LO1	
	3	RESERVED	do not use	
	4	HO2	output HO2	
	5	LO2	output LO2	
	6	HO3	output HO3	
	7	LO3	output LO3	
	8	RESERVED	do not use	
	9	HO4	output HO4	
	10	LO4	output LO4	

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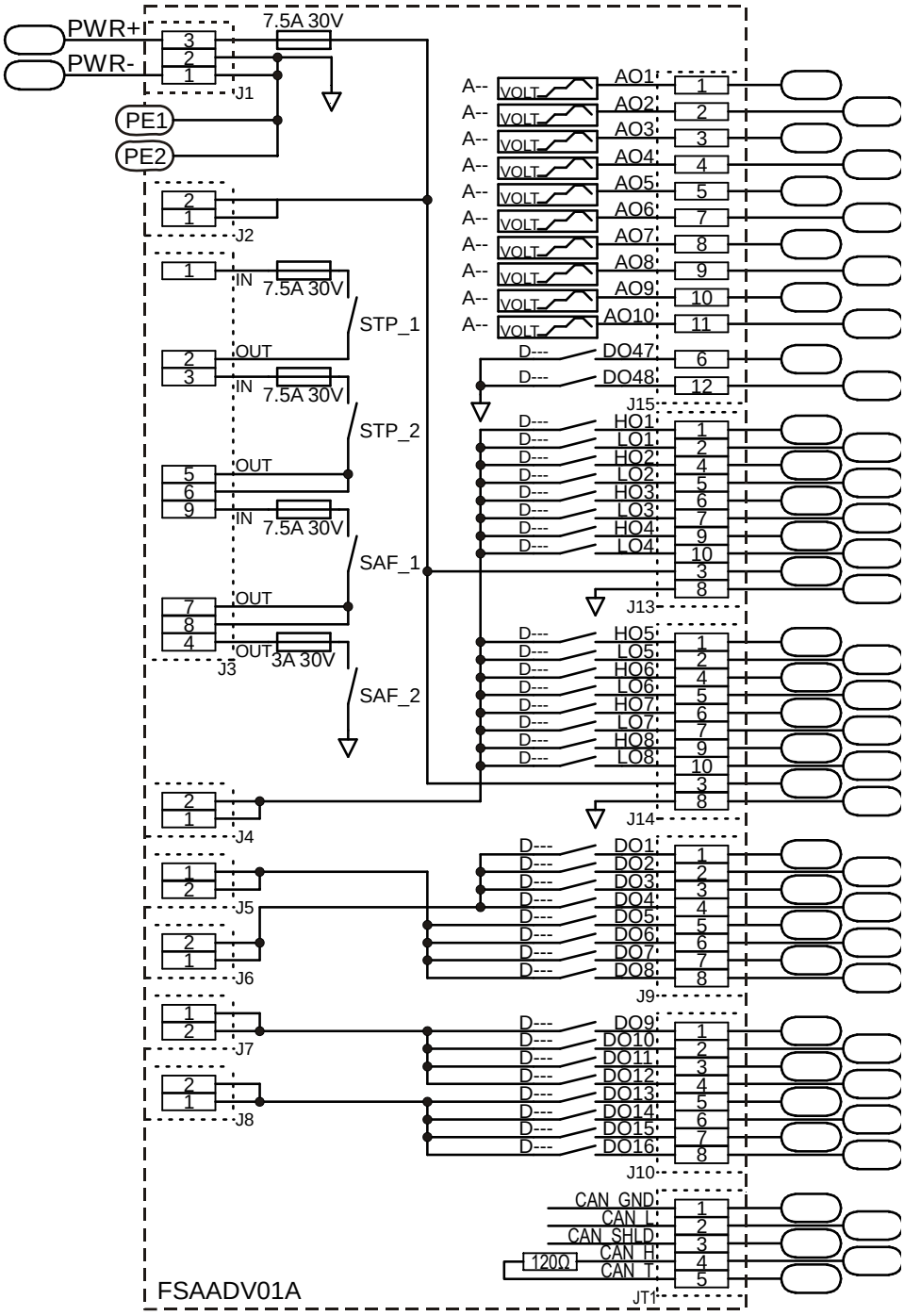
Connector	Pin	Name	Description	Function
J14	**1**	HO5	output HO5	digital outputs HO5-8 and LO5-8
	2	LO5	output LO5	
	3	RESERVED	do not use	
	4	HO6	output HO6	
	5	LO6	output LO6	
	6	HO7	output HO7	
	7	LO7	output LO7	
	8	RESERVED	do not use	
	9	HO8	output HO8	
	10	LO8	output LO8	
J15	**1**	AO1	output AO1	voltage driven analogue outputs AO1-10 digital outputs DO47-48
	2	AO2	output AO2	
	3	AO3	output AO3	
	4	AO4	output AO4	
	5	AO5	output AO5	
	6	DO47	output DO47	
	7	AO6	output AO6	
	8	AO7	output AO7	
	9	AO8	output AO8	
	10	AO9	output AO9	
	11	AO10	output AO10	
	12	DO48	output DO48	
JT1	**1**	CAN_GND	GND	CAN BUS (see chapter 14)
	2	CAN_L	L	
	3	CAN_SHLD	shield	
	4	CAN_H	H	
	5	CAN_T	line termination (120 Ω)	

3.1.4 DIP switches

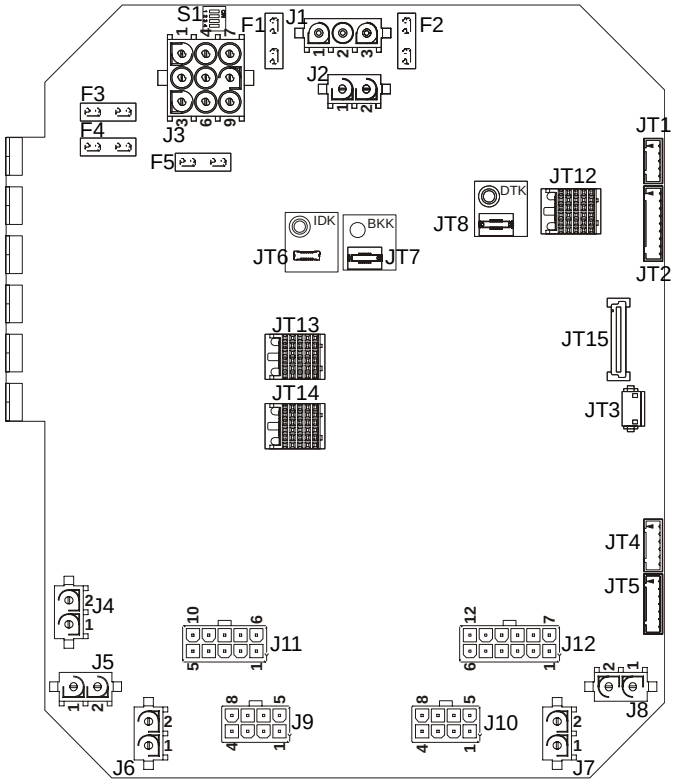
DIP	Position	Function
1	**ON**	enables the reverse recovery diode between SAF_1_OUT (cathode) and SAF_2_OUT (anode)
	OFF	disables the reverse recovery diode between SAF_1_OUT (cathode) and SAF_2_OUT (anode)
2	**ON**	enables filter capacitor on STP_1_OUT
	OFF	disables filter capacitor on STP_1_OUT
3	**ON**	enables filter capacitor on STP_2_OUT
	OFF	disables filter capacitor on STP_2_OUT
4	**///**	RESERVED: do not change

3.1.5 Technical data sheet



3.2 FSAADP01A (PWM) - current-driven analogue outputs

3.2.1 Description



CONNECTORS	
J1	Power supply
J2	Fused PWR+
J3	STOP and SAFETY outputs
J4 **J11** **J12**	PWM driven analogue outputs AO1-AO8 Voltage-driven analogue outputs AO9-AO10 Digital outputs DO47-DO48
J5 **J6** **J9**	Digital outputs DO1-8
J7 **J8** **J10**	Digital outputs DO9-16
JT1	CAN BUS
JT2	LEDs on cover
JT3 **JT15**	Radio module
JT4	Cable control
JT5	Programming
JT6	IDK (address key)
JT7	BKK (backup data memory)
JT8	DTK (data memory)
JT12	Optional digital cards
JT13 **JT14**	Optional analogue cards

FUSES	
F1	SAF_2
F2	power supply
F3	STP_1
F4	STP_2
F5	SAF_1

DIP SWITCH	
S1	Group of 4 DIPs

3.2.2 Technical data

Power supply ..... 8-30 V⎓
Absorbed power ..... 5 W
Protection of power supply (fuse F2) ..... 7.5 A (32 V⎓, autofuse)

Outputs' maximum switching voltage ..... 30 V⎓

Rated current of STP_1 and STP_2 ..... 7.5 A (30 V⎓)
Protection of STP_1 (fuse F3) ..... 7.5 A (32 V⎓, autofuse)
Protection of STP_2 (fuse F4) ..... 7.5 A (32 V⎓, autofuse)

Rated current of SAF_1 ..... 7.5 A (30 V⎓)
Protection SAF_1 (fuse F5) ..... 7.5 A (32 V⎓, autofuse)
Rated current of SAF_2 ..... 3 A (30 V⎓)
Protection SAF_2 (fuse F1) ..... 3 A (32 V⎓, autofuse)

Rated current of digital outputs ..... 4 A (30 V⎓)
Rated current of analogue outputs ..... 2 A (30 V⎓)

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3.2.3 Pin layout

Connector	Pin	Name	Description	Function
J1	**1, 2**	PWR-	negative	Power supply
	3	PWR+	positive	
Plug	**PE1, PE2**	PWR-	negative	
J2	**1, 2**	PWR+	protected positive	Fused PWR+
J3	**1**	STP_1 IN	power supply positive terminal of STP_1	STOP (see chapter 11) SAFETY (see chapter 12)
	2	STP_1 OUT	output of STP_1	
	3	STP_2 IN	power supply positive terminal of STP_2	
	4	SAF_2 OUT	output of SAF_2	
	5, 6	STP_2 OUT	output of STP_2	
	7, 8	SAF_1 OUT	output of SAF_1	
	9	SAF_1 IN	power supply positive terminal of SAF_1	
J4	**1, 2**	COM AO1-AO8	common wire	PWM driven analogue outputs AO1-8
J5	**1, 2**	COM DO5-8	common wire	digital outputs DO5-8
J6	**1, 2**	COM DO1-4	common wire	digital outputs DO1-4
J7	**1, 2**	COM DO9-12	common wire	digital outputs DO9-12
J8	**1, 2**	COM DO13-16	common wire	digital outputs DO13-16
J9	**1**	DO1	output DO1	digital outputs DO1-8
	2	DO2	output DO2	
	3	DO3	output DO3	
	4	DO4	output DO4	
	5	DO5	output DO5	
	6	DO6	output DO6	
	7	DO7	output DO7	
	8	DO8	output DO8	
J10	**1**	DO9	output DO9	digital outputs DO9-16
	2	DO10	output DO10	
	3	DO11	output DO11	
	4	DO12	output DO12	
	5	DO13	output DO13	
	6	DO14	output DO14	
	7	DO15	output DO15	
	8	DO16	output DO16	
J11	**1**	AO4 L	output AO4	PWM driven analogue outputs AO1-4
	2	AO4 H		
	3	AO1 L	output AO1	
	4	AO1 H		
	5	RESERVED	do not use	
	6	AO3 H	output AO3	
	7	AO3 L		
	8	AO2 H	output AO2	
	9	AO2 L		
	10	RESERVED	do not use	

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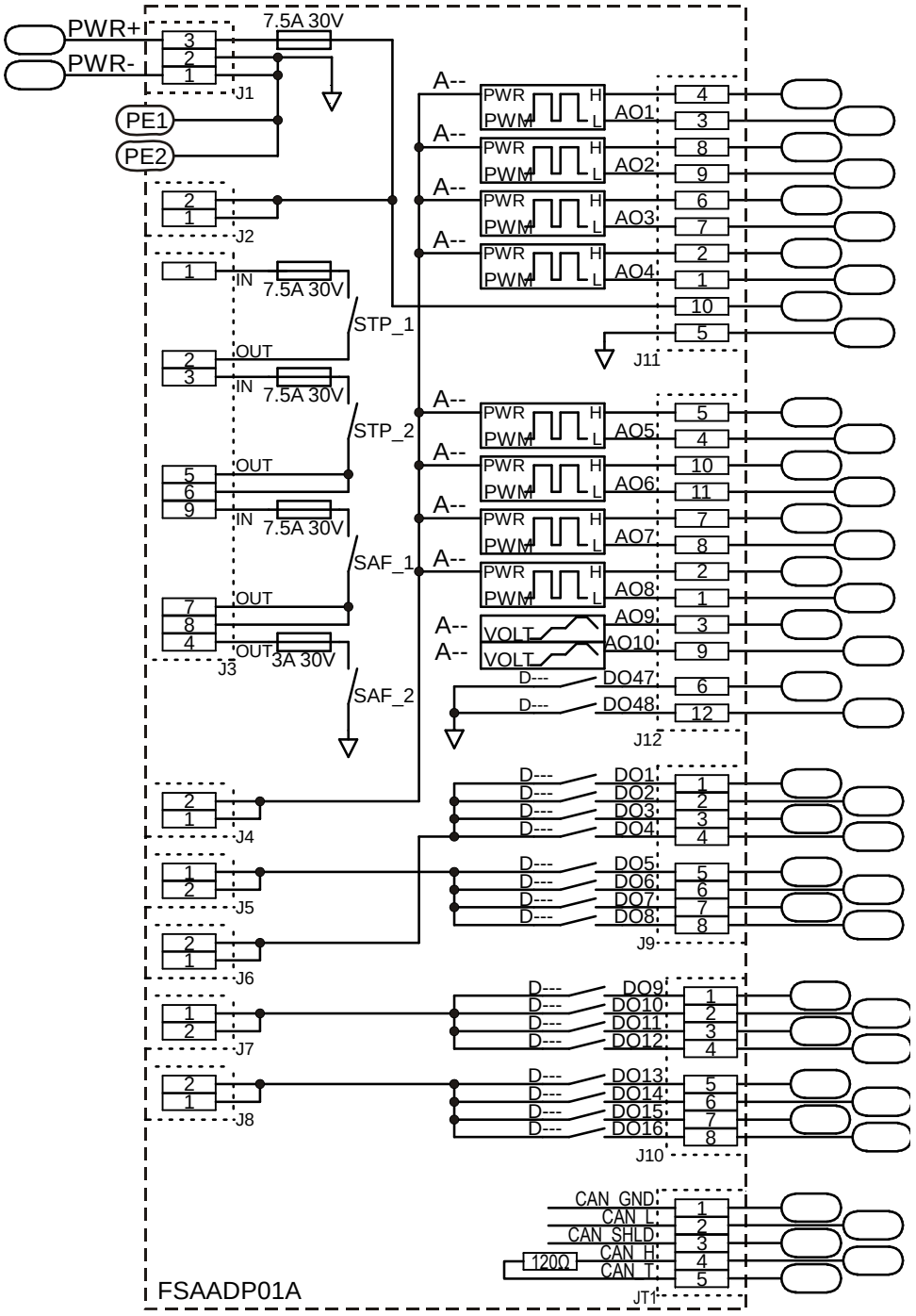
Connector	Pin	Name	Description	Function
J12	1	AO8 L	output AO8	PWM driven analogue outputs AO5-8 voltage driven analogue outputs AO9-10 digital outputs DO47-48
	2	AO8 H		
	3	AO9	output AO9	
	4	AO5 L	output AO5	
	5	AO5 H		
	6	DO47	output DO47	
	7	AO7 H	output AO7	
	8	AO7 L		
	9	AO10	output AO10	
	10	AO6 H	output AO6	
	11	AO 6L		
	12	DO48	output DO48	
JT1	1	CAN_GND	GND	CAN BUS (see chapter 14)
	2	CAN_L	L	
	3	CAN_SHLD	shield	
	4	CAN_H	H	
	5	CAN_T	line termination (120 Ω)	

3.2.4 DIP switches

DIP	Position	Function
1	ON	enables the reverse recovery diode between SAF_1_OUT (cathode) and SAF_2_OUT (anode)
	OFF	disables the reverse recovery diode between SAF_1_OUT (cathode) and SAF_2_OUT (anode)
2	ON	enables filter capacitor on STP_1_OUT
	OFF	disables filter capacitor on STP_1_OUT
3	ON	enables filter capacitor on STP_2_OUT
	OFF	disables filter capacitor on STP_2_OUT
4	///	RESERVED: do not change

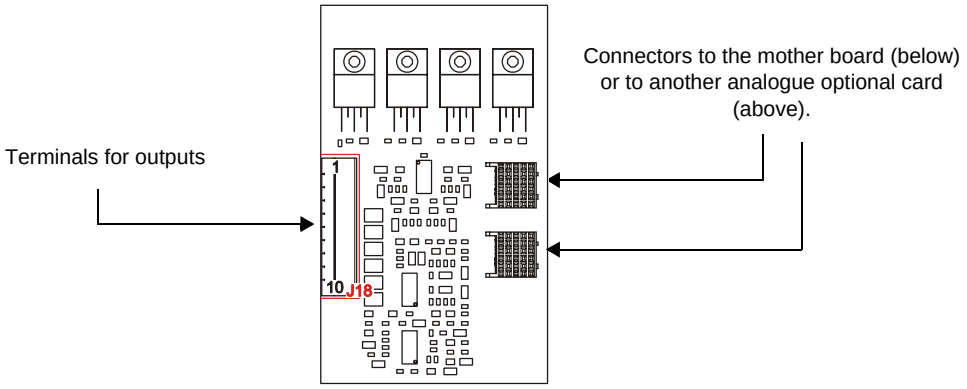
3.2.5 Technical data sheet



4 Optional analogue cards

4.1 FSAAVO10A - voltage driven analogue outputs

4.1.1 Description



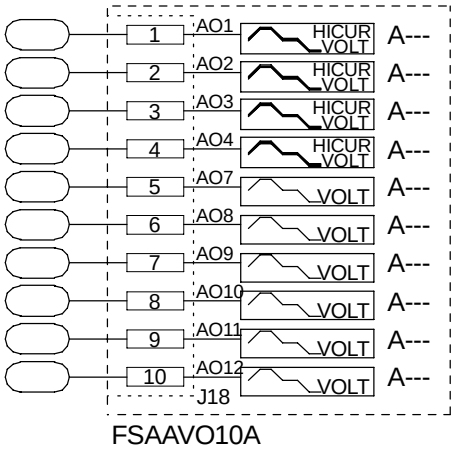
4.1.2 Technical data

Rated current of AO1-4 ..... ⎓100 mA (3 V)
Rated current of AO7-12 ..... 10 mA (28 V⎓)

4.1.3 Terminals layout

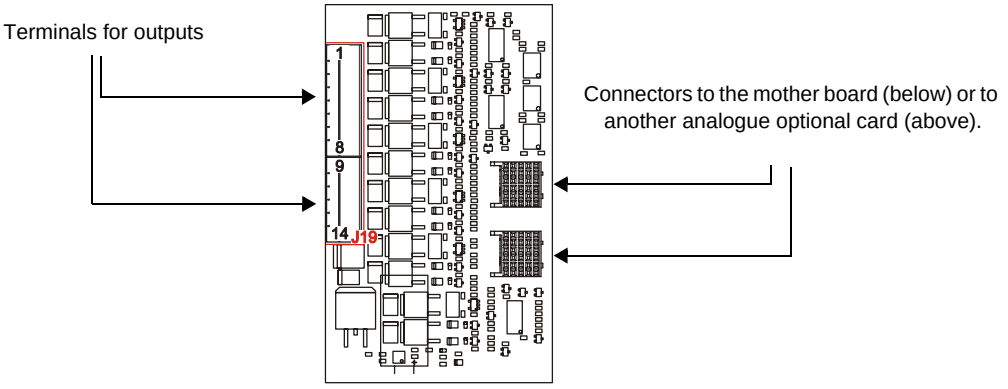
Connector	Terminal	Name	Description	Function
J18	1	AO1	output AO1	voltage driven analogue outputs AO1-4 and AO7-12
	2	AO2	output AO2	
	3	AO3	output AO3	
	4	AO4	output AO4	
	5	AO7	output AO7	
	6	AO8	output AO8	
	7	AO9	output AO9	
	8	AO10	output AO10	
	9	AO11	output AO11	
	10	AO12	output AO12	

4.1.4 Technical data sheet



4.2 FSAAPO06A - PWM driven analogue outputs

4.2.1 Description



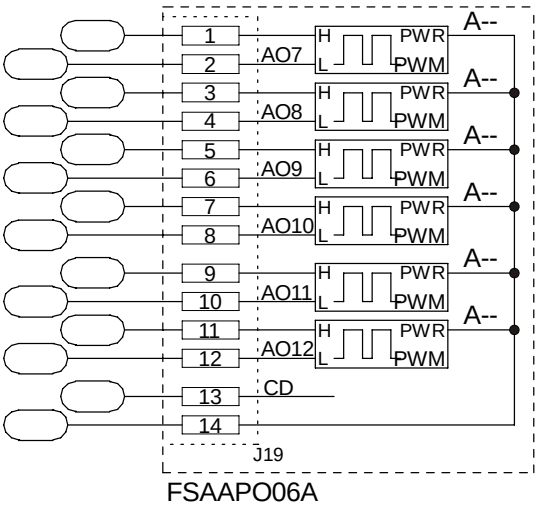
4.2.2 Technical data

Rated current of AO7-12 ..... 2 A (30 V⎓)

4.2.3 Terminals layout

Connector	Terminal	Name	Description	Function
J19	1	AO7 H	output AO7	PWM driven analogue outputs AO7-12
	2	AO7 L		
	3	AO8 H	output AO8	
	4	AO8 L		
	5	AO9 H	output AO9	
	6	AO9 L		
	7	AO10 H	output AO10	
	8	AO10 L		
	9	AO11 H	output AO11	
	10	AO11 L		
	11	AO12 H	output AO12	
	12	AO12 L		
	13	CD	common of reverse recovery diodes	
	14	COM AO7-12	common wire	

4.2.4 Technical data sheet



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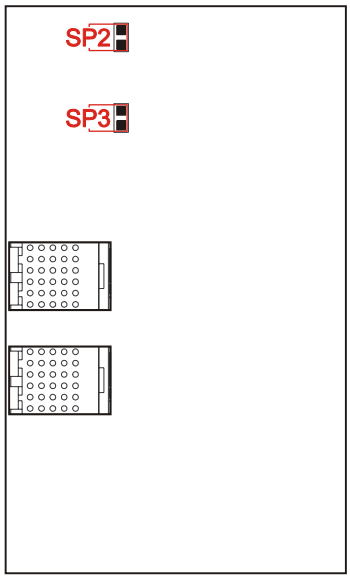
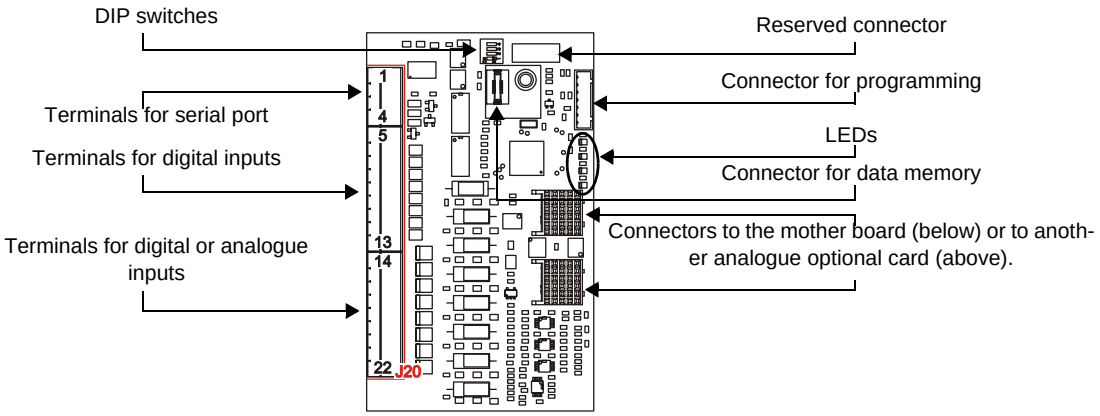
4.2.5 Pads

If optional card FSAAPO06A is installed in another ARM receiving unit with mother board FSAADP01A, pad groups SP2 and SP3 shall not be short-circuited.



4.3 FSAAMI01A - analogue inputs

4.3.1 Description



4.3.2 Technical data

RS485 serial interface ..... according to the standard TIA/EIA-485
RS232 serial interface ..... according to the standard TIA/EIA-232
Voltage on digital inputs ..... 5 - 30 V⎓
Voltage on analogue inputs ..... 0 - 10 V⎓
Current on analogue inputs ..... 4 - 20 mA (Ri=320Ohm)

4.3.3 Terminals layout

Connector	Terminal	Name	Description	Function
J20	1	GND SER	GND	serial port
	2	232RX	RX (RS232)	
	3	232TX 485A	TX (RS232) A (RS485)	
	4	232CTS 485B	CTS (RS232) B (RS485)	
	5	DIG IN 1	digital input 1	digital inputs 1-8
	6	DIG IN 2	digital input 2	
	7	DIG IN 3	digital input 3	
	8	DIG IN 4	digital input 4	
	9	DIG IN 5	digital input 5	
	10	DIG IN 6	digital input 6	
	11	DIG IN 7	digital input 7	
	12	DIG IN 8	digital input 8	
	13	GND DIG	GND (digital inputs 1-8)	
	14	ANL IN 1	analogue input 1	analogue inputs 1-8
	15	ANL IN 2	analogue input 2	
	16	ANL IN 3	analogue input 3	
	17	ANL IN 4	analogue input 4	
	18	ANL IN 5	analogue input 5	
	19	ANL IN 6	analogue input 6	
	20	ANL IN 7	analogue input 7	
	21	ANL IN 8	analogue input 8	
	22	GND ANL	GND (analogue inputs 1-8)	

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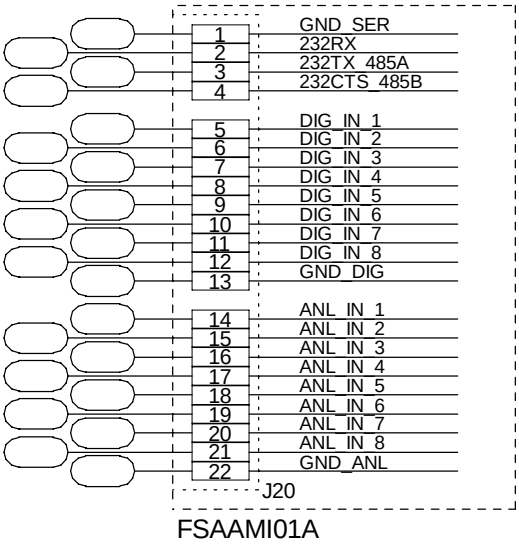
4.3.4 Technical data sheet

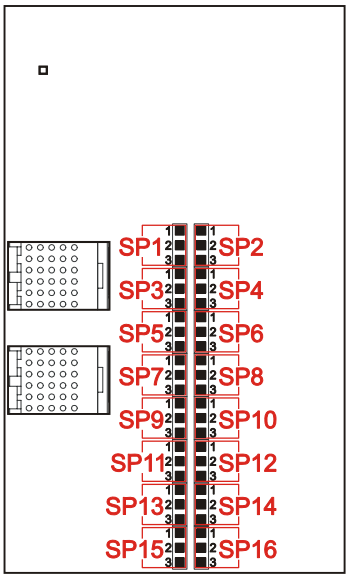


4.3.5 DIP switches

DIP	Position	Function
1	**ON**	RS232
	OFF	RS485
2	**ON/OFF**	not used
3	**ON/OFF**	not used
4	**ON**	RS485 termination enabled
	OFF	RS485 termination disabled

4.3.6 Pads

Pad groups on the back of the card are used to set analogue inputs either as current driven or voltage driven inputs. If you short-circuit pads 1-2 of both groups of a given input, you will obtain a current driven input; on the contrary, if you want to obtain a voltage driven input, you need to short circuit pads 2-3.



Analogue input	Current input	Voltage input
ANL IN 1	SP1 SP2	SP1 SP2
ANL IN 2	SP3 SP4	SP3 SP4
ANL IN 3	SP5 SP6	SP5 SP6
ANL IN 4	SP7 SP8	SP7 SP8
ANL IN 5	SP9 SP10	SP9 SP10
ANL IN 6	SP11 SP12	SP11 SP12
ANL IN 7	SP13 SP14	SP13 SP14
ANL IN 8	SP15 SP16	SP15 SP16

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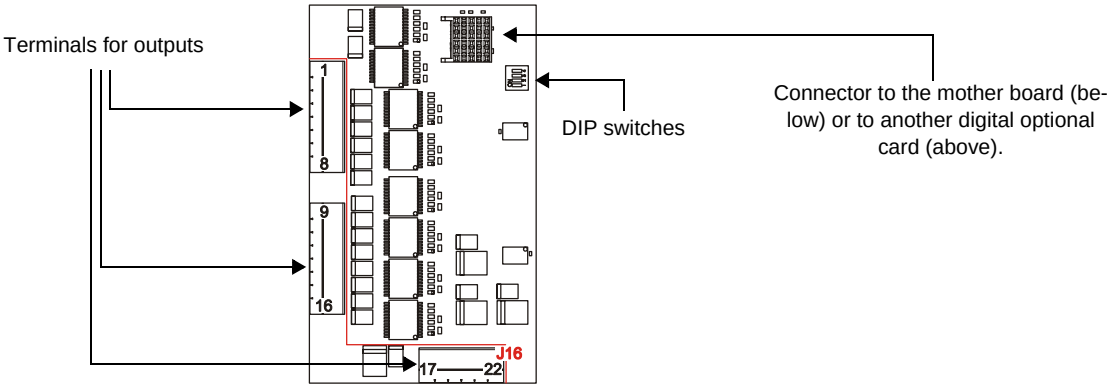
4.3.7 Light signals

LEDs	Position	Meaning
green	**off**	no power supply
	blinking	card is working
red	**on**	data memory is missing or error on the memory
yellow	**on**	set-up mode
blue	**///**	not used

5 Optional digital cards

5.1 FSADSO16A - solid state digital outputs

5.1.1 Description



5.1.2 Technical data

Rated current of digital outputs ..... 4 A (30 V⎓)

5.1.3 Terminals layout

Configuration A				
Connector	**Terminal**	**Name**	**Description**	**Function**
J16	**1**	DO17	output DO17	digital outputs DO17-32
	2	DO18	output DO18	
	3	DO19	output DO19	
	4	DO20	output DO20	
	5	DO21	output DO21	
	6	DO22	output DO22	
	7	DO23	output DO23	
	8	DO24	output DO24	
	9	DO25	output DO25	
	10	DO26	output DO26	
	11	DO27	output DO27	
	12	DO28	output DO28	
	13	DO29	output DO29	
	14	DO30	output DO30	
	15	DO31	output DO31	
	16	DO32	output DO32	
	17	COM DO29-32	common DO29-32	
	18	COM DO25-28	common DO25-28	
	19	COM DO21-24	common DO21-24	
	20	COM DO17-20	common DO17-20	
	21	CD	common of reverse recovery diodes	
	22	CD	common of reverse recovery diodes	

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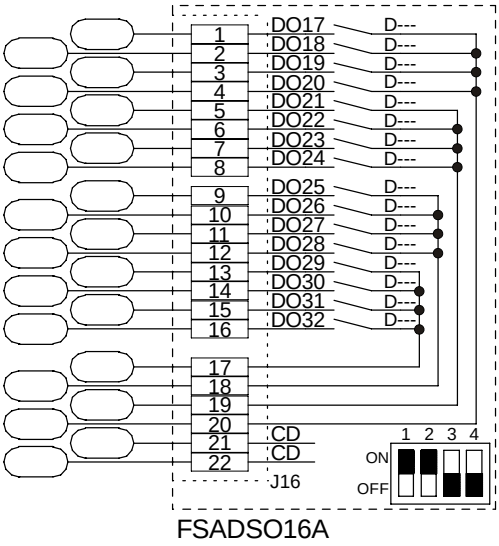
Configuration B				
Connector	**Terminal**	**Name**	**Description**	**Function**
J16	**1**	DO33	output DO33	digital outputs DO33-48
	2	DO34	output DO34	
	3	DO35	output DO35	
	4	DO36	output DO36	
	5	DO37	output DO37	
	6	DO38	output DO38	
	7	DO39	output DO39	
	8	DO40	output DO40	
	9	DO41	output DO41	
	10	DO42	output DO42	
	11	DO43	output DO43	
	12	DO44	output DO44	
	13	DO45	output DO45	
	14	DO46	output DO46	
	15	DO47	output DO47	
	16	DO48	output DO48	
	17	COM DO45-48	common DO45-48	
	18	COM DO41-44	common DO41-44	
	19	COM DO37-40	common DO37-40	
	20	COM DO33-36	common DO33-36	
	21	CD	common of reverse recovery diodes	
	22	CD	common of reverse recovery diodes	

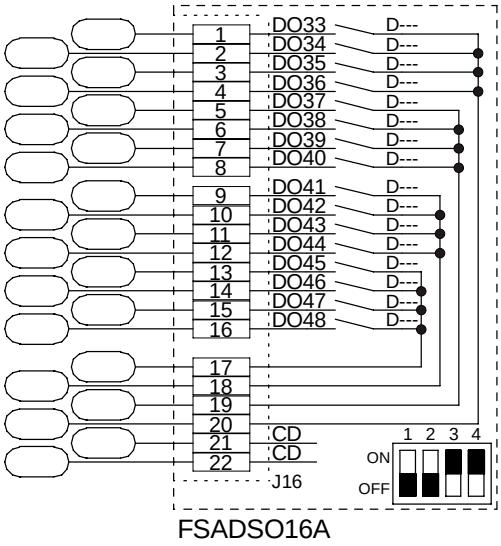
5.1.4 Technical data sheet

Configuration A



FSADSO16A

Configuration B



FSADSO16A

5.1.5 DIP switches

The two configurations indicated in the technical data sheet are the only possible settings for DIP switches.

	DIP 1	**DIP 2**	**DIP 3**	**DIP 4**	**Function**
Configuration A	**ON**	**ON**	**OFF**	**OFF**	card outputs are DO17-32
Configuration B	**OFF**	**OFF**	**ON**	**ON**	card outputs are DO33-48

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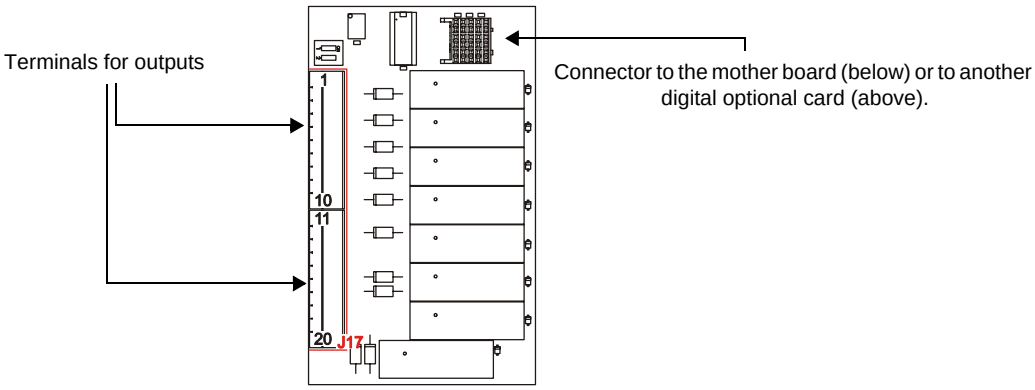
5.2 FSADRO08_ - relay digital outputs

5.2.1 Description



Optional card FSADRO08A shall be used when the receiving unit power supply is 24 V⎓.
Optional card FSADRO08B shall be used when the receiving unit power supply is 12 V⎓.

5.2.2 Technical data

Rated current of digital outputs ..... 4 A (30 V⎓)

5.2.3 Terminals layout

Configuration A				
Connector	**Terminal**	**Name**	**Description**	**Function**
J17	**1**	DO17	NC or NO DO17[a]	relay digital outputs DO17-24
	2		common DO17	
	3	DO18	NC or NO DO18[a]	
	4		common DO18	
	5	DO19	NC or NO DO19[a]	
	6		common DO19	
	7	DO20	NC or NO DO20[a]	
	8		common DO20	
	9	DO21	NC or NO DO21[a]	
	10		common DO21	
	11	DO22	NC or NO DO22[a]	
	12		common DO22	
	13	DO23	common DO23	
	14		NC DO23	
	15		NO DO23	
	16	DO24	common DO24	
	17		NC DO24	
	18		NO DO24	
	19	CD	common of reverse recovery diodes	
	20	CD	common of reverse recovery diodes	

a. NC or NO depends on how pads have been short-circuited (see paragraph 5.2.6)

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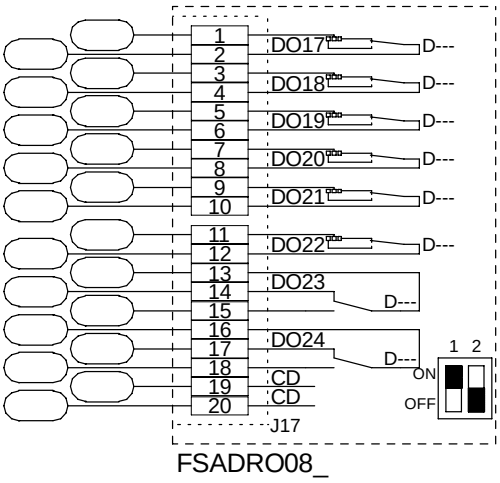
Configuration B				
Connector	**Terminal**	**Name**	**Description**	**Function**
J17	**1**	DO25	NC or NO DO25[a]	relay digital outputs DO25-32
	2		common DO25	
	3	DO26	NC or NO DO26[a]	
	4		common DO26	
	5	DO27	NC or NO DO27[a]	
	6		common DO27	
	7	DO28	NC or NO DO28[a]	
	8		common DO28	
	9	DO29	NC or NO DO29[a]	
	10		common DO29	
	11	DO30	NC or NO DO30[a]	
	12		common DO30	
	13	DO31	common DO31	
	14		NC DO31	
	15		NO DO31	
	16	DO32	common DO32	
	17		NC DO32	
	18		NO DO32	
	19	CD	common of reverse recovery diodes	
	20	CD	common of reverse recovery diodes	

a. NC or NO depends on how pads have been short-circuited (see paragraph 5.2.6)

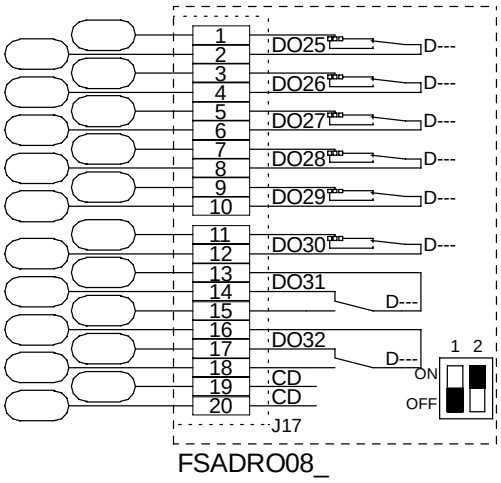
5.2.4 Technical data sheet

Configuration A



FSADRO08_

Configuration B



FSADRO08_

5.2.5 DIP switches

The two configurations indicated in the technical data sheet are the only possible settings for DIP switches.

	DIP 1	DIP 2	Function
Configuration A	**ON**	**OFF**	card outputs are DO17-24
Configuration B	**OFF**	**ON**	card outputs are DO25-32

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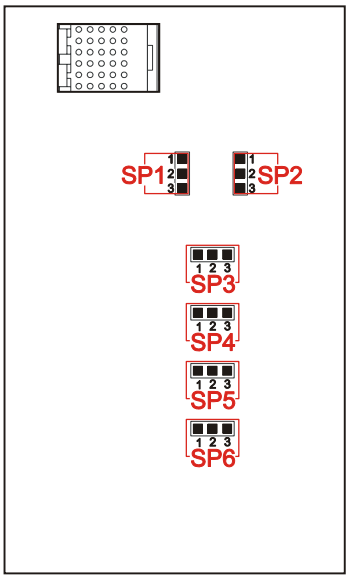
5.2.6 Pads

Pad groups on the back of the card are used to set outputs DO17-22 (configuration A) or outputs DO25-30 (configuration B) either as NC or NO. Short-circuit pads 1-2 to have an NC output; on the contrary, short-circuit pads 2-3 to have an NO output.

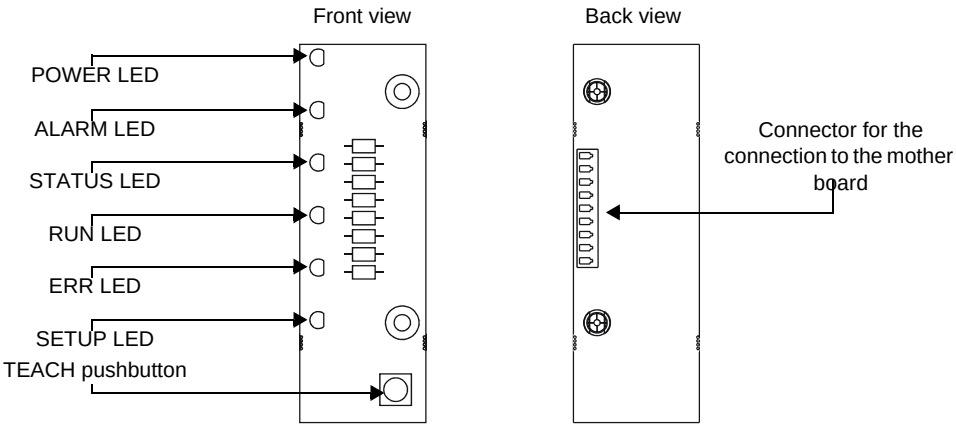


Output		NC	NO
Configuration A	Configuration B		
DO17	DO25		
DO18	DO26		
DO19	DO27		
DO20	DO28		
DO21	DO29		
DO22	DO30		

6 LED card

6.1 FSADLS06A - user interface

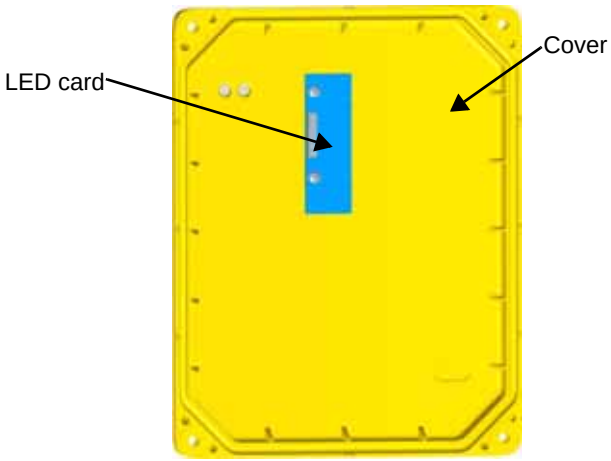
6.1.1 Description



7 Card position

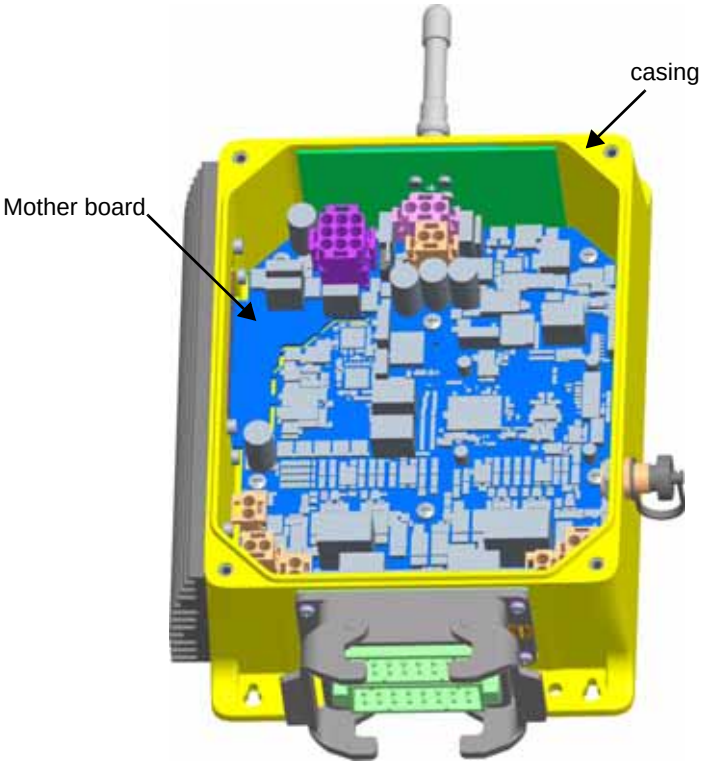
7.1 LED card position for user interface

The LED card shall be screwed in on the inner side of the cover.



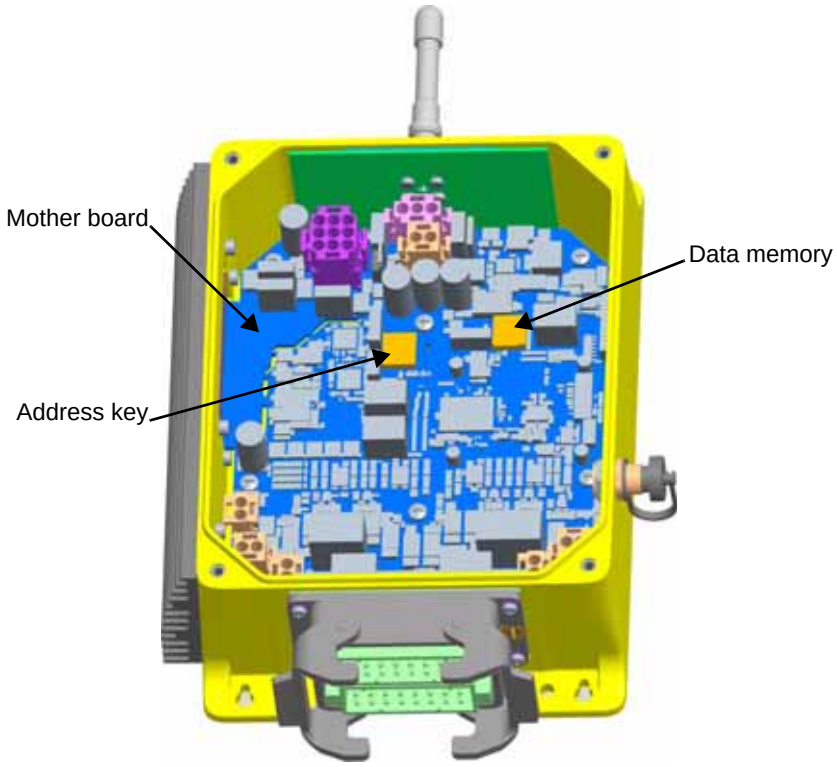
7.2 Mother board position

The mother board shall be screwed in inside the casing.



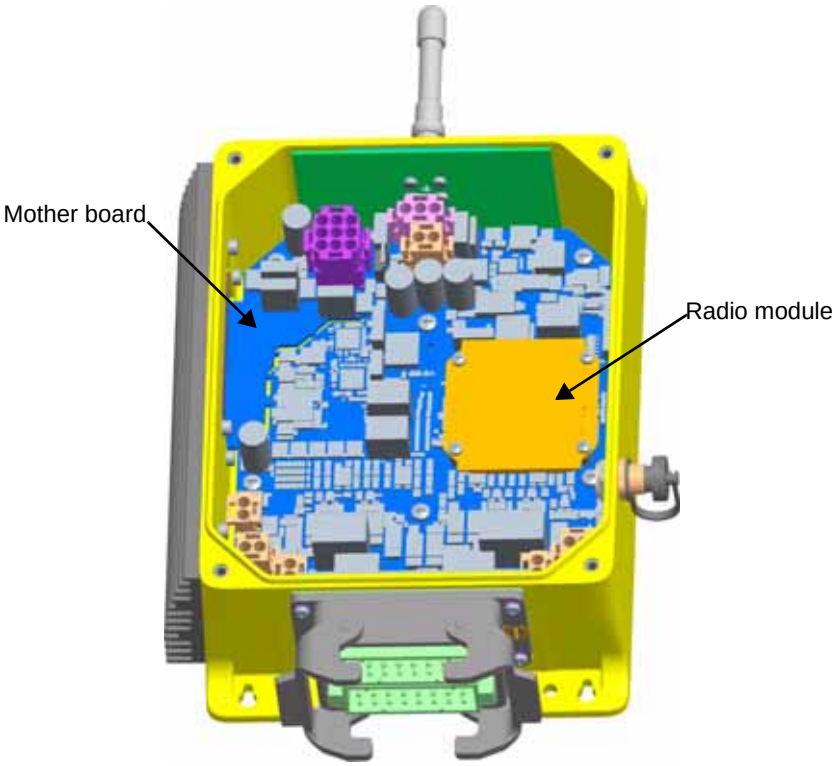
7.3 Address key and data memory position

The address key and the data memory shall be connected to the mother board through connectors JT6 (IDK) and JT8 (DTK) respectively and they shall be fastened with their screw.



7.4 Radio module position

The radio module shall be connected to the mother board through connectors JT3 and JT15 on the mother board and it shall be fastened with its four screws.



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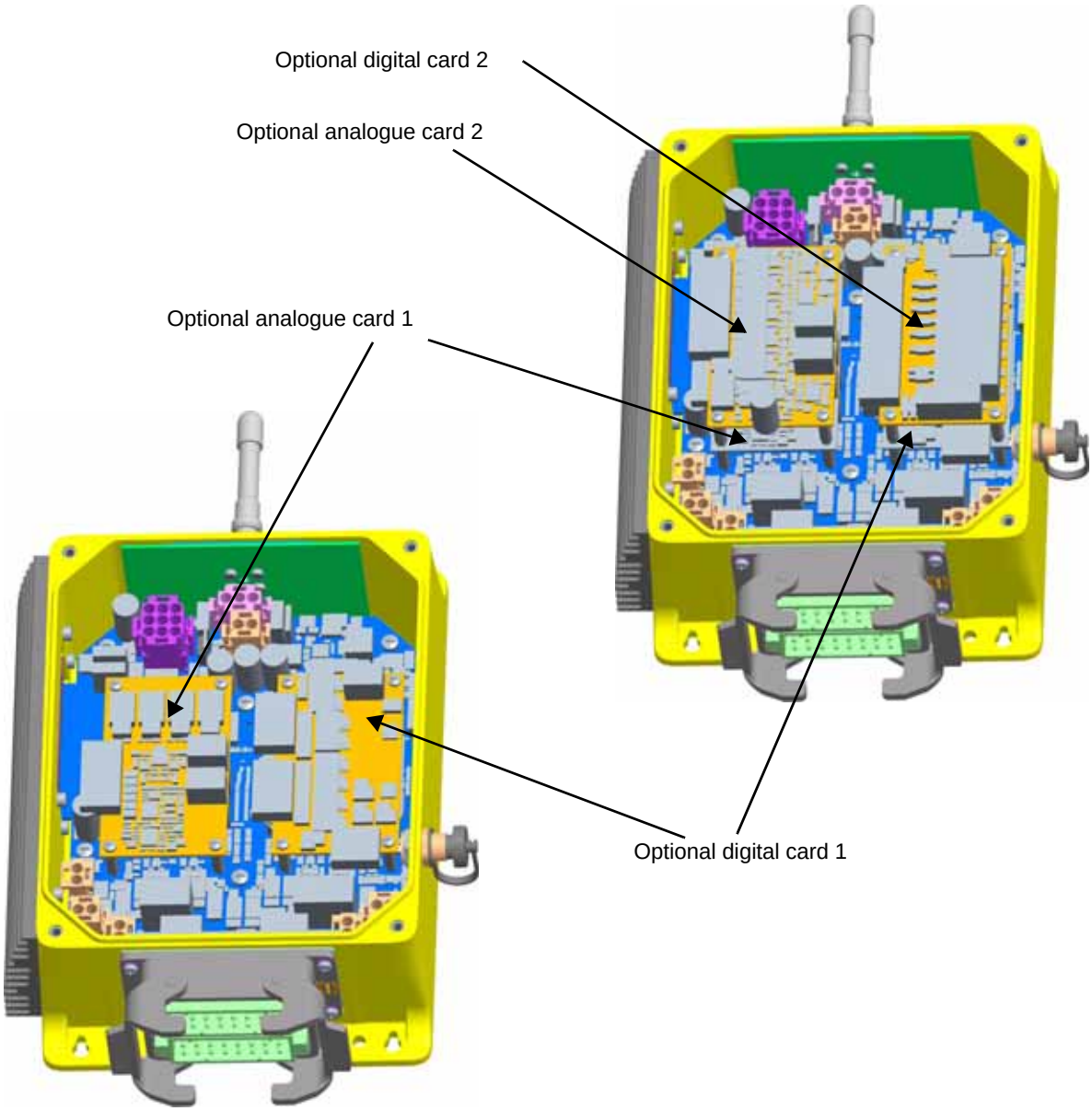
7.5 Optional cards position

ARM receiving unit may contain up to 4 optional cards, two of them with digital outputs and two of them with analogue outputs.
Up to two analogue optional cards may be placed, stacked, on the left.
Up to two digital optional cards may be placed, stacked, on the right.

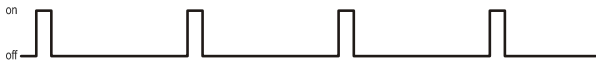


8 Light signals

The ARM receiving unit has six LEDs:
- POWER is green
- ALARM is red
- STATUS is blue
- RUN is green
- ERR is red
- SETUP is yellow.

8.1 POWER LED (green)

The POWER LED indicates the status of the receiving unit and of the radio link.

The POWER LED ...	Meaning
... is off	The receiving unit is switched off.
... blinks slowly 	Radio link has been built.
... is on	No radio link.

8.2 ALARM LED (red)

The ALARM LED warns about anomalies in the receiving unit.

The ALARM LED ...	Meaning
... is off	The receiving unit works correctly.
... repeats the sequence: a slow blink and a pause 	Error on the STOP outputs.
... repeats the sequence: two slow blinks and a pause 	Error on the SAFETY outputs.
... repeats the sequence: three slow blinks and a pause 	Error on the outputs corresponding to direction commands.
... is on	The receiving unit does not work correctly.

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8.3 STATUS LED (blue)

The STATUS LED warns about anomalies on the outputs or on the power supply and indicates the reception of data from the transmitting unit.

The STATUS LED ...	Meaning
... is off	No radio link.
... blinks slowly 	Over-voltage on power supply.
... blinks fast 	The receiving unit receives data from the transmitting unit.
... is on	Over-current in one of the PWM analogue outputs.

8.4 RUN LED (green)

RUN LED signals reflect the guidelines of the CANopen® standard, CiA recommendation 303-3. Terms used in the following table are therefore consistent with such recommendation.

The RUN LED indicates the status of the application layer (CANopen node).

The RUN LED ...	Meaning
... is off	The CAN node is off: the receiving unit is switched off or is performing a reset
... blinks fast 	The CAN node does not send commands on the network: configuration through the LSS services is in progress
... blinks slowly 	The CAN node does not send commands on the network: the receiving unit is in state PREOPERATIONAL
... repeats the sequence: a slow blink and a pause 	The CAN node does not send commands on the network: the receiving unit is in state STOPPED
... is on	The CAN node is working correctly: the receiving unit is in state OPERATIONAL

8.5 ERR LED (red)

ERR LED signals reflect the guidelines of the CANopen® standard, CiA recommendation 303-3. Terms used in the following table are therefore consistent with such recommendation.

The ERR LED indicates the status of the (CAN bus) physical layer and errors due to wrong configurations.

The ERR LED ...	Meaning
... is off	No operating problems.
... blinks fast 	CAN communication is not available: configuration through the LSS services is in progress

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The ERR LED ...	Meaning
... blinks slowly 	CAN communication does not work correctly: configuration errors on the receiving unit.
... repeats the sequence: a slow blink and a pause 	CAN communication does not work correctly: at least one of the frame error counters has reached the warning level.
... repeats the sequence: two slow blinks and a pause 	CAN communication does not work correctly: a "heartbeat event" or a "guard event" has occurred.
... repeats the sequence: three slow blinks and a pause 	CAN communication does not work: the SYNC message has not been received within the configured communication cycle period time out.
... is on	CAN communication does not work: the CAN controller is bus off.

8.6 SETUP LED (yellow)

The SETUP LED shows the status of the data memory and of the address key, depending on the receiving unit's working status.

The ALARM LED ...	Meaning
... is off	The receiving unit works correctly.
... repeats the sequence: a slow blink and a pause 	Error on the address key.
... repeats the sequence: two slow blinks and a pause 	Error on the data memory.
... repeats the sequence: three slow blinks and a pause 	Calibration of the rest position values for proportional outputs is being performed within the REMOTE SETUP procedure.
... repeats the sequence: three fast blinks and a pause 	The receiving unit is storing data set through the “REMOTE SETUP” or through the “Data memory backup”.
... repeats the sequence: four slow blinks and a pause 	Inversion of movement direction of the joysticks axis is being performed within the REMOTE SETUP procedure.
... blinks slowly 	A data memory is connected to the BKK connector.
... blinks fast 	This signal may have one of the following meanings, depending on the operations the receiving unit is performing: - two analogue commands are being activated simultaneously during the “REMOTE SETUP” procedure - the receiving unit is restoring factory settings - an error occurred during the “Data memory backup”.
... is on	The receiving unit is in “REMOTE SETUP” mode.

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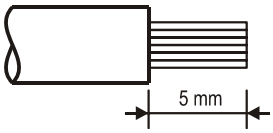
9 Electrical connection

Only use the provided connectors and terminals for electrical connections inside the ARM receiving unit. Depending on the connectors, to carry out receiving unit's wiring it may be necessary to connect a wire to the following components:

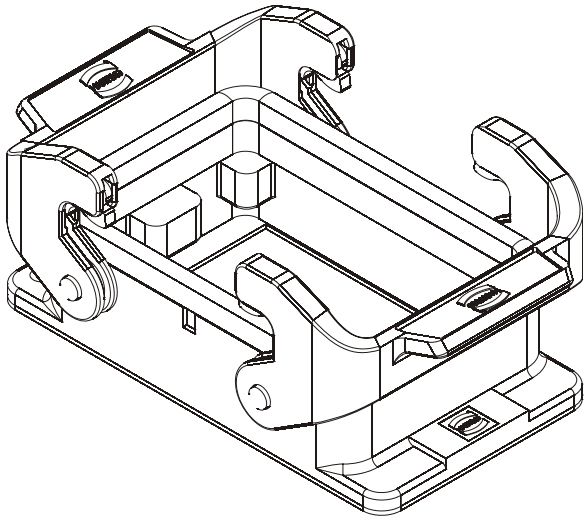
- a screw terminal on a Harting 32-pole plug
- a screw terminal on a Phoenix connector
- a crimp-style terminal on a Harting 50- or 72-pole plug
- a crimp-style terminal on a Tyco connector
- a crimp-style terminal on a Molex connector

Wires to be connected shall be stripped of as shown below.



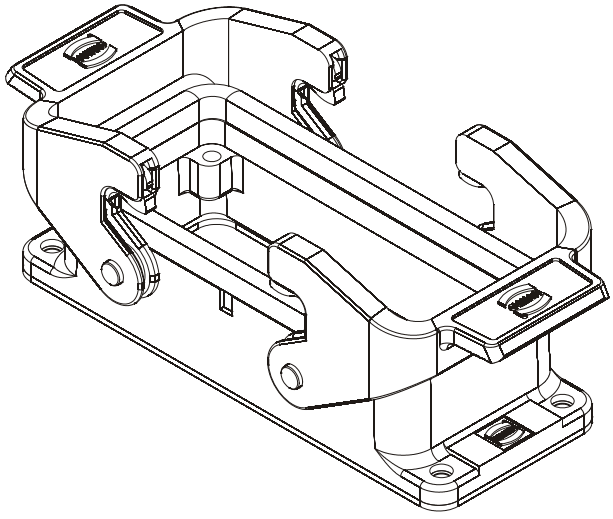
9.1 Housing for plugs (male insert) on the casing

9.1.1 Bulkhead mounting of Harting 32- and 50-pole plug



09 20 032 0301

9.1.2 Bulkhead mounting of Harting 72-pole plug



09 30 016 0301

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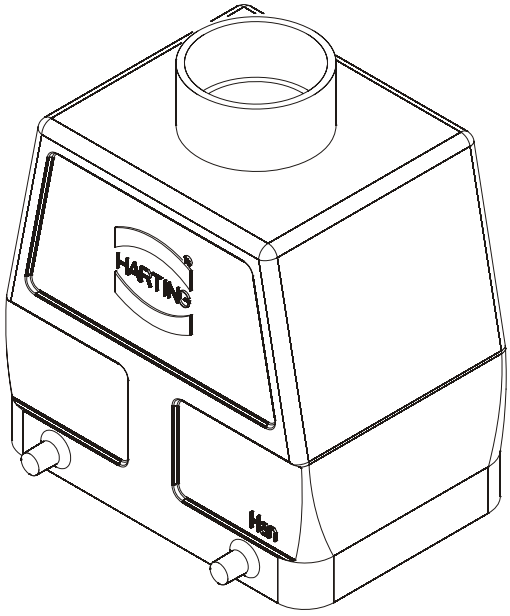
9.2 Housing for socket mounting (female insert) on the cable

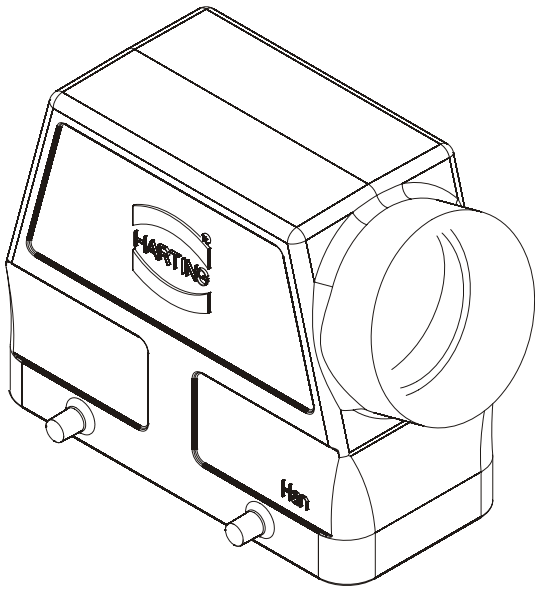
There are different kinds of hoods; one example for each model is listed here

9.2.1 Hood for Harting 32- and 50-pole socket



09 20 032 0420

9.2.2 Hood for Harting 72-pole socket

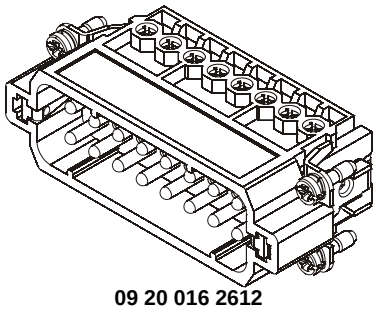


09 30 016 0521

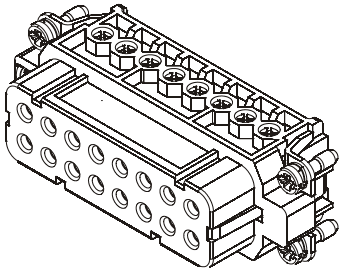
9.3 Screw terminals

9.3.1 Harting 32-pole plug

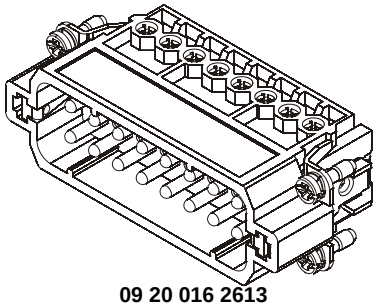
Brand	Model	No. of poles	Plug (on casing)	Socket (cable)
Harting	HAN 32 A	32	(1-16) 09 20 016 2612 (17-32) 09 20 016 2613	(1-16) 09 20 016 2812 (17-32) 09 20 016 2813



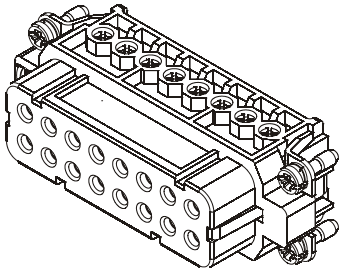
09 20 016 2612



09 20 016 2812



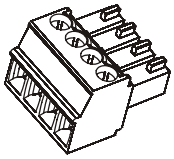
09 20 016 2613



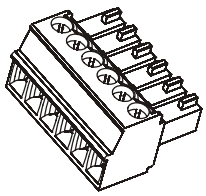
09 20 016 2813

9.3.2 Phoenix connector

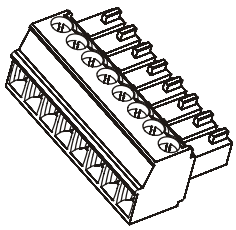
Brand	No. of poles	Type	Order number
Phoenix	4	MC 1,5/4-ST-3,5	1840382
	6	MC 1,5/6-ST-3,5	1840405
	8	MC 1,5/8-ST-3,5	1840421
	9	MC 1,5/9-ST-3,5	1840434
	10	MC 1,5/10-ST-3,5	1840447



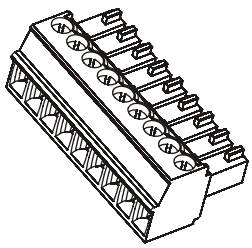
1840382



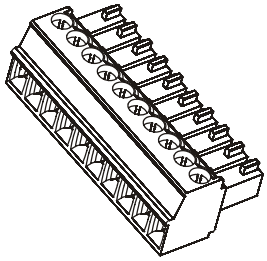
1840405



1840421



1840434



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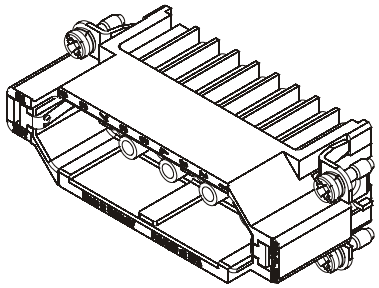
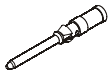
9.4 Crimp-style terminals

9.4.1 50- or 72-pole plug

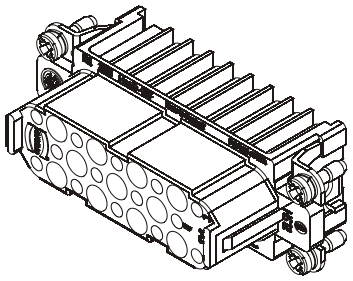
Brand	Model	No. of poles	Plug (on casing)			Socket (cable)		
			Connector	Crimp-style terminal		Connector	Crimp-style terminal	
			Art.	Wire section [mm^2]	Art.	Art.	Wire section [mm^2]	Art.
Harting	HAN 50 D	50	09 21 025 3001	0.5 mm^2	09 15 000 6103	09 21 025 3101	0.5 mm^2	09 15 000 6203
Harting	HAN 72 DD	72	09 16 072 3001	1.0 mm^2	09 15 000 6102	09 16 072 3101	1.0 mm^2	09 15 000 6202



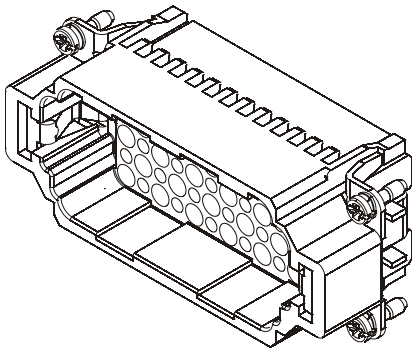
09 21 025 3001



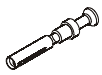
09 15 000 61xx



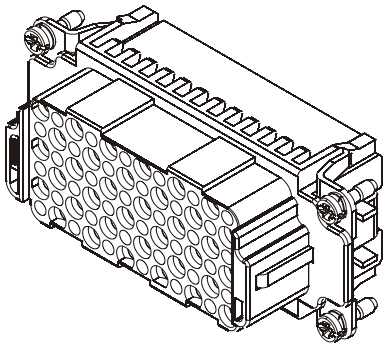
09 21 025 3101



09 16 072 3001



09 15 000 62xx

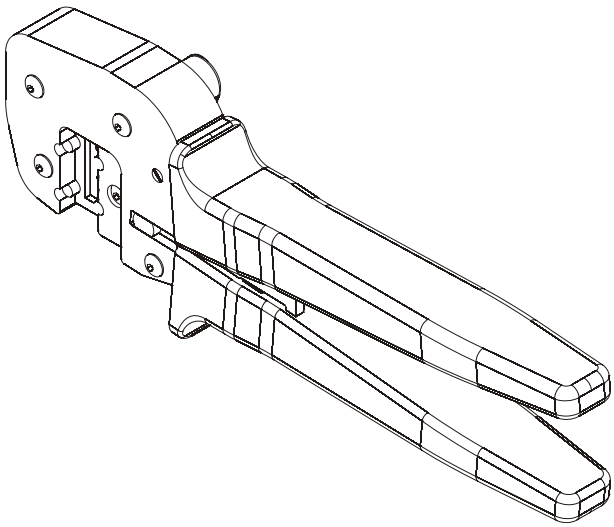


09 16 072 3101

Wire crimping

Use the specific Harting hand crimp tool to crimp wires to be connected to 50- or 72-pole connectors. The following instructions refer to Harting hand crimp tool part number 09 99 000 0110.

- Grip the hand crimp tool securely and squeeze, ratcheting the mechanism until it bottoms out. Then allow it to open completely.
- Insert the terminal in the appropriate hole on the hand crimp tool.
- Insert the pre-stripped wire into the terminal.
- Hold the wire and make sure that its isolation bottoms out in the terminal hole, then hold the hand crimp tool tight.
- Complete the crimp by squeezing the tool until the ratchet releases.
- Remove the terminated wire from the tool.



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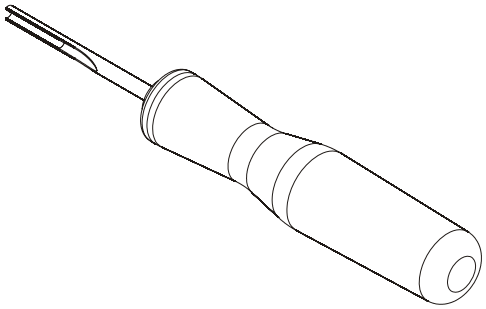
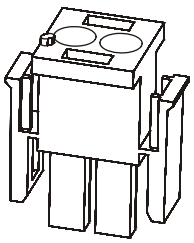
Inserting the terminated wire in the connector
Insert the terminated wire in the corresponding connector cavity.
We suggest to use a specific tool, Harting art. 09 99 000 0059, to insert 0.5 mm^2 section terminated wires.



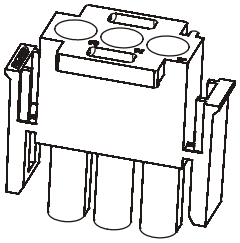
Terminals shall be inserted from the wiring side and shall be pushed until they bottom out.
Complete terminal insertion by pushing the terminated wire through the cavity until you hear a "click". Verify proper terminal seating with a light tug on the wire.

9.4.2 Tyco connector

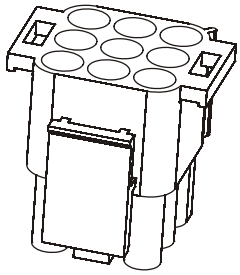
Brand	Series	Plug		
		Connector		Crimp-style terminal
		No. of poles	Art.	Art.
Tyco Electronics	Universal MATE-N-LOK	2	1-480698-0	350536-1
		3	1-480700-0	
		9	1-480706-0	



1-480698-0



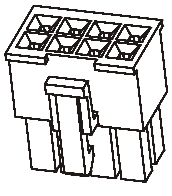
1-480700-0



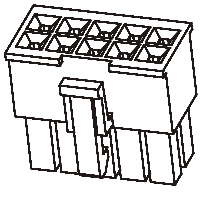
1-480706-0

9.4.3 Molex connector

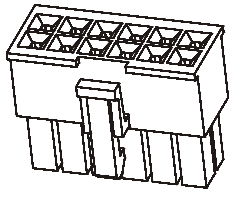
Brand	Series	Plug				
		Connector			Crimp-style terminal	
		No. of poles	Model	Part	Model	Art.
Molex	Mini Fit	8	5557	39-01-2080	5556	39-00-0038
Molex		10		39-02-2100		
Molex		12		39-02-2120		



39-01-2080



39-01-2100



39-02-2120

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10 Warnings for installation

The radio remote control can only be installed and tested by competent staff that masters the technical knowledge required to carry out such procedure and is qualified according to the regulation of the country where the radio remote control is mounted.
Only if the radio remote control is installed correctly can it be used safely.

Besides instructions established by the machine's manufacturers, installers must always observe the following warnings.

DANGER

Never connect power supply positive pole to the outputs. Such connection would exclude the UMFS and STOP safety functions. In this case the machine may be in a dangerous condition, out of the user's control. The installer or the machine's manufacturer must avoid that a power supply positive pole is connected to the outputs.

10.1 General

WARNING

Respect and enforce the provisions of all reference standards relevant in the concerned application field (i.e. IEC 60204-32 for hoisting machines.)

Always follow the instructions provided in the “technical data sheet” and respect values given in the technical data to carry out correct installation.

Due to the characteristics of radio propagation (i.e.: EM interference, near out-of-range condition), a delay up to the "Passive stop time" may occasionally occur from the moment a command in the transmitting unit is released to the moment its corresponding output in the receiving unit is deactivated.
With regards to the SAFETY outputs only (SAF_1 and SAF_2), a regular deactivation delay (approx. 1 second) applied to such outputs may add to this time.
Those who decide upon the installation of the radio remote control must make sure that these delays never lead to a dangerous situation in the specific uses.

10.2 Mounting and fastening the receiving unit in the best position

WARNING

Place the receiving unit so as to avoid incidental contact.

Place the receiving unit so that it can be easily reached in case of need.

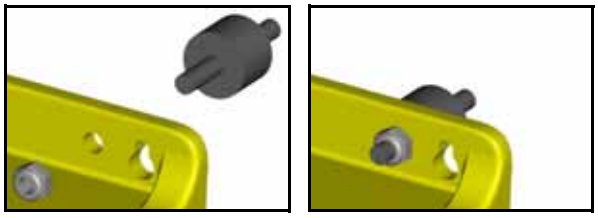
Place the receiving unit so that it can be easily reached, and far from heat sources (i.e. exhaust pipes, heat exchangers, radiators).

Place the receiving unit vertically, with the plug facing down.

Fix the receiving unit in four points, using the specific holes in the housing.

Do not perforate the receiving unit in any case.

It is recommended to use the appropriate vibration dampers when installing the system on machines that produce strong vibrations.



10.3 Mounting and fastening the antenna in the best position

WARNING

Install the antenna so that shields, structures or materials do not obstruct the radio link; in particular:
- **the antenna shall not be placed inside closed metal containers**
- **the antenna must be installed in a vertical position, and possibly in sight of the work area**
- **the antenna must be placed at least 50 cm far from metal objects in its surroundings.**

If these warnings are disregarded, the typical working range of the radio remote control may be reduced.

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The appropriate extension kit for the antenna may be used, in order to abide by the above-mentioned indications. In this case, place the antenna as far as possible from the receiving unit and from other electrical and electronic devices.

10.4 Wiring

WARNING **Wiring inside the receiving unit shall be made with electrical wires resistant to at least 125°C usage temperature.**

Group wiring according to the following indications:
1. **all wires connected to the same connector must be grouped together**
2. **all wires connected to connectors J1 to J8 on the mother board must be grouped together**
3. **all groups of wires shall be far from the radio module, in order to avoid interference and dangers related to electrical safety.**

Make sure that the receiving unit's power supply is protected against short circuits and is supplied either by a battery or by a power supply unit with safety isolating transformer.

The power supply of the receiving unit must have a switch that allows power supply disconnection during installation, wiring and/or maintenance operations. Connect the receiving unit immediately downstream of the machine main switch or of the electrical panel main switch (see paragraph 13).

Pay special attention to the currents flowing in outputs SAF_1, SAF_2, STP_1 and STP_2: they shall not exceed the maximum permitted values (see paragraphs 3.1.2 and 3.2.2).

The current of STOP outputs is interrupted at regular intervals for approx. 1 ms every 100 ms. If STOP outputs are used to power electronic devices, check that they are compatible with this recurring interruption (use suitable filters if necessary).

If STOP outputs are connected in series with SAFETY outputs, set DIP 3 on the mother board in the ON position.

10.5 At end of installation

WARNING **Make sure that during installation the safety mechanisms on the radio remote control and/or in the machine have not been made ineffective by possible procedures carried out.**

Correctly close the receiving unit so that the protection degree from dust and water is not jeopardised: check that the gasket is intact, correctly put the housing parts one over the other so that they overlap, and screw in the screws.

10.6 Testing

WARNING **After installation and wiring, test the system “machine+radio remote control”, and check that the operations carried out correspond exactly to the commands sent (in particular check the STOP command).**

Make sure that outputs SAF_1 and SAF_2 only activate after the radio remote control start up.

The installer must check and complete the "Technical Data Sheet" in all its parts, adding the date the system has been put into service, his stamp and signature.

In case of malfunction, disable the system “machine+radio remote control” until the problem has been completely solved.

11 STOP outputs

Outputs STP_1 and STP_2 are enabled by the STOP command.

STP_1_IN and STP_2_IN shall always receive power supply between 8 and 30 V⎓, even though the corresponding outputs STP_1 and STP_2 are not used.

CAUTION

The current of STOP outputs is interrupted at regular intervals for approx. 1 ms every 100 ms. Risk analysis must consider this interruption.

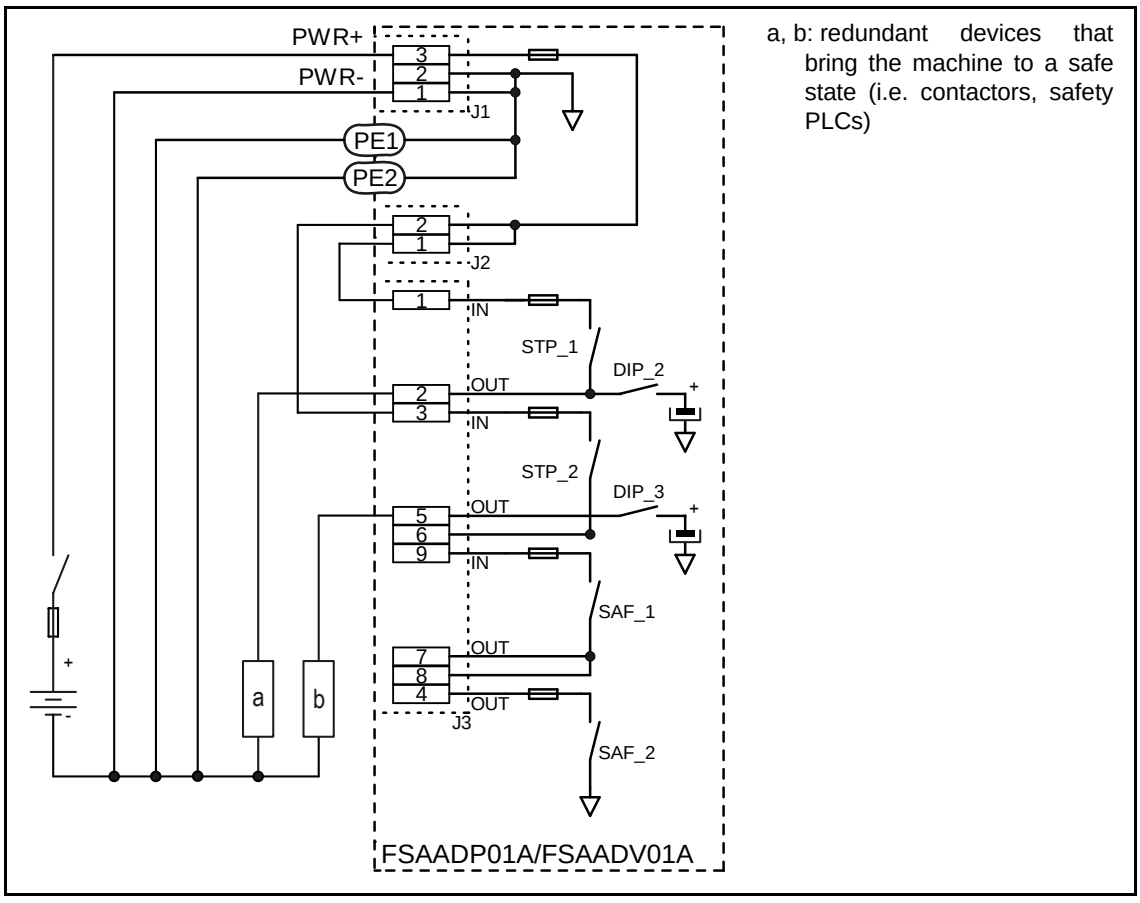
WARNING

If failure not related to the ARM receiving unit occurs (i.e. short circuit between STP_2_IN and STP_2_OUT) and if DIP_2 and/or DIP_3 in the mother board are in the ON position (even by mistake or due to failure), the filter capacitors (1000 μF) may cause a further delay in de-energising the STOP circuit, thus extending the declared stop time. This delay depends on the device connected to the output (i.e. this delay is shorter than 500 ms if impedance of the device is lower than 500 Ω or if such device absorbs constant current higher than 50 mA). **Take into account this aspect when carrying out the risk analysis, as well as the fact that such situations are not detected by the radio remote control.**

Wiring of outputs STP_1 and STP_2 is the factor that defines the safety level for the UMFS protection function.

11.1 Stop function complying with cat. 4 PL=e and SIL 3

The stop function complies with cat. 4 and PL=e according to the EN ISO 13849-1 and with SIL 3 according to the EN IEC 62061 if outputs STP_1 and STP_2 in the receiving unit have been wired as follows:



a, b: redundant devices that bring the machine to a safe state (i.e. contactors, safety PLCs)

WARNING

The installer or the machine manufacturer is in any case responsible for carrying out wiring in such a way as to ensure the safety level required by risk analysis; in particular, short circuit among the wires of the STOP circuit outside the receiving unit must be avoided.

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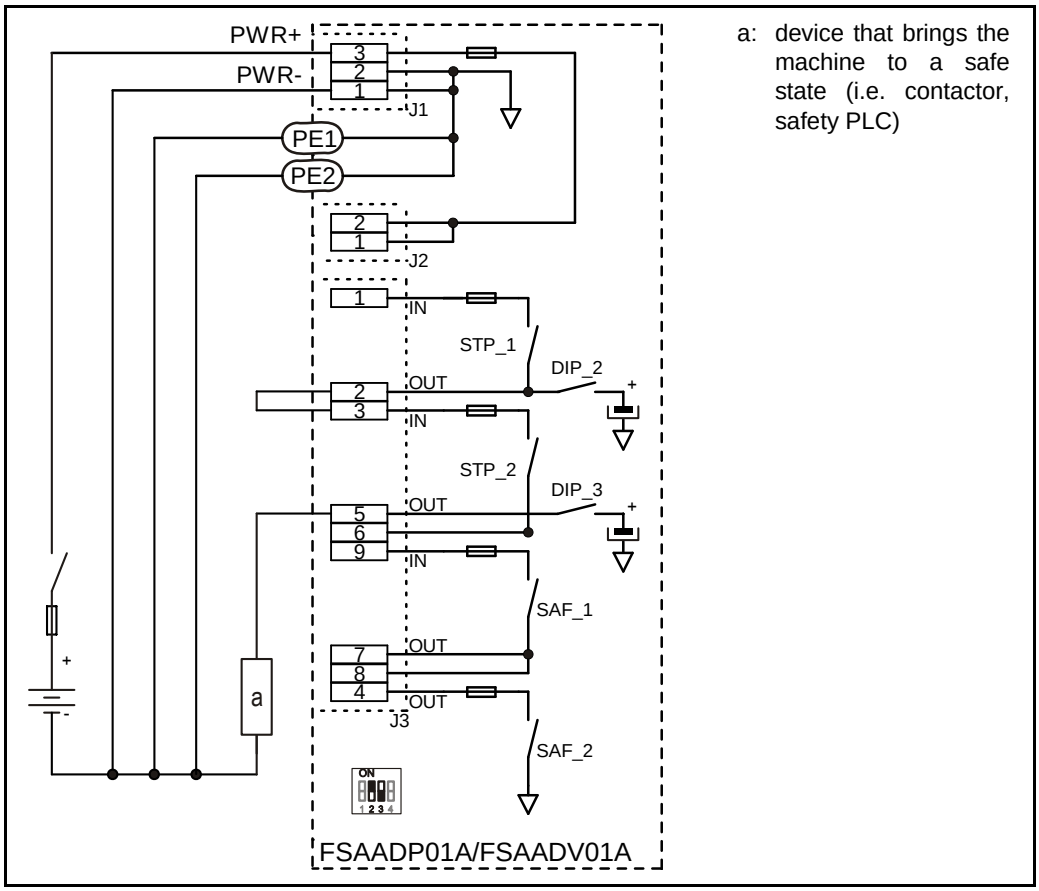
11.2 Stop function complying with cat. 3 PL=d and SIL 2

If outputs STP_1 and STP_2 require a 2-wire wiring, the stop function complies with cat. 3 and PL=d according to the EN ISO 13849-1 and SIL 2 according to the EN IEC 62061 if wiring is carried out as follows:



a: device that brings the machine to a safe state (i.e. contactor, safety PLC)

WARNING **When outputs STP_1 and STP_2 are connected in series, set DIP 2 on the mother board (activating the filter capacitor) in the ON position.**

WARNING **The installer or the machine manufacturer is in any case responsible for carrying out wiring in such a way as to ensure the safety level required by risk analysis; in particular, short circuit among the wires of the STOP circuit outside the receiving unit must be avoided.**

12 SAFETY outputs

Outputs SAF_1 and SAF_2 are enabled by the SAFETY command.

Outputs SAF_1 and SAF_2 are designed to drive power loads and are protected through fuses and reverse recovery diodes, to ensure longest lifetime in most applications.
If these outputs drive inductive loads (i.e. solenoid valves, relays), it is recommended to use a reverse recovery diode with the load, to further reduce the effects of demagnetisation currents.

DANGER

If a power supply positive pole is connected by mistake to SAF_2_OUT, then if DIP_1 on the mother board closes, this compromises correct operation of output SAF_1 and excludes the UMFS safety function. In this case the machine may be in a dangerous condition, out of the user's control.

The installer or the machine's manufacturer must avoid that a power supply positive pole is connected to SAF_2 _OUT.

SAF_1_IN shall always receive power supply between 8 and 30 V⎓, even though output SAF_1 is not used.

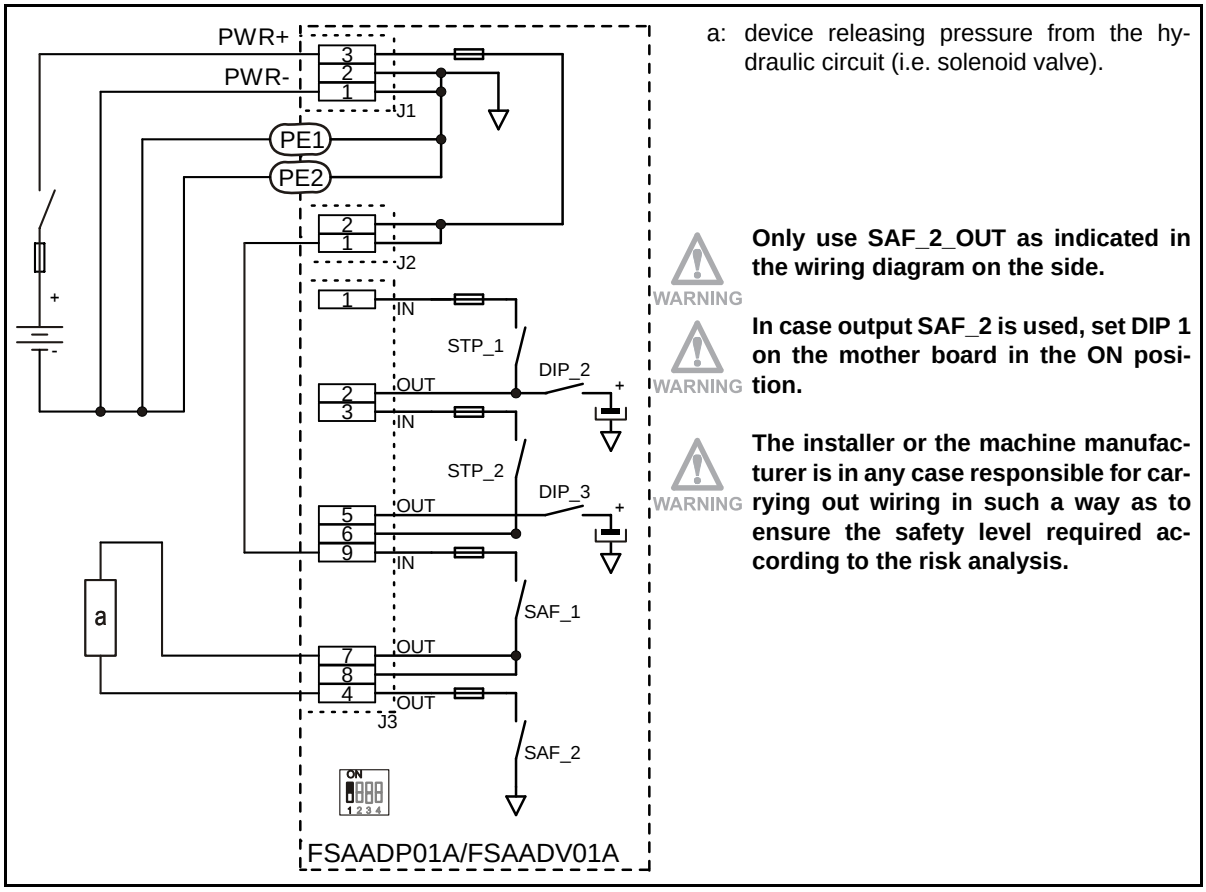
WARNING

When failure is detected in at least one of the of outputs SAF_1 and SAF_2, the STOP circuit automatically opens within 200 ms. Risk analysis must consider this delay.

Wiring of outputs SAF_1 and SAF_2 is the factor that defines the safety level for the UMFS protection function.

12.1 Device releasing pressure from the machine's hydraulic circuit

The UMFS safety function meets the requirements of cat. 3 and PL=d according to the EN ISO 13849-1 and SIL 2 according to the EN IEC 62061 only if SAFETY outputs on the mother board FSAADP01A or FSAADV01A enable the device that releases pressure from the machine's hydraulic circuit. Wiring shall be as follows:



a: device releasing pressure from the hydraulic circuit (i.e. solenoid valve).

WARNING

Only use SAF_2_OUT as indicated in the wiring diagram on the side.

WARNING

In case output SAF_2 is used, set DIP 1 on the mother board in the ON position.

WARNING

The installer or the machine manufacturer is in any case responsible for carrying out wiring in such a way as to ensure the safety level required according to the risk analysis.

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12.2 Analogue command

The UMFS safety function meets the requirements of cat.3 and PL=d according to the EN ISO 13849-1 and SIL 2 according to the EN IEC 62061 if the following conditions are satisfied:

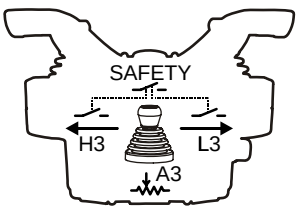
- commands A1-8 and L1-8/H1-8 are enabled by joysticks in the **transmitting unit**
- in the **receiving unit**
  - **with mother board FSAADP01A (PWM)** output SAF_1 is connected in series with the common of outputs AO1-8 enabled by commands A1-8 and L1-8/H1-8.
  - **with mother board FSAADV01A (voltage)** output SAF_1 is connected in series with the common of outputs LO1-8, HO1-8 enabled by commands L1-8/H1-8.
  - outputs STP_1 and STP_2 are connected as indicated in paragraph 11.1 or in paragraph 11.2.
    If outputs STP_1 and STP_2 are not used, they must be wired in series with output SAF_1 (see paragraph 12.4).

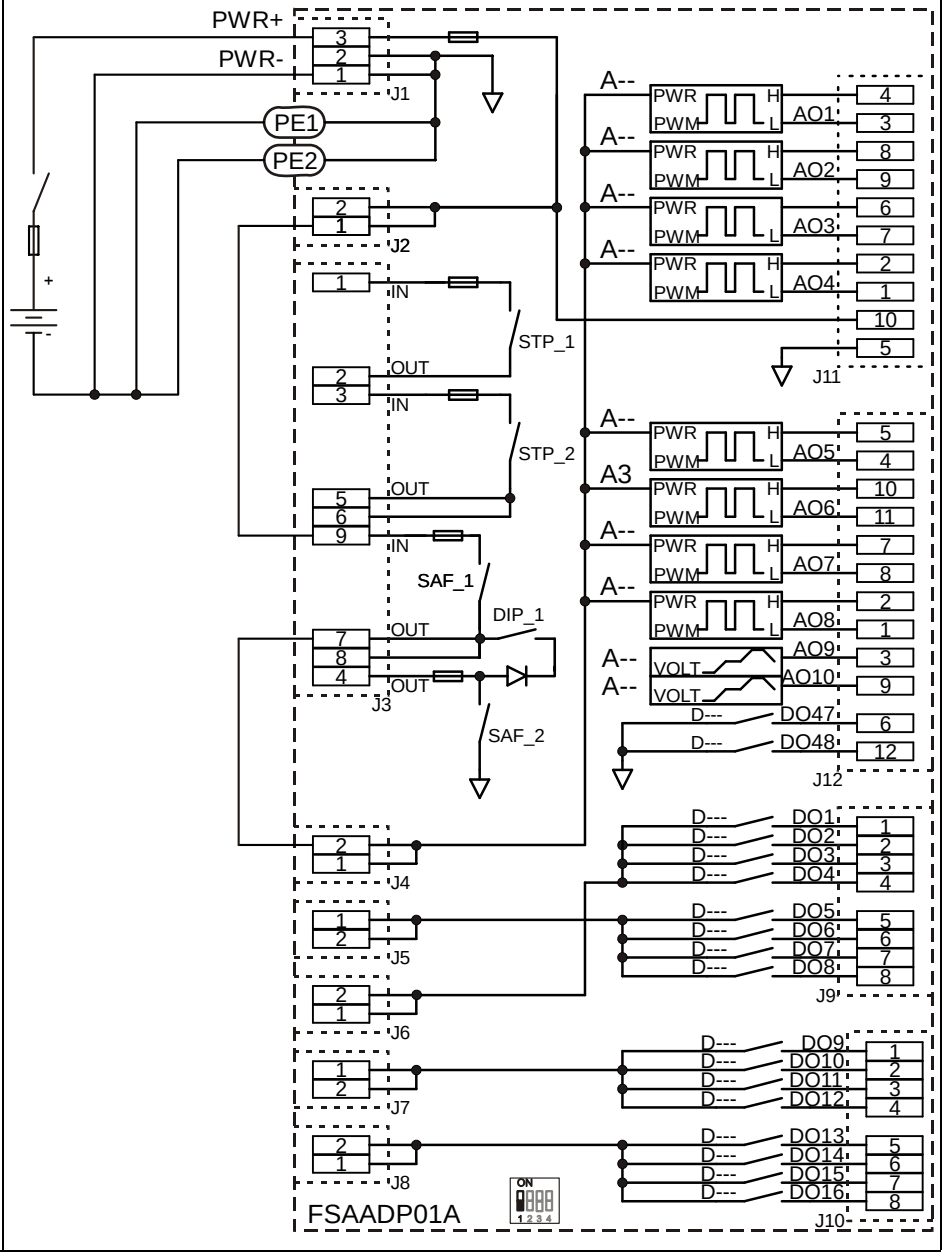
WARNING

The installer or the machine manufacturer is in any case responsible for carrying out wiring in such a way as to ensure the safety level required according to the risk analysis.

Example of wiring of a PWM analogue output

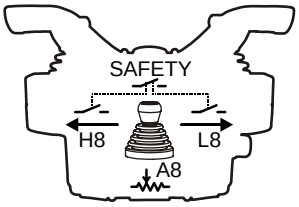
Transmitting unit	Receiving unit with mother board FSAADP01A

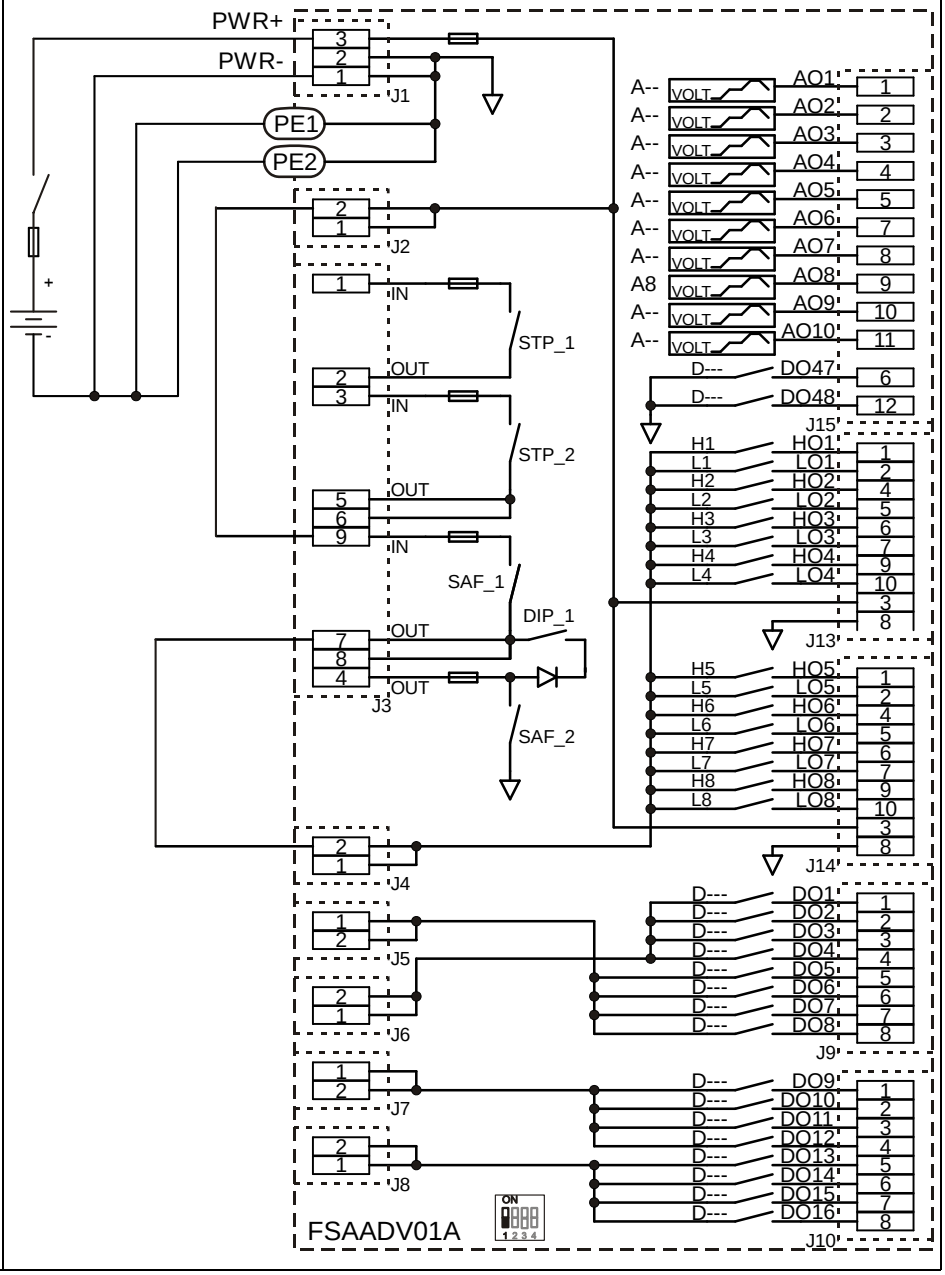




Example of wiring of a voltage analogue output

Transmitting unit	Receiving unit with mother board FSAADV01A





12.3 Digital command

The UMFS safety function meets the requirements of cat.3 and PL=d according to the EN ISO 13849-1 and SIL 2 according to the EN IEC 62061 if the following conditions are satisfied:

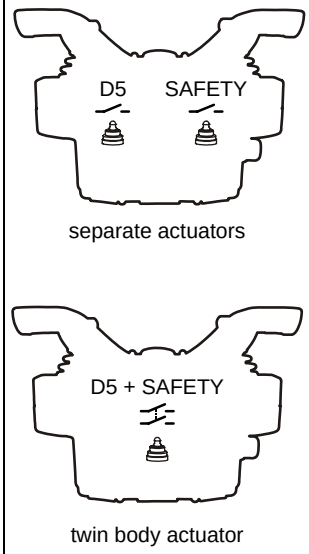
- in the **transmitting unit** commands D2-16 and SAFETY are enabled simultaneously by separate actuators or by a twin body actuator compliant with IEC EN 60947-5-1
- in the **receiving unit**, output SAF_1 is connected in series with the common of outputs enabled by commands D2-16, and outputs STP_1 and STP_2 are connected as indicated in paragraph 11.1 or in paragraph 11.2.
  If outputs STP_1 and STP_2 are not used, they must be wired in series with output SAF_1 (see paragraph 12.4).

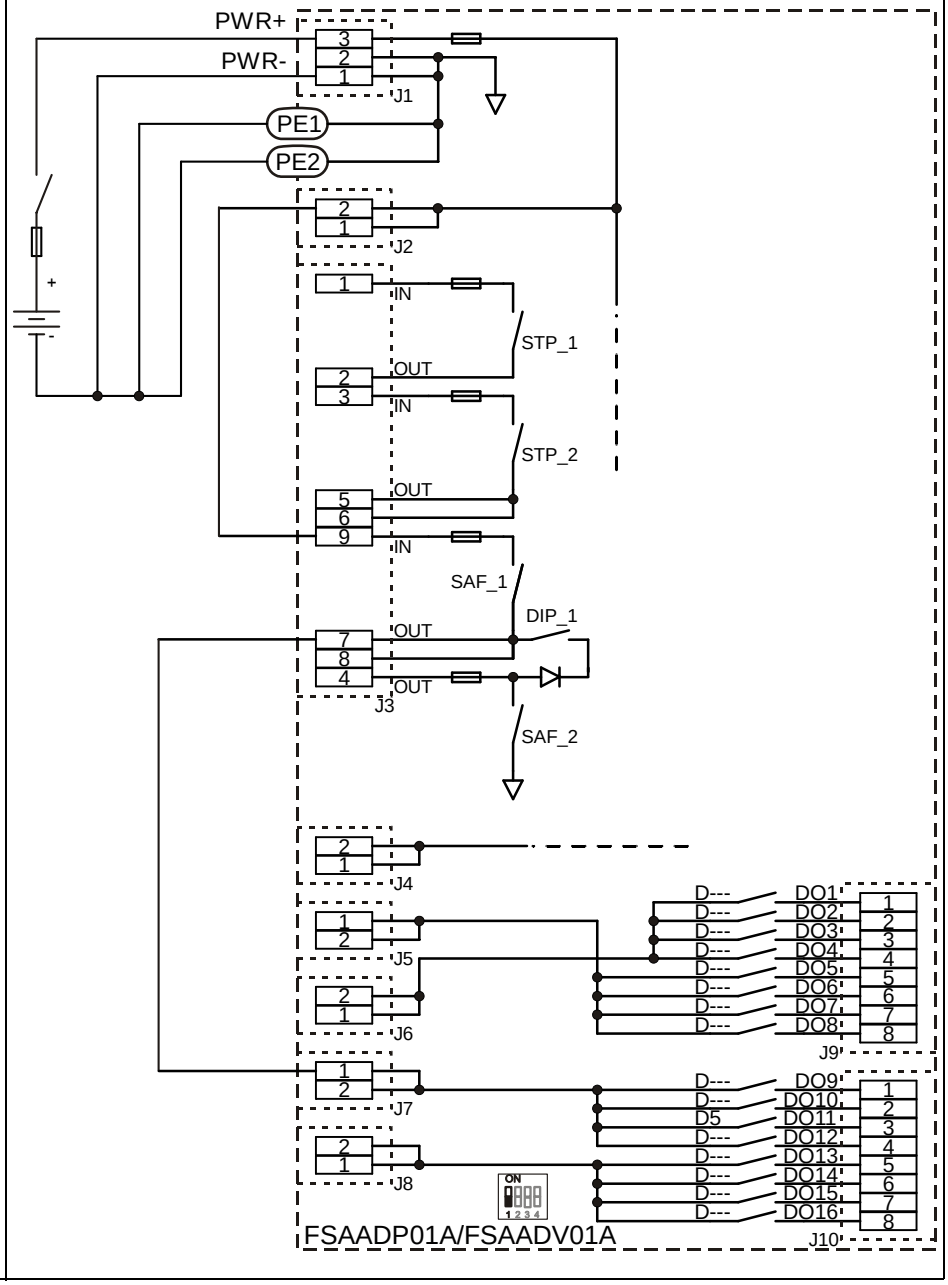
WARNING

The installer or the machine manufacturer is in any case responsible for carrying out wiring in such a way as to ensure the safety level required according to the risk analysis.

Example of wiring of a digital output

Transmitting unit	Receiving unit





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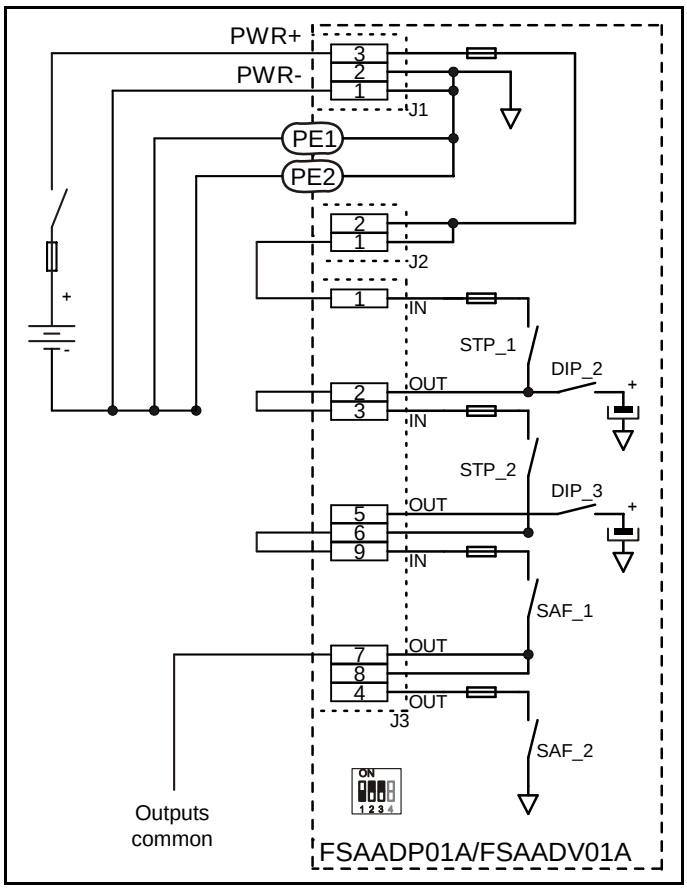
12.4 Outputs STP_1 and STP_2 not used for the Stop function

If outputs STP_1 and STP_2 are not used in cases described in paragraphs 12.2 and 12.3, the UMFS safety function only complies with cat.3 and PL=d according to the EN ISO 13849-1 and with SIL 2 according to the EN IEC 62061 if those outputs are connected in series with output SAF as follows.1



WARNING **When outputs STP_1, STP_2 and SAF_1 are connected in series, set DIP 2 and DIP 3 on the mother board (activating the filter capacitors) in the ON position.**
If failure occurs (i.e. short circuit between SAF_1_IN and SAF_1_OUT), such capacitors (1000 μF) may cause a further delay in de-energising the output common, thus extending the declared stop time. This delay depends on devices connected to the outputs' common (i.e. new delay is shorter than 500 ms if impedance of devices is lower than 500 Ω or if such devices absorb constant current higher than 50 mA). Take into account this aspect when doing the risk analysis, as well as the fact that such failure is not detected by the radio remote control.

WARNING **The installer or the machine manufacturer is in any case responsible for carrying out wiring in such a way as to ensure the safety level required according to the risk analysis.**

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13 Power supply

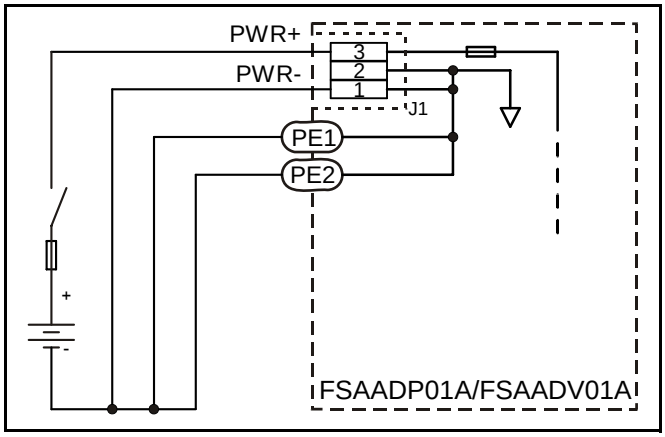
Power on the receiving unit through a battery or a power supply unit with safety isolating transformer, and always respect technical data.

Power supply must be protected against short circuits.

The power supply must have a switch that allows power supply disconnection during installation, wiring and/or maintenance operations. Connect the receiving unit immediately downstream of the machine main switch or of the electrical panel main switch.

13.1 Wiring power supply

Connect power supply to the receiving unit as follows:

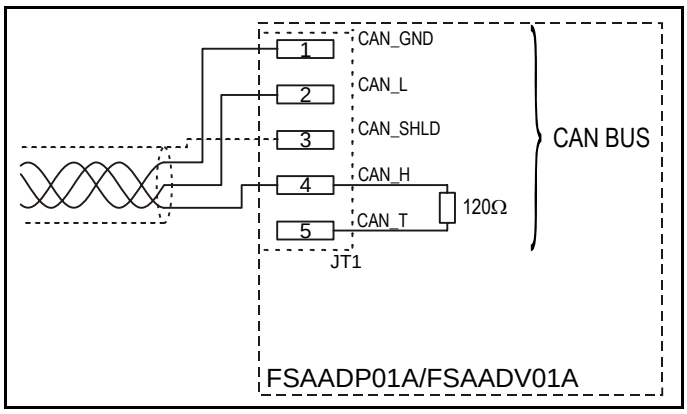


14 CAN BUS

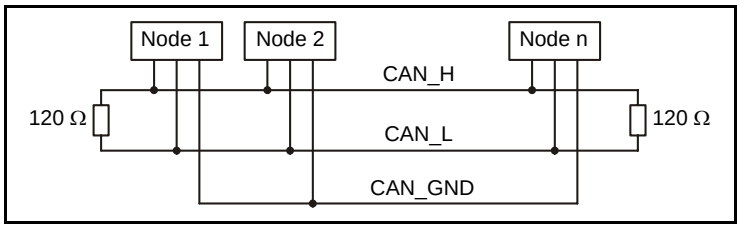
The CAN BUS port is used to connect the receiving unit in a network that communicates through CANopen® protocol.

14.1 Wiring the CAN network

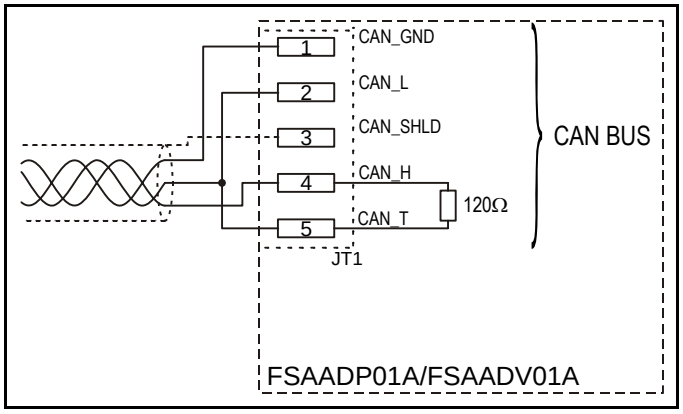
Use CAN_H and CAN_L to wire the CAN network.
Use CAN_GND to wire GND of CAN network.
A coiled and shielded cable should be used. In this case, use CAN_SHLD to wire the shield.



Both ends of CAN networks must be terminated with a 120 Ω resistor between CAN_H and CAN_L.



If the ARM receiving unit is at the beginning or at the end of the network, connect outputs CAN_T and CAN_L so that the line termination is connected.



All CAN network nodes must have the same bit rate. The bit rate defines the maximum length for the network:

Bitrate [kbit/s]	1000	800	500	250	125	100	50	20	10
Approximate network length [m]	30	50	100	250	500	600	1000	2500	5000

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