

BCX-3CLU

BCX body control units

KEY FEATURES

- Modular construction kit based on a mechanical platform and a generic control platform
- Flexible programming in C and CODESYS V3.5 IEC61131
- Compliance with standards for the automotive, agricultural and construction machinery industries
- Error Diagnostics
- Monitoring of relays, fuses and consumers in the on-board network
- Less wiring effort

TECHNICAL DATA

- TriCore TC 1798 32bit, 300MHz
- 288 kB SRAM internal
- 8 MB SDRAM external
- 4 MB Flash internal
- 32 kB EEPROM
- 4 CAN interfaces, 1 RS232 interface, 1 RS485 interface and 1 Ethernet interface
- 36 inputs
- 74 outputs

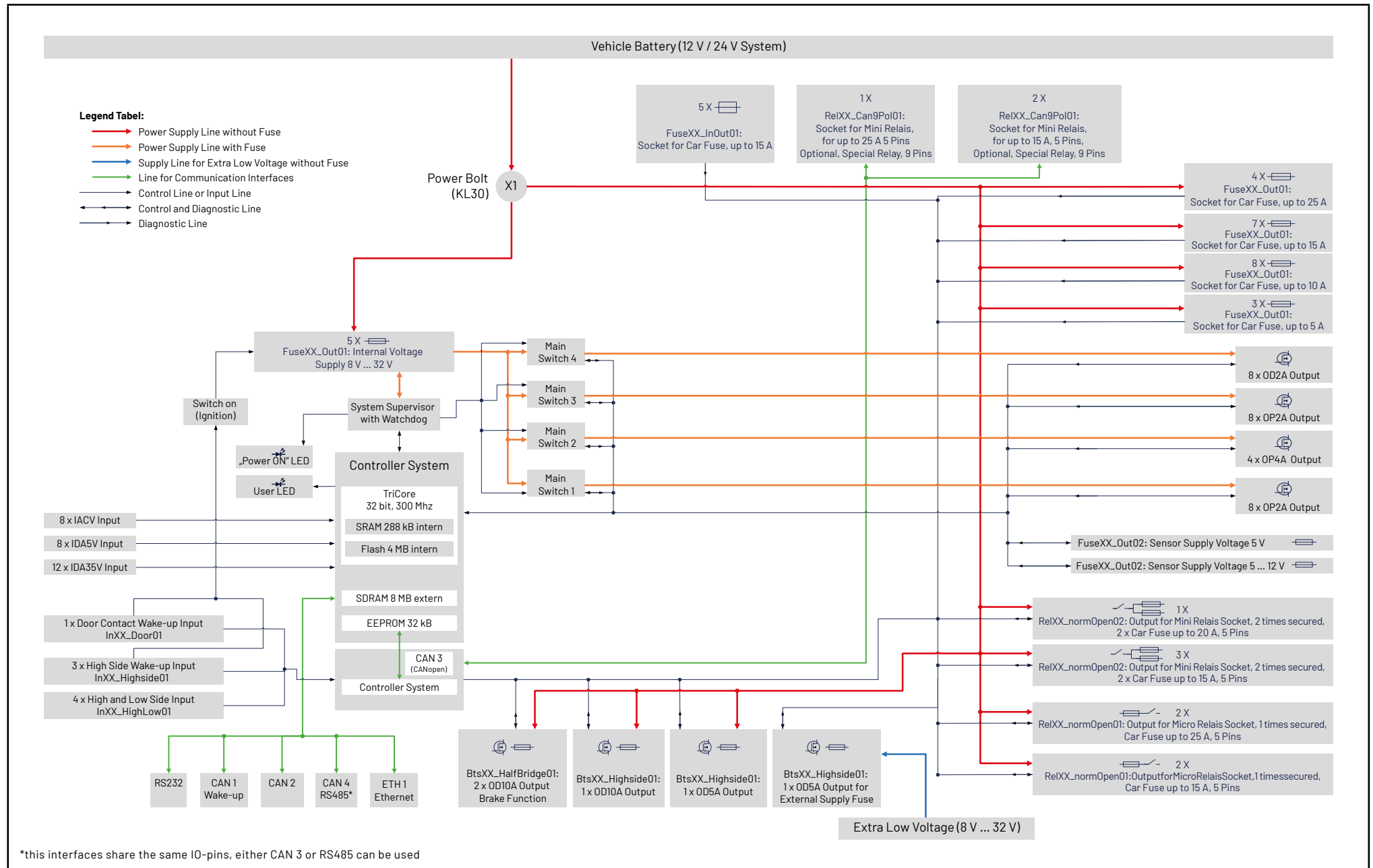
ACCESSORIES

- Mating connector
- Break out Box
- Compiler Package
- C-Software CD
- IEC 61131-3 Package V3.x
- Step-files
- Manual

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BLOCK DIAGRAM



TECHNICAL DATA CONTROL UNIT

Processor and memory

Type	Properties	Features
TriCore TC1798	32 bit, 300 MHz	External system supervisor with programmable watchdog, 12 bit A/D converter for analog signal processing
SRAM	128 kB internal	On-chip RAM of the TriCore. This memory is used for system and application data. The space available for the customer application depends on the configuration of the system.
DSPRAM	128 kB internal	On-chip RAM of the TriCore without wait states. This memory mainly serves as system memory for BIOS stack and data, but also includes a heap for the customer application.
SDRAM	8 MB external	7.8 MB available for customer application
Flash	4 MB internal	3.75 MB available for customer application
EEPROM	32 kB	24 kB available for customer application (non-safety) Typical endurance according to manufacturer: 1,000,000 erase/program cycles @ 25°C 300,000 erase/program cycles @ 85°C Data retention > 20 years

Communication Interfaces

Type	Max. Quantity	Configuration
CAN	4	CAN 2.0 B, high-speed and low-speed, baud rate from 40 kbit/s to 1 Mbit/s CAN bus 1 with ECU wake-up feature CAN bus 3: Only used internally CAN bus 4: Configurable as CAN- or RS485-interface
RS485	1	CAN 4 configured as RS485 interface: Baud rate up to 115 kbit/s, half-duplex communication,
RS232	1	Baud rate up to 115 kbit/s
Ethernet	1	10/100 Mbit/s, hardware variant with additional connector

TECHNICAL DATA CONTROL UNIT

System Data

Type	Property	Values
Supply Voltage	Voltage at +UE ECU supply and +UB1..4 power supply	8...32V
Current consumption	1 x power bolt fully loaded	210 A
	- Stand-by: Sum of input currents at +UE and +UB1..4 (UKL15 = 0 V, ignition off)	< 2 mA
	- ECU active: +UE supply current (UKL15 > UKL15HIGH, no external load)	< 800mA @ +UE = 12 V < 400mA @ +UE = 24 V
Operating temperature	Chassis temperature	-40 °C ...+85 °C
Connector	X1	Power bolt M10x16
	X2 ... X8	See Applicable Connectors
	ETH1	4 pins M12 connector, D-coded
Indicators	2 LED, dual color (red/green or mixed colors)	1 for the state of the system, 1 freely programmable
Housing	Aluminum die casting	
Dimensions	Variant without Ethernet connector	248 mm x 191 mm x 78,4 mm
	Variant with Ethernet connector	262 mm x 191 mm x 78,4 mm
Weight	1,6 kg / 3,53 lbs	
Degree of Protection	IP30	

Inputs

Type	Max. Quantity	Configuration	Measurement
Multi Functional Input 12 IDA35V		analog voltage	0 ... 35 V
		programmable pull-up resistor to +8.5V	1.1 kΩ
		programmable pull-down resistor to GND	1 kΩ
		NAMUR sensor compatible	
		digital	low active
			high active
		event driven	events, reacts on falling or rising edge of the signal
Analog Input IACV	8	frequency	0.6 Hz ... 20 kHz
		incremental encoder interface	change of position or angular change
		analog voltage	0 ... 12 V
		analog current	0 ... 25 mA
		digital (voltage mode)	low active
			high active
		event driven	events, reacts on falling or rising edge of the signal

TECHNICAL DATA CONTROL UNIT

Inputs

Type	Max. Quantity	Configuration	Measurement
Multi Functional Input 8 IDA5V		analog voltage	0 ... 5 V
		programmable pull-up resistor to +5V	6.8 kΩ
		digital	low active high active
		event driven	events, reacts on falling or rising edge of the signal
		frequency	0.6 Hz ... 20 kHz
		SENT interface	
Digital Wake-up Input 3 InXX_Highside01		digital	high active
Digital Wake-up Input 1 InXX_Door01		digital	low active Input is triggered by a negative edge
Digital Input InXX_HighLow01	4	digital	high and low active

Outputs

Type	Max. Quantity	Configu-ration	Range	Property	Features	Group
Digital/ PWM Output OP4A	4	digital PWM	0 ... 4 A	ON/OFF 0 ... 100 % duty cycle resolution <0.1 % PWM frequency 20..500 Hz	high side switch precise current measurement, accuracy is 2 % supports current control mode digital feedback, open load detection in OFF state automated shutdown on overcurrent > 7.5 A ±20 % combine several outputs for parallel operation up to 15 A	Power supply group 2 +UB2: 4 outputs All outputs together can drive up to 15 A

TECHNICAL DATA CONTROL UNIT

Outputs

Type	Max. Quantity	Configu-ration	Range	Property	Features	Group
Digital/PWM Output OP2A	16	digital PWM	0 ... 2.5 A	0 ... 100 % duty cycle resolution <0.1 % PWM frequency 20..500 Hz	high side switch precise current measurement, accuracy is 2 % supports current control mode digital feedback, open load detection in OFF state automated shutdown on overcurrent > 4.6 A ±20 % combine several outputs for parallel operation up to 15 A	Power supply group 1 +UB1: 8 outputs Power supply group 3 +UB3: 8 outputs All outputs together can drive up to 15 A per group

Outputs

Type	Max. Quantity	Configu-ration	Range	Property	Features	Group
Digital Output OD2A	8	digital PWM	0 ... 2.5 A	0 ... 100 % duty cycle resolution <0.1 % PWM frequency 20..500 Hz	high side switch optimized for digital operation mode (ON/OFF) current feedback, measurement accuracy is ±15.0 % (gain) ±100 mA (offset) output voltage feedback, voltage measurement with ±3 % automated shutdown on overcurrent > 3.6 A ±20 % combine several outputs for parallel operation up to 15 A	Power supply group 4 +UB4: 8 outputs All outputs together can drive up to 15 A

TECHNICAL DATA CONTROL UNIT

Outputs

Type	Max. Quantity	Configu-ration	Range	Property	Features	Group
Sensor supply U _{ext}	2	programmable	5 ... 12 V ±2.5 %	programmable output needs derating for output voltages U _{EXT} < 10 V: I _{MAX} = 0.9 / (13.6 - U _{EXT}) A	The U _{ext} output voltage is stable also when the +UE input voltage is below the U _{ext} output voltage. E.g. it is possible to use U _{ext} = 12 V when +UE is at the min voltage +UE _{MIN} = 8 V	Supplied from ECU power pin +UE
		fixed voltage	5 V ±1.0 %	Maximal output current I _{MAX} = 250 mA		
Main Switch	4			ON/OFF	switches the four output groups high side switch Current up to 15 A	
Fused constant voltage FuseXX_Out01	4 7 8	constant	25 A 15 A 10 A		Supplied with KL30	
	3	constant	5 A			
Fused voltage FuseXX_In-Out01	5		15 A		External voltage can be fused	

Outputs

Type	Max. Quantity	Configu-ration	Range	Property	Features	Group
High current relay RelXX_normOpen02	1 3	digital	40 A 30 A	ON/OFF	One relay with 2 outputs (20 A each) One relay with 2 outputs (15 A each)	
High current relay RelXX_normOpen01	2 2	digital	25 A 15 A	ON/OFF		
RelXX_Can-9Pol01	2	arbitrary	25 A		9 pole socket with arbitrary function. CAN connection present.	
	1	arbitrary	15 A		Intelligent modules possible	
High current semiconductor outputs BtsXX_Highside01	1 2	digital	10 A 5 A	ON/OFF		
BtsXX_Half-Bridge01	3	digital	10 A	ON/OFF	High side output with breaking function (for example wiper)	

TECHNICAL DATA CENTRAL CONTROL

Interfaces

Type Fuses	Max. Quantity	range	attributes
Fuse protection ext. voltages	1	5 V max. 250 mA	Fuse protection on GND
Fuse protection ext. voltages	1	5 ... 12 V max. 250 mA	Fuse protection on GND
Fuses	3	5 A	Power supply via power bolt with diagnostic function
Fuses	8	10 A	Power supply via power bolt with diagnostic function
Fuses	7	15 A	Power supply via power bolt with diagnostic function
Fuses	4	25 A	Power supply via power bolt with diagnostic function
Fuses	5	15 A	External power supply with diagnostic function

Interfaces

Type Semi-conductor outputs	Max. Quantity	Configuration	Values	Features	Property
Half bridge protected	2	Digital	0 ... 10 A	Current On/Off	Power supply via power bolt Half bridge with brake function protected by fuse
High Side	1	Digital	0 ... 10 A	Current On/Off	Power supply via power bolt protected by fuse, with diagnostic function
High Side	1	Digital	0 ... 5 A	Current On/Off	Power supply via power bolt protected by fuse, with diagnostic function
High Side	1	Digital	0 ... 5 A	Current On/Off	Power supply via power bolt protected by fuse, with diagnostic function external power supply (8...32 V)

TECHNICAL DATA CENTRAL CONTROL

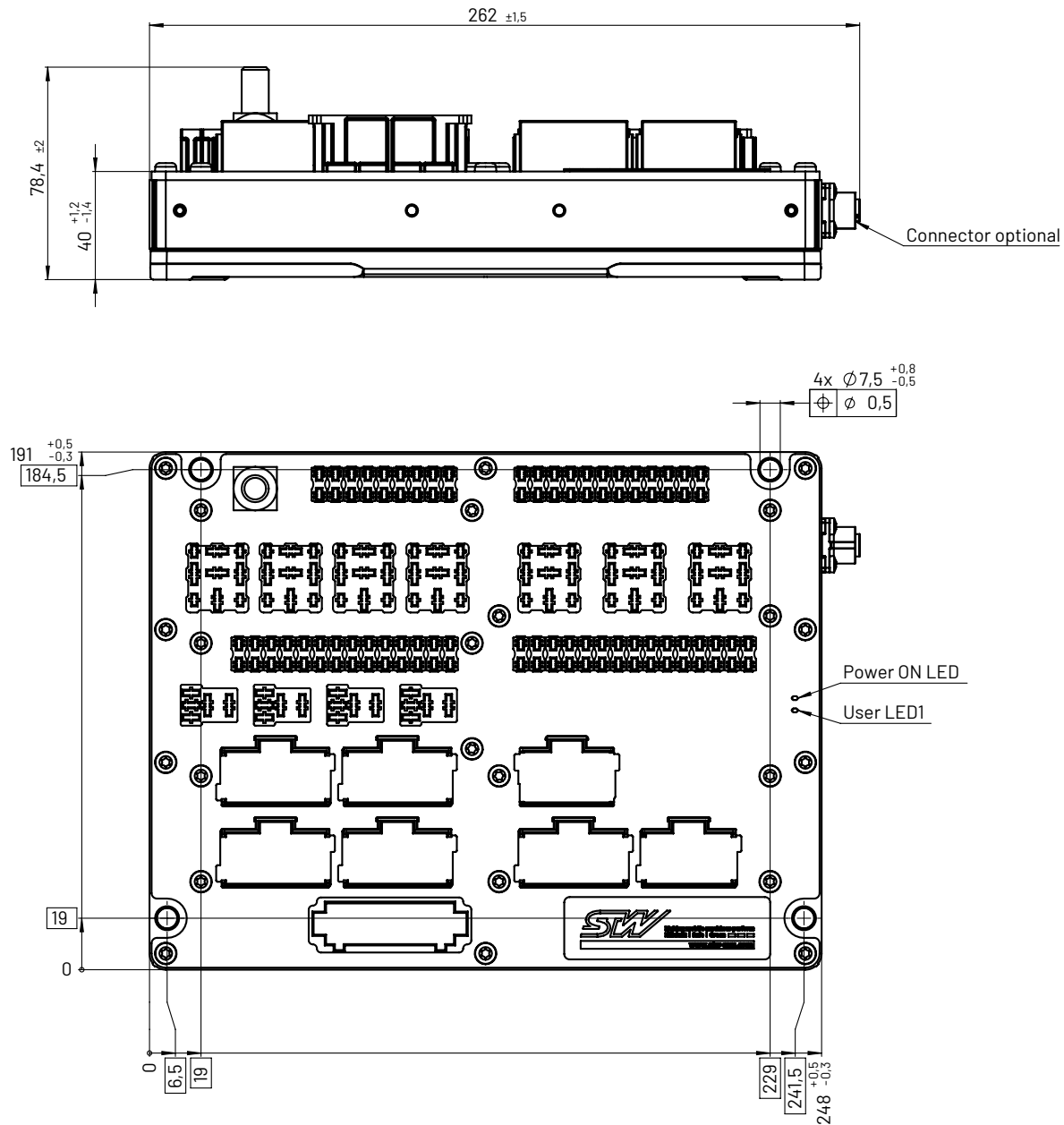
Interfaces

Type Relay outputs	Max. Quantity	Pins	range	protection	attributes
Micro Relay	2	5	0 ... 15 A	1	Power supply via power bolt with diagnostic function internal control by processor
Micro Relay	2	5	0 ... 25 A	1	Power supply via power bolt with diagnostic function internal control by processor
Mini Relay	3	5	0 ... 15 A	2	Power supply via power bolt with diagnostic function internal control by processor
Mini Relay	1	5	0 ... 20 A	2	Power supply via power bolt with diagnostic function internal control by processor
Mini Relay	1	9	0 ... 25 A	–	external power supply external triggering no diagnostic function CAN interface for extensions
Mini Relay	2	9	0 ... 15 A	–	external power supply external triggering no diagnostic function CAN interface for extensions

Connectors

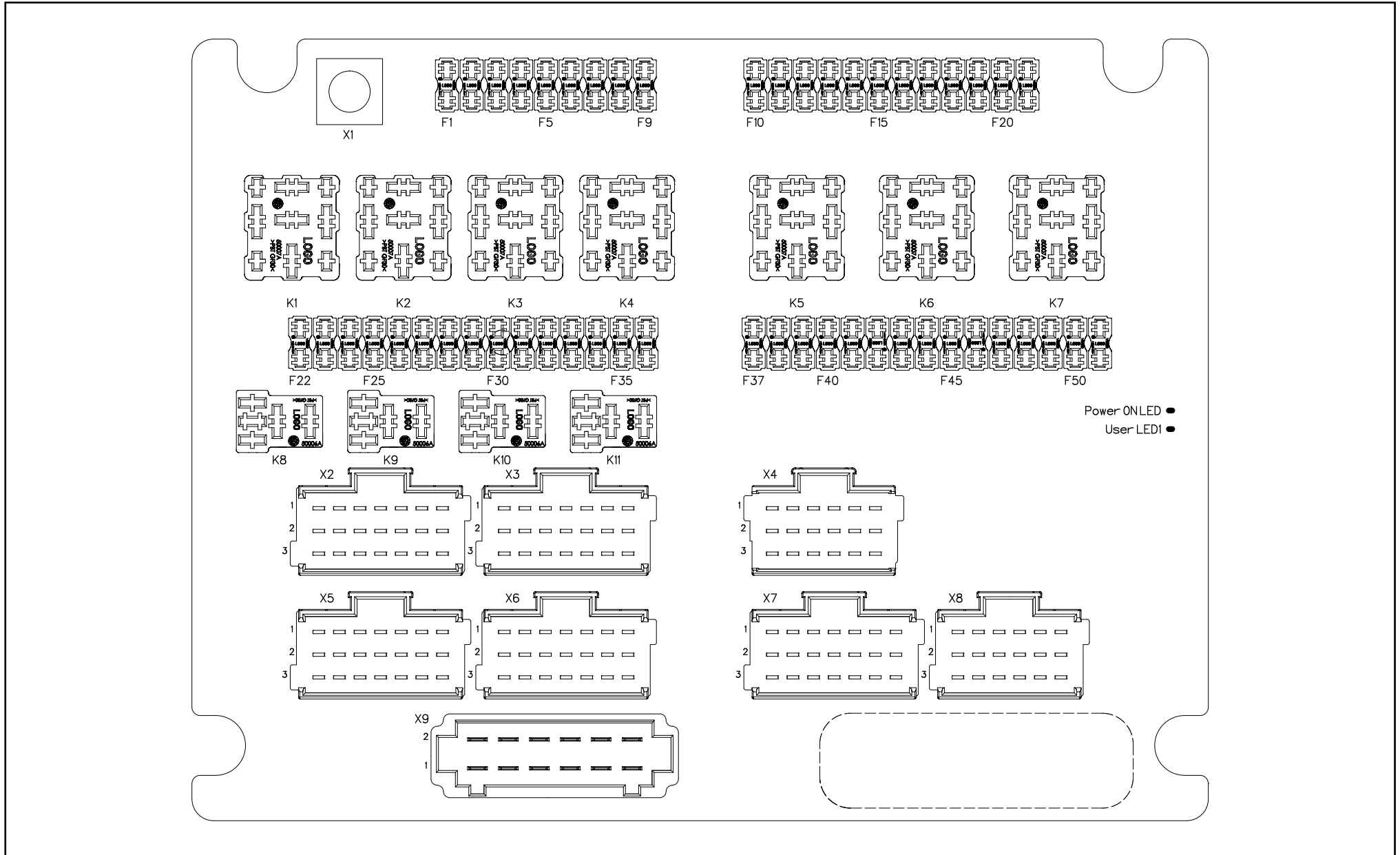
Type	Quantity	Pins
JPT	5	21
JPT	2	18
DFK	1	12

TECHNICAL DRAWING



PIN ASSIGNMENT

Connector X1: Power Bolt



PIN ASSIGNMENT

Pin assignment of connector X2 (green) sorted by pin numbers

X2 Pin	Connected component	Additional description of functionality	Connected fuse	Connected relay	Supplied from
1	Fuse05_Out01_03		F25		X1
2	Fuse10_Out01_02		F10		X1
3	Fuse10_Out01_01		F8		X1
4	Fuse15_Out01_06		F1		X1
5	IDA35V_7	Input of controller			
6	OP2A_14	Output of controller			
7	Fuse05_Out01_02		F2		X1
8	IDA35V_8	Input of controller			
9	IDA35V_9	Input of controller			
10	Fuse05_Out01_01		F4		X1
11	IDA35V_4	Input of controller			
12	IDA35V_5	Input of controller			
13	Rel30_normOpen02_01		F27	K2	X1
14	IDA35V_6	Input of controller			
15	IDA35V_3	Input of controller			
16	Rel30_normOpen02_01		F28	K2	X1
17	CAN4_H or RS485_A	CAN bus or serial interface of controller			
18	CAN4_H or RS485_A	CAN bus or serial interface of controller			
19	OP2A_16	Output of controller			
20	CAN4_L or RS485_B	CAN bus or serial interface of controller			
21	CAN4_L or RS485_B	CAN bus or serial interface of controller			

Pin assignment of connector X3 (magenta) sorted by pin numbers

X3 Pin	Connected component	Additional description of functionality	Connected fuse	Connected relay	Supplied from
1	Rel25_Can9PoI01_02				K5 KL87a
2	Rel25_Can9PoI01_02				K5 C
3	OD2A_1	Output of controller			
4	Rel30_normOpen02_02		F32	K3	X1
5	IACV_2	Input of controller			
6	OD2A_2	Output of controller			
7	Rel30_normOpen02_03		F33	K4	X1
8	IDA35V_12	Input of controller			
9	IACV_3	Input of controller			
10	Fuse10_Out01_07		F7		X1
11	IDA35V_10	Input of controller			
12	IACV_1	Input of controller			
13	Rel25_Can9PoI01_02				K5 KL86
14	IDA5V_3	Input of controller			
15	IDA35V_11	Input of controller			
16	Rel15_normOpen01_02		F35	K11	X1
17	5Vext	5Vext external sensor supply output of controller			
18	OD2A_3	Output of controller			
19	Rel25_Can9PoI01_02				K5 X
20	Fuse02_Out02_01	AGND of 5Vext of the ESX-3CM	F42		
21	OD2A_4	Output of controller			

PIN ASSIGNMENT

Pin assignment of connector X4 (white) sorted by pin numbers

X4 Pin	Connected component	Additional description of functionality	Connected fuse	Connected relay	Supplied from
1	Fuse15_Out01_07		F11		X1
2	OP2A_2	Output of controller			
3	In35_HighLow01_01	Input of controller			
4	Fuse15_Out01_03		F39		X1
5	CAN2_L	CAN bus of controller			
6	CAN2_L	CAN bus of controller			
7	Fuse15_InOut01_03	External voltage supply in	F41		
8	CAN2_H	CAN bus of controller			
9	CAN2_H	CAN bus of controller			
10	Fuse15_InOut01_03	External voltage supply out	F41		
11	GND				
12	OP2A_8	Output of controller			
13	Rel15_Can9Pol01_01			K6 C	
14	Rel15_Can9Pol01_01			K6 KL30	
15	OP2A_1	Output of controller			
16	Bts08_HalfBridge01_02		F47	Internal (K13)	X1
17	Bts08_HalfBridge01_01		F45	Internal (K12)	X1
18	IDA35V_2	Input of controller			

Pin assignment of connector X5 (blue) sorted by pin numbers

X5 Pin	Connected component	Additional description of functionality	Connected fuse	Connected relay	Supplied from
1	Fuse15_InOut01_01	External voltage supply in	F29		
2	Fuse15_Out01_05		F9		X1
3	In35_Highside01_01	Input of controller			
4	Fuse15_InOut01_01	External voltage supply out	F29		
5	GND				
6	OP2A_5	Output of controller			
7	RS232_TxD	Serial interface			
8	RS232_RxD	Serial interface			
9	OP2A_6	Output of controller			
10	Fuse15_InOut01_02	External voltage supply out	F36		
11	CAN1_H	CAN bus			
12	CAN1_H	CAN bus			
13	Rel30_normOpen02_03		F34	K4	X1
14	CAN1_L	CAN bus			
15	CAN1_L	CAN bus			
16	Rel30_normOpen02_02		F31	K3	X1
17	IDA5V_6	Input of controller			
18	OP2A_7	Output of controller			
19	Rel15_normOpen01_01		F30	K10	X1
20	IDA35V_1	Input of controller			
21	In35_HighLow01_02	Input of controller			

PIN ASSIGNMENT

Pin assignment of connector X6 (yellow) sorted by pin numbers

X6 Pin	Connected component	Additional description of functionality	Connected fuse	Connected relay	Supplied from
1	In35_Door01_01	Input of controller			
2	In35_Highside01_02	Input of controller			X1
3	In35_Highside01_03	Input of controller			
4	In35_HighLow01_04	Input of controller			
5	OP2A_15	Output of controller			
6	In35_HighLow01_03	Input of controller			
7	Rel15_Can9Pol01_01			K6 KL87	
8	Rel15_Can9Pol01_01			K6 KL87a	
9	OP2A_13	Output of controller			
10	Rel15_Can9Pol01_01			K6 X	
11	Rel25_Can9Pol01_01			K7 C	
12	IDA5V_4	Input of controller			
13	OP2A_9	Output of controller			X1
14	Rel25_Can9Pol01_01			K7 X	
15	OP2A_11	Output of controller			
16	Rel15_Can9Pol01_01			K6 KL86	X1
17	Rel25_Can9Pol01_01			K7 KL87a	
18	OP2A_12	Output of controller			
19	Rel25_Can9Pol01_01			K7 KL86	X1
20	Fuse15_InOut01_02	External voltage supply in F36			
21	OP2A_10	Output of controller		K7 KL86	X1

Pin assignment of connector X7 (brown) sorted by pin numbers

X7 Pin	Connected component	Additional description of functionality	Connected fuse	Connected relay	Supplied from
1	Fuse15_InOut01_04	External voltage supply out	F37		
2	Fuse15_InOut01_04	External voltage supply in	F37		X1
3	OD2A_7	Output of controller			
4	Fuse15_Out01_01		F38	X1	
5	IACV_4	Input of controller			
6	GND				
7	Fuse15_Out01_04		F40	X1	
8	OD2A_8	Output of controller			
9	OD2A_6	Output of controller			
10	Fuse15_InOut01_05	External voltage supply in	F43		
11	IDA5V_1	Input of controller			
12	IDA5V_2	Input of controller			
13	Fuse15_InOut01_05	External voltage supply out	F43		X1
14	IACV_7	Input of controller			
15	IACV_8	Input of controller			
16	Fuse10_Out01_03		F16	X1	X1
17	IACV_6	Input of controller			
18	OP4A_2	Output of controller			
19	OP4A_1	Output of controller			X1
20	OD2A_5	Output of controller			
21	IACV_5	Input of controller			

PIN ASSIGNMENT

Pin assignment of connector X8 (grey) sorted by pin numbers

X8 Pin	Connected component	Additional description of functionality	Connected fuse	Connected relay	Supplied from
1	Bts10_Highside01_01		F49	Internal (K14)	X1
2	Fuse10_Out01_08		F17		X1
3	OP2A_3	Output of controller			
4	Fuse15_Out01_02		F18		X1
5	IDA5V_5	Input of controller			
6	Fuse02_Out02_02	AGND of 5-12Vext of the controller	F46		
7	Fuse10_Out01_04		F20		X1
8	Fuse10_Out01_05		F48		X1
9	5-12Vext	5-12Vext external sensor supply output of controller			
10	Fuse10_Out01_06		F21		X1
11	IDA5V_8	Input of controller			
12	OP4A_3	Output of controller			
13	Bts05_Highside01_01	External voltage supply in	F44	Internal (K15)	
14	IDA5V_7	Input of controller			
15	OP4A_4	Output of controller			
16	Bts05_Highside01_02		F50	Internal (K16)	X1
17	Bts05_Highside01_01	External voltage supply out	F44	Internal (K15)	
18	OP2A_4	Output of controller			

Pin assignment of connector X9 (black) sorted by pin numbers

X9 Pin	Connected component	Additional description of functionality	Connected fuse	Connected relay	Supplied from
1	Rel25_normOpen01_01	F22	K8	X1	X1
2	Rel40_normOpen02_01	F24	K1	X1	X1
3	Rel40_normOpen02_01	F23	K1	X1	
4	Rel25_normOpen01_02	F26	K9	X1	X1
5	Fuse25_Out01_01	F5		X1	
6	Fuse25_Out01_02	F3		X1	
7	Fuse25_Out01_04	F12		X1	X1
8	Fuse25_Out01_03	F6		X1	X1
9	Rel25_Can9Pol01_02		K5	KL30	
10	Rel25_Can9Pol01_02		K5	KL87	X1
11	Rel25_Can9Pol01_01		K7	KL30	
12	Rel25_Can9Pol01_01		K7	KL87	

QUALIFICATION

Norm	Description
EMC industrial (CE)	This chapter is not fully available at this state of the BCX-3CLU development.
EMC automotive	This chapter is not fully available at this state of the BCX-3CLU development.
Electrical tests	This chapter is not fully available at this state of the BCX-3CLU development.
Climatic and mechanical tests	This chapter is not fully available at this state of the BCX-3CLU development.