Programmed with Eaton CONTROL F(x)™ Software to IEC 61131-3 Standard

2nd CAN interface for gateway function according to SAE J1939 Supply voltage 10...32V DC

Technical Data	Controller for the Implementation of a Central or Decentralized Electrohydraulic System			
Housing	closed screened metal housing with flange fastening			
Dimensions (H x W x D)	153 x 226 x 43 mm			
Mounting	screw connection by means of 4 M5xL screws according to DIN 7500 or DIN 7984 mounting position horizontal or vertical to the mounting wall			
Connection	55-pin connector, latched, protected against reverse polarity type AMP housing or Framatome AMP junior timer contacts, crimp connection 0.5/2.5 mm^2			
Weight	1.2 kg			
Housing/storage temperature	– 40...85° C (depending on the load) / – 40...85° C			
Protection	IP 67 (for inserted plug with individually sealed cores e.g. ECEFX16 12S)			
Input/output channels Total	max. 24 (total number available depends on wiring and configuration of the controller)			
Inputs Possible configurations	max. 24 (corr. to 0 outputs)			
	Number	**Signal**	**Version**	
	8 or	digital analog	for positive sensor signals, with diagnostic capability 0...10/32 V DC, 0/4...20 mA or ratiometric	B_L A
	8	digital	for positive sensor signals	B_L
	4 or	digital frequency	for positive sensor signals, with diagnostic capability max. 50 kHz	B_L I_L
	4 or	digital frequency	for positive/negative sensor signals, with diagnostic capability* max. 1 kHz *only positive sensor signals with diagnostic capability	$B_{L/H}$ I_L
Outputs Possible configurations	**Number**	**Signal**	**Version**	
	8	digital	positive switching (high side), with diagnostic capability max. 8 (corr. to 16 inputs)	B_H
	or	PWM	PWM frequency 20...250 Hz	PWM
	or	current-controlled	f0,1...4 A	PWM_I

Abbreviations

A	= analog
B_H	= binary high side
B_L	= binary low side
FRQ/CYL	= frequency inputs
I_H	= pulse high side
I_L	= pulse low side
PWM	= pulse width modulation
PWM_I	= current-controlled output
%IWx	= IEC address for analog input
%IX0.xx	= IEC address for binary input
%QX0.xx	= IEC address for binary output

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EFX 1624m	Technical Data		
Operating voltage U_B	10...32 V DC		
Overvoltage	36 V for t ≤ 10 s		
Undervoltage detection	for U_B ≤ 10 V		
Switching-off in case of undervoltage	for U_B ≤ 8 V		
Current consumption	≤ 160 mA (without external load at 24 V DC)		
CAN interface 1	CAN interface 2.0 B, ISO 11898		
Baud rate	50 Kbits/s...1 Mbits/s (default setting 125 Kbits/s)		
Communication profile	CANopen, CiA DS 301 version 4, CiA DS 401 version 1.4		
Node-ID (CANopen)	hex 7F (= dec. 127)		
CAN interface 2	CAN interface 2.0 A/B, ISO 11898		
Baud rate	50 Kbits/s...1 Mbits/s (default setting 125 Kbits/s)		
Communication profile	SAE J1939 or free protocol		
Serial interface	RS-232 C		
Baud rate	9.6 / 19.2 / 28.8 / 38.4 / 57.6 kBit/s (default setting 9.6 Kbits/s)		
Topology	point-to-point (max. 2 participants); master-slave connection		
Protocol	predefined protocol (INTELHEX)		
Processor	CMOS microcontroller 16 bits C167CS cycle frequency 20/40 MHz		
Device monitoring	undervoltage monitoring, watchdog function, check sum test for program, and system excess temperature monitoring		
Process monitoring concept	Two relays according to EN 954 monitor 2 groups of 4 outputs each		
Program memory	768 Kbytes Flash can be used by the user (+ 832 Kbytes for extended functions)		
Data memory	128 Kbytes SRAM, 128 Kbytes Flash		
Data memory (protected in case of power failure)	1024 bytes (retain data), 16 Kbytes (general data)		
Status indication	three-color LED (R/G/B)		
Operating status (status LED)	**LED Color**	**Status**	**Description**
	–	off	no operating voltage
	yellow	1 x on	initialization or reset checks
	green	5 Hz	no operating system loaded
	green	2.0 Hz	run
		on	stop
	red	2.0 Hz	run with error
		on	fatal error or stop with error

	Test Standards and Regulations
Climatic test	Damp heat to EN 60068-2-30, test Db (≤ 95% rel. humidity, non-condensing), salt mist test to EN 60068-2-52, test Kb, severity level 3 degrees of protection to EN 60529
Mechanical resistance	Vibration to EN 60068-2-6, test Fc, shock to EN 60068-2-27, test Ea, bump to EN 60068-2-29, test Eb
Immunity to conducted interference	to ISO 7637-2, pulses 2, 3a, 3b, severity level 4, function state A to ISO 7637-2, pulse 5, severity level 1, function state A to ISO 7637-2, pulse 1, severity level 4, function state C
Immunity to interfering fields	directive 95/54/EC at 100 V/m (e1 type approval) and EN 61000-6-2 :2001 (CE)
Interference emission	directive 95/54/EC (e1 type approval) and EN 61000-6-3 :2001 (CE)
Tests for the approval for railway applications	to BN 411 002 (DIN EN 50155 clause 10.2)

EFX 1624m	Characteristics of the Inputs	
Digital/analog inputs (B_L, A) %IW03...10 %IX0.00...07 Can be configured as ...	■ Voltage inputs	
	input voltage	0...10/32 V
	resolution	12 bits
	precision	± 1.0% FS
	input resistance	50/30 kΩ
	input frequency	50 Hz
	■ Current inputs	
	input current	0/4...20 mA
	resolution	12 bits
	precision	± 1.0% FS
	input resistance	400 Ω
	input frequency	50 Hz
	■ Digital inputs for positive sensor signals, with diagnostic capability *	
	switch-on level	0.7 U_B
	switch-off level	0.4 U_B
	input resistance	30 kΩ
	input frequency	50 Hz
Digital inputs (B_L) %IX0.08...11 %IX1.00...03 Can be configured as ...	■ Digital inputs for positive sensor signals	
	switch-off level	0.43...0.73 U_B
	switch-off level	0.29 U_B
	input resistance	3.21 kΩ
	input frequency	50 Hz
Digital inputs (B_L, I_L) %IX0.12...15 Can be configured as ...	■ Digital inputs for positive sensor signals, with diagnostic capability *	
	switch-on level	0.7 U_B
	switch-off level	0.4 U_B
	input resistance	2.86 kΩ
	input frequency	50 Hz
	■ Frequency inputs for positive sensor signals with diagnostic capability, evaluation with integrated comparator	
	switch-on level	0.43...0.73 U_B
	switch-off level	0.29 U_B
	input resistance	2.86 kΩ
	input frequency max.	50 kHz
Digital inputs ($B_{L/H}$, I_L) %IX1.04...07 Can be configured as ...	■ Digital inputs for positive/negative sensor signals, positive with diagnostic capability*	
	switch-on level	0.7 U_B
	switch-off level	0.4 U_B
	Input resistance	3.21 kΩ
	Input frequency	50 Hz
	■ Frequency inputs for positive sensor signals with diagnostic capability, evaluation with integrated comparator switch-on level	0.43...0.73 U_B
	switch-off level	0.29 U_B
	input resistance	3.21 kΩ
	input frequency max.	50 kHz
Test input	During the test mode (e.g. programming), the "TEST" connection must be connected to VBB_S (10...32 V DC). For the "RUN" mode, the test input must not be connected. Input resistance	3.21 kΩ
*** NAMUR inputs**	■ Digital inputs with diagnostic capability can be used as NAMUR inputs when used with an external resistor connection. supply voltage	5...25 V
	Wiring see page 5	

EFX 1624m	Characteristics of the Outputs	
Outputs (B_H, PWM, PWM_I) %QX0.00...07 Can be configured as ...	■ Semiconductor outputs, with diagnostic capability positive switching (high side), short-circuit and overload protected	
	switching voltage	10...32 V DC
	switching current	max. 4 A
	output frequency	max. 100 Hz (depending on the load)
	■ PWM outputs, diagnosis via current feedback	
	PWM frequency	max. 250 Hz
	mark-to-space ratio	1...99 %
	resolution	depends on the PWM frequency
	load current	max. 4 A
	integrated pull-down resistor	(4.7 kΩ)
	■ Current-controlled outputs, diagnosis via current feedback	
	load current	0,1...4 A
	load resistance	min. 3 Ω (at UB = 12 V DC) min. 6 Ω (at UB = 24 V DC)
	setting resolution	1 mA
	control resolution	5 mA
	accuracy	± 2% FS
Overload protection (valid for all outputs)	max. 5 minutes (at 100%)	
Internal relay outputs For electrically isolated deactivation of the outputs	Normally open contacts in series to 2 groups of 4 semiconductor outputs. Sustained forcing by means of hardware and additional controlling by means of user program. The relays must always be switched without load!	
	total current max.	12 A per group
	switching current	0.1...15 A
	overload current	20 A
	number of operating cycles	≥ 10^6 (without load)
	switching-time constant	≤ 3 ms
Output error	■ Semiconductor output, positive switching (high side)	
	switching voltage	10...32 V DC
	switching current	max. 100 mA
	overload current	0.5 A
	switching function	OFF (0 V) in case of an error
	Wiring see page 5	

Wiring

Pin	Potential	Description	Note
23	VBB_S (10...32 V DC)	Supply sensors and module	
05	VBB_O (10...32 V DC)	Supply outputs	Relay switched (1)
34	VBB_R (10...32 V DC)	Supply via relay	Relay switched (2)
01	GND_S	Ground sensors and module	
15	GND_O	Ground outputs	
12	GND_A	Ground analog outputs	

CAN, RS-232, ERROR, TEST

Pin	Potential	Description	Note
14	$CAN1_H$	CAN-Interface 1 (high)	
32	$CAN1_L$	CAN-Interface 1 (low)	
26	$CAN2_H$	CAN-Interface 2 (high)	SAE J1939
25	$CAN2_L$	CAN-Interface 2 (low)	SAE J1939
33	GND	Ground (RS-232/CAN)	
06	RxD	RS-232 Interface (programming)	Pin 03, PC D-Sub (9 pin)
07	TxD	RS-232 Interface (programming)	Pin 02, PC D-Sub (9 pin)
13	ERROR	Error output B H	
24	TEST	Test input	

Inputs/Outputs

Pin	Inputs	Configuration	Outputs	Configuration	Diagnostic capability* Input/Output	Relay switched
08	%IX0.00 / %IW03	B_L A	–	–	•/–	
27	%IX0.01 / %IW04	B_L A	–	–	•/–	
09	%IX0.02 / %IW05	B_L A	–	–	•/–	
28	%IX0.03 / %IW06	B_L A	–	–	•/–	
10	%IX0.04 / %IW07	B_L A	–	–	•/–	
29	%IX0.05 / %IW08	B_L A	–	–	•/–	
11	%IX0.06 / %IW09	B_L A	–	–	•/–	
30	%IX0.07 / %IW10	B_L A	–	–	•/–	
44	%IX0.08	B_L	%QX0.00	B_H PWM PWM_I	–/•	VBB_O (1)
45	%IX0.09	B_L	%QX0.01	B_H PWM PWM_I	–/•	VBB_O (1)
46	%IX0.10	B_L	%QX0.02	B_H PWM PWM_I	–/•	VBB_O (1)
47	%IX0.11	B_L	%QX0.03	B_H PWM PWM_I	–/•	VBB_O (1)
20	%IX0.12	B_L I_L	(FRQ 0) –	–	•/–	
02	%IX0.13	B_L I_L	(FRQ 1) –	–	•/–	
21	%IX0.14	B_L I_L	(FRQ 2) –	–	•/–	
38	%IX0.15	B_L I_L	(FRQ 3) –	–	•/–	
36	%IX1.00	B_L	%QX0.04	B_H PWM PWM_I	–/•	VBB_R (2)
54	%IX1.01	B_L	%QX0.05	B_H PWM PWM_I	–/•	VBB_R (2)
17	%IX1.02	B_L	%QX0.06	B_H PWM PWM_I	–/•	VBB_R (2)
53	%IX1.03	B_L	%QX0.07	B_H PWM PWM_I	–/•	VBB_R (2)
19	%IX1.04	$B_{L/H}$ I_L	(CYL 0) –	–	• / –	
55	%IX1.05	$B_{L/H}$ I_L	(CYL 1) –	–	•/–	
18	%IX1.06	$B_{L/H}$ I_L	(CYL 2) –	–	•/–	
37	%IX1.07	$B_{L/H}$ I_L	(CYL 3) –	–	•/–	

Note the double pin connection of inputs/outputs.
*Only positive sensor signals with diagnostic capability

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