

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

2 control units with a total of 80 inputs/outputs 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 247 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		2 x 55-pin connector, latched, protected against reverse polarity, type AMP or Framatome, AMP junior timer contacts, crimp connection 0.5/2.5 mm ²		
Weight		1.6 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		max. 2 x 40 (total number available depends on wiring and configuration of the controller)		
Inputs		max. 2 x 40 (corr. to 0 outputs)		
Possible configurations	Number	Signal	Version	
	2 x 8	digital	for positive sensor signals, with diagnostic capability	B _L
	or	analog	0...10/32 V DC, 0/4...20 mA or ratiometric	A
	2 x 8	digital	for positive sensor signals	B _L
	2 x 4	digital	for positive sensor signals, with diagnostic capability	B _L
	or	frequency	max. 50 kHz	I _L
	2 x 4	digital	for positive/negative sensor signals, with diagnostic capability*	B _{L/H}
	or	frequency	max. 1 kHz	I _L
	2 x 8	digital	for positive/negative sensor signals, with diagnostic capability *	B _{L/H}
	2 x 8	digital	for positive sensor signals, with diagnostic capability	B _L
			*only positive sensor signals with diagnostic capability	
Outputs		max. 2 x 24 (corr. to 2 x 16 inputs)		
Possible configurations	Number	Signal	Version	
	2 x 8	digital	positive switching (high side), with diagnostic capability	B _H
	or	PWM	PWM frequency 20...250 Hz	PWM
	or	current-controlled	0,1...4 A	PWM _I
	2 x 8	digital	positive switching (high side), with diagnostic capability	BH
	2 x 4	digital	positive switching (high side), with diagnostic capability	BH
	or	PWM	PWM frequency 20...250 Hz	PWM
	2 x 4	digital	positive/negative switching (high/low side) with diagnostic capability	B _{H/L}
			(can also be used as H bridge)	H bridge

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



Powering Business Worldwide

EFX 1680m		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 12 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
		yellow	no operating voltage
		green	1 x on
		green	5 Hz
		green	2.0 Hz
			on
		red	stop
			2.0 Hz
			on
			run with error
			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 61000-6-4 :2001 (CE)	
Tests for the approval for railway applications		to BN 411 002 (DIN EN 50155 clause 10.2)	

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	$\pm 1.0\%$ FS
input resistance	50/30 k Ω
input frequency	50 Hz
- Current inputs

input current	0/4...20 mA
resolution	12 bits
precision	$\pm 1.0\%$ 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 k Ω
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 k Ω
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 k Ω
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 k Ω
input frequency max.	max. 50 kHz

Digital inputs (B_{LH} , 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 k Ω
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 k Ω
input frequency max.	max. 50 kHz

Digital inputs (B_L)

%IX2.00...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 k Ω
input frequency	50 Hz

Digital inputs (B_{LH})

%IX1.08...15

Can be configured as ...

- Digital inputs for positive/negative sensor signals, positive with diagnostic capability*

switch-on level	$0.43...0.73 U_B$
switch-off level	$0.29 U_B$
input resistance	3.21 k Ω
input frequency	50 Hz

Test input

 During the test mode (e.g. programming), the "TEST" connection must be connected to V_{BB_S} (10...32 V DC).

For the "RUN" mode, the test input must not be connected.

 Input resistance 3.21 k Ω
*** 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
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Wiring see page 5

EFX 1680m**Characteristics of the Outputs** (per control unit)**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
- 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

Outputs (B_H)

%QX0.08...15

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. 2 A
output frequency	max. 100 Hz (depending on the load)

Outputs (B_H, PWM)

%QX1.00, 03, 04, 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

PWM frequency	max. 250 Hz
mark-to-space ratio	1...99 %
resolution	depends on the PWM frequency
load current	max. 4 A

Outputs (B_{H/L})

%QX1.01, 02, 05, 06

Can be configured as ...

- Semiconductor outputs, with diagnostic capability positive/negative 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)

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 12 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**Wiring for CPU 1 is the same as for CPU 2**

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 J 1939
25	CAN2 _L	CAN-Interface 2 (low)	SAE J 1939
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	BL 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 _L	– / •	VBB _O (1)
45	%IX0.09	B _L	%QX0.01	B _H PWM PWM _L	– / •	VBB _O (1)
46	%IX0.10	BL	%QX0.02	B _H PWM PWM _L	– / •	VBB _O (1)
47	%IX0.11	B _L	%QX0.03	B _H PWM PWM _L	– / •	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 _L	– / •	VBB _R (2)
54	%IX1.01	B _L	%QX0.05	B _H PWM PWM _L	– / •	VBB _R (2)
17	%IX1.02	B _L	%QX0.06	B _H PWM PWM _L	– / •	VBB _R (2)
53	%IX1.03	B _L	%QX0.07	B _H PWM PWM _L	– / •	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) –	–	• / –	
39	%IX1.08	B _{L/H}	%QX0.08	B _H	• / •	VBB _O (1)
03	%IX1.09	B _{L/H}	%QX0.09	B _H	• / •	VBB _O (1)
40	%IX1.10	B _{L/H}	%QX0.10	B _H	• / •	VBB _O (1)
22	%IX1.11	B _{L/H}	%QX0.11	B _H	• / •	VBB _O (1)
41	%IX1.12	B _{L/H}	%QX0.12	B _H	• / •	VBB _O (1)
42	%IX1.13	B _{L/H}	%QX0.13	B _H	• / •	VBB _O (1)
43	%IX1.14	B _{L/H}	%QX0.14	B _H	• / •	VBB _O (1)
04	%IX1.15	B _{L/H}	%QX0.15	B _H	• / •	VBB _O (1)
48	%IX2.00	B _L	%QX1.00	B _H PWM	• / •	VBB _R (2)
49	%IX2.01	B _L	%QX1.01	B _{H/L} H-Bridge	• / •	VBB _R (2)
31	%IX2.02	B _L	%QX1.02	B _{H/L} H-Bridge	• / •	VBB _R (2)
50	%IX2.03	B _L	%QX1.03	B _H PWM	• / •	VBB _R (2)
51	%IX2.04	B _L	%QX1.04	B _H PWM	• / •	VBB _R (2)
52	%IX2.05	B _L	%QX1.05	B _{H/L} H-Bridge	• / •	VBB _R (2)
16	%IX2.06	B _L	%QX1.06	B _{H/L} H-Bridge	• / •	VBB _R (2)
35	%IX2.07	B _L	%QX1.07	B _H PWM	• / •	VBB _R (2)

Note the double pin connection of inputs/outputs.

*Only positive sensor signals with diagnostic capability

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