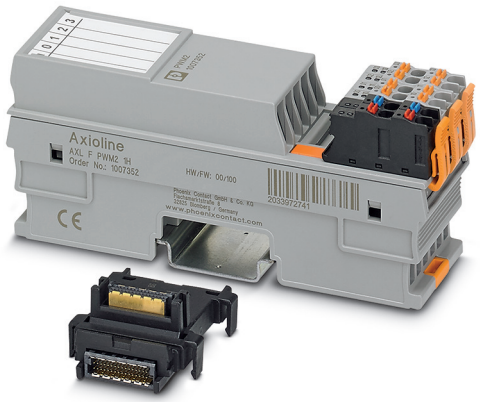
AXL F PWM2 1H

Axioline F, function module, pulse width modulation



Data sheet
107749_en_08

1 Description

The module is designed for use within an Axioline F station.
Two channels that operate independently of one another offer the option of pulse width modulation (PWM) for the output signals.
The module supports PWM, pulse generator, and push-pull output operating modes.

Features

- 2 independent channels
- Output of 5 V or 24 V signals
- Push-pull output
- Nominal current per output: 500 mA (at 24 V DC), 10 mA (at 5 V DC)
- Frequency output (0 Hz ... 65535 Hz)
- Frequency resolution can be configured using the divider (1 Hz, 0.1 Hz, 0.01 Hz)
- Pulse width resolution can be configured using the divider (1 ms, 0.1 ms, 0.01 ms)
- Configurable pulse duty factor (0 % ... 100 %)
- Device rating plate stored

This data sheet is only valid in association with the UM EN AXL F SYS INST user manual.

Make sure you always use the latest documentation.
It can be downloaded at: phoenixcontact.net/product/1007352

2 Table of contents

3 Ordering data

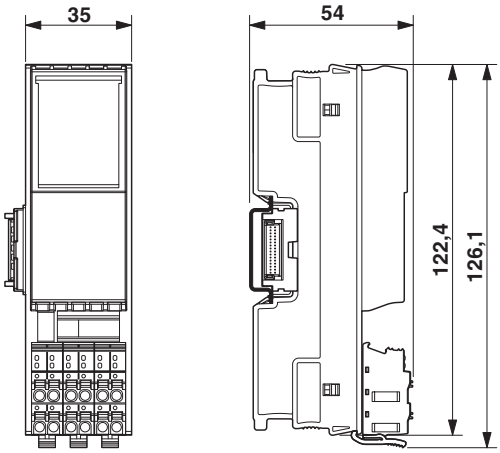
Description	Type	Item no.	Pcs./Pkt.
Axioline F, function module, pulse width modulation, transmission speed in local bus 100 Mbps, IP20 degree of protection, including bus base module and Axioline F male connectors	AXL F PWM2 1H	1007352	1

Accessories	Type	Item no.	Pcs./Pkt.
Axioline F bus base module for housing type H (Replacement item)	AXL F BS H	2700992	5
Axioline shield connection set (contains 2 shield bus holders and 2 SK 5 shield connection clamps)	AXL SHIELD SET	2700518	1
Zack marker strip for Axioline F (device labeling), in 2 x 20.3 mm pitch, unprinted, 25-section, for individual labeling with B-STIFT 0.8, X-PEN, or CMS-P1-PLOTTER (Marking)	ZB 20,3 AXL UNPRINTED	0829579	25
Zack Marker strip, flat, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snapped, for terminal block width: 10.15 mm, lettering field size: 4 of 10.15 x 5 mm and 1 of 5.8 x 5 mm, Number of individual labels: 50 (Marking)	ZBF 10/5,8 AXL UNPRINTED	0829580	50
Insert label, Roll, white, unlabeled, can be labeled with: THERMOMARK ROLLMASTER 300/600, THERMOMARK X1.2, THERMOMARK ROLL X1, THERMOMARK ROLL 2.0, THERMOMARK ROLL, mounting type: snapped, lettering field size: 35 x 28 mm, Number of individual labels: 500 (Marking)	EMT (35X28)R	0801602	1

Documentation	Type	Item no.	Pcs./Pkt.
User manual, English, Axioline F: System and installation	UM EN AXL F SYS INST	-	-
User manual, English, Axioline F: Diagnostic registers, and error messages	UM EN AXL F SYS DIAG	-	-

4 Technical data

Dimensions (nominal sizes in mm)	



Width	35 mm
Height	126.1 mm
Depth	54 mm
Note on dimensions	The depth is valid when a TH 35-7,5 DIN rail is used (according to EN 60715).

General data	
Color	traffic grey A RAL 7042
Weight	130 g (with connectors and bus base module)
Ambient temperature (operation)	-25 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Permissible humidity (operation)	5 % ... 95 % (non-condensing)
Permissible humidity (storage/transport)	5 % ... 95 % (non-condensing)
Air pressure (operation)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Air pressure (storage/transport)	70 kPa ... 106 kPa (up to 3000 m above sea level)
Degree of protection	IP20
Protection class	III (IEC 61140, EN 61140, VDE 0140-1)
Overvoltage category	II (IEC 60664-1, EN 60664-1)
Degree of pollution	2 (IEC 60664-1, EN 60664-1)
Mounting type	DIN rail mounting
Mounting position	any (no temperature derating)

Connection data: Axioline F connector	
Connection method	Push-in connection
Conductor cross section, rigid	0.2 mm² ... 1.5 mm²
Conductor cross section, flexible	0.2 mm² ... 1.5 mm²
Conductor cross section [AWG]	24 ... 16
Stripping length	8 mm

Please observe the information provided on conductor cross sections in the “Axioline F: system and installation” user manual.

Interface: Axioline F local bus	
Number	2
Connection method	Bus base module
Transmission speed	100 Mbps

Axioline F local bus supply (U_{Bus})	
Supply voltage	5 V DC (via bus base module)
Current consumption	max. 150 mA
Power consumption	max. 0.75 W

Supply voltage input U_O	
Supply voltage	24 V DC
Supply voltage range	19.2 V DC ... 30 V DC including all tolerances, including ripple
Current consumption	typ. 30 mA (own current consumption) max. 1.1 A
Power consumption	typ. 0.72 W max. 33 W (of which 1.3 W internal losses)
Surge protection	electronic (35 V, 0.5 s)
Reverse polarity protection	parallel diode; with external 1 A fuse (for start-up only)

NOTE: Damage to the electronics

Provide external protection for the module to ensure reverse polarity protection. If you use a fuse, the power supply unit must be capable of supplying four times the nominal current of the fuse. This ensures that the fuse trips reliably in the event of a fault.

When using the module for the first time, protect it with a 1 A fuse. When all modules in the system are correctly connected, the 1 A fuse can be replaced with an 8 A fuse.

PWM outputs	
Number of outputs	2
Connection method	Push-in connection
Connection technology	2-conductor
Operating mode	PWM, pulse generator, push-pull output
Nominal output voltage	24 V (U_O - 1.1 V) 5 V DC
Nominal current I_N	max. 500 mA (at 24 V DC) max. 10 mA (at 5 V DC)
Frequency range	0 Hz ... 65535 Hz
Pulse duty factor	0 % ... 100 %
Nominal load, ohmic	max. 12 W (at 24 V DC nominal voltage) max. 50 mW (at 5 V DC nominal voltage)
Nominal load, inductive	max. 12 VA (at 24 V DC nominal voltage) max. 50 mVA (at 5 V DC nominal voltage)
Nominal load, lamp	max. 6 W (at nominal voltage)
Short-circuit-proof	yes
Short-circuit current	typ. 2.2 A (for approx. 1.2 µs, auto-retry after approx. 40 µs, 24 V output) typ. 24 mA (5 V output)
Transient surge protection	yes

NOTE: Damage to the electronics

If there is a faulty external voltage (reverse voltage) at one of the outputs, the output may be destroyed. This may cause unintentional setting of further outputs.

Reverse voltage protection:
24 V: Up to 1 A per channel (with external fuse for commissioning)
5 V: No reverse voltage protection

Input and output address area	
Input address area	0 Byte
Output address area	8 Byte

Configuration and parameter data in a PROFIBUS system	
Required parameter data	1 Byte
Required configuration data	6 Byte

Electrical isolation/isolation of the voltage areas	
Test section	**Test voltage**
5 V supply of the local bus (U_{Bus}) / 24 V supply (I/Os)	500 V AC, 50 Hz, 1 min.
5 V supply of the local bus (U_{Bus}) / functional ground	500 V AC, 50 Hz, 1 min.
24 V supply (I/O) / functional ground	500 V AC, 50 Hz, 1 min.

Mechanical tests	
Vibration resistance in acc. with EN 60068-2-6/ IEC 60068-2-6	5g
Shock in acc. with EN 60068-2-27/IEC 60068-2-27	30g
Continuous shock according to EN 60068-2-27/ IEC 60068-2-27	10g

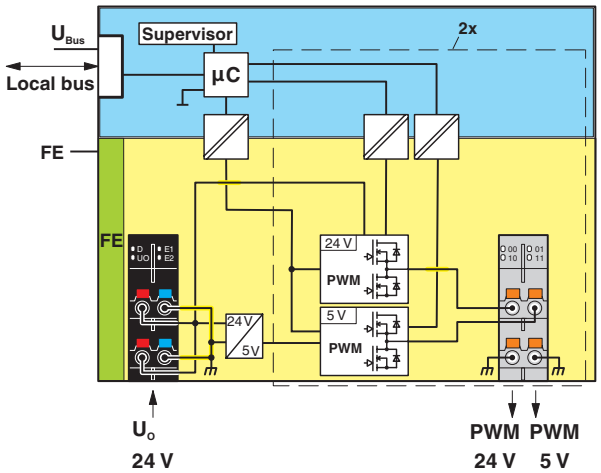
Conformance with EMC Directive 2014/30/EU	
Immunity test in accordance with EN 61000-6-2/IEC 61000-6-2	
Electrostatic discharge (ESD) EN 61000-4-2/ IEC 61000-4-2	Criterion B, 6 kV contact discharge, 8 kV air discharge
Electromagnetic fields EN 61000-4-3/IEC 61000-4-3	Criterion A, Field intensity: 10 V/m
Fast transients (burst) EN 61000-4-4/IEC 61000-4-4	Criterion B, 2 kV
Transient overvoltage (surge) EN 61000-4-5/ IEC 61000-4-5	Criterion B, DC supply lines: ±0.5 kV/±0.5 kV (symmetrical/ asymmetrical)
Conducted interference EN 61000-4-6/IEC 61000-4-6	Criterion A, Test voltage 10 V
Noise emission test according to EN 61000-6-3/ IEC 61000-6-3	Class B

When using the device in residential, commercial, and light-industrial environments, observe the following:
When connecting the device to a local DC power supply network, the cable length must not exceed 30 m.
When connecting the device to a local battery, the cable length must not exceed 30 m.

Approvals	
For the latest approvals, refer to:	phoenixcontact.net/product/1007352

5 Internal circuit diagram

Figure 1 Internal wiring of the terminal points



Key:

FE	Functional ground
Local bus	Axioline F local bus (hereinafter referred to as local bus)
Supervisor	Hardware monitoring
µC	Microcontroller
	Electrical isolation (optocoupler or isolator)
	Logic reference ground
	Noiseless ground/functional earth FE
	Reference ground of I/O devices
PWM	PWM push-pull driver
	Electrically isolated areas

6 For your safety

6.1 Intended use

Use the Axioline F modules exclusively in accordance with the specifications in the accompanying data sheet and the “Axioline F: System and Installation” user manual.

6.2 Qualification of users

The use of products described in this data sheet is oriented exclusively to electrically skilled persons or persons instructed by them. The users must be familiar with the relevant safety concepts of automation technology as well as applicable standards and other regulations.

6.3 Electrical safety

WARNING: loss of electrical safety

If used incorrectly, device safety may be impaired.

The instructions given in this data sheet as well as the UM EN AXL F SYS INST user manual must be observed during installation, startup, and operation.

6.4 Installation

Only install the Axioline F modules in a control cabinet or junction box.

The enclosure must meet the requirements regarding the protection against spread of fire according to the following standards:

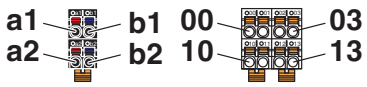
– EN 61010-1/IEC 61010-1
– UL 61010-1 (for applications with UL approval)

7 UL note

– Use copper conductors only.

8 Terminal point assignment

Figure 2 Terminal point assignment

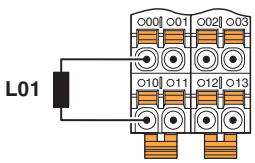


Terminal point	Color	Assignment		
Supply voltage input				
a1, a2	Red	24 V DC (U_O)	Supply voltage feed-in (bridged internally)	
b1, b2	Blue	GND	Reference potential of the supply voltage (bridged internally)	
Channel 1				
00	Orange	PWM01_24V	PWM output 1	24 V DC
10	Orange	GND	Reference potential	
01	Orange	PWM01_5V	PWM output 1	5 V DC
11	Orange	GND	Reference potential	
Channel 2				
02	Orange	PWM02_24V	PWM output 2	24 V DC
12	Orange	GND	Reference potential	
03	Orange	PWM02_5V	PWM output 2	5 V DC
13	Orange	GND	Reference potential	

The module actuates the 24 V and 5 V outputs of a channel simultaneously.
You can operate the 24 V and 5 V outputs concurrently.

9 Connection example

Figure 3 Connection example



L01 Load

10 Connection notes

NOTE: Damage to contacts

- Before working on the the module, disconnect the module's I/O devices and supply from the power supply!

11 Application example: Connection with high inrush currents

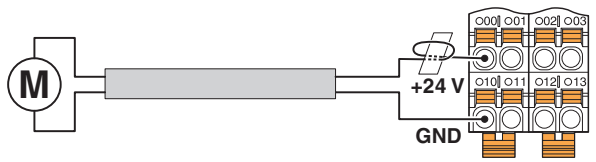
If a connected motor causes a very abrupt momentary inrush current, this triggers the “Short circuit or overload at channel x” error message.

Among other things, the input current depends on the cable length used. To attenuate this current, a cable length of at least 20 m would be required. However, you can also achieve this attenuation by using a ferrite clamp or ferrite core inductor.

11.1 Using a ferrite clamp

Loop the 24 V cable through the ferrite clamp once.

Figure 4 Connection when a ferrite clamp is used



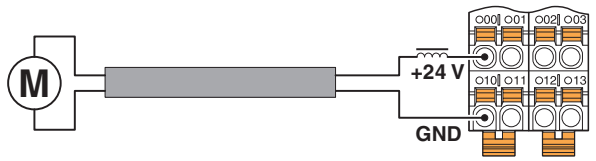
Example of a suitable ferrite clamp (as at 01/2022):

Manufacturer	Manufacturer’s part no.
Würth Elektronik	74272733

11.2 Using an inductor

Instead of a ferrite clamp, you can use a ferrite core inductor in the 24 V cable.

Figure 5 Connection when chokes are used

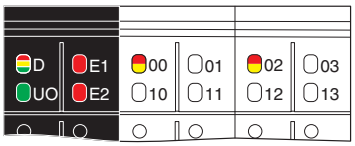


Examples of suitable inductors (as at 01/2022):

Manufacturer	Manufacturer’s part no.
TDK	B82111B0000C024
Bourns	5248-RC

12 Local diagnostic and status indicators

Figure 6 Local diagnostic and status indicators



Designation	Color	Meaning	State	Description
D	Red/ yellow/ green	Diagnostics of local bus communication		
		Run	Green on	The device is ready for operation, communication within the station is OK. All data is valid. An error has not occurred.
		Active	Flashing green	The device is ready to operate, communication within the station is OK. The data is **not** valid. The controller or superordinate network is not delivering valid data. There is no error on the module.
		Device application not active	Flashing green/yellow	The device is ready for operation, communication within the station is OK. Output data **cannot** be outputted and/or input data **cannot** be read. There is a fault on the periphery side of the module..
		Ready	Yellow on	The device is ready for operation but did not detect a valid cycle after power-up.
		Connected	Flashing yellow	The device is not (yet) part of the active configuration.
		Reset	Red on	The device is ready for operation but has lost the connection to the bus head.
		Not connected	Flashing red	The device is ready for operation but there is no connection to the previously existing device.
		Power down	Off	Device is in (power) reset.
UO	Green	U_{Output}	On	I/O supply is present.
			Off	I/O supply is not present.
E1	Red	Supply voltage error	On	Supply voltage feed-in U_O is faulty (failure or undervoltage)
			Off	No error
E2	Red	Channel error	On	Error at channel 1 and/or channel 2
			Off	No error
00	Yellow/ red	PWM output 1	Yellow on	PWM output 1 is active.
			Red on	PWM output 1 is active, a short circuit or overload is present.
			Off	PWM output 1 is not active.
02	Yellow/ red	PWM output 2	Yellow on	PWM output 2 is active.
			Red on	PWM output 2 is active, a short circuit or overload is present.
			Off	PWM output 2 is not active.

The module detects a short circuit or overload only at the 24 V output.

13 Process data

The module uses two words of output process data per channel. The relevance of the words depends on the operating mode.

The module does not use any input process data.

14 Operating modes

The terminal supports three operating modes.

– PWM (pulse width modulation)
– Pulse generator
– Push-pull output

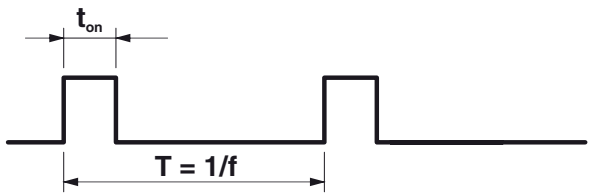
14.1 Explanation of terms: Pulse duty factor

The pulse duty factor is also referred to as pulse-pause ratio or duty cycle.

The pulse duty factor defines the ratio of the switch-on time (pulse width, high pulse) to the cycle duration of a square-wave signal as a percentage.

At a pulse duty factor of 100 %, the output remains on the whole time. At a pulse duty factor of 40 %, the output remains on for 40 % and off for 60 % of the time.

Figure 7 Signal



Where:

t_{on} Switch-on time (pulse width, high signal)
T Period length
f Frequency
Pulse duty factor = t_{on} / T * 100 %

14.2 Effect of the pulse duty factor in the operating modes

In the **PWM operating mode**, you can define the cycle duration using the frequency that you specify.
The pulse duty factor defines the percentage level of the period pulse period that is set to "high".
As a result, you can use the pulse duty factor to control the pulse width while keeping the frequency the same.

In the **pulse generator operating mode**, you can use the pulse width parameter to define the length of the high pulse. The cycle duration is taken from the pulse width and pulse duty factor.
As a result, you can use the pulse duty factor to vary the cycle duration while keeping the pulse width the same.

In the **push-pull output** operating mode, you can use a bit to actuate the output. You do not need to specify a pulse duty factor.

14.3 Selecting the operating mode

You can select the operating mode for each channel using the operating mode object (0400_{hex}, OP_Mode).

14.4 Specifying parameters

You can use the process data to specify the parameters for the PWM operating mode.

You can use the process data and the pulse width object (0405_{hex}) to specify the parameters for the pulse generator operating mode.

In the push-pull output operating mode, you can use the process data to actuate the output.

14.5 Changing the operating mode

If you want to change the operating mode, proceed as follows:

1. Stop the output of signals in the operating mode that has been used thus far.
2. Select the new operating mode.

The following parameters stop the output of signals in the respective operating mode:

PWM		
	Pulse duty factor (duty cycle)	= 0
and	Frequency	= 0
Pulse generator		
	Pulse duty factor (duty cycle)	= 0
or	Number of pulses	= 0
or	Pulse width (object 0405_{hex})	= 0
Push-pull output 1		
	Word 0, bit 8	= 0
Push-pull output 2		
	Word 2, bit 8	= 0

In order to stop output of the signals in an operating mode, we recommend setting **all** operating mode parameters to 0.

14.6 PWM (pulse width modulation)

In the PWM operating mode, you can set both the pulse duty factor and the frequency using process data. The module uses the set parameters to generate continuous pulses.

For example, you can use the PWM operating mode for applications such as the following:

– Actuating semiconductor relays
– Temperature control
– Rotation speed specification for drives

The set frequency can have a maximum deviation of 0.4 % from the set point.
The set pulse duty factor can have a maximum deviation of 0.6 % from the set point.

Figure 8 Pulse width modulation with constant frequency (f) and variable pulse duty factor of 40% or 80%

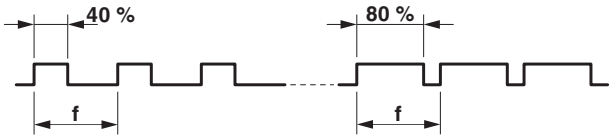


Figure 9 Pulse width modulation with constant pulse duty factor of 50% and variable frequency of 1 kHz and 10 kHz

OUT process data

You can use the first output word for each channel to set the pulse duty factor as a percentage.

You can use the second output word for each channel to set the frequency.

If the output process data has a value of 0, the module stops operation. The corresponding LED is off.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0	Not used						Channel 1, pulse duty factor									
Word 1	Channel 1 frequency															
Word 2	Not used						Channel 2, pulse duty factor									
Word 3	Channel 2 frequency															

Value range

Pulse duty factor (duty cycle)	0 % ... 100 %
Frequency	0 Hz ... 65535 Hz

Pulse duty factor

See "Explanation of terms: Pulse duty factor".

The 10-bit resolution (1000 steps) results in a step width of 0.1 % (100 % = 1000).

Value		Pulse duty factor (duty cycle)	Note
hex	dec	%	
0000	0	0	Steady off
0001	1	0.1	
000A	10	1.0	
0064	100	10.0	
01F4	500	50.0	
03E8	1000	100.0	Steady on

Frequency

You can set the frequency resolution using a divider (PDI object 0403_{hex}).

Setting in object 0403_{hex}	Resolution	Frequency
No division	1 Hz	0 Hz ... 65535 Hz
Division by 10	0.1 Hz	0 Hz ... 6553.5 Hz
Division by 100	0.01 Hz	0 Hz ... 655.35 Hz

Examples

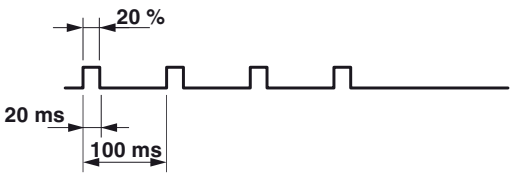
Value		Frequency (Hz)		
dec	hex	Without division	Division by 10	Division by 100
0	0000	0	0	0
1	0001	1	0.1	0.01
2	0002	2	0.2	0.02
10	000A	10	1.0	0.10
100	0064	100	10.0	1.00
500	01F4	500	50.0	5.00
32000	7D00	32000	3200.0	320.00
65535	FFFF	65535	6553.5	655.35

14.7 Pulse generator

In this operating mode, you can generate a specific number of pulses.
Specify the pulse duty factor and the number of pulses in the process data.
Use the pulse width object (0405_{hex}) to set the pulse width (switch-on time).

You can use these pulses to control the opening time of a valve, for example.

Figure 10 Pulse generator: number of pulses = 4, duty factor = 20%, pulse width = 20 ms, period = 100 ms



OUT process data

You can use the first output word for each channel to set the pulse duty factor as a percentage.

You can use the second output word for each channel to set the number of pulses to be output.

If the output process data has a value of 0, the module stops operation. The corresponding LED is off.

The module outputs pulses if the following conditions are met simultaneously:

- Pulse duty factor (duty cycle) > 0
- Number of pulses > 0
- Pulse width (object 0405_{hex}) > 0

To start a new pulse generation process, change the pulse duty factor and/or the number of pulses.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0	Not used						Channel 1, pulse duty factor									
Word 1	Not used								Channel 1, number of pulses							
Word 2	Not used						Channel 2, pulse duty factor									
Word 3	Not used								Channel 2, number of pulses							

Value range

Pulse duty factor (duty cycle)	0 % ... 100 %
Number of pulses	0 ... 255

Pulse duty factor

See "Explanation of terms: Pulse duty factor".

The 10-bit resolution (1000 steps) results in a step width of 0.1 % (100 % = 1000).

Value		Pulse duty factor (duty cycle)	Note
hex	dec	%	
0000	0	0	Steady off
0001	1	0.1	
000A	10	1.0	
0064	100	10.0	
01F4	500	50.0	
03E8	1000	100.0	Steady on

Number of pulses

Enter the number of pulses that you want the module to output consecutively.

Value		Number of pulses	Note
hex	dec		
00	0	0	Off
01	1	1	
0A	10	10	
32	50	50	
64	100	100	
FF	255	255	

14.8 Push-pull output

In this operating mode, you can use both channels as digital push-pull outputs.

OUT process data

If you set bit 8 of the first output word of a channel, the module sets the associated output to "1". The output remains set for as long as the associated bit is set.

The second output word of each channel is reserved.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0	Not used							X	Not used							
Word 1	Not used															
Word 2	Not used							X	Not used							
Word 3	Not used															

Value range

X = 0	Output set to "0"
X = 1	Output set to "1"

15 Parameter, diagnostics and information (PDI)

Parameter and diagnostic data as well as other information is transmitted as objects via the PDI channel of the Axioline F station.

The standard and application objects stored in the module are described in the following section.

The following applies to all tables below:

You will find an explanation of the data types in the user manual UM EN AXL F SYS INST.

Abbreviation	Meaning
A	Number of elements
L	Length of the elements in bytes
R	Read
W	Write

Each visible string is terminated with a null terminator (00_{hex}). The length of a visible-string-type element is therefore at least one byte larger than the number of user data items.
If the number of user data items plus null terminator is smaller than the specified length of the element, the visible string will be populated with a null character (00_{hex}).

You will find detailed information on the PDI objects in the user manual
UM EN AXL F SYS INST.

16 Standard objects

16.1 Objects for identification (device rating plate)

Index (hex)	Object name	Data type	A	L	Rights	Meaning	Contents
Manufacturer							
0001	VendorName	Visible String	1	32	R	Vendor name	PHOENIX CONTACT
0002	VendorID	Visible String	1	7	R	Vendor ID	00A045
0003	VendorText	Visible String	1	58	R	Vendor text	Components and systems for industrial automation
0012	VendorURL	Visible String	1	58	R	Vendor URL	www.phoenixcontact.net/qr/1007352
Module - general							
0004	DeviceFamily	Visible String	1	20	R	Device family	I/O function module
0006	ProductFamily	Visible String	1	32	R	Product family	AXL F
000E	CommProfile	Visible String	1	4	R	Communication profile	634
000F	DeviceProfile	Visible String	1	5	R	Device profile	0010
0011	ProfileVersion	Record of Visible Strings	2	11; 19	R	Profile version	2018-04-19; Basic profile V3.0
0017	Language	Record of Visible Strings	2	6; 8	R	Language	en-us; English
Module - special							
0005	Capabilities	Octet string	1	8	R	Capabilities	FwUpdt0
0007	ProductName	Visible String	1	32	R	Product name	AXL F PWM2 1H
0008	SerialNo	Visible String	1	22	R	Serial number	e. g., 1234512345
0009	ProductText	Visible String	1	58	R	Product text	2 channel pulse-width modulation
000A	OrderNumber	Visible String	1	32	R	Item No.	1007352
000B	HardwareVersion	Record of Visible Strings	2	11; 11	R	Hardware version	e. g., 2011-02-04; 00
000C	FirmwareVersion	Record of Visible Strings	2	11; 11	R	Firmware version	e.g., 2017-12-31; 1.00
000D	PChVersion	Record of Visible Strings	2	11; 11	R	PDI version	e. g., 2010-06-21; V1.00
0037	DeviceType	Octet string	1	8	R	Device type	00 00 20 08 00 00 00 $F8_{hex}$
003A	VersionCount	Array of UINT16	4	4 * 2	R	Version counter	e.g. 0009 0002 0001 0100_{hex}
003D	WakeUpTime	UINT16	1	2	R	Start time until ready to operate in ms	500
Use of the device							
0014	Location	Visible String	1	58	R/W	Location	Can be completed by the user.
0015	EquipmentIdent	Visible String	1	58	R/W	Equipment identifier	Can be completed by the user.
0016	ApplDeviceAddr	UINT16	1	2	R/W	Application-specific device address	Can be completed by the user.

16.2 Miscellaneous standard objects

Index (hex)	Object name	Data type	A	L	Rights	Meaning/contents	Startup parame-ters	
Object descriptions								
0038	ObjDescrReq	Record			R/W	Object description request	No	
0039	ObjDescr	Record			R	Object description	No	
Diagnostics objects								
0018	DiagState	Record	1 1	123	R	Diagnostic state	No	*
0019	ResetDiag	UINT8	1	1	W	Handling diagnostic messages	No	*
E801	DiagHistory	Record			R	Diagnostics archive	No	*
E806	CurrentDiagState	Record			R	Diagnostic overview	No	*
Objects for process data management								
0024	ResetCode	Array of UINT16	2	2 * 2	R/W	Substitute value behavior during bus reset (PDOUT)	Yes	*
0025	PDIN	Octet string	1	8	R	Input process data, not relevant	No	
0026	PDOUT	Octet string	1	8	R	Output process data	No	*
003B	PDIN_Descr	Array of Records			R	Description of the IN process data	No	
003C	PDOUT_Descr	Array of Records			R	Description of the output process data	No	
002E	ParamHash	UINT32	1	4	R	Hash value	No	*
0040	ListOfObjToRestore	Record	4	12	R	List of all the startup parameters of the device	No	*

The objects identified with * in the last column are described in more detail in the following sections.

The description of the other objects is to be found in the user manual UM EN AXL F SYS INST.

The objects 0038_{hex}, 0039_{hex}, $003B_{hex}$ and $003C_{hex}$ are only applicable to tools.

16.3 Diagnostics state (0018_{hex}: DiagState)

This object is used for a structured message of an error.

0018_{hex}: Diagnostics state (read)					
Subindex	**Data type**	**Length in bytes**	**Meaning**	**Contents**	
00	Record	Max. 123	Diagnostic state	Current diagnostic state of the device in short form	
01	UINT16	2	Error number	0 ... 65535_{dec}	
02	UINT8	1	Priority	00_{hex}	No error
				01_{hex}	Error
				02_{hex}	Warning
				81_{hex}	Error removed
				82_{hex}	Warning eliminated
03	UINT8	1	Channel	00_{hex}	No error
				01_{hex}	Channel 1
				02_{hex}	Channel 2
				FF_{hex}	Entire device
04	UINT16	2	Error code	See table below	
05	UINT8	1	More follows	80_{hex}	
06	Octet string	2	Reserved	0000_{hex}	
07	UINT8	1	Submodule number	00_{hex}	
08	Octet string	8	Function group	GENERAL, PWM	
09	Octet string	4	More follows	0000 0000_{hex}	
0A	UINT8	1	Text length	Length of the following diagnostic text in bytes	
0B	Visible String	Max. 99 + 1	Diagnostic text	See table below	

The message with priority 81_{hex} or 82_{hex} is a one-off, internal message to the bus coupler. The bus coupler transfers this error message to the error mechanisms of the higher-level system.

After all errors have been eliminated, it is automatically reset.

Error and status of the local diagnostics and status indicators

Subindex	02	03	04	08	0B						
Error	Priority	Channel/ group/ module	Error code	Function group	Text	LED					
	hex	hex	hex			D	UO	E1	E2	00	02
No error	00	00	0000	General	Status OK	X	●	○	○	X	X
Supply voltage faulty (I/O supply)	01	FF	5160	General	General fault at peripheral supply. Check 24 V supply of module.	X	○	●	X	X	X
Short circuit or overload at channel 1	01	01	5112	PWM	Short circuit at PWM channel 1 on terminal point 00. Check cabeling or actuator.	X	X	X	●	●	X
Short circuit or overload at channel 2	01	02	5112	PWM	Short circuit at PWM channel 2 on terminal point 02. Check cabeling or actuator.	X	X	X	●	X	●
Parameter table invalid	01	FF	6320	General	Parameter required	X	X	●	X	X	X

Key:

X The LED is not affected by this error.

○ Off

● On

The module does not distinguish between the 24 V and 5 V output. If a short circuit or overload is detected at the 24 V output of a channel, then the 5 V output of this channel will also not be functional.

The module does not detect a short circuit or overload at the 5 V output.

A short circuit or overload is detected from a pulse duty factor of > 5%.

16.4 Handling diagnostic messages (0019_{hex}: ResetDiag)

You can use this object to specify how the module should handle diagnostic messages.

0019_{hex}: Handling diagnostic messages (read, write)				
Subindex	**Data type**	**Length in bytes**	**Contents**	
			Code (hex)	**Meaning**
0	UINT8	1	00	Permit all diagnostic messages
			01	Delete the diagnostic archive (objects $E801_{hex}$: DiagHistory and $E802_{hex}$: DiagHistoryLong)
			02	Delete and acknowledge all diagnostic messages that are still pending
			03	Delete and acknowledge all diagnostic messages and reset the error counter
			06	Delete and acknowledge all diagnostic messages and do not permit new diagnostic messages
			Other	Reserved

16.5 Diagnostic archive ($E801_{hex}$: DiagHistory)

You can use this object to access a diagnostics archive. The archive consists of a list of up to 64 entries. The data has the same structure as that of DiagState. The oldest information with the lowest error number is transmitted first.

Access is then only possible using the Upload Read protocol.

For more detailed information about the Upload Read protocol, please refer to the basic profile.
The basic profile is available on the Internet at www.interbusclub.com under “Downloads, INTERBUS Profiles”.

$E801_{hex}$: diagnostics archive (read)			
Element	**Data type**	**Length in bytes**	**Meaning/contents**
1	Record	Dynamic	Oldest diagnostic state, see DiagState
...	Record	Dynamic	...
N (N ≤ 64)	Record	Dynamic	Newest diagnostic state, see DiagState

16.6 Diagnostic overview ($E806_{hex}$: CurrentDiagState)

You can use this object to access all diagnostic messages that are currently present. The object can contain up to 64 entries. The data has the same structure as that of DiagHistory.

Access is then only possible using the Upload Read protocol.

$E806_{hex}$: diagnostic overview (read)			
Element	**Data type**	**Length in bytes**	**Meaning/contents**
1	Record	Dynamic	Diagnostic entry 1, see DiagState
...	Record	Dynamic	...
N (N ≤ 64)	Record	Dynamic	Diagnostic entry N, see DiagState

16.7 Substitute value behavior during bus reset (PDOUT) (0024_{hex}: ResetCode)

With this object, you parameterize the behavior of the module in the event that process data is missing.

0024_{hex}: substitute value behavior during bus reset (PDOUT) (read, write)				
Element	**Data type**	**Length in bytes**	**Meaning/contents**	
1	UINT16	2	Reset code	Channel 1
2	UINT16	2	Reset code	Channel 2

Value range

Code (hex)	Behavior	Default	Note
0000	0 is output to all output bits	X	
0002	Hold the last valid value		
0004	Output the minimum permissible value		Corresponds to "0 is output to all output bits"
0005	Output the maximum permissible value		Depends on the operating mode

Maximum permissible values in the different operating modes:

Operating mode	Word		Parameter	Maximum permissible value	
	Channel 1	Channel 2		bin	hex
PWM	0	2	Pulse duty factor (duty cycle)	0000 0011 1111 1000	03E8
	1	3	Frequency	1111 1111 1111 1111	FFFF
Pulse generator	0	2	Pulse duty factor (duty cycle)	0000 0011 1111 1000	03E8
	1	3	Number of pulses	0000 0000 1111 1111	00FF
Push-pull output	0	2	Push-pull output	0000 0001 0000 0000	0100
	1	3	Reserved	0000 0000 0000 0000	0000

16.8 Output process data (0026_{hex}: PDOUT)

You can read the OUT process data of the module with this object.

The structure corresponds to the representation in the "Process data" section.

0026_{hex}: OUT process data (read)			
Subindex	**Data type**	**Length in bytes**	**Meaning**
0	Octet string	8	Output process data

16.9 Hash value ($002E_{hex}$: ParamHash)

The hash value is a unique value that is generated for a specific device and which ensures the integrity of the parameter data. The data of the startup objects is verified with this hash value. The value changes only if an object relevant for startup has been changed. The value is therefore suitable for comparing the parameterization.

16.10 List of all the startup parameters of the device (0040_{hex}:ListOfObjToRestore)

The object contains a list of all the startup parameters of the device. This enables parameters to be uploaded from the device (e.g., to clone a station).

17 Application objects

Index (hex)	Object name	Data type	A	L	Rights	Meaning/contents
0400	Op_Mode	UINT8	2	2 * 1	R/W	Operating mode
0403	Divider	UINT8	2	2 * 1	R/W	Divider
0405	PulseWidth	UINT16	2	2 * 2	R/W	Pulse width

17.1 Operating mode (0400_{hex}: Op_Mode)

You can set the operating mode of the module prior to start-up with this object.

0400_{hex}: Op_Mode (read, write)				
Subindex	**Data type**	**Length in bytes**	**Contents**	
0	Array of UINT8	2	Read/write all elements	
1	UINT8	1	Operating mode	Channel 1
2	UINT8	1	Operating mode	Channel 2

Value range

Value	Meaning	Default
0	Reserved	
1	PWM	X
2	Pulse generator	
3	Push-pull output	
Other	Reserved	

17.2 Divider (0403_{hex}: Divider)

You can select a divider with this object.

In the PWM operating mode, you can use this divider to set the frequency in steps of 0.01 Hz, 0.1 Hz or 1 Hz.

In the pulse generator operating mode, you can use this divider to set the pulse width in steps of 1 ms, 100 µs or 10 µs.

0403_{hex}: Divider (read, write)				
Subindex	**Data type**	**Length in bytes**	**Contents**	
0	Array of UINT8	2	Read/write all elements	
1	UINT8	1	Divider	Channel 1
2	UINT8	1	Divider	Channel 2

Value range

Value	Meaning	Default
0	No division	X
1	Division by 10	
2	Division by 100	
Other	Reserved	

Effect of the divider on the frequency and pulse width

Spacing	Frequency (Hz)		Pulse width (ms)	
	Resolution	**Value range**	**Resolution**	**Value range**
No division	1 Hz	0 ... 65535	1	0 ... 65535
Division by 10	0.1 Hz	0 ... 6553.5	0.1	0 ... 6553.5
Division by 100	0.01 Hz	0 ... 655.35	0.01	0 ... 655.35

17.3 Pulse width (0405_{hex}: PulseWidth)

The object is relevant only in the pulse generator operating mode.

You can use this object to set the pulse width to a value from 10 µs to 65 s for a single pulse.

The value 0 deactivates the process of outputting pulses.

If you have selected "No division" in object 0403_{hex} (divider), the value set under pulse width corresponds to a pulse width of 1 ms to 65 s.

If you specify a divider in object 0403_{hex} (divider), you can set the pulse width in steps of 10 µs or 100 µs.

0405_{hex}: PulseWidth (read, write)				
Subindex	**Data type**	**Length in bytes**	**Contents**	
0	Array of UINT16	4	Read/write all elements	
1	UINT16	2	Pulse width	Channel 1
2	UINT16	2	Pulse width	Channel 2

Value range

Pulse width (ms) 0 ... 65535

Examples

Value		**Pulse width (ms)**		
dec	**hex**	**Without division**	**Division by 10**	**Division by 100**
0	0000	0	0	0
1	0001	1	0.1	0.01
2	0002	2	0.2	0.02
10	000A	10	1.0	0.10
100	0064	100	10.0	1.00
500	01F4	500	50.0	5.00
32000	7D00	32000	3200.0	320.00
65535	FFFF	65535	6553.5	655.35

18 Device descriptions

The device is described in the device description files.
The device descriptions for controllers from Phoenix Contact are included in PC Worx and PLCnext Engineer, as well as in the corresponding service packs.
The device description files for other systems are available for download at phoenixcontact.net/products in the download area of the bus coupler installed.