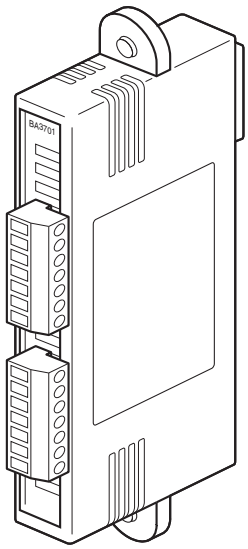
Instructions for BA3701 Pageant Digital Input Module 2 x Totaliser or Counter



Issue 4
21st October 2025

BEKA associates Ltd. Old Charlton Rd, Hitchin, Hertfordshire, SG5 2DA, UK Tel: +44(0)1462 438301 e-mail: sales@beka.co.uk
web: www.beka.co.uk

1. INTRODUCTION

The BA3701 plug-in digital input module has two identical counter inputs. Separate IECEx, ATEX and UKEX intrinsic safety apparatus certification allows it to be safely plugged into any one of the seven slots on a Pageant BA3101 operator display. It is primarily intended for use with hazardous area intrinsically safe pulse output flowmeters, but may be used for any pulse counting application.

Each of the two inputs may be individually configured to accept pulses from a NAMUR compliant 2-wire proximity detector, a sensor with an open collector output, a switch contact or a voltage pulse output. Each channel is certified as a separate intrinsically safe circuit but is not individually isolated as they is intended for use with isolated sensors.

Output safety parameters are compatible with most 2-wire intrinsically safe NAMUR proximity detectors, and for voltage inputs zero output safety parameters simplify connection to a sensor.

Each input has a separate hardware counter which may be interrogated up to ten times per second by the Pageant operator panel's CODESYS runtime PLC. The total pulse count and pulse rate can be calculated and scaling applied to convert input pulses to engineering units.

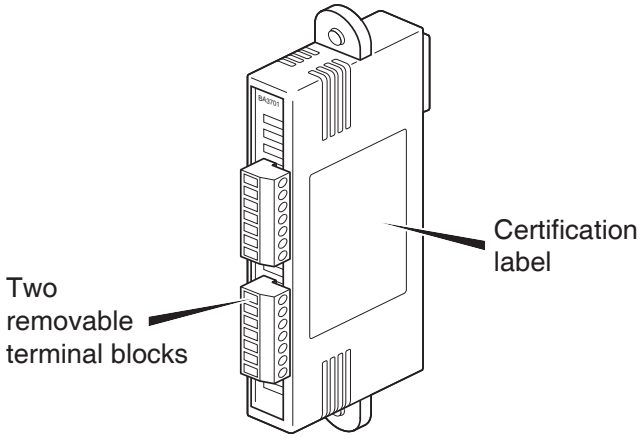


Fig 1 BA3701 Pageant Digital Input Module
2 x Totaliser or Counter

Each channel has an isolated open collector synchronous pulse output which duplicates the input pulse for retransmission applications. Alternatively, pulses representing either input in engineering units after scaling by the PLC, or the sum of both inputs can be retransmitted. The intrinsic safety output parameters of both pulse outputs are zero allowing simple connection to other hazardous area instruments and safe area isolators.

2. INTRINSIC SAFETY CERTIFICATION

Notified Body CML B.V. and UK Approved Body Eurofins CML have issued the plug-in BA3701 Pageant Digital input module with the following apparatus certificates:

IECEx	IECEx CML 21.0141X
ATEX	CML 21ATEX21241X
UKEX	CML 21UKEX21242X

The ATEX certificate has been used to confirm compliance with the European ATEX Directive for Group II, Category 1GD equipment, similarly the UKEX certificate has been used to confirm compliance with UK statutory requirements. All BA3701 modules carry both the CE and UKCA marks therefore, subject to local codes of practice, they may be installed in any of the European Economic Area (EEA) member countries and in the UK. ATEX certificates are also acceptable for installations in some non EU countries.

Plug-in BA3701 Pageant Digital Input Modules are CE marked to show compliance with the European Explosive Atmospheres Directive 2014/34/EU* and the *European EMC Directive 2014/30/EU.

The modules are also UKCA marked to show compliance with UK statutory requirements Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations UKSI 2016:1107 (as amended)* and with the *Electromagnetic Compatibility Regulations UKSI 2016:1091.

These instructions describe IECEx, ATEX and UKEX installations which conform with IEC / EN60079-14 *Electrical installations design, selection and erection*. When designing systems the local code of practice should be consulted.

2.1 Zones, gas groups and T rating

All of the BA3701 certificates specify the same certification codes:

Ex ia IIC T4 Ga
Ex ia IIIC T226°C Da*
-40°C ≤ Ta ≤ 65°C

** Dust certification requires the Pageant Operator Panel and the BA3701 module to have a minimum additional IP54 rear protection - see 2.2 ii.*

2.2 Special conditions for safe use

i. Under certain extreme circumstances, the non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. In addition, the equipment shall only be cleaned with a damp cloth.

ii. In installations requiring EPL Da, Db, or Dc, the equipment shall be mounted to an enclosure which provides a minimum degree of protection of IP5X and which meets the requirements of IEC / EN60079-0 Clause 8.4 (material composition requirements for metallic enclosures for Group III) and/or IEC / EN60079-0 Clause 7.4.3 (Avoidance of a build up of electrostatic charge for Group III) as appropriate. All cable entries into the equipment shall be made via cable glands which provided a minimum degree of protection of IP5X.

iii. The BA3701 plug-in module shall only be used as part of a BEKA Pageant system.

2.3 Certification label information

The certification information label is fitted to the side of the plug-in BA3701 module. It shows the model number, certification information, BEKA associates address and year of manufacture together with the serial number.

Certification Information Label

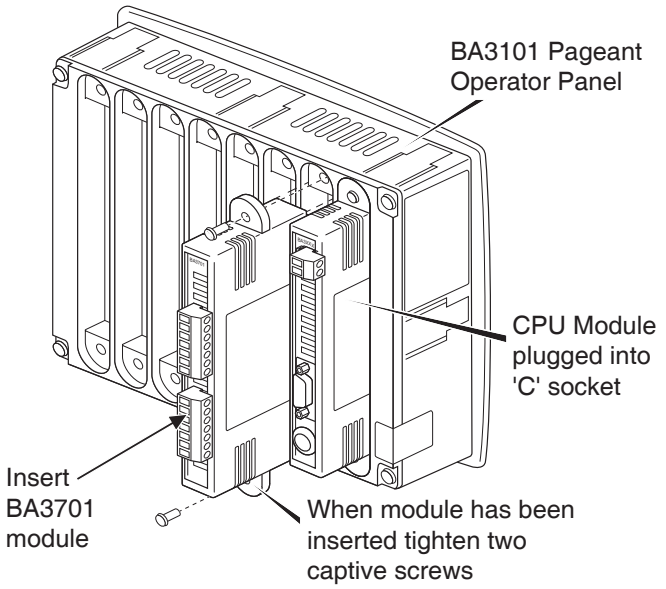


Fig 2 Inserting BA3701 module into one of seven sockets

3. INSTALLATION

The BA3701 plug-in module should be fitted into one of the seven sockets at the rear of a BA3101 Pageant Operator Panel as shown in Fig 2.

For a hazardous area installation the plug-in module must be manufactured by BEKA and have certification that specifies that it shall be used as part of a BEKA Pageant system.

3.1 Power consumption

The intrinsic safety certification of the BA3701 plug-in module permits any combination to be installed in a Pageant BA3101 display, but there are power limitations.

The percentage of the total available power that the BA3701 consumes is:

BA3701	2 x Totaliser or Counter with one or both inputs energised for use with NAMUR sensor(s).	24%
BA3701	2 x Totaliser or Counter with neither input energised.	8%

The sum of the percentage power consumption's of all the plug-in modules installed in a BA3101 display must not exceed 100%.

3.2 Plug-in BA3701 module Installation

1. The module may be fitted before or after the Operator Panel is installed. The Operator Panel should not be powered while the module is being fitted.

2. Carefully insert the module into the selected slot at the rear of the BA3101 Pageant Operator Display. When correctly positioned secure the module by tightening the two captive module fixing screws.

3. Connect field wiring to each of the two removable input terminal blocks. Both the inputs are identical as shown in Fig 3. Each of the two inputs is a separate intrinsically safe circuit and field wiring should comply with segregation requirements specified in IEC / EN 60079-14. If a multicore cable is used for the inputs, it should have Type A or B construction as specified in Clause 16.2.2.7 of IEC / EN 60079-14 Wiring should be supported to avoid damaging the module's terminals.

4. PULSE INPUTS

The Pageant BA3701 module has two identical pulse input channels. Each is certified as a separate intrinsically safe circuit but they are not galvanically isolated from each other and are intended for connection to isolated sensors. Sensors and associated wiring should be able to withstand a 500V rms insulation test to earth.

4.1 Pulse input thresholds

Each input may be individually configured from the Pageant operator panel menu into which the BA3701 module is fitted to operate with a wide range of different sensors. The following table shows the input switching thresholds for each type. For reliable operation input pulses must fall below the lower threshold and rise above the upper threshold.

Input Sensor	Switching thresholds	
	Lower	Upper
Switch	100Ω	1000Ω
Proximity detector	1.2mA	2.1mA
Open collector	2kΩ	10kΩ
Magnetic pick-off	0mV	40mV peak
Voltage pulse low	1.0V	3.0V
Voltage pulse high	3.0V	10.0V

4.2 Pulse input frequency

The maximum counting frequency depends upon the debounce level selected, the shape of the input pulse and its amplitude. The following table assumes a square wave input and is only for guidance. The maximum counting frequency will be lower if the input pulses have sloping edges and the pulse amplitude only slightly exceeds the input switching thresholds.

ONLY FOR GUIDANCE		
De-bounce level	Max counting frequency	
	Type of input	
	Contact	All others
Default	250Hz	12kHz
Heavy	120Hz	2kHz
Light	1000Hz	100kHz

The minimum input frequency is 0.01Hz. Below this frequency the rate display will be forced to zero.

4.3 Input safety parameters

For sensors that require energising to determine their state, such as a switch contact or a 2-wire proximity detector, fitting an external link between terminals 1 & 2 of the channel terminals connects an internal 8.2V, 4mA supply to the input. Energising is not required for voltage pulse inputs.

The output safety parameters of a BA3701 input change depending on whether terminals 1 and 2 are linked as shown in the following table which also shows the types of sensor requiring energising (link fitting).

		Output safety parameters of a BA3701 input		
Type of input	**Link terminals 1 & 2**	**Uo**	**Io**	**Po**
Switch contact	Yes	8.8V	7.4mA	16mW
Proximity detector	Yes	8.8V	7.4mA	16mW
Open collector	Yes	8.8V	7.4mA	16mW
Co in a IIC gas	≤	5.5µF		
Lo in a IIC gas	≤	556mH		
Voltage input (low)	No	1.15V	0	0
Voltage input (high)	No	1.15V	0	0
Magnetic pick-off	No	1.15V	0	0

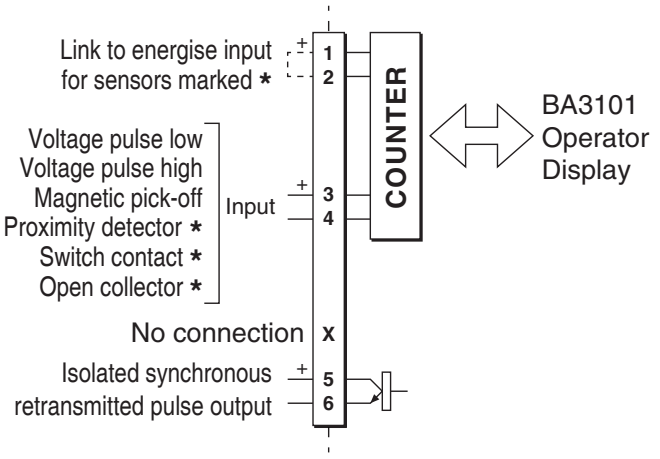
For voltage and magnetic pick-off inputs for which the input is not energised and no link is required, the output safety parameters of the BA3701 are below those specified for simple apparatus. For most applications these parameters can be ignored when assessing the safety of the input circuit.

The output safety parameters of the voltage sensor should be equal to or less than:

Uo ≤ 28V
Io ≤ 200mA
Po ≤ 0.66W

The BA3701 input's internal capacitance Ci is 0 and the internal inductance Li is 4µH which are unlikely to be significant when assessing the safety of the input circuit.

Subject to their certification, sensors may be in a flammable gas atmosphere located in Zone 0, 1, or 2, or in a combustible dust atmosphere located in Zone 20, 21 or 22.



Both inputs channels have the same terminal connections

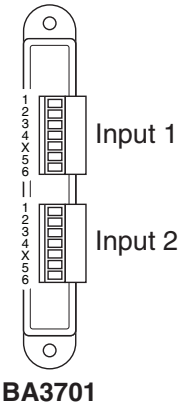


Fig 3 Input terminals

5. SYNCHRONOUS PULSE OUTPUT

Each input has an isolated, open collector, polarised current sink pulse output on terminals 5 and 6 with the following electrical parameters:

Ron	=	51Ω + 3V
Roff	=	1MΩ
Isink	=	10mA max

The output can retransmit synchronous duplicate input pulses for retransmission applications. Alternatively, the output can be configured to output pulses representing either a BA3701 input in engineering units after scaling by the Pageant operator panel, or an output representing the sum of both pulse inputs.

5.1 Intrinsic safety parameters

Both pulse outputs are certified as separate galvanically isolated circuits with the following safety parameters:

Ui	=	28V
Ii	=	200mA
Pi	=	0.66W
Uo	=	0
Io	=	0
Po	=	0

The intrinsic safety output parameters of both retransmitted outputs are zero allowing simple connection to other instruments in the hazardous area and safe area instruments via a Zener barrier or galvanic isolator.

6. MAINTENANCE

A BA3701 digital input module should be regularly inspected to ensure that it has not been damaged. The frequency of inspection depends upon environmental conditions.

No attempt should be made to repair a faulty plug-in module. Suspect modules should be returned to BEKA associates or your local BEKA agent.

7. GUARANTEE

Modules which fail within the guarantee period should be returned to BEKA associates or your local BEKA agent. It is helpful if a brief description of the fault symptoms is provided.

8. CUSTOMER COMMENTS

BEKA associates are always pleased to receive comments from customers about our products and services. All communications are acknowledged and whenever possible, suggestions are implemented.

APPENDIX 1
BA3701 Pageant Digital Input Module 2 x Totaliser or Counter Codesys Mapping and Parameters

The Pageant Codesys Quick Start Guide which can be downloaded from the BEKA website https://www.beka.co.uk/manuals/pageant_codesys_quick_start_guide.pdf explains how to setup the CODESYS v3 environment to work with a BEKA Pageant Operator Panel and to start developing PLC applications.

The BEKA Quick Start Guide is not a programming manual, for detailed documentation about the CODESYS v3 development system please refer to https:/www.codesys.com and to the on-line help.

The following table lists the BA3701 Pageant Digital Input Totaliser or Counter Module Codesys parameters. These can be set and mapped during the initialisation of the PLC application which is described in the BEKA Quick Start Guide. If values are not set in the Codesys project, the default values will be used. The bidirectional channels are both read and write, the value written by the application is cleared once processed by the module.

BA3701 Digital Input Module Codesys Mapping and Parameters

Channel or Parameter Name		Type	Default	Variable Type	Range	Description
Input A Configuration	Input Type	Parameter (1)	Volts Low	Enumeration Of BYTE	Volts Low Volts High Coil Proximity Switch Switch Open Collector	Type of input
	Input Debounce	Parameter (1)	Medium	Enumeration Of BYTE	Light Medium High	Debounce applied to the input
	Input Count Edge	Parameter (1)	Leading	Enumeration Of BYTE	Leading Trailing	Select edge to count
	Input Timebase	Parameter (1)	Second	Enumeration Of BYTE	Second Minute Hour	Timebase used for the input
	Input Scale T	Parameter (1)	1.0	REAL	32 bits Float	Scaling applied to the total
	Input Scale R	Parameter (1)	1.0	REAL	32 bits Float	Scaling applied to the rate
	Input Clip-Off Threshold	Parameter (1)	0.0	REAL	32 bits Float	Value below which counts are ignored
Input B Configuration	Input Type	Parameter (1)	Volts Low	Enumeration Of BYTE	Volts Low Volts High Coil Proximity Switch Switch Open Collector	Type of input
	Input Debounce	Parameter (1)	Medium	Enumeration Of BYTE	Light Medium High	Debounce applied to the input
	Input Count Edge	Parameter (1)	Leading	Enumeration Of BYTE	Leading Trailing	Select edge to count
	Input Timebase	Parameter (1)	Second	Enumeration Of BYTE	Second Minute Hour	Timebase used for the input
	Input Scale T	Parameter (1)	1.0	REAL	32 bits Float	Scaling applied to the total
	Input Scale R	Parameter (1)	1.0	REAL	32 bits Float	Scaling applied to the rate
	Input Clip-Off Threshold	Parameter (1)	0.0	REAL	32 bits Float	Value below which counts are ignored

table continued...

Channel or Parameter Name		Type	Default	Variable Type	Range	Description
Count Mode		Parameter (1)	A+B	Enumeration Of BYTE	A+B A-B A Controlled by B Quadrature	Method used for counting pulses
Count Direction		Parameter (1)	Up	Enumeration Of BYTE	Up Down	Counting direction
Output A	Source	Parameter (1)	Direct	Enumeration Of BYTE	Direct Count A Count B Count A+B	Source for pulse output
	Divisor	Parameter (1)	1	Enumeration Of BYTE	1 10 100 1000 10000	Divisor for pulse output
	Width	Parameter (1)	1.0	Enumeration Of BYTE	0.1 0.5 1.0 2.5 5.0 10.0 25.0 50.0 100.0 250.0 500.0	Width for pulse output in ms
Output B	Source	Parameter (1)	Direct	Enumeration Of BYTE	Direct Count A Count B Count A+B	Source for pulse output
	Divisor	Parameter (1)	1	Enumeration Of BYTE	1 10 100 1000 10000	Divisor for pulse output
	Width	Parameter (1)	1.0	Enumeration Of BYTE	0.1 0.5 1.0 2.5 5.0 10.0 25.0 50.0 100.0 250.0 500.0	Width for pulse output in ms

Notes

(1) Parameters are only set during the initialisation of the PLC application, if the value is not set in the CODESYS project, the default value will be used.

(2) These bidirectional channels are both write and read, the value written by the application is cleared once processed by the module.

table continued...

Channel or Parameter Name	Type	Default	Variable Type	Range	Description
Clear	Bidirectional (2)	N/A	BYTE	0..255	Bit Field: If Bit 2 is set, clears total for Calculated Channel If Bit 1 is set, clears total for Channel B If Bit 0 is set, clears total for Channel A
Channel A Total	Input	N/A	LREAL	64 bits Float	
Channel B Total	Input	N/A	LREAL	64 bits Float	
Calculated Total	Input	N/A	LREAL	64 bits Float	
Channel A Rate	Input	N/A	REAL	32 bits Float	
Channel B Rate	Input	N/A	REAL	32 bits Float	
Calculated Rate	Input	N/A	REAL	32 bits Float	
Channel A Status	Input	N/A	BYTE	0...255	Bit Field: If Bit 1 is set, this indicates that the input rate is below the Clip-Off Threshold If Bit 0 is set, this indicates that the maximum value has been reached and counting has stopped
Channel B Status	Input	N/A	BYTE	0...255	Bit Field: If Bit 1 is set, this indicates that the input rate is below the Clip-Off Threshold If Bit 0 is set, this indicates that the maximum value has been reached and counting has stopped
Calculated Channel Status	Input	N/A	BYTE	0...255	Bit Field: If Bit 1 is set, this indicates that the input rate is below the Clip-Off Threshold If Bit 0 is set, this indicates that the maximum value has been reached and counting has stopped

Notes

(1) Parameters are only set during the initialisation of the PLC application, if the value is not set in the CODESYS project, the default value will be used.

(2) These bidirectional channels are both write and read, the value written by the application is cleared once processed by the module.

EU Declaration of Conformity

This certificate is issued for electrical apparatus BA3701

Description
BA3701 is a Pageant intrinsically safe plug-in digital input module. 2 x totaliser or counter.

Manufactured by
BEKA associates Ltd, Old Charlton Road, Hitchin, Herts. UK. SG5 2DA

Council Directives this equipment complies with:

2014/34/EU (ATEX Directive)

Relating to equipment and protective systems intended for use in potentially explosive atmospheres.

Provisions of the Directive fulfilled by the equipment:

Group II Category 1G Ex ia IIC T4 Ga -40°C ≤ Ta ≤ +65°C
Group II Category 1D Ex ia IIIC T226ºC Da -40°C ≤ Ta ≤ +65°C

Notified Body for EU-Type Examination
CML B.V., Chamber of Commerce No 6738671, Koopvaardijweg 32, 4906CV Oosterhout, The Netherlands, Notified Body Number 2776
CML 21ATEX21241X Issue 0 9th November 2021

Notified Body for production
INTERTEK ITALIA SPA 2575 Via Guido Miglioli, 2/A 20063 Cernusco sul Naviglio (MI) Italy.

Standards used:
EN IEC 60079-0:2018 and EN 60079-11:2012

2014/30/EU (EMC Directive)

Standards used:
EN 61326-1:2013

2011/65/EU (RoHS Directive) relating to hazardous substances in electronic and electrical equipment.

2015/863/EU additional substances added by amending Annex II to Directive 2011/65/EU as regards the list of restricted substances.

CE **mark first affixed in 2021**

Authorised Signatory: Issue 1 1st November 2021

Olivier Lebreton CEng MIET
Managing Director

BEKA associates Ltd. Old Charlton Road, Hitchin, SG5 2DA UK
Telephone +44 (0) 1462 438301 Fax +44 (0) 1462 453971
e-mail sales@beka.co.uk www.beka.co.uk

All associated manuals, certificates, and datasheets can be downloaded from
https://www.beka.co.uk/qr-ba3701_1

BEKA associates
Old Charlton Rd, Hitchin, Hertfordshire, SG5 2DA, UK
Tel: +44(0)1462 438301 e-mail: sales@beka.co.uk
web: www.beka.co.uk