

# EU-TYPE EXAMINATION CERTIFICATE



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**Equipment or Protective System intended for use  
in Potentially Explosive Atmospheres  
Directive 2014/34/EU**

EU-Type Examination Certificate Number: **UL 22 ATEX 2673X Rev. 0**

Product: **Optical Encoder System**

Manufacturer: **Dynapar Corporation**

Address: **2100 West Broad Street, Elizabethtown, NC 28337 USA**

This product and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

UL International Demko A/S, notified body number 0539 in accordance with Article 17 of the Council Directive 2014/34/EU of 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report no. **US/UL/ExTR21.0127/00.**

Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

**EN 60079-25:2010**

If the sign "X" is placed after the certificate number, it indicates that the product is subject to special conditions for safe use specified in the schedule to this certificate.

This EU-Type Examination Certificate relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by the certificate.

The marking of the product shall include the following:

 **II 1 G Ex ia op is IIB T4 Ga**

**Certification Manager**  
Jan-Erik Storgaard

This is to certify that the sample(s) of the Product described herein ("Certified Product") has been investigated and found in compliance with the Standard(s) indicated on this Certificate, in accordance with the ATEX Product Certification Program Requirements. This certificate and test results obtained apply only to the product sample(s) submitted by the Manufacturer. UL did not select the sample(s) or determine whether the sample(s) provided were representative of other manufactured product. UL has not established Follow-Up Service or other surveillance of the product. The Manufacturer is solely and fully responsible for conformity of all product to all applicable Standards, specifications, requirements or Directives. The test results may not be used, in whole or in part, in any other document without UL's prior written approval.

**Date of issue:** 2022-03-31

**Notified Body** UL International Demko A/S, Borupvang 5A, 2750 Ballerup, Denmark  
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# Schedule

## EU-TYPE EXAMINATION CERTIFICATE No.

### UL 22 ATEX 2673X Rev. 0

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Description of Product

System 1 (+15 Vdc Zener Barrier System)

System 1 is a 15 Vdc system which consists of a maximum of four shunt zener barrier modules where one is connected to the encoder power terminals and up to three are connected to any of the optical encoder signal terminals (A, A-, B, B-, Z and/or Z-).

1. Associated Apparatus, Located in a non-hazardous area
  - i. Any single channel shunt zener diode safety barrier or any single channel of a dual channel shunt zener diode safety barrier certified by any EC approved body to [Ex ia] IIC or IIB having the following output parameters:

Used for	Associated Apparatus Parameters		
	Uo (Vdc)	Io (mA)	Po (W)
Power Connection	15	150	0.56

- ii. Up to three single channel shunt zener diode safety barriers or three single channels using dual channel shunt zener diode safety barriers certified by any EC approved body to [Ex ia] IIC or IIB having the following output parameters:

Used for	Associated Apparatus Parameters		
	Uo (Vdc)	Io (mA)	Po (W)
Encoder signal Connections	12	12	0.036

- iii. The above barriers are to be supplied from apparatus which is not specified in this report with the exception that it must not be supplied from nor contain in normal or abnormal conditions a source of potential with respect to earth in excess of 250 volts r.m.s or 250 volts d.c.

Notes:

- Only a single shunt barrier channel is to be used for the power connections.
- All barrier modules shall be of like polarity.
- Only DC-type barrier modules are allowed, AC-type barrier modules are not allowed.
- The output current of each channel shall be limited by a resistor of value R such that:
  - $I_o = U_o / R_o$

2. Equipment located in hazardous area

A single optical encoder of types 2222, 4469, 7272, 7273, 2222R, 7272R, or 7273 R to certificate number UL 21 ATEX 2654X and Ex ia IIB T4 (-40°C < Ta < +80°C)

3. Temperature Class and Ambient Temperature

The optical encoder is suitable for a temperature class of T4.

An ambient temperature range has not been awarded to the system as a whole since each item of the equipment contained in the safe and hazardous areas shall retain its individual ambient temperature range as appropriate.

4. Permissible interconnecting cables

The capacitance (Co) and either the inductance (Lo) or the inductance-to-resistance ratio (Lo/Ro) of the interconnecting cables shall not exceed the following values:

Gas Group	C (uF)	L (mH)	or L/R (uH/Ω)
IIB	1.54	1.9	184
IIA	11.99	5.1	368

The permitted capacitance takes account of Ci = 2.01uF in the Optical Encoder.

System 2 (+28 Vdc Zener Barrier System)

System 2 is a 28 Vdc system which consists of shunt zener barrier modules in which one is connected to the encoder power terminals and up to three are connected to any of the optical encoder signal terminals (A, A-, B, B-, Z and/or Z-).

1. Associated Apparatus, Located in a non-hazardous area
  - i. Any single channel shunt zener diode safety barrier or any single channel of a dual channel shunt zener diode safety barrier certified by any EC approved body to [Ex ia] IIC or IIB having the following output parameters:

Used for	Associated Apparatus Parameters		
	Uo (Vdc)	Io (mA)	Po (W)
Power Connection	28	93.3	0.65

- ii. Up to three single channel shunt zener diode safety barriers or three single channels using dual channel shunt zener diode safety barriers certified by any EC approved body to [Ex ia] IIC or IIB having the following output parameters:

Used for	Associated Apparatus Parameters		
	Uo (Vdc)	Io (mA)	Po (W)
Encoder signal Connections	12	12	0.036

- iii. The above barriers are to be supplied from apparatus which is not specified in this report with the exception that it must not be supplied from nor contain in normal or abnormal conditions a source of potential with respect to earth in excess of 250 volts r.m.s or 250 volts d.c.

Notes:

- Only a single shunt barrier channel is to be used for the power connections.
- All barrier modules shall be of like polarity.
- Only DC-type barrier modules are allowed, AC-type barrier modules are not allowed.



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- The output current of each channel shall be limited by a resistor of value R such that:
  - $I_o = U_o / R_o$

2. Equipment located in hazardous area

A single optical encoder of types 2222, 7272, 7273, 2222R, 7272R, or 7273 R to certificate number UL 21 ATEX 2654X and Ex ia IIB T4 (-40°C < Ta < +80°C), use of 4469 Optical encoder is not permitted.

3. Temperature Class and Ambient Temperature

The optical encoder is suitable for a temperature class of T4.

An ambient temperature range has not been awarded to the system as a whole since each item of the equipment contained in the safe and hazardous areas shall retain its individual ambient temperature range as appropriate.

4. Permissible interconnecting cables

The capacitance (Co) and either the inductance (Lo) or the inductance-to-resistance ratio (Lo/Ro) of the interconnecting cables shall not exceed the following values:

Gas Group	C (uF)	L (mH)	or L/R (uH/Q)
IIB	0.02	3.6	194
IIA	1.52	9.7	389

The permitted capacitance takes account of Ci = 0.63uF in the Optical Encoder.

#### System 3 (Galvanic Isolator System)

System 3 is a system with multiple galvanic isolators in which one is connected to the encoder power terminals and up to three are connected to any of the optical encoder signal terminals (A, A-, B, B-, Z and/or Z-).

1. Associated Apparatus, Located in a non-hazardous area

- i. To permit one galvanic isolator may be selected from the following list for connection to the power terminals:

Manufacturer	Galvanic Isolator Part Number	Description	Certificate number
Pepperl + Fuchs	KFD0-SD2-Ex-1045	Transformer Isolated Driver	Baseefa 06ATEX0252
Pepperl + Fuchs	KFD0-SD2-Ex1065	Transformer Isolated Driver	Baseefa 06ATEX0252
Pepperl + Fuchs	KFD2-SL2-Ex1.B	Solenoid Driver Module	ZELM 00ATEX0024

- ii. To permit up to three galvanic isolators may be selected from the following list for connection to the optical encoder signal terminals:

Manufacturer	Galvanic Isolator Part Number	Description	Certificate number
Pepperl + Fuchs	KCD2-SOT-Ex2	Isolated Switch Amplifier	Baseefa 13ATEX0080
Pepperl + Fuchs	KFD2-VR-Ex1.19-Y109129	Isolated Switch Amplifier	BAS 01 ATEX 7262

- iii. The above barriers are to be supplied from apparatus which is not specified in this report with the exception that it must not be supplied from nor contain in normal or abnormal conditions a source of potential with respect to earth in excess of 250 volts r.m.s or 250 volts d.c.

- iv. Entity parameters for each of the above-listed isolation barriers are listed below:

Quantity	Used for	Item	Associated Apparatus Parameters				
			Uo (Vdc)	Io (mA)	Po (mW)	Ci (uF)	Li (mH)
1	Power Input	KFD0-SD2-Ex-1045	25.2	93	586	0	0
		KFD0-SD2-Ex1065	17.22	220	947	0	0
		KFD2-SL2-Ex1.B	28	110	77	0	0
3	Encoder Signal Output	KCD2-SOT-Ex2	10.5	17.1	45	0	0
		KFD2-VR-Ex1.19-Y109129	15.5	7.2	28	0	0

2. Equipment located in hazardous area

A single optical encoder of types 2222, 7272, 7273, 2222R, 7272R, or 7273 R to certificate number UL 21 ATEX 2654X and Ex ia IIB T4 (-40°C < Ta < +80°C), use of 4469 Optical encoder is not permitted.



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3. Permissible interconnecting cables  
The capacitance (Co) and either the inductance (Lo) or the inductance-to-resistance ratio (Lo/Ro) of the interconnecting cables shall not exceed the following values:

Input Isolator	Gas Group	C (uF)	L (mH)	or L/R (uH/Ω)
KFD0-SD2-Ex-1045	IIB	0.19	16.44	242
	IIA	2.0	32.88	485
KFD0-SD2-Ex-1045	IIB	1.43	2.93	150
	IIA	7.6	5.87	300
KFD2-SL2-Ex1.B	IIB	0.02	12	-
	IIA	1.52	23	-

The permitted capacitance takes account of Ci = 0.63uF in the Optical Encoder.

#### System 4 (Single Galvanic Isolator System)

System 4 is a system with a single galvanic isolator which is connected to the encoder power terminals and up to three optical encoder signal terminals (A, A-, B, B-, Z and/or Z-).

1. Associated Apparatus, Located in a non-hazardous area  
i. To permit one multi-channel galvanic isolator:

Manufacturer	Galvanic Isolator Part Number	Description	Certificate number
BEI Technologies	60004-XXXX	Isolation Barrier	DEMKO 03ATEX0313867X

2. Equipment located in hazardous area  
A single optical encoder of types 2222, 4469, 7272, 7273, 2222R, 7272R, or 7273 R to certificate number UL 21 ATEX 2654X.
3. Permissible interconnecting cables  
The capacitance (Co) and either the inductance (Lo) or the inductance-to-resistance ratio (Lo/Ro) of the interconnecting cables shall not exceed the following values, based on the input isolator chosen:

Input Isolator	Gas Group	C (uF)	L (mH)	or L/R (uH/Ω)
60004-XXXX	IIB	24.99	1.05	-
	IIA	252.99	2.1	-

The permitted capacitance takes account of Ci = 2.01uF in the Optical Encoder.

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#### Descriptive Documents

The scheduled drawings are listed in the report no. provided under item no. [ 8 ] on page 1 of this EU-Type Examination Certificate.

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#### Specific conditions of use/Conditions for System Installation:

- The special conditions for safe use detailed in the individual certificates of each equipment that forms part of the intrinsically safe system shall be observed.
- Installation requirements, particularly with regards to earth and isolation shall be in accordance with relevant national regulations such as EN 60079-14.
- The multicore cables used in the system are required to meet the requirements of Type A, Type B, or Type C multi-core cables as required in EN 60079-25.
- The applicant shall take all reasonable steps to ensure that the user/installer complies with the special conditions for certification associated with the barriers, isolators, and optical encoders. In addition, the applicant shall provide the user/installer with an appropriate copy of the certificate for each certified device that is fitted in the system.
- The descriptive system drawing listed in descriptive documents section of this certificate shall be readily traceable, for example by marking the system with the System Certificate Number UL 22 ATEX 2673X.
- The intrinsically safe circuit in the hazardous area shall be capable of withstanding an a.c. test voltage of 500V rms to earth/ground in accordance with clause 6.3.13 of EN 60079-11:2012 (or equivalent).
- Where the system is installed in location particularly susceptible to lightning or other surges, precautions shall be taken as per clause 12 of EN 60079-25:2010.

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#### Essential Health and Safety Requirements

The Essential Health and Safety Requirements (EHSRs) covered by the standards listed at item 9.

#### Additional information

The manufacturer shall inform the notified body concerning all modifications to the technical documentation as described in Annex III to Directive 2014/34/EU of the European Parliament and the Council of 26 February 2014.