



# Mining And Surface Certification (Pty) Ltd

2015/021934/07



Certificate Number: MASC M/17-0784  
Issue: 27 March 2023  
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## IA – CERTIFICATE

(Supplement 2 – Supplemented for revision as per ARP 0108)

IN TERMS OF REGULATION 21.17.2 OF THE MINERALS ACT (INCORPORATION THE MINE HEALTH AND SAFETY ACT) AND REGULATION 9 (1) OF THE ELECTRICAL MACHINERY REGULATIONS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT

Ex – Type Examination

Certificate number: **MASC M/17-0784**  
Equipment: Isolating Amplifier Type KFD2-\*\*\*-Ex\*\*\*  
Serial No: (See “Conditions of Certification”)

Requested by: Pepperl+Fuchs (Pty) Ltd  
Address: 1st fl Zerwick Forum  
8 Glen Eagle Office Park  
Cnr Monument Rd and Braambos St  
Glen Erasmia, Kempton Park 1619  
South Africa

Manufacturer: Pepperl+Fuchs SE  
Address: D – 68307  
Mannheim

### DESCRIPTION:

The isolation amplifiers are designed to transmit control signals between the non-hazardous area and the hazardous area.  
The electrical circuit of each isolated amplifier is mounted secured on isolation boards. These insulation boards are mounted inside a plastic housing.  
For connecting the intrinsically safe and non-intrinsically safe circuit terminals are located at the top of the housing.

Isolating amplifier type KFD2-\*\*\*-Ex\*\*\* with the following variants:

Type KFD2-SOT-Ex2 (with module TM/Ex\*\*\*)

Type KFD2-SOT2-Ex \*\*\*  
Optional  
Non Ex relevant markings  
Outputs  
1 = 1 Channel  
2 = 2 Channels

Type KFD2-STC4-Ex1.H, KFD2-STC4-Ex1-2O.H

Type KFD2-ST\*4-Ex1\* (without KFD2-STC4-Ex1.H, KFD2-STC4-Ex1-2O.H)

Optional  
-2O\* = Output implemented twice  
\* = Non ex-relevant marking  
Outputs  
C = Current Output  
V = Voltage Output

**/.** Type KFD2 VR Ex1.12...

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**Isolating Amplifier Type KFD2-\*\*\*-Ex\*\*\***

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Type KFD2 VR Ex1.12  
Type KFD2-VR4-Ex1.26

Description:

Isolation amplifier type KFD2-\*\*\*-Ex\*\*\* will comply with approved standards:  
EN 60079-0: 2009  
EN 60079-11: 2007

The KFD2-SOT2-Ex.\* model, separately tested and certified opto-coupler type TOC1 or type TOC3 (PTB 10 ATEX 2016 U).

Parameters:

**Isolating Amplifier Type KFD2-SOT-Ex2**

Non-intrinsically safe supply circuit (Terminals 11, 12)

Rated voltage		DC	20 – 35V
max. voltage	U <sub>m</sub>	DC	125V
or	U <sub>m</sub>	AC	253V

non-intrinsically safe output circuits (terminals 7, 8 and 9, 10)

Rated voltage		DC	40V
Max. Voltage	U <sub>m</sub>	AC/DC	60V
Current			500mA
Power			250mW

intrinsically safe control circuits (terminals 1, 2, 3 and 4, 5, 6) in type protection class Ex ia I

Voltage	U <sub>o</sub>	DC	12.7V
Current	I <sub>o</sub>		17.3mA
Power	P <sub>o</sub>		55mW
Linear Characteristic			
Max. external inductance	L <sub>o</sub>		600mH
Max. external capacitance	C <sub>o</sub>		25µF

values for result of parallel connection of both circuits:

Voltage	U <sub>o</sub>	DC	12.7V
Current	I <sub>o</sub>		34.6mA
Power	P <sub>o</sub>		110mW
Linear Characteristic			
Max. external inductance	L <sub>o</sub>		180mH
Max. external capacitance	C <sub>o</sub>		25µF

**Isolating Amplifier Type KFD2-SOT2-Ex\*\*\***

non-intrinsically safe power supply circuit (Contacts PR1 and PR2 or terminals 14 and 15)

Rated voltage		DC	20 – 30V
max. voltage	U <sub>m</sub>	AC/DC	40V

non-intrinsically safe output circuits (terminals 7, 8, 9)

Rated voltage		DC	30V
Rated current			100mA
Max. voltage	U <sub>m</sub>	AC/DC	40V

**/I. non-intrinsically...**

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## Isolating Amplifier Type KFD2-\*\*\*-Ex\*\*\*

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### non-intrinsically safe signal circuits (contacts PR2, PR4)

Rated voltage	DC	30V
Rated current		10mA
Max. voltage	U <sub>m</sub>	AC/DC 40V

### intrinsically safe control circuits (terminals 1, 2, 3 and 4, 5, 6) in type protection Ex ia I

Voltage	U <sub>o</sub>	DC	10.5V
Current	I <sub>o</sub>		13mA
Power	P <sub>o</sub>		34mW
Linear Characteristic			
Max. external inductance	L <sub>o</sub>		1H
Max. external capacitance	C <sub>o</sub>		66µF

### when connecting (Parallel connection) of the two circuits give the following:

Voltage	U <sub>o</sub>	DC	10.5V
Current	I <sub>o</sub>		26mA
Power	P <sub>o</sub>		68mW
Linear Characteristic			
Max. external inductance	L <sub>o</sub>		380mH
Max. external capacitance	C <sub>o</sub>		66µF

### **KFD2-STC4-Ex1.H and KFD2-STC4-Ex1-20.H**

#### non-intrinsically safe power supply circuit (Contacts PR01 and PR02 and terminals 14 and 15)

Rated voltage	DC	20 – 35V
max. voltage	U <sub>m</sub>	AC 250V

#### non-intrinsically safe output circuits (terminals 7, 8, 9 and 10, 11, 12)

Rated voltage	DC	40V
Max. voltage	U <sub>m</sub>	AC 250V

#### Output circuit 1

(Terminals 1,3)

Max. Output Voltage	U <sub>o</sub>	27.2V
Max. Output Current	I <sub>o</sub>	93mA
Max. Output Power	P <sub>o</sub>	632mW
Max. external inductance	L <sub>o</sub>	51.9mH
Max. external capacitance	C <sub>o</sub>	3.63µF
Max. external Ratio	L <sub>o</sub> /R <sub>o</sub>	687µH/Ω

#### Output circuit 2

(Terminals 2, 3, 5)

Max. Output Voltage	U <sub>o</sub>	3.5V
Max. Output Current	I <sub>o</sub>	73mA
Max. Output Power	P <sub>o</sub>	64mW
Max. Input Voltage	U <sub>i</sub>	30V
Max. Input Current	I <sub>i</sub>	117mA
Max. Internal inductance	L <sub>i</sub>	Negligible
Max. Internal capacitance	C <sub>i</sub>	Negligible

**/I. Max. external...**

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Max. external capacitance	$C_o$	1mF
Max. external inductance	$L_o$	42mH
External Ratio	$L_o/R_o$	7.21mH/ $\Omega$

### Output circuit 3

(Terminals 1, 2, 3, 5)

Max. Output Voltage	$U_o$	27.2V
Max. Output Current	$I_o$	117mA
Max. Output Power	$P_o$	639mW
Max. external inductance	$L_o$	30mH
Max. external capacitance	$C_o$	3.63 $\mu$ F
Max. external Ratio	$L_o/R_o$	409 $\mu$ H/ $\Omega$

### Output circuit 4

(Terminals 2, 5, 6)

Max. Output Voltage	$U_o$	8.7V
Max. Output Current	$I_o$	0A
Max. Input Voltage	$U_i$	30V
Max. Input Current	$I_i$	117mA
Max. Internal capacitance	$C_i$	Negligible
Max. Internal inductance	$L_i$	Negligible
Max. external capacitance	$C_o$	5.9 $\mu$ F

### **Isolating Amplifier KFD2-ST\*4-Ex1\***

non-intrinsically safe power supply circuit (Contacts PR01 and PR02 and terminals 14 and 15)

Rated voltage		DC	20 – 35V
max. voltage	$U_m$	AC	250V

non-intrinsically safe output circuits (terminals 7, 8, 9 and 10, 11, 12)

Rated voltage		DC	40V
Max. voltage	$U_m$	AC	250V

intrinsically safe control circuits in the protection class Ex ia I (Terminals 1, 3)

Max. Output Voltage	$U_o$	DC	25.4V
Max. Output Current	$I_o$		88.2mA
Max. Output Power	$P_o$		560mW
Linear Characteristic			
Max. external inductance	$L_o$		36mH
Max. external capacitance	$C_o$		4.06 $\mu$ F
Max. external Ratio	$L_o/R_o$		833 $\mu$ H/ $\Omega$

**/ intrinsically...**

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**Isolating Amplifier Type KFD2-\*\*\*-Ex\*\*\***

intrinsically safe control circuits in the protection class Ex ia I (Terminals 2, 3, 5)

Max. Output Voltage	U <sub>o</sub>	DC	3.5V
Max. Output Current	I <sub>o</sub>		74mA
Max. Output Power	P <sub>o</sub>		64mW
Linear Characteristic			
Max. Input Voltage	U <sub>i</sub>		30V
Max. Input Current	I <sub>i</sub>		115mA
Max. Internal inductance	L <sub>i</sub>		Negligible
Max. Internal capacitance	C <sub>i</sub>		Negligible
Max. external inductance	L <sub>o</sub>		50mH
Max. external capacitance	C <sub>o</sub>		1mF
External Ratio	L <sub>o</sub> /R <sub>o</sub>		7207μH/Ω

intrinsically safe control circuits in the protection class Ex ia I (Terminals 1, 2, 3, 5)

Max. Output Voltage	U <sub>o</sub>	DC	25.4V
Max. Output Current	I <sub>o</sub>		115mA
Max. Output Power	P <sub>o</sub>		584mW
Linear Characteristic			
Max. external inductance	L <sub>o</sub>		22mH
Max. external capacitance	C <sub>o</sub>		4.06μF

intrinsically safe control circuits in the protection class Ex ia I (Terminals 2, 5, 6)

Max. Output Voltage	U <sub>o</sub>	DC	8.7V
Max. Output Current	I <sub>o</sub>		0mA
Max. Input Voltage	U <sub>i</sub>		30V
Max. Input Current	I <sub>i</sub>		115mA
Max. Internal inductance	L <sub>i</sub>		Negligible
Max. Internal capacitance	C <sub>i</sub>		Negligible
Max. external capacitance	C <sub>o</sub>		5.9uF

**Isolating Amplifier KFD2-VR-Ex1.12**

non-intrinsically safe power supply circuit (Contacts PR01 and PR02 and terminals 11 and 12)

Rated voltage		DC	20 – 35V
max. voltage	U <sub>m</sub>	AC	250V

non-intrinsically safe output circuits (terminals 7, 8)

Rated voltage		DC	0-12V
Max. voltage	U <sub>m</sub>	AC	250V

**/.** intrinsically...

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intrinsically safe control circuits in the protection class Ex ia I (Terminals 4, 5)

Voltage	U <sub>o</sub>	DC	12V
Current	I <sub>o</sub>		2.8mA
Power	P <sub>o</sub>		8.4mW
Max. external inductance	L <sub>o</sub>		1000mH
Max. external capacitance	C <sub>o</sub>		35µF

### Isolating Amplifier KFD2-VR4-Ex1.26

non-intrinsically safe power supply circuit (Contacts PR01 and PR02 and Terminals 11, 12)

Rated voltage		DC	20 – 35V
max. voltage	U <sub>m</sub>	AC	250V

non-intrinsically safe output circuits (terminals 7, 8)

Rated voltage		DC	0-20V
Max. voltage	U <sub>m</sub>	AC	250V

Intrinsically safe output circuit 1 (Terminals 1, 3, 4, 5) in protection class Ex ia I

Max. Output Voltage	U <sub>o</sub>	DC	-25.2V
Max. Output Current	I <sub>o</sub>		90mA
Max. Output Power	P <sub>o</sub>		0.57W
Max. external inductance	L <sub>o</sub>		24.4mH
Max. external capacitance	C <sub>o</sub>		2.48µF

circuit 2 (Terminals 2, 4, 6)

Max. Output Voltage	U <sub>o</sub>	DC	1.2V
Max. Output Current	I <sub>o</sub>		0.12mA
Max. Output Power	P <sub>o</sub>		0.036mW
Max. external inductance	L <sub>o</sub>		1000mH
Max. external capacitance	C <sub>o</sub>		1000µF

circuit 3 (Terminals 1 - 6)

Max. Output Voltage	U <sub>o</sub>	DC	-26.4V
Max. Output Current	I <sub>o</sub>		90mA
Max. Output Power	P <sub>o</sub>		0.57W
Max. external inductance	L <sub>o</sub>		24.4mH
Max. external capacitance	C <sub>o</sub>		2.48µF

<u>Ambient temperature range</u>	T <sub>a</sub>		-20°C to +60°C
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### MARKING:

DMT marking remains applicable. The following MASC Certificate number (IA number) must be additionally applied to the equipment.

IA No: MASC M/17-0784

**/ . COMPLIANCE...**

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**COMPLIANCE:**

The equipment as described above and in MASC letter 17-0784 is hereby certified "Explosion Protected" [Ex ia] I and is suitable for use in hazardous locations as stated below and as tested, assessed and inspected in accordance with the relevant requirements of SANS / IEC Standards:

**The evaluation was conducted according to the requirements of:**

- i) SANS (IEC) 60079-0 : 2009 "Explosive atmospheres – Part 0: Equipment — General requirements"**
- ii) SANS (IEC) 60079-11 : 2007 "Explosive atmospheres – Part 11: Equipment protection by intrinsic safety 'i'"**

Location	Zone *0, 1 & 2	Mining Underground
Hazard Frequency	---	Continues as could occur under normal operating conditions in hazardous area (*Outputs only)
Environment	Group I	Methane and Coal dust
Surface Temperature	T4	135°C
Service/Ambient Temperature	-20°C to +40°C	

***The use of apparatus in hazardous locations is subject to the following provisions as applicable, which shall be adhered to:***

- i. SANS 10086 requirements;
- ii. Any conditions mentioned in the above document;
- iii. Codes of Practice enforced in terms of Regulations 21.17.2 of Minerals Act, by Chief Inspector of Mines;
- iv. Any restrictions and conditions enforced by Chief Inspectors of Mines, Principal Inspector (Group I equipment) of Chief Inspector of Factories (Group II equipment);
- v. Any relevant requirements of the MHS Act or the OHS Act.

**CONDITIONS OF MANUFACTURE:**

- None

**SPECIAL CONDITIONS OF USE (X):**

- None

**/I. CONDITIONS...**

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**CONDITIONS OF CERTIFICATION:**

1. This Certificate remains valid based of the QAR/QAN and no more than 3 years.
2. The apparatus must be additionally marked with the MASC marking details above.
3. This approval only covers the equipment as certified above and does not include any scheduled additions or variations / amendments / new issues to the certificate(s), made after the above date.
4. The equipment does not need to be re-tested when used on the conditions and with such restrictions as prescribed by DMT and in this approval.
5. The DMT certification must remain valid.
6. The extent of the requirements in the ARP 0108 (or regulations) and SANS 10108 on the certification of the equipment must remain unchanged.
7. The Ex quality assurance notification/report for the equipment must remain valid.



**S. Jordaan**  
**TECHNICAL SPECIALIST**



**C. Welthagen**  
**TECHNICAL SPECIALIST**

**Mining And Surface Certification**

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*MASC takes no responsibility for any non-conformances, exclusions or any results / assessments not in compliance with the standards. By marking the equipment in accordance with the documentation / standard, the manufacturer attests on his own responsibility that the equipment has been constructed in accordance with the applicable requirements of the relevant standards and that the routine verifications and routine tests have been successfully completed and the product complies with the documentation and standard(s).*

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