Installation Instructions

Original Instructions

Allen-Bradley
by ROCKWELL AUTOMATION

FLEX I/O Digital DC Output Modules

Catalog Numbers 1794-OB8, 1794-OB8EP, 1794-OB16, 1794-OB16P, 1794-OB32P

Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Updated Certifications	12
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Rockwell Automation

Environment and Enclosure

ATTENTION: This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in EN/IEC 60664-1), at altitudes up to 2000 m (6562 ft) without derating.
This equipment is not intended for use in residential environments and may not provide adequate protection to radio communication services in such environments.

This equipment is supplied as open-type equipment for indoor use. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA or be approved for the application if nonmetallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain more information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

In addition to this publication, see the following:

- Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1, for more installation requirements.
- NEMA Standard 250 and EN/IEC 60529, as applicable, for explanations of the degrees of protection provided by enclosures.

Prevent Electrostatic Discharge

ATTENTION: This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- Use a static-safe workstation, if available.
- Store the equipment in appropriate static-safe packaging when not in use.

UK and European Hazardous Location Approval

The following modules are UK and European Zone 2 approved: 1794-OB8, 1794-OB8EP, 1794-OB16 and 1794-OB16P.

The following applies to products marked Ⓔx II 3 G:

- Are Equipment Group II, Equipment Category 3, and comply with the Essential Health and Safety Requirements relating to the design and construction of such equipment given in Schedule 1 of UKEX and Annex II of EU Directive 2014/34/EU. See the UKEx and EU Declaration of Conformity at rok.auto/certifications for details.
- The type of protection is Ex ec IIC T4 Gc (**1794-OB8, 1794-OB8EP, 1794-OB16**) and Ex ec IIC T3 Gc (**1794-OB16P**) according to EN IEC 60079-0:2018 and EN IEC 60079-7:2015+A1:2018.
- Comply with standards EN IEC 60079-0:2018 & EN IEC 60079-7:2015+A1:2018 reference certificate number DEMKO 14 ATEX 1342501X and UL22UKEX2378X.
- Are intended for use in areas in which explosive atmospheres caused by gases, vapors, mists, or air are unlikely to occur, or are likely to occur only infrequently and for short periods. Such locations correspond to Zone 2 classification according to UKEX regulation 2016 No. 1107 and ATEX directive 2014/34/EU.

IEC Hazardous Location Approval

The following applies to products with IECEx certification:

- Are intended for use in areas in which explosive atmospheres caused by gases, vapors, mists, or air are unlikely to occur, or are likely to occur only infrequently and for short periods. Such locations correspond to Zone 2 classification to IEC 60079-0.
- The type of protection is Ex ec IIC T4 Gc (**1794-OB8, 1794-OB8EP, 1794-OB16**) and Ex ec IIC T3 Gc (**1794-OB16P**) according to IEC 60079-0 and IEC 60079-7.
- Comply with Standards IEC 60079-0, Explosive atmospheres Part 0: Equipment - General requirements, Edition 7, Revision Date 2017, IEC 60079-7, 5.1 Edition revision date 2017, Explosive atmospheres - Part 7: Equipment protection by increased safety “e”, reference IECEx certificate number IECEx UL 14.0066X.

WARNING: Special Conditions for Safe Use:

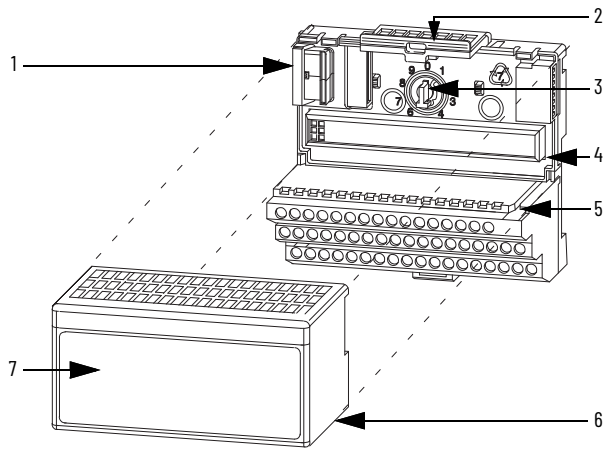
- This equipment shall be mounted in an UKEX/ATEX/IECEx Zone 2 certified enclosure with a minimum ingress protection rating of at least IP54 (in accordance with EN/IEC 60079-0) and used in an environment of not more than Pollution Degree 2 (as defined in EN/IEC 60664-1) when applied in Zone 2 environments. The enclosure must be accessible only by the use of a tool.
- This equipment shall be used within its specified ratings defined by Rockwell Automation.
- Transient protection shall be provided that is set at a level not exceeding 140% of the peak rated voltage value at the supply terminals to the equipment.
- The instructions in the user manual shall be observed.
- This equipment must be used only with UKEX/ATEX/IECEx certified Rockwell Automation backplanes.
- Earthing is accomplished through mounting of modules on rail.

WARNING: Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product. Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.

WARNING: When you insert or remove the module while backplane power is on, an electric arc can occur. This could cause an explosion in hazardous location installations.
Be sure that power is removed or the area is nonhazardous before proceeding. Repeated electric arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

Overview

The FLEX™ I/O Digital DC Output module mounts on a 1794 terminal base.



	Description		Description
1	Flexbus connectors	5	Groove
2	Latching mechanism	6	Alignment bar
3	Keyswitch	7	Module
4	Terminal base		

Install Your Module

ATTENTION: During mounting of all devices, be sure that all debris (metal chips, wire strands, and so on) is kept from falling into the module. Debris that falls into the module could cause damage on power-up.

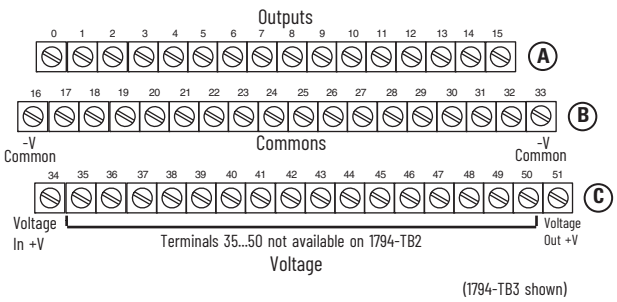
1. Rotate the keyswitch (3) on the terminal base (4) clockwise to position 2 as required for this type of module.
2. Make sure the Flexbus connector (1) is pushed all the way to the left to connect with the neighboring terminal base or adapter. **You cannot install the module unless the connector is fully extended.**
3. Make sure the pins on the bottom of the module are straight so they align properly with the connector in the terminal base.
4. Position the module (7) with its alignment bar (6) aligned with the groove (5) on the terminal base.
5. Press firmly and evenly to seat the module in the terminal base unit. The module is seated when the latching mechanism (2) is locked into the module.

Connect Wiring for 1794-OB8, 1794-OB8EP, 1794-OB16, and 1794-OB16P

1. Connect individual output wiring to numbered terminals on the 0...15 row (A) as indicated in Table 1.
   1794-OB8 – Terminals 0...7; **1794-OB16 and 1794-OB16P** – terminals 0...15; **1794-OB8EP** – even numbered terminals 0...14.
2. Connect the associated -V output common to the corresponding terminal on the 16...33 row (B) for each output as indicated in Table 1. Commons are internally connected together.
   1794-OB8EP – connect associated output common to odd-numbered terminals on row A or associated terminals on row (B).
3. Connect +V DC power to terminal 34 on the 34...51 row (C).
4. Connect DC common to terminal 16 on the 16...33 row (B).
5. If daisy chaining power to the next terminal base, connect a jumper from terminal 51 (+V DC) on this base unit to terminal 34 on the next base unit.
6. If continuing DC common to the next base unit, connect a jumper from terminal 33 (common) on this base unit to terminal 16 on the next base unit.

Figure 1 - Connect Wiring for 1794-TB2, 1794-TB3, and 1794-TB3S

Connect -V (Supply Common) to terminal B-16.
Use B-33 and C-51 for daisy chaining to next terminal base unit.
Total current draw through the terminal base is limited to 10 A.
Separate power connections to each terminal base may be necessary.



(1794-TB3 shown)

Figure 2 - Connect Wiring for 1794-TBN

Connect -V (Supply Common) to terminal B-16.
Connect +V (Supply +Voltage) to terminal C-34.
Use B-33 and C-51 for daisy chaining to next terminal base unit.
Total current draw through the terminal base is limited to 10 A.
Separate power connections to each terminal base may be necessary.

Table 1 - Wiring Connections for the 1794-OB8, 1794-OB16, and 1794-OB16P Modules
Use with a 1794-TB2, 1794-TB3, or 1794-TB3S Terminal Base

Output[1]	Output Terminal	Common Terminal
Output 0	A-0	B-17
Output 1	A-1	B-18
Output 2	A-2	B-19
Output 3	A-3	B-20
Output 4	A-4	B-21
Output 5	A-5	B-22
Output 6	A-6	B-23
Output 7	A-7	B-24
Output 8	A-8	B-25
Output 9	A-9	B-26
Output 10	A-10	B-27
Output 11	A-11	B-28
Output 12	A-12	B-29
Output 13	A-13	B-30
Output 14	A-14	B-31
Output 15	A-15	B-32
+V DC	C-34...C-51 (C-34 and C-51 for 1794-TB2)	
Common	B-16...B-33	

(1) **1794-OB8** – Outputs 0...7; **1794-OB16 and 1794-OB16P** – Outputs 0...15

Table 2 - Wiring Connections for the 1794-OB8EP Module

Output	1794-TB2, 1794-TB3, 1794-TB3S		1794-TBN	
	Output Terminal	Common Terminal[1]	Output Terminal	Common Terminal[2]
Output 0	A-0	A-1/B-17	B-0	C-1
Output 1	A-2	A-3/B-18	B-2	C-3
Output 2	A-4	A-5/B-19	B-4	C-5
Output 3	A-6	A-7/B-20	B-6	C-7
Output 4	A-8	A-9/B-21	B-8	C-9
Output 5	A-10	A-11/B-22	B-10	C-11
Output 6	A-12	A-13/B-23	B-12	C-13
Output 7	A-14	A-15/B-24	B-14	C-15
+V DC	C-34...C-51 (C-34 and C-51 for 1794-TB2, 1794-TBN)			
Common	B-16...B-33 (B-16 and B-33 for 1794-TBN)			

(1) **1794-TB2, 1794-TB3, and 1794 -TB3S** – A-1, A-3, A-5, A-7, A-9, A-11, A-13, and A-15 are connected together inside the module to 24V DC common.
(2) **1794-TBN** – C-1, C-3, C-5, C-7, C-9, C-11, C-13, and C-15 are connected together inside the module to 24V DC common.

Table 3 - Wiring Connections for the 1794-OB32P Module (Continued)
Use with a 1794-TB32 or 1794-TB32S Terminal Base

Output	Output Terminal	Common	Power
For Outputs 0...15, use +V1 and COM1			
+V1 DC power	Power terminals 35, 37, 39, and 41		
COM1 DC Return	Common terminals 36, 38, 40, and 42		
For Outputs 16...31, use +V2 and COM2			
+V2 DC power	Power terminals 43, 45, 47, and 49		
COM2 DC Return	Common terminals 44, 46, 48, and 50		

Configure Your 1794-OB8EP Output Module

Configure your output module by setting bits in the configuration word.

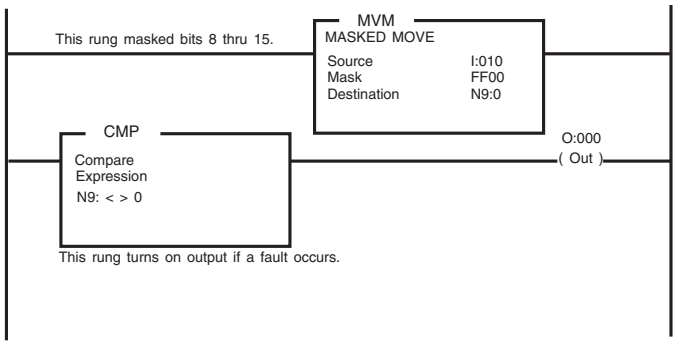
Table 4 - Image Table Memory Map for 1794-OB8EP

Dec	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Oct	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Read	F7	F6	F5	F4	F3	F2	F1	F0	Reserved(1)							
Write	Not used							FR	07	06	05	04	03	02	01	00
Where:	O = Output – 00 corresponds to output 0, 01 corresponds to output 1, and so on. F = Overload fault bit – 1 = fault present; 0 = no fault FR = Fault reset bit – 1 = reset output; 0 = no change															

(1) The unused lower byte in read word 1 floats during operation. Do not use this byte for fault status. See Program the 1794-OB8EP Module.

Program the 1794-OB8EP Module

If your program automatically checks for fault bits, bits 8...15 of read word 1 must be masked. This is a sample program for a module at rack address 1, group 0. Add similar rungs to your program.



Reset a Fault on the 1794-OB8EP – You can reset the faults three ways: Press the fault reset button on the front of the module; or toggle the output reset bit (write word 1, bit 08); or cycle backplane power.

Use the Reset Button on the 1794-OB8EP – When you press the reset button, the fault indicator for the faulted output turns off for about 1.2 s. After the delay, the faulted output attempts to turn on. If the external condition causing the fault is corrected, the output will remain on, the fault indicator is off, and the status indicator is on.

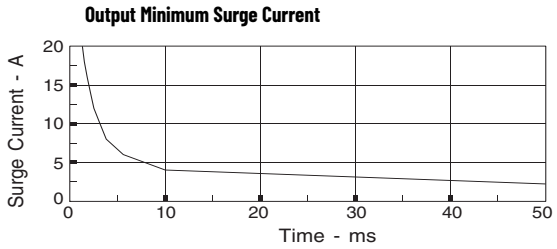
Configure Your 1794-OB8, 1794-OB16, 1794-OB16P, and 1794-OB32P Output Modules

Configure your output module by setting bits in the configuration word (Word 3).

Table 5 - Image Table Memory Map for 1794-OB8, 1794-OB16, 1794-OB16P, and 1794-OB32

Dec	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Oct	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Read	Not used															
Write	015	014	013	012	011	010	09	08	07	06	05	04	03	02	01	00
Write **1794-OB32P** only	031	030	029	028	027	026	025	024	023	022	021	020	019	018	017	016
Where:	O = Output – 00 corresponds to output 0, 01 corresponds to output 1, and so on. **1794-OB8** uses outputs 0...7; 1**794-OB16 and 1794-OB16P** use outputs 0...15; **1794-OB32P** uses outputs 0...31.															

Figure 4 - Surge Current for 1794-OB8EP



Specifications – 1794-OB16 and 1794-OB16P

Attribute	1794-OB16	1794-OB16P
Number of outputs	16, current, sourcing	
Recommended terminal base unit	1794-TB2,1794-TB3,1794-TB3S, 1794-TB3K, 1794-TB3SK	
On-state voltage, min	10V DC	
On-state voltage, nom	24V DC	
On-state voltage, max	31.2V DC (see Figure 5)	
Output current rating	8.0 A (16 outputs @ 0.5 A)	
On-state current, min per channel	1.0 mA	
On-state current, max per channel	500 mA	
On-state voltage drop, max	0.5V DC	
Surge current, repeatable every 2 seconds	2 A for 50 ms	1.5 A for 50 ms
Off-state leakage current, max	0.5 mA	
Isolation voltage	50V (continuous), Basic Insulation Type Tested at 850V DC for 1 s between user and system No isolation between individual channels	50V (continuous), Basic Insulation Type Type tested at 2121V DC for 60 s, between field side and system No isolation between individual channels
Output signal delay Off to On On to Off	 0.5 ms 1.0 ms	
Flexbus current	80 mA @ 5V DC	60 mA @ 5V DC
Power dissipation, max	5.3 W @ 31.2V DC	5.0 W @ 31.2V DC
Thermal dissipation, max	18.1 BTU/hr @ 31.2V DC	17.0 BTU/hr @ 31.2V DC
Fusing	Module outputs are not fused. Fusing is recommended. If fusing is desired, you must provide external fusing. Use SAN-O MQ4-800mA fuses.	Outputs are electronically protected

Specifications – 1794-OB32P

Attribute	Value
Number of outputs	32, current, sourcing
Recommended terminal base unit	1794-TB32, 1794-TB32S
On-state voltage, min	10V DC
On-state voltage, nom	24V DC
On-state voltage, max	31.2V DC
Output current rating	14.0 A max per module (6 A total for channels 0…15; 8 A total for channels 16…31)
On-state current, min per channel	1.0 mA
On-state current, max per channel	500 mA
On-state voltage drop, max	0.5V DC
Surge current	2 A for 50 ms, repeatable every 2 seconds
Off-state leakage current, max	0.5 mA
Isolation voltage	50V (continuous), Basic Insulation Type Type tested at 850V DC for 60 s, between field side and system No isolation between individual channels
Output signal delay Off to On On to Off	 0.5 ms 1.0 ms
Flexbus current	80 mA @ 5V DC
Power dissipation, max	5.3 W @ 32.1V DC
Thermal dissipation, max	18.1 BTU/hr @ 31.2V DC
Fusing	Outputs are electronically protected.

General Specifications

Attribute	1794-OB8	1794-OB8EP	1794-OB16	1794-OB16P	1794-OB32P
Off-state voltage, max	31.2V DC				
Terminal base screw torque	Determined by the installed terminal base				
Keyswitch position	2				
Indicators (field side indication)	8 yellow status indicators	8 yellow status indicators 8 red fault indicators	16 yellow status indicators	16 yellow status indicators	32 yellow status indicators
External DC power supply voltage, nom	24V DC				
External DC power voltage range	19.2...31.2V DC (includes 5% AC ripple)	19.2...31.2V DC (includes 5% AC ripple)	19.2...31.2V DC (includes 5% AC ripple)	10...31.2V DC (includes 5% AC ripple)	10...31.2V DC (includes 5% AC ripple)
External DC power supply current	25 mA @ 24V DC (10...35 mA)	80 mA @ 24V DC	49 mA @ 24V DC (20...65 mA)	60 mA @ 24V DC (25...75 mA)	219 mA @ 24V DC (104 mA @ 10V DC; 278 mA @ 31.2V DC)
Wiring category[1]	2 - on signal ports				
Wire size	Determined by installed terminal base				
Dimensions, approx. (H x W x D) (with module installed)	94 x 94 x 69 mm (3.7 x 3.7 x 2.7 in.)				
Weight, approx.	73 g (2.57 oz.)	104 g (3.66 oz.)	78 g (2.75 oz.)	74 g (2.61 oz.)	85 g (2.99 oz.)
Enclosure type rating	None (open-style)				
North American temp code	T4A	T4A	T4A	T3C	T3C
UKEX/ATEX temp code	T4	T4	T4	T3	–
IECEx temp code	T4	T4	T4	T3	–

(1) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications

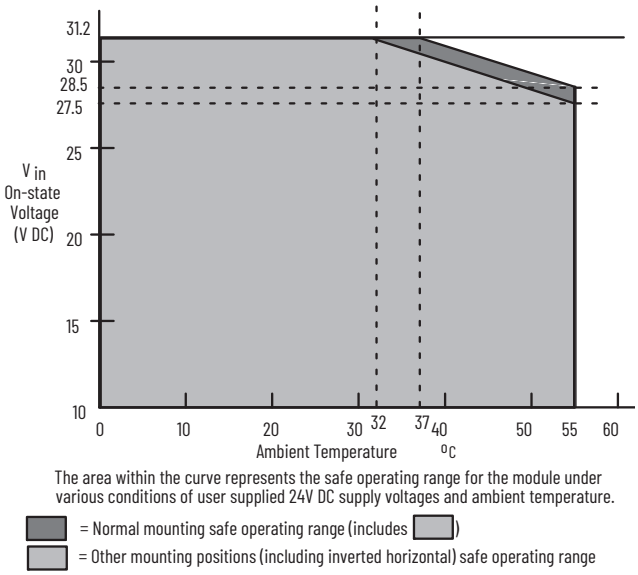
Attribute	Value
Temperature, operating	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20...+55 °C (-4...+131 °F) – **1794-OB8, 1794-OB8EP, 1794-OB16, 1794-OB16P** 0...55 °C (32...131 °F) – **1794-OB32P**
Temperature, surrounding air, max.	55 °C (131 °F)
Temperature, nonoperating	IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock): -40...+85 °C (-40...+185 °F)
Relative humidity	IEC 60068-2-30 (Test Db, Unpackaged Damp Heat): 5...95% non-condensing
Vibration	IEC60068-2-6 (Test Fc, Operating): 5 g @ 10...500 Hz
Shock, operating	IEC60068-2-27 (Test Ea, Unpackaged shock): 30 g
Shock, nonoperating	IEC60068-2-27 (Test Ea, Unpackaged shock): 50 g
Emissions	CISPR 11: Group 1, Class A (with appropriate enclosure)
ESD immunity	IEC 61000-4-2: 6 kV contact discharges 8 kV air discharges
Radiated RF immunity	IEC 61000-4-3: 10V/m with 1 kHz sine-wave 80% AM from 80...6000 MHz
EFT/B immunity	IEC 61000-4-4: ±2 kV @ 5 kHz on power ports – **1794-OB8, 1794-OB16, 1794-OB32P** ±3 kV @ 5 kHz on power ports – **1794-OB8EP, 1794-OB16P** ±2 kV @ 5 kHz on signal ports – **1794-OB8, 1794-OB16, 1794-OB32P** ±3 kV @ 5 kHz on signal ports – **1794-OB8EP, 1794-OB16P**
Surge transient immunity	IEC 61000-4-5: ±1 kV line-line(DM) and ±2 kV line-earth(CM) on signal ports
Conducted RF immunity	IEC 61000-4-6: 10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications

Certifications (when product is marked)(1)	Value
c-UL-us	**For 1794-OB8, 1794-OB8EP, 1794-OB16, 1794-OB16P** UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810. **For 1794-OB32P** UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E322657. UL Listed for Class I Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E334470.
UK and CE	UK Statutory Instrument 2016 No. 1091 and European Union 2014/30/EU EMC Directive, compliant with: EN 61326-1; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61131-2; Programmable Controllers EN 61000-6-4; Industrial Emissions UK Statutory Instrument 2012 No. 3032 and European Union 2011/65/EU RoHS, compliant with: EN 63000; Technical documentation
Ex	UK Statutory Instrument 2016 No. 1107 and European Union 2014/34/EU ATEX Directive, compliant with: EN IEC 60079-0; General Requirements EN IEC 60079-7; Explosive Atmospheres, Protection "e" II 3 G Ex ec IIC T4 Gc – **1794-OB8, 1794-OB8EP, 1794-OB16** II 3 G Ex ec IIC T3 Gc – **1794-OB16P** DEMKO 14 ATEX 1342501X UL22UKEX2378X
IECEx	IECEx System, compliant with: IEC 60079-0; General Requirements IEC 60079-7; Explosive Atmospheres, Protection "e" Ex ec IIC T4 Gc – **1794-OB8, 1794-OB8EP, 1794-OB16** Ex ec IIC T3 Gc – **1794-OB16P** IECEx UL 14.0066X
TÜV	**For 1794-OB8EP, 1794-OB16, 1794-OB16P** TÜV Certified for Functional Safety: up to and including SIL 2
RCM	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3
Morocco	Arrêté ministériel n° 6404-15 du 29 ramadan 1436
CCC	**For 1794-OB8, 1794-OB8EP, 1794-OB16, 1794-OB16P** CNCA-C23-01 强制性产品认证实施规则 防爆电气 CNCA-C23-01 CCC Implementation Rule Explosion-Proof Electrical Products 2020122309111829

(1) See the Product Certification link at rok.auto/certifications for Declarations of Conformity, Certificates, and other certification details.

Figure 5 - Derating Curve for 1794-OB16P



Normal Mounting - Horizontal