ARTESYN TECHNOLOGIES

BXA15 and BXA30 SERIES

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- **Safety and the low voltage directive**
- **Electromagnetic Compatibility Immunity**
- **Electromagnetic Compatibility Conducted and Radiated Interference**
- **Telecom and Distributed Power Architecture Features**
- **System Protection Features**
- **Thermal Considerations**
- **Input Impedance Considerations**

1. Safety and the Low Voltage Directive

The BXA15 and BXA30 series is intended to be supplied only from a SELV (Safe Extra Low Voltage) circuit or a TNV (Telecommunications Network Voltage) power source which are insulated from the AC mains by reinforced insulation. Basic isolation, tested to 1,500VDC, for EN60950 and UL1950, is provided.

SELV	DC Distributed Power of 12V, 24V or 48V
TNV	Central Office -48V

2. Electromagnetic Compatibility Immunity

Good design practice dictates that the electronic system be immune to noise interference. This practice has now been encapsulated in European law in the form of the EMC directive. It is imperative that any system on sale in the European Union meets the terms of the EMC directive and thus carries the CE mark. To simplify system compliance to the EMC Directive, the BXA15 and BXA30 have been designed to meet and comply with the necessary immunity standards.

Description	Standard	Compliance Level
Electro-Static Discharge	EN61000-4-2	4kV Contact 8kV Discharge
Radiated Immunity	IEC801-3	10V/m
Fast Transients/Bursts	EN61000-4-4	2kV
Surges	EN61000-4-5	0.5KV (40 Ohm Generator, Secondary surge protection)

3. Electromagnetic Compatibility Conducted and Radiated Interference

Radiated Interference:
The BXA15 and BXA30 series meet the harmonised standard EN55022 level A and CISPR22 level A. The series almost meets the requirements of level B. System performance to level B could be assured with the appropriate enclosure.

Conducted Interference - Level A Internal Filter Option:
All three input voltage versions of the series, 12VDC, 24VDC and 48VDC, are available with an internal filter option which meets input conducted noise per VDE0871/8-A or EN55022-A. To order a model with the internal filter, add '-F' after the model number eg. BXA15-48S12-F.

Conducted Interference - Level B External Filter:
The addition of an external capacitor enables the BXA15 and BXA30 products to meet VDE0871/8-B, EN55022-B and CISPR22-B conducted noise limits. The test set-up is per VDE 0877 Part 1 fig.4 with the load < 10 cm's away from the test converter.

Input Voltage	Recommended External Cap.
48 Volt	Nippon Chemi-Con SXE series120uF, 100V ITW PAKTRON Capstick series part number 405K100CS4, 4uF @ 100V
24 Volt	ITW PAKTRON 405K100CS4
12 Volt	2 * ITW PAKTRON 405K100CS4 capacitors in close parallel.

For height critical applications, the ITW Paktron capacitor offers a low profile of <7mm.

Note on the test set up and system grounding:
The products meet input conducted noise VDE0878-B, EN55022-B and CISPR22-B 10kHz - 30MHz, if the load is not more than 10 cm's away. Tightly parallel tracks or twisted pair wiring to the load should be used. Long leads to the load could radiate common mode noise, typically above 20 MHz, back to the input power leads. Conducted emissions should be checked at a system level.
If the unit fails level B at a frequency greater then 20MHz, because of system wiring, an additional external 'Y-capacitor' could be connected between input ground and output common, to locally decouple common-mode noise. This capacitor type is usually intended for use in interference suppression between line and earth. A recommended capacitor is EVOX-RIFA PME271Y422M or equivalent.

4. Telecom and Distributed Power Architecture Features

Input Undervoltage Protection:
Internally, the BXA15 and BXA30 series contain an undervoltage lockout zener circuit. The converter should not be operated continuously at levels between the 'maximum guaranteed-off-threshold' and the 'minimum guaranteed-on-threshold.'

Nominal Input Voltage	Maximum Off Voltage	Minimum On Voltage
12	7.0	8.8
24	14	17
48	28	34

Remote Sense:
The remote sense feature automatically adjusts the output voltage of the dc/dc converter to compensate for line voltage drops to loads which are distant form the output pins. Internally, 150R, 0.25Watt resistors connect the sense circuitry to the output pins. In applications, the sense connections must be made. These can either be made directly at the pins whereby compensation for voltage line drops is not needed.

Or the connection can be made at the load or point of critical regulation. If the sense connections are not made the output voltage will typically be up 7% on nominal and load regulation will be substantially degraded.

Voltage Drops on the lines to the load may be compensated up to a maximum value of 10%. This includes any voltage increase that may result by use of the 'TRIM' function. If the output voltage is raised above the nominal value +10%, the unit performance at low input voltage may be degraded.

Ensure the load power lines are never open circuit in a remote sense application. Even transient open circuits in the power connections could result in full load current flow through the sense leads, resulting in damage to the internal circuitry.

The usual rules for remote sensing apply:

a) The remote sense tracks should be parallel and close to each other. Alternatively screened cable could be used. This minimises inductive noise pick-up and reduces 2 pole roll-off effects in the feedback loop.

b) Remote sensing provides DC regulation at the sense points but AC regulation is degraded. To maintain best possible transient response performance, a decoupling capacitor should be used at point of sensing. A capacitance value >10uF/Amp is recommended.

Output Voltage Trim:
Output voltage trim enables the user to adjust the output voltage to a pre-defined value within ±10% of the nominal output voltage.

5. System Protection Features

Overvoltage Protection:
Internally, a 400Watt/1ms semiconductor transient voltage suppressor has been inserted across each output voltage. This is designed to protect both the BXA15/BXA30 and the customer's load from transient overvoltages induced or reflected by the load. This feature is not intended to guarantee steady state overvoltage protection.

Output	OVP Value
3.3V	3.9V breakdown init.
5V	6.7V breakdown init.
12V	15.6V breakdown init.
15V	18.9V breakdown init.

6. Thermal Considerations

Maximum Operating Temperatures:
The BXA15 and BXA30 baseplate must never be allowed to exceed 100°C. The maximum operating ambient temperature depends on the ambient airflow, the ambient temperature, the unit mounting/orientation and the power dissipated by the unit. In application, the worst case operating baseplate temperature should be measured.

As an example, for the BXA15 and BXA30 with the baseplate mounted vertically, in free natural convection:

$$Rth_{B.P - AMB.} = 6.5°/Watt.$$

For a BXA15 and BXA30 with baseplate and heatsink mounted vertically, in free natural convection:

$$Rth_{(B.P.+H.S.) - AMB.} = 5.2°/Watt.$$

For operation at output powers > 50% nominal max. and with input voltages within 30% of nominal, the operating efficiency is approximately = the specified nominal efficiency:

$$(Pdiss._{MAX.} * Rth_{B.P - AMB.}) + T_{AMBIENT.MAX.} \leq 100°C.$$

$$Pdiss. = Pout\ (100 - h)\ /h \quad h = \text{Operating Efficiency \%}.$$

These formulae calculate deratings necessary at high operating temperatures. An optional heatsink is available to increase output power at high ambient temperatures.

Minimum Operating Temperature:
All qualification and design testing were conducted with baseplates ranging from -25°C to +100°C.

Short Circuit Ratings:
The product is indefinitely short-circuit rated. The baseplate should be maintained at less than 100°C. Under a short circuit, the typical power dissipation is 7 Watts. This may be up to 10 Watts at maximum input voltage.

Short Circuit Protection on Multiple Output Units:
With the exception of the BXA15-48D05 and BXA30-48D05, all of the multiple output units have short circuit protection as outlined above. For details on the two exception models, please consult the factory.

Cross Regulation Dual Output Models:
Internally the absolute value sum of the output voltages is regulated. The total output on a 48D05 will be regulated to be 10 volts.

Model Number	Cross Regulation %	Load One Output	Load Other Output
48D05	2.5%	100%	40%
	4%	100%	10%
	7%	100%	0%

These figures are typical for all dual models.

Remote ON/OFF:
Internally this is connected to a bipolar Vbe + 2 Si diodes in series. The pin is connected to -Vin, via a 15K resistor. This provides noise immunity. An open collector sink (maximum current 3mA) to a voltage <1Volt is required. The open circuit voltage will be 3 Volts.

Transient Response:
For best output voltage response to load transients; a minimum output load of 5% is recommended. On 12 Volt (input) models, the input voltage should be maintained >9.5 Volts for optimum transient response.

Input Impedance Considerations:
Care needs to be taken to ensure the source impedance is sufficiently low to allow correct operation of the DC/DC over all operating conditions; particularly for power-ups and load transients.

It is imperative to account for both the resistive and reactive components of source impedance.

The input operating voltage range specified refers to the voltage which must be maintained across the inputs pins, during all steady state and transient conditions. Models without the internal filter option will generally require a much lower reactive source impedance than for those with the internal filter installed. This is because the input current will have large harmonics at the DC/DC converter switching frequency.
The reactive source impedance can be effectively reduced by adding local film or ceramic capacitors. A recommended film capacitor is ITW Paktron 20µF, 50 Volts Capstick or equivalent. (ITW Paktron Part Number: 206K050CS4).

Local Decoupling of High Frequency Input Ripple Current:
This is particularly important for 12Vin models. Non filter versions have a maximum input current of 5 Amps DC with 0.7A ACrms superimposed. The AC current is almost sinusoidal and at 350 - 400kHz. The source impedance must be able to supply this current with negligible voltage ripple. Adding the recommended film capacitor across the input pins will allow the high frequency input current requirement to be locally sourced. This will also dramatically reduce both input conducted noise and radiated noise.

Start-up Surge Consideration:
Depending on lead inductance and source impedance a higher value, parallel, 'reservoir' electrolytic may be required to ensure adequate input voltage is maintained during start-up and transients. The start-up surge current is always well within ETSI limits but is still significant and the source must be able to supply it with low dropout. During this surge the input voltage should remain above the minimum on threshold.

IR Steady State Voltage Drop Consideration:
Care must be taken with lead and connector resistances. The source voltage should be a minimum of 9 Volts + R (total, leads + connectors).