# IB IL DC AR 48/10A (-2MBD-PAC)

# Inline Servo Amplifier for DC Motors With Brushgears

## AUTOMATION

Data Sheet 6455\_en\_02

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## 1 Description

The Inline servo amplifier is designed for use within an Inline station. It is a universal speed or torque controller with a power output module for permanently excited DC motors with brushgears with a power consumption of up to 450 W.

The Inline servo amplifier has a 4 quadrant function, i.e., it supplies power back to the power supply unit when the brake function is used.

### 1.1 Features

- Diagnostic and status indicators
- Can be used as a torque controller or speed controller
- 4 quadrant function
- External brake chopper
- Short-circuit-proof motor output



#### 1.2 Applications

The Inline servo amplifier is used under the following conditions:

- Permanently excited DC motors with brushgears
- Nominal voltages of 12 V to 48 V
- Power consumption of up to 450 W
- Motor current of up to 10 A

 This data sheet is only valid in association with the IL SYS INST UM E user manual or the Inline system manual for your bus system, as well as the user manual for the Inline servo amplifier UM EN IB IL DC AR 48/10A.
Make sure you always use the latest documentation. It can be downloaded at www.download.phoenixcontact.com. A conversion table is available on the Internet at www.download.phoenixcontact.com/general/7000\_en\_00.pdf.
This data sheet is valid for all products listed on the following page:



#### 2 **Ordering Data**

Products				
Description	Туре	Order No.	Pcs./Pck.	
Inline servo amplifier for DC motors with brushgears; complete with accessories (connectors); transmission speed of 500 kbps	IB IL DC AR 48/10A	2819286	1	
Inline servo amplifier for DC motors with brushgears; complete with accessories (connectors); transmission speed of 2 Mbps	IB IL DC AR 48/10A-2MBD-PAC	2897677	1	
Documentation				
Description	Туре	Order No.	Pcs./Pck.	
"Inline Servo Amplifier for DC Motors With Brushgears" user manual	UM EN IB IL DC AR 48/10A	2699192	1	
"Automation Terminals of the Inline Product Range" user manual	IL SYS INST UM E	2698737	1	
"Configuring and Installing the INTERBUS Inline Product Range"	IB IL SYS PRO UM E	2743048	1	

"Configuring and Installing the INTERBUS Inline Product Range" user manual

#### 3 **Technical Data**

#### 3.1 **Housing Dimensions**



6455A031

48 mm x 85 mm x 166 mm
PA 6.6; black, anodized aluminum
Aluminum
460 g
-25°C to +55°C
-25°C to +85°C

Concerel Date

General Data (Continued)			
Permissible humidity (storage/transport with unused i (standard packaging))	interfaces 75% permanent, 85% occasionally		
For a short period, slight condensation r from a vehicle.	For a short period, slight condensation may appear on the outside of the housing if, for example, the module is brought into a closed room from a vehicle.		
Permissible air pressure (operation)	80 kPa to 106 kPa (up to 2000 m above sea level)		
Permissible air pressure (storage/transport)	70 kPa to 106 kPa (up to 3000 m above sea level)		
Permissible humidity (operation/storage/transport)	10% to 95%, according to EN 61131-2		
Degree of protection	IP20 according to IEC 60529		
Protection class	Class 3 according to VDE 0106, IEC 60536		
Transmission Speed			
IB IL DC AR 48/10A	500 kbps		
IB IL DC AR 48/10A-2MBD-PAC	2 Mbps		
Mechanical Requirements			
Vibration test:	2g load. 2 hours in each space direction		
sinusoidal vibrations according to IEC 60068-2-6, EN	1 60068-2-6		
Shock test; according to IEC 60068-2-27, EN 60068-2-27	25g for 1 ms, three shocks in each space direction		
Free fall according to IEC 60068-2-32	1 m		
Power Supply			
Status indicators	US LED		
Connection method	2-pos. COMBICON connector		
Supply voltage U <sub>S</sub>	12 V DC to 48 V DC ±15%		
Supply current	0 A to 10 A		
Surge voltage shutdown	U <sub>S</sub> > 60 V DC		
Outputs			
Number	1		
Connection	1 permanently excited DC motor with brushgears		
Connection method	3-pos. COMBICON connector with shield connection clamp		
Output voltage	± Supply voltage U <sub>S</sub> , maximum Mean value 92% of U <sub>S</sub> , maximum		
Motor cable	2-wire, shielded		
Continuous current	10 A, maximum		
Starting current	10 A, maximum		
Motor current limiting	0 A to 10 A (can be set via bus)		
Maximum motor voltage	±65 V DC		
Function	4 quadrant servo controller		
Braking	Energy fed back to the power supply unit (brake chopper may be required)		
Minimum motor inductance	200 µH at U <sub>S</sub> = 48 V DC 100 µH at U <sub>S</sub> = 24 V DC		
Cycle Time of Internal Digital Controll	ers		
Speed controller	1 ms		
Torque/current controller	250 μs		
Electrical Isolation			
Logic UL/I/O/motor	500 V AC test voltage		
Pulse Width Modulation (PWM)			
CIOCK Trequency	20 KHZ		

## IB IL DC AR 48/10A (-2MBD-PAC)

Interfaces	500 kbps	2 Mbps
Local bus	Inline potential distributor	Inline potential distributor
Communications power UL	7.5 V DC (via potential distributor)	7.5 V DC (via potential distributor)
Current consumption at UL	45 mA, typical	60 mA, typical
Main voltage U <sub>M</sub>	24 V DC (via potential distributor)	24 V DC (via potential distributor)
Current consumption at U <sub>M</sub>	65 mA, typical	65 mA, typical

### Conformance With EMC Directive 89/336/EEC and 2004/108/EC

	1		Conformance is only ensured if the shielded motor cable is connected to the FE terminal and the module is connected to functional earth ground via the DIN rail.
No	oise I	m	munity Test According to EN 61000-6-2

Electrostatic discharge (ESD)	EN 61000-4-2 IEC 61000-4-2	Criterion B 6 kV contact discharge 8 kV air discharge	
Fast transients (burst)	EN 61000-4-4 IEC 61000-4-4	Criterion B Supply lines: 2 kV Signal/data lines: 2 kV	
		Criterion A Interfaces: 1 kV	
Conducted interference	EN 61000-4-6 IEC 61000-4-6	Criterion A, test voltage 10 V	
Noise Emission Test According to EN 61000-6-4			
Noise emission of housing	EN 55011	Class A	

#### Approvals

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For the latest approvals, please visit www.download.phoenixcontact.com or www.eshop.phoenixcontact.com.



## 4 Typical Application of the Inline Servo Amplifier

Figure 1 Typical application of the Inline servo amplifier

## 5 Structure of the Module



Figure 2 Structure of the Inline servo amplifier

The Inline servo amplifier consists of the following components:

- 1 Motor connection
- 2 Power supply connection
- 3 Diagnostic and status indicators
- 4 Heatsink



## 6 Local Diagnostic and Status Indicators

Figure 3 Local diagnostic and status indicators

Des.	Color	Meaning	
IB	Green LED	Diagnostics	
	ON:	Bus active	
	Flashing:		
	0.5 Hz:	Communications power present, bus not active	
	2 Hz:	Communications power present, bus active, I/O error	
	4 Hz:	Communications power present, terminal before the flashing module failed, terminal after the flashing module not part of the configuration frame	
	OFF:	Communications power not present, bus not active	
TR	Green LED	PCP active	
	ON:	PCP messages being transmitted to the Inline servo amplifier	
	OFF:	No transmission of PCP messages	
US	Green LED	Supply voltage of the power section	
	ON:	Supply voltage for the output module is more than 75% of the nominal voltage of the power supply	
	OFF:	Supply voltage for the output module is less than 75% of the nominal voltage of the power supply	
ERR	Red LED	Error	
	ON:	An error has occurred (corresponds to bit 3 in the status word).	
		The cause of the error can be read in the "ErrorCode" parameter (index $603F_{hex}$ ).	
	OFF:	No error	

## 7 Terminal Point Assignment

### 7.1 Power Supply Connection



Figure 4 Terminal point assignment of the power supply connection (US)

64554003

Terminal Point	Assignment
1	U <sub>S</sub> +
2	U <sub>S</sub> -

#### 7.2 Motor Connection



Figure 5 Terminal point assignment of the motor connection (MOTOR)

64554004

Terminal Point	Assignment
1	Motor +
2	Motor –
3	Functional earth ground (FE)

## 8 Function Description

The Inline servo amplifier is designed as an Inline terminal. It can thus be easily operated in any control system and can be used to create a distributed positioning control system simply by mounting Inline positioning terminals side by side (e.g., positioning CPUs, position detection terminals, and other digital and analog output terminals).

Optical status and diagnostic indicators enable quick local error diagnostics.

The following operating modes are possible:

- Speed control without IxR compensation (voltage control)
- Speed control with IxR compensation
- Torque control (current control)

The Inline servo amplifier autonomously controls the speed or the torque of the connected motor to the value specified as the desired speed/torque via Inline in the form of process data (4 quadrant mode).

A special feature of the Inline servo amplifier is that it can be used to create simple speed-controlled drives using costeffective DC motors with brushgears, without the need for a rotary encoder system (e.g., on the motor shaft).

This method relies on a particular aspect of the behavior of DC motors: their speed changes in proportion to the supply voltage. In this way the speed can be indirectly controlled via the motor voltage.

In addition, the Inline servo amplifier uses an  $\ensuremath{\text{lxR}}$  controller, which compensates for speed variations caused by the changing load.

Operation, setting the operating mode, and parameterization are compatible with the "DRIVECOM profile 22" protocol.

The Inline servo amplifier has safety equipment, which provides protection against:

- Overcurrent
- Surge voltage and undervoltage
- Overtemperature
- Short circuit between motor cables
- Short circuit to the power supply

The Inline servo amplifier is based on digital controllers. Its task is to provide current and voltage values, which can be used to directly operate DC motors with brushgears.

Since Inline jumpering cannot supply these high currents, the Inline servo amplifier must be supplied externally with 12 V to 48 V and 0 A to 10 A.

The level of the current and voltage values depends on the various functions that the Inline servo amplifier carries out in the individual operating modes.

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For a description of the operating modes and the parameters, please refer to the UM EN IB IL DC AR 48/10A user manual.

## 9 Programming Data/Configuration Data

## 9.1 Local Bus

ID code	C3 <sub>hex</sub> (195 <sub>dec</sub> )
Length code	02 <sub>hex</sub> (02 <sub>dec</sub> )
Process data channel	32 bits
Input address area	2 words
Output address area	2 words
Parameter channel (PCP)	1 word
Register length (bus)	3 words

### 9.2 Other Bus Systems



For the programming data/configuration data of other bus systems, please refer to the corresponding electronic device data sheet (e.g., GSD, EDS) at <u>www.phoenixcontact.com</u>.