4-Axis Position Control

INFO-4KPr

**Position Control
Ramp Profiles
Trajectory Run**

The INFO-4KPr is the field bus node for high-precision and very fast positioning and control tasks. Four complete and independent channels are incorporated on the board.

The position board is a pure periphery board, i.e. the control algorithms requiring much computing power are performed by the firmware in the INFO-Master. The firmware also performs the conversion of increments into degrees, meters or mm as well as reference runs accurate to one increment. One INFO-PPC Master with the PowerPC RISC CPU controls up to 64 axes beside performing the entire control of the machine.

The board is suitable for controlling frequency converters or for registering the position of handwheels. On board is a DC/DC converter for the encoder and proximity switches.

Technical Data

Sampling rate
- Standard:

64 axes	4ms
32 axes	2ms
16 axes	1ms
8 axes	0.5ms

- S-Curve

4 incremental inputs
- RS422, TTL or 15 … 24V
- max. 2.5MHz counting frequency

4 zero point inputs
- RS422, TTL or 15 … 24V
- Reference run accurate to one increment

4 DAC outputs
- for analog controller activation
- ±10V with 0.3mV resolution

8 outputs
- 4 controller enables
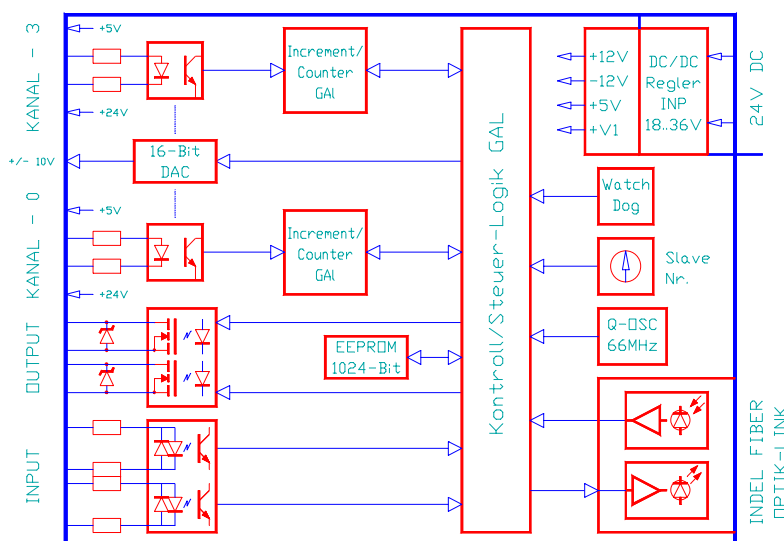 4 control outputs
- 24V/0.3A individually isolated

8 inputs
- Status inputs
- 24V potential-free, bipolar

5V power supply
- for encoder
- 4 x 100mA max.

15V power supply
- for 4 proximity switches
- 4 x 20mA max.

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Software

The position control software of the INFO-Power PC Master simultaneously controls up to 64 axes on its own.
The activation of this software is possible in **any** programming language.
The axis parameters (control weights, standard factors, preselection values, etc.) are written via the INCO-DLL to the field bus master. The preselection values are specified in the user-specific units such as degrees, meters or mm.
The INFO-PPC Master controls and monitors the entire ramp and constant run, brakes to the accuracy of an increment at the desired point, and maintains this point until the next run command. In addition, the resolution of the encoders is extended by a software function on the basis of the 4-quadrant method to 32-bit. Each axis is sampled every 500µs, the control intervals last 4, 2, 1 or 0.5ms, depending on the number of axes. Speed changes during runs, multi-axis trajectory runs (Pull Mode) are just as possible as premature termination or EMERGENCY OFF. Of course, the current position can also be read at all times.

Other modes:
- Start-up mode (without fault detection)
- Control and simulation mode (without feedback, without closed-loop control)
- Automatic norming (always between 0 ... 360 degrees)
- Automatic zeroing after each run
- Endless rotation
- DAC/increment mode (pure DAC output ± 10V) and 2-bit encoder path registration
- DAC/path mode (pure DAC output ± 10V) and path registration with conversion to meters, mm or degrees

Connector Allocations

Pin	d			b			z		
2	O	+	5 V	O	+	24 V	I	+	24 V
4	I	+	N 0	I	-	N 0	I		0 V
6	I	+	A 0	I	-	A 0	O		0 V
8	I	+	B 0	I	-	B 0			Shield
10	O	+	5 V	O	+	24 V	O		0 V
12	I	+	N 1	I	-	N 1	O		0 V
14	I	+	A 1	I	-	A 1			Shield
16	I	+	B 1	I	-	B 1			Shield
18	O	+	5 V	O	+	24 V	O		0 V
20	I	+	N 2	I	-	N 2	O		0 V
22	I	+	A 2	I	-	A 2			Shield
24	I	+	B 2	I	-	B 2			Shield
26	O	+	5 V	O	+	24 V	O		0 V
28	I	+	N 3	I	-	N 3	O		0 V
30	I	+	A 3	I	-	A 3			Shield
32	I	+	B 3	I	-	B 3			Shield

Connector 1
90° angled
DIN 41612, Type F-48
2.8mm pins

Pin	d			b			z		
2	O	-	OUT 0	O	+	OUT 0	O	+	24 V
4	O	-	EN 0	O	+	EN 0	O		0 V
6	I		IN1 0	I		IN0 0	I	C	IN 0
8	O	+	Vout 0	O	-	Vout 0			Shield
10	O	-	OUT 1	O	+	OUT 1	O	+	24 V
12	O	-	EN 1	O	+	EN 1	O		0 V
14	I		IN1 1	I		IN0 1	I	C	IN 1
16	O	+	Vout 1	O	-	Vout 1			Shield
18	O	-	OUT 2	O	+	OUT 2	O	+	24 V
20	O	-	EN 2	O	+	EN 2	O		0 V
22	I		IN1 2	I		IN0 2	I	C	IN 2
24	O	+	Vout 2	O	-	Vout 2			Shield
26	O	-	OUT 3	O	+	OUT 3	O	+	24 V
28	O	-	EN 3	O	+	EN 3	O		0 V
30	I		IN1 3	I		IN0 3	I	C	IN 3
32	O	+	Vout 3	O	-	Vout 3			Shield

Connector 2
90° angled
DIN 41612, Type F-48
2.8mm pins

4-Axis Position Control

Assembly

Assembly diagram
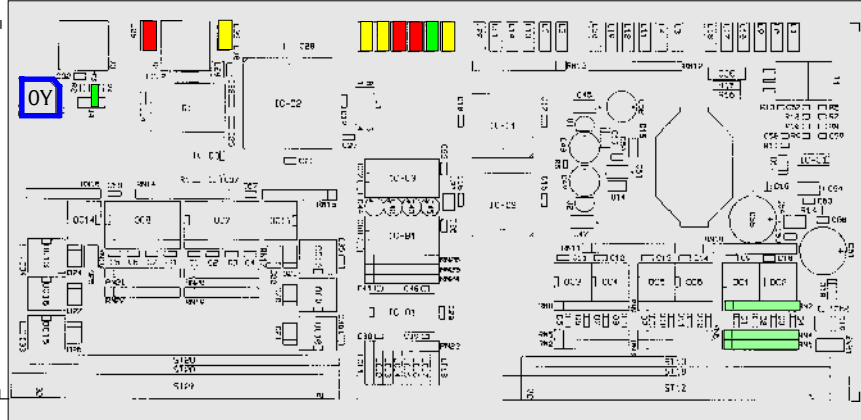
Addressing (blue)

S1 (0Y)	axis
0	0 to 3
...	
F	60 to 63

LEDs on the front panel

Per channel, 6 LEDs are included, which signal the following functions:

yellow	= Motor turns forward
green	= Sync pulse input
red	= Motor enable
red	= Output
yellow	= Input 0
yellow	= Input 1

LEDs on the receiver module

LED-red	=	+5V power supply
LED-yellow	=	INFO-Link receiver signal OK

Jumpers (green)

The jumpers influence the illumination intensity of the emitting LED and thereby the segment length of the fiber cable to the next board.

Segment length	Jumper position
0 ... 10m	no jumper
8 ... 30m	>10
20 ... 50m	>30

Resistor array (light green)

The resistor arrays are used for configuring the input voltage of the encoders. (See page 5)

Customized modifications are available as needed.

Specifications

Power supply

- +18 ... 34V, 450mA @ 24V
- electrically isolated

Climatic conditions

- Ambient temperature:
  Storage: -20...+80°C
  Operation: 0 ... +45°C
- Board temperature:
  Operation: 0...+70 °C
- Relative air humidity
  no condensation: 95%

Encoder and zero pulse inputs

- Required A,B tracks
- 4-fold resolution
- Input frequency max. 2.5MHz
- 14-bit counter
- Software-based expansion to 64-bit floating point path registration
- Zero pulse input positive active, min. 400µs
- RS422 with 330Ω termination
- +5V with 2.5V switching point
- +15V with 5V switching point

DAC outputs

- ±10V / 16-bit
- Resolution 300µV/bit
- Precision better than 10mV
- Offset and gain correction in EEPROM (no potentiometers)
- Offset drift max. -1.8mV/degree
- Gain drift max. ±0.15%/degree
- Internal gain, offset drift and error of the final motor stage are automatically balanced by a software function in position control.

Additional inputs/outputs

- Inputs:
  +15 ... 24V with 5V switching point, potential-free, bipolar, 24V, 12mA
- Output: (FET) $V_{off} = 48V$, $I_{on} = 300mA$, $R_{on} = 0.35\Omega$

5/15V power supply, on-board

- 5V +10%,-5%, 400mA max.
- 15V ±10%, 100mA max.

Mounting

- Connector DIN 41612, Type F-48
- Mounting in 19" chassis
- Dimensions:
  100 x 234 x 20mm (LxHxW)
- 6U x 4SU

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Connections

Board power supply

For the board power supply, a 3-phase rectifier without electrolytic capacitor will suffice. But in order to prevent interference, we recommend an electrolytic capacitor of 4,700 ... 10,000µF.
The 24V power supply must pass through a line filter.

Shielded leads

The encoders must always be connected through shielded leads and wherever possible with differential signals (RS422).
The DAC output must also be connected through shielded leads to the motor power section.
The shields to the motor controller and to the encoder must always be connected at both ends. In order to prevent undesired leakage currents through the shielding, it may be necessary to provide a bonding conductor, especially over long distances or with different power supplies.
If frequency converters are applied, their motor leads should if possible be installed so as to be shielded.

Encoder power supply

The DC/DC converter on the board also provides the +5V power supply to the encoders. A special power supply for these encoders is therefore not required. As a zero pulse generator, it is possible to use proximity switches, which are also provided with a 15V power supply through the board.

Grounding

The INFO-4KPr board is grounded on the front panel. Care must be taken to ensure that the connection between the rack housing and the control cabinet is conductive. This is best achieved using chromatized mounting bars. The motor controller should be separately grounded. the encoders are frequently mounted directly on the motor. This motor-encoder combination must always also be grounded, as otherwise the encoder electronics will be exposed to interference by the motor current.
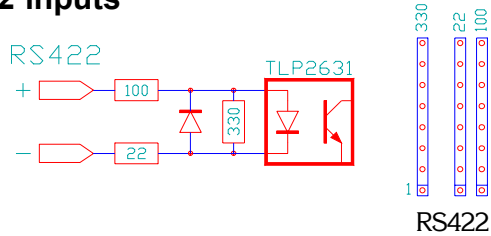
Connection Example
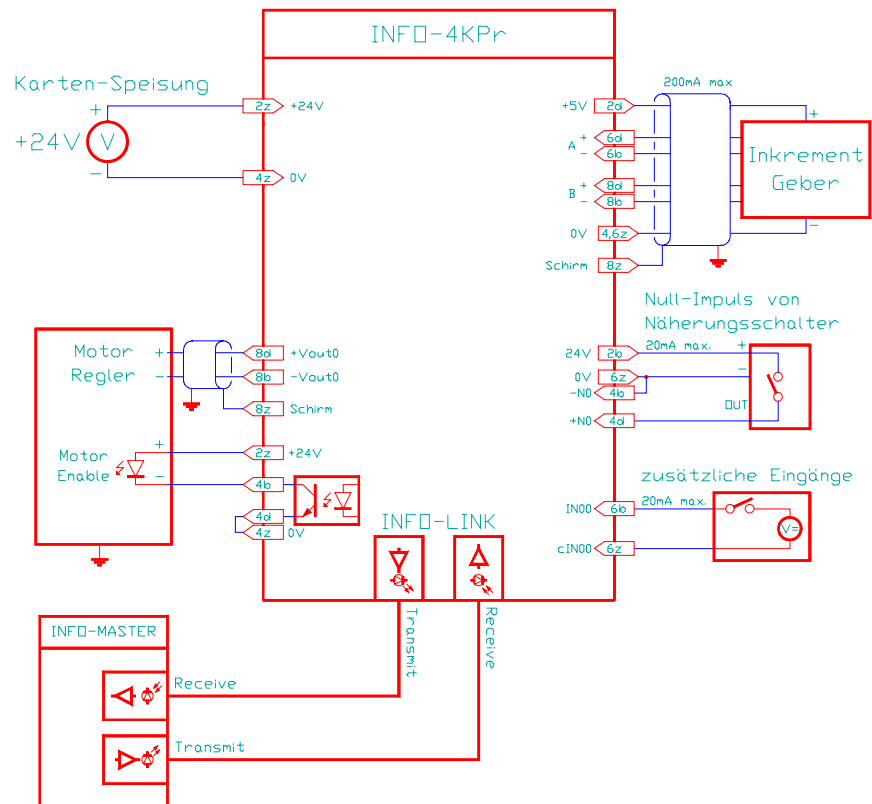
Additional inputs and outputs

The additional inputs and outputs must always be wired inside the control cabinet (max. length 1m). Otherwise they must be installed with shielded leads.
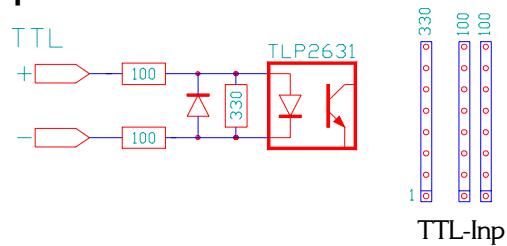
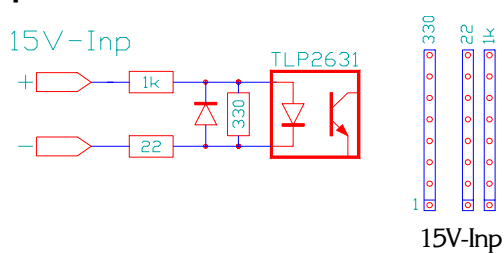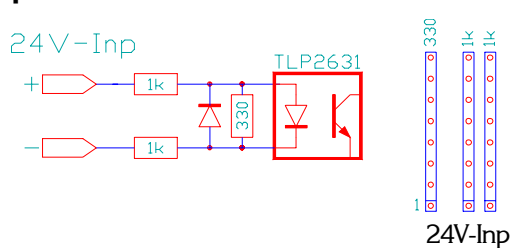See also the INDEL Wiring Guidelines and INDEL Design Guidelines.

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Interfaces

RS422 inputs

RS422

TTL inputs

TTL-Inp

15V inputs
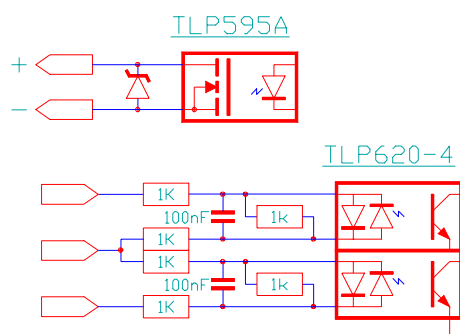

15V-Inp

24V inputs

24V-Inp

Additional inputs/outputs

Wiring

Encoders

The inputs of the encoders and zero pulses can be wired for RS422, TTL, 15V or 24V inputs. The board has three assembly fields for this purpose, into which the resistor arrays can be plugged. Two encoders each and all zero pulses must have the same input wiring.

- J1   encoder channels 0 and 1
- J2   encoder channels 2 and 3
- J3   zero pulse channels 0 ... 3

Additional inputs/outputs

The additional inputs can be operated with 15 ... 24V. The inputs are potential-free. They can be wired in any desired polarity (bipolar). The common pin of two inputs can be wired as needed to V+ or V-.

The outputs are also potential-free. The typical current loading is 300mA, the no-load voltage 48V.

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