Allgemein

Das hipecs-CIO51 ist ein kompaktes CANopen Modul mit 2 Vollbrückentreibern zur Ansteuerung von Gleichstrommotoren, Ventilen und ähnlichen Lasten. Die Ansteuerung der Last erfolgt mittels PWM, die Basisfrequenz ist im Bereich von 500Hz bis 12 kHz einstellbar. Zur Entlastung der CPU können für die Beschleunigung und Verzögerung automatisch Rampenverläufe generiert werden.

Der maximale Ausgangsstrom ist einstellbar und wird vom Treiber automatisch begrenzt.

Die momentane Ausgangsströme werden für beide Kanäle gemessen. Eine Temperaturüberwachung mit Notabschaltung ist ebenfalls implementiert.

In diesem E/A-Modul sind die komplexen CANopen-Standards DS301 und DS401 implementiert. Alle üblichen Baudraten bis zu 1 Mbit werden unterstützt.

Funktionen

- **CANopen remote I/O Module entsprechend den CiA Draft Standards DS301 Version 4.0 und DS401 Version 2.0**
- **2 Vollbrückentreiber bis max. 2 A Spitzenstrom**
- **Rücklesen des momentanen Ausgangsstrom**
- **interne Temperaturüberwachung und Abschaltung bei Übertemperatur**
- **CAN-Baudraten bis 1Mbit**
- **CAN-Bus ISO11898 mit Transceiver TJA1050**
- **4 Transmit und 4 Receive PDOs**
- **Dynamisches PDO Mapping**
- **Variable PDO Identifier**
- **CANopen PDO Übertragungsmodi: synchron, asynchron, ereignisgesteuert, zyklisch, azyklisch und Remote Frame bezogen.**
- **Event Timer und Inhibit Timer für alle Transmit PDOs.**
- **Nodeguarding, Lifeguarding und Heartbeat**
- **Emergency Nachrichten**
- **Minimum boot up**
- **Kunststoffgehäuse zum Aufrasten auf DIN-Trageschienen**
- **Betriebsspannung nominell DC24V**
- **Betriebstemperatur 0 bis 55°C (opt. -40…+70°C)**

Bestellinformation

Bauteil	Beschreibung
hipecs-CIO51-i	CANopen I/O-Modul mit 2 Vollbrückentreibern, 0…55°C
hipecs-CIO51-ie	CANopen I/O-Modul mit 2 Vollbrückentreibern, -40…+70°C

Technische Daten

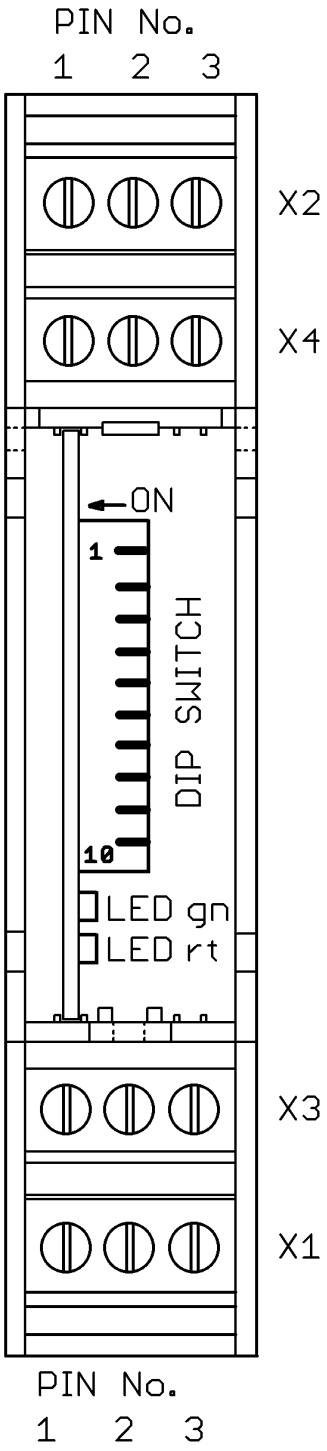
Das Modul hipecs-CIO51 hat getrennte Spannungsversorgungen für das System und die Vollbrückentreiber. Die Vollbrückentreiber sind von der CPU nicht galvanisch entkoppelt. Für den CAN-Bus ist eine galvanische Entkopplung vorgesehen.

Spannungsversorgung System	Min.	Norm.	Max.
Nominale System/Bus Versorgungsspannung	11 V	24 V	32 V
Stromaufnahme System / Bus	20 mA (bei Vcc=32V)	30 mA	60 mA (bei Vcc=11V)
Nominale E/A Versorgungsspannung DC			
CAN bus Norm	ISO11898		
CiA Draft Standards	DS301 Version 4.0 und DS401 Version 2.0		
Konformitätserklärung	CE		

Ausgänge mit Vollbrückentreiber	
Maximaler Ausgangsstrom	2 A
Ausgangs-Dauerstrom	1 A (mit interner Temperaturüberwachung)
Maximale Temperatur im Modul	55°C .. 85 °C einstellbar
PWM-Frequenz	500 Hz .. 12 kHz mit Prescaler einstellbar

Stecker und Abmessungen	
Stecker	Schraubklemme
Leitungsquerschnitt [mm²]	0,08 bis 1,5 mm²
Leitungsquerschnitt [AWG]	14 bis 28 AWG
Leiterlänge	7 mm
Abmessung Gehäuse	ca. 17,8 x 90 x 62 mm (Bild “Abmessungen” beachten!)
Betriebstemperatur	0 .. 55°C (opt. -40…+70°C)

Anschluss-Klemmen



Klemmenbelegung X1 (Versorgung)

Pin Nr.	Name	Funktion
1	U	Versorgungsspannung DC +24V
2	GND	Masse für System / Bus
3	G1	Masse für Ausgänge

Klemmenbelegung X2 (CAN)

Pin Nr.	Name	Funktion
1	L0	CAN Low Signal
2	H0	CAN High Signal
3	G0	CAN GND Masse für CAN-Bus

Klemmenbelegung X3 (PWM-Ausgang2)

Pin Nr.	Name	Funktion
1	2L	PWM-Ausgang 2 Low
2	P1	Betriebsspannung für Vollbrückentreiber
3	2H	PWM-Ausgang 2 High

Die Last muss immer zwischen den Klemmen X3.1 und X3.3 angeschlossen werden.

Klemmenbelegung X4 (PWM-Ausgang1)

Pin Nr.	Name	Funktion
1	1L	PWM-Ausgang 1 Low
2	-	Reserviert
3	1H	PWM-Ausgang 1 High

Die Last muss immer zwischen den Klemmen X4.1 und X4.3 angeschlossen werden.

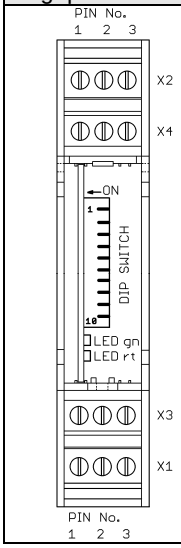
Konfiguration Dip-Schalter

Der DIP-Schalter zur Einstellung von Knotennummer und Baudrate liegen hinter der Frontklappe, die nach oben geöffnet werden kann.

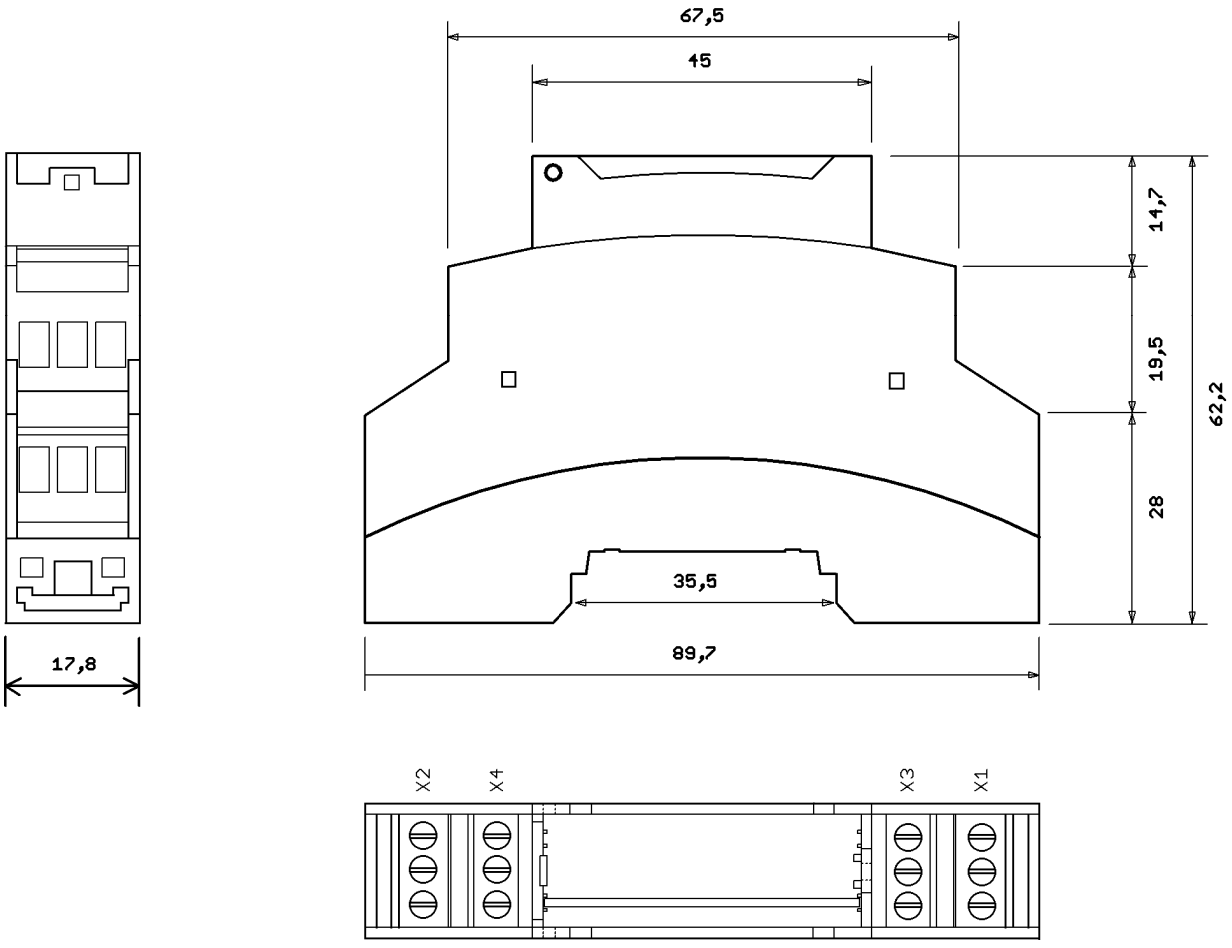
Switch Nummer										Funktion
1	2	3	4	5	6	7	8	9	10	
RT										RT Abschluss-Widerstand CAN-Bus
	BD2	BD1	BD0							BDx Baudrate CAN-Bus
				ID5	ID4	ID3	ID2	ID1	ID0	IDx Einstellung Node-ID
ON										CAN-Terminierung ein (120 Ohm)
OFF										CAN-Terminierung aus
	OFF	OFF	OFF							1 Mbit / sec
	OFF	OFF	ON							800 kbit / sec
	OFF	ON	OFF							500 kbit / sec
	OFF	ON	ON							250 kbit / sec
	ON	OFF	OFF							125 kbit / sec
	ON	OFF	ON							50 kbit / sec
	ON	ON	OFF							20 kbit / sec
	ON	ON	ON							Reserviert
				OFF	OFF	OFF	OFF	OFF	OFF	Reserviert
				OFF	OFF	OFF	OFF	OFF	ON	Node ID = 1
				OFF	OFF	OFF	OFF	ON	OFF	Node ID = 2
				OFF	OFF	OFF	OFF	ON	ON	Node ID = 3
				…	…	…	…	…	…	…
				ON	ON	ON	ON	OFF	OFF	Node ID = 60
				ON	ON	ON	ON	OFF	ON	Node ID = 61
				ON	ON	ON	ON	ON	OFF	Node ID = 62
				ON	ON	ON	ON	ON	ON	Node ID = 63

CAN Signal LED's

Die LEDs befinden sich ebenfalls hinter der Frontklappe.

Lageplan	LED	Farbe	Funktion
	RUN-LED	grün	Die RUN-LED zeigt den NMT-Zustand entsprechend DRP303-3 an Aus — Betriebsspannung fehlt oder Defekt Flackern — CAN noch nicht gestartet 1 x Flashen (kurzes Aufblitzen) — Stopped Blinken — Preoperational Ein — Operational
	ERR-LED	rot	Die Error-LED zeigt den Fehlerzustand entsprechend DRP303-3 an Aus — Kein Fehler 1 x Flashen — CAN-Modul ist im Error-Warning-Zustand 2 x Flashen — Node-Guarding-Fehler Ein — Bus-Off-Zustand des Knoten

Abmessungen Kunststoffgehäuse



CANopen Objektverzeichnis

Im hipecs-CIOxx Controller ist das komplexe Objektverzeichnis für CANopen E/A-Geräte implementiert.

hipecs-CIO51 Objekte

Alle Werte dieser Tabelle sind in hexadezimaler Schreibweise notiert. Als Zugriffsberechtigungen sind folgend e Typen definiert:

ro read only / nur lesen
wo write only / nur schreiben
rw read and write access enabled / lessen und schreiben
rww read and write access enabled by SDO, write only by PDO / lesen, schreiben per SDO,PDO nur schreiben

Index	Sub-Index	Name	Data type	Acc.	Map-pable	Default Value / Note	Object Category
1000	-	Device Type	Unsigned 32	ro	no	000F 0191 h	Global
1001	-	Error Register	Unsigned 8	ro	yes	-	Global
1002	-	Manufacturer Status Register	Unsigned 32	ro	yes	-	Global
1005	-	COB-ID Sync Identifier Sync Object	Unsigned 32	ro	no	80 h	Global
1008	-	Device Name	Visible String	ro	no	"hipecsCIO-51"	Global
1009	-	Hardware Version	Visible String	ro	no	-	Global
100A	-	Software Version	Visible String	ro	no	active Version	Global
100C	-	Guard Time	Unsigned 16	rw	no	0 h	Global
100D	-	Life Time Factor	Unsigned 8	rw	no	0 h	Global
1014	-	COB ID Emergency	Unsigned 32	rw	no	80 h + Node-ID	Global
1015	-	Inhibit Time Emergency	Unsigned 16	rw	no	0 h (disabled)	Global
1016	-	Consumer Heartbeat Time	Array	-	-		Global
	0	Nr of Subobjects	Unsigned 8	ro	no	04 h	Global
	1	Consumer Heartbeat Time 1	Unsigned 32	rw	no	0 h	Global
	2	Consumer Heartbeat Time 2	Unsigned 32	rw	no	0 h	Global
	3	Consumer Heartbeat Time 3	Unsigned 32	rw	no	0 h	Global
	4	Consumer Heartbeat Time 4	Unsigned 32	rw	no	0 h	Global
1017	-	Producer Heartbeat Time	Unsigned 16	rw	no	0 h	Global
1018		Identity Object	Record	-	-	-	Global
	0	Nr of Subobjects	Unsigned 8	ro	no	04 h	Global
	1	Vendor ID	Unsigned 32	ro	no	0000 0058 h	Global
	2	Product Code	Unsigned 32	ro	no	0300 5100 h	Global
	3	Revision Number	Unsigned 32	ro	no	actual Rev. Code	Global
	4	Serial Number	Unsigned 32	ro	no	-	Global
1029		Error Behavior Object	Array	-	-	-	Global
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	Global
	1	Communication error	Unsigned 8	rw	no	0 h	Global
	2	Application error	Unsigned 8	rw	no	0 h	Global
1400		Receive PDO1 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	PDO
	1	COB-ID	Unsigned 32	rw	no	200 h + Node-ID	PDO
	2	Transmission Type	Unsigned 8	rw	no	FF h	PDO
1401		Receive PDO2 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	PDO
	1	COB-ID	Unsigned 32	rw	no	0x300 + Node-ID	PDO
	2	Transmission Type	Unsigned 8	rw	no	FF h	PDO

Index	Sub-Index	Name	Data type	Acc.	Map-pable	Default Value / Note	Object Category
1402		Receive PDO3 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	PDO
	1	COB-ID	Unsigned 32	rw	no	0x80000400 + Node-ID	PDO
	2	Transmission Type	Unsigned 8	rw	no	FF h	PDO
1403		Receive PDO4 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	PDO
	1	COB-ID	Unsigned 32	rw	no	0x80000500 + Node-ID	PDO
	2	Transmission Type	Unsigned 8	rw	no	FF h	PDO
1600		Receive PDO1 - Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	2 h	PDO
	1	Mapped Object	Unsigned 32	rw	no	6200 0108 h Dig. Output Control for Driver 1	PDO
	2	Mapped Object	Unsigned 32	rw	no	6200 0208 h Dig. Output Control for Driver 1	PDO
1601		Receive PDO2 - Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	2 h	PDO
	1	Mapped Object	Unsigned 32	rw	no	6411 0110 h Full Bridge Driver 1 PWM Duty	PDO
	2	Mapped Object	Unsigned 32	rw	no	6411 0210 h Full Bridge Driver 2 PWM Duty	PDO
1602		Receive PDO3 - Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	0 h	PDO
1603		Receive PDO4 - Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	0 h	PDO
1800		Transmit PDO1 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	5 h	PDO
	1	COB-ID	Unsigned 32	rw	no	180 h + Node-ID	PDO
	2	Transmission Type	Unsigned 8	rw	no	FF h	PDO
	3	Inhibit Time	Unsigned 16	rw	no	0 h	PDO
	4	Compatibility Entry	Unsigned 8	rw	no	-	PDO
	5	Event Time	Unsigned 16	rw	no	0 h	PDO
1801		Transmit PDO2 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	5 h	PDO
	1	COB-ID	Unsigned 32	rw	no	280 h + Node-ID	PDO
	2	Transmission Type	Unsigned 8	rw	no	FF h	PDO
	3	Inhibit Time	Unsigned 16	rw	no	0 h	PDO
	4	Compatibility Entry	Unsigned 8	rw	no	-	PDO
	5	Event Time	Unsigned 16	rw	no	0 h	PDO

Index	Sub-Index	Name	Data type	Acc.	Map-pable	Default Value / Note	Object Category
1802		Transmit PDO3 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	5 h	PDO
	1	COB-ID	Unsigned 32	rw	no	8000 03 80 h + Node-ID	PDO
	2	Transmission Type	Unsigned 8	rw	no	01 h	PDO
	3	Inhibit Time	Unsigned 16	rw	no	0 h	PDO
	4	Compatibility Entry	Unsigned 8	rw	no	-	PDO
	5	Event Time	Unsigned 16	rw	no	0 h	PDO
1803		Transmit PDO4 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	5 h	PDO
	1	COB-ID	Unsigned 32	rw	no	8000 04 80 h + Node-ID	PDO
	2	Transmission Type	Unsigned 8	rw	no	01 h	PDO
	3	Inhibit Time	Unsigned 16	rw	no	0 h	PDO
	4	Compatibility Entry	Unsigned 8	rw	no	-	PDO
	5	Event Time	Unsigned 16	rw	no	0 h	PDO
1A00		Transmit PDO1 – Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	2 h	PDO
	1	Mapped Object	Unsigned 32	rw	no	6000 01 08 h Digital Input Status of Driver 1	PDO
	2	Mapped Object	Unsigned 32	rw	no	6000 02 08 h Digital Input Status of Driver 2	PDO
1A01		Transmit PDO2 – Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	3 h	PDO
	1	Mapped Object	Unsigned 32	rw	no	6401 0110 h Full Bridge Driver 1 Current Feedback	PDO
	2	Mapped Object	Unsigned 32	rw	no	6401 0210 h Full Bridge Driver 2 Current Feedback	PDO
	3	Mapped Object	Unsigned 32	rw	no	6401 0310 h Analog Input 3 Internal Temperature	PDO
1A02		Transmit PDO3 – Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	0 h	PDO
1A03		Transmit PDO4 – Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	0 h	PDO
2000	-	Device Manufacturer	Visible String	ro	no	“FRENZEL+BERG”	Global
2009		Serial Number 64 Bit	Array	-	-	-	Global
	0	Nr of Subobjects	Unsigned 8	ro	no	5 h	Global
	1	Serial Number 64 Bit LSDW	Unsigned 32	ro	no	-	Global
	2	Serial Number 64 Bit MSDW	Unsigned 32	ro	no	-	Global
2101	-	System Configuration	Unsigned 32	ro	no	Setting of Config. Input Pins	Global
2102	-	Remapping Enabled Info	Unsigned 8	ro	no	1 h (enabled)	Global
2103	-	Enable Guarding Warning	Unsigned 8	rw	no	0 h (disabled)	Global
2105	-	Internal API State	Unsigned 32	ro	yes	-	Global

Index	Sub-Index	Name	Data type	Acc.	Map-pable	Default Value / Note	Object Category
2110	-	Conformance Test Object	Record	-	-		Global
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Global
	1	Range Check Object	Unsigned 16	rw	no	500	Global
2180	-	CAN Restart Time	Unsigned 16	rw	no	1000 h (restart after one second)	Global
5104	-	Output Driver max Current	Array	-	-		Ana Out
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Ana Out
	1	Output Driver max Current Full Bridge Driver 1 [mA]	Unsigned 16	rww	yes	1000 max Current is 1 A	Ana Out
	2	Output Driver max Current Full Bridge Driver 2 [mA]	Unsigned 16	rww	yes	1000 max Current is 1 A	Ana Out
5107	-	Output PWM Prescaler	Unsigned 16	rw	no	24 PWM base frequency is 1 kHz	Ana Out
5108	-	Output PWM Max Change per msec	Array	-	-	-	Ana Out
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	Ana Out
	1..2	Channel 1..2	Unsigned 16	rw	no	1 (max Change of 1/1000 per msec)	Ana Out
5109	-	Output Current Max Change Prescaler	Array	-	-	-	Ana Out
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	Ana Out
	1..2	Channel 1..2	Unsigned 16	rw	no	10	Ana Out
51F0	-	Overheat Limit Temperature	Unsigned 16	rw	no	65	Global
5200	-	Reset Output Object 6200 on Error	Unsigned 8	rw	no	1 h	Dig. Out
5400	-	Reset Output Object 6411 on Error	Unsigned 8	rw	no	1 h	Ana Out
6000		Digital Input 8 Bit	Array	-	-	-	Dig. In
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	Dig. In
	1..2	Digital Input Byte 1..2 Status of Current Output 1..2	Unsigned 8	ro	yes	-	Dig. In
6005		Global Interrupt Enable	Unsigned 8	rw	no	1 h	Dig. In
6006		Interrupt Mask any Change	Array	-	-	-	Dig. In
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	Dig. In
	1..2	Interrupt Mask Any Change Byte 1..2	Unsigned 8	rw	no	FF h (interrupt enabled)	Dig. In
6007		Interrupt Mask Rising Edge	Array	-	-	-	Dig. In
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	Dig. In
	1..2	Interrupt Mask Rising Edge Byte 1..2	Unsigned 8	rw	no	0 h (interrupt disabled)	Dig. In
6008		Interrupt Mask Falling Edge	Array	-	-	-	Dig. In
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	Dig. In
	1..2	Interrupt Mask Falling Edge Byte 1..2	Unsigned 8	rw	no	0 h (interrupt disabled)	Dig. In
6100		Read Digital Input 16 Bit	Array	-	-	-	Dig. In
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. In
	1	Read Digital Input 16 Bit	Unsigned 16	ro	no	-	Dig. In

Index	Sub-Index	Name	Data type	Acc.	Map-pable	Default Value / Note	Object Category
6120		Read Digital Input 32 Bit	Array	-	-	-	Dig. In
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. In
	1	Read Digital Input 32 Bit Long 0	Unsigned 16	ro	no	-	Dig. In
6200		Write Digital Output 8 Bit	Array	-	-	-	Dig. Out
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	Dig. Out
	1..2	Dig. Output Byte 1 Control of Full Bridge Driver Stage 1..2	Unsigned 8	rw	yes	-	Dig. Out
6206		Error Mode Output 8 bit	Array	-	-	-	Dig. Out
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	Dig. Out
	1..2	Error Mode Output 8 Bit Byte 1..2	Unsigned 8	rw	no	FF h	Dig. Out
6207		Error State Output	Array	-	-	-	Dig. Out
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	Dig. Out
	1..2	Error Value Output 8 Bit Byte 1..2	Unsigned 8	rw	no	0 h (Driver Disabled)	Dig. Out
6300		Write Digital Output 16 bit	Array	-	-	-	Dig. Out
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Out
	1	Dig. Output Word 1	Unsigned 16	rww	yes	-	Dig. Out
6320		Write Digital Output 32 bit	Array	--	-	-	Dig. Out
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Out
	1	Dig. Output Long 1	Unsigned 32	rww	yes	-	Dig. Out

Description of Object Dictionary

The following list gives a short description of all dictionary entries, available for the hipecs CIO series of CANopen I/O modules.

Index 0005

This object is implemented to enable reservation of data space in PDOs by mapping dummy entries.

Index	0005
Name	Dummy 8
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	0

Index 0006

This object is implemented to enable reservation of data space in PDOs by mapping dummy entries.

Index	0006
Name	Dummy 16
Description	-
Data Type	Unsigned 16
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	0

Index 0007

This object is implemented to enable reservation of data space in PDOs by mapping dummy entries.

Index	0007
Name	Dummy 32
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	0

DS301: Global Objects

Index 1000 : Device Type

Description of the device type. The Object gives the CiA device profile number and additionally the functionality of the device.

Index	1000h
Name	Device Type
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	000F 0191 h

Index 1001 : Error Register

This object holds an error of the device.

Index	1001h
Name	Error Register
Description	-
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	-

The error register has the following structure

Bit	Meaning
0	Generic error. This bit is set, if any error is active
1	0
2	0
3	0
4	CAN bus or communication error
5	0
6	0
7	Device Error

Index 1002 : Status Register

This object gives additional information for the device

Index	1002h
Name	Status Register
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	-

Index 1005 : COB-ID Sync

Identifier of Can Object for the Synchronisation message. The hipecs CIO may only operate in Sync consumer mode. Generating of Sync messages is not possible. Therefore the Identifier for the Sync message can only be set to the value range 1 . 7FFh.

Index	1005h
Name	COB-ID Sync
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	1 .. 7FFh
Default Value	80h

Index 1008 : Device Name

This object shows the name of the device as visible string.

Index	1008h
Name	Device Name
Description	-
Data Type	Visible String
Access modes	RO
PDO Mapping	No
Value Range	The maximum string length is 20 characters
Default Value	“hipecs-CIO51”

Index 1009 : Hardware Version

This object shows the hardware version and firmware version as visible string.

Index	1009h
Name	Hardware Version
Description	-
Data Type	Visible String
Access modes	RO
PDO Mapping	No
Value Range	The maximum string length is 20 characters
Default Value	-

Index 100A : Software Version

This object shows the software version as visible string.

Index	100Ah
Name	Software Version
Description	-
Data Type	Visible String
Access modes	RO
PDO Mapping	No
Value Range	The maximum string length is 20 characters
Default Value	-

Index 100C : Guard Time

The objects at index 100Ch (Guard Time in milli-seconds) and 100Dh (Life Time Factor) are used to implement the life guarding protocol. The Guard Time multiplied with the Life Time Factor gives the Life Time in milliseconds.
It is 0 (zero) if not used.

Index	100Ch
Name	Guard Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	
Default Value	0

Index 100D : Life Time Factor

The objects at index 100Ch (Guard Time in milli-seconds) and 100Dh (Life Time Factor) are used to implement the life guarding protocol. The Guard Time multiplied with the Life Time Factor gives the Life Time in milliseconds.
It is 0 (zero) if not used.

Index	100Dh
Name	Life Time Factor
Description	-
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	
Default Value	0

Index 100E : COB-ID Guard

Identifier of Can Object for the Node Guarding protocol. The Object is not represented in the object dictionary because of standard conforming reasons.

Index	100Eh
Name	COB-ID Guard
Description	-
Data Type	Unsigned 32
Access modes	-
PDO Mapping	No
Value Range	-
Default Value	700h + Node-ID

Index 1014 : COB-ID Emergency

Identifier of Can Object for the emergency messages.

Index	1014h
Name	COB-ID Emergency
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	80h + Node-ID

Index 1015 : Inhibit Time Emergency

Inhibit Time for emergency messages. If the Inhibit Time is set to 0, inhibit delay is disabled. The Inhibit Time is a multiple of 100usec, but the hipecs CIO offers a maximum resolution of 1 millisecond.

Index	1015h
Name	Inhibit Time Emergency
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0 (disabled)

Index 1016 : Consumer Heartbeat Time

The objects of Index 1016 are used to define the consumer heartbeat times for up to 4 nodes. With each sub index, the configuration for one monitored node can be set.

Index	1016h
Name	Consumer Heartbeat Time
Description	-
Data Type	Structure

Index	1016h Subindex 0
Name	Largest SubIndex supported
Description	-
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	4

Index	1016h Subindex 1
Name	Consumer Heartbeat Time 1
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Index	1016h Subindex 2
Name	Consumer Heartbeat Time 2
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Index	1016h Subindex 3
Name	Consumer Heartbeat Time 3
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Index	1016h Subindex 4
Name	Consumer Heartbeat Time 4
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Structure of consumer heartbeat time:

MSB LSB

Byte3	Byte2	Byte1	Byte0
reserved	Node-ID	Heartbeat time	

Note:
Monitoring of the heartbeat producer starts after the reception of the first heartbeat.
The consumer heartbeat time should be higher than the corresponding producer heartbeat time.
Before the reception of the first heartbeat the status of the heartbeat producer is unknown.

Index 1017 : Producer Heartbeat Time

The producer heartbeat time defines the cycle time of the heartbeat. The producer heartbeat time is 0 if it is not used. The time has to be a multiple of 1ms.

Index	1017h
Name	Producer Heartbeat Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Note:
Either Heartbeat or node guarding may be allowed at the same time. Do not use both protocols at the same time.

Index 1018 : Identity Object

The object at index 1018h keeps general information of the device and the CANopen chip manufacturer frenzel + berg electronic GmbH & Co.KG.
It cannot be modified.

Index	1018h
Name	Identity Object
Description	-
Data Type	Structure

Index	1018h Subindex 0
Name	Largest SubIndex supported
Description	-
Data Type	Unsigned char
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	4

Index	1018h Subindex 1
Name	Vendor ID
Description	Registration Code of frenzel + berg electronic at the CiA
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	58h

Index	1018h Subindex 2
Name	Product Code
Description	Internal Product Code for hipecs-CIO51 at frenzel + berg electronic
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	0300 5100 h

Index	1018h Subindex 3
Name	Revision Code
Description	
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	Revision of the device

Index	1018h Subindex 4
Name	Serial Number
Description	
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	0

Index 1029 : Error Behaviour

With object 1029 the CANopen chip can be configured to enter alternatively the preoperational or the stopped state or remain in the current state in case of a device failure. Device failures shall include the following communication errors:
Bus-off conditions of the CAN interface, Life guarding error, Serious device errors also can be caused by device internal failures.
The value of the Error Classes is as follows:
0 = pre-operational
(only if current state is operational)
1 = no state change
2 = stopped
3 .. 127 = reserved

Index	1029h
Name	Error Behaviour Object
Description	-
Data Type	Structure

Index	1029h Subindex 0
Name	Largest SubIndex supported
Description	-
Data Type	Unsigned char
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	2

Index	1029h Subindex 1
Name	Communication Error
Description	NMT state change in case of communication error
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	00h

Index	1029h Subindex 2
Name	Application Error
Description	NMT state change in case of internal error due to hardware malfunction
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	00h

DS301: PDO Parameter Objects

Communication Parameter Objects

The following table shows the communication parameter objects for Index 140x (Receive PDOs) and Index 180x (Transmit PDOs). The tables show Index 1400 as an example for all PDOs
The transmission type (sub-index 2) defines the mode for transmission / reception of the PDO. See table for detailed description of this entry.
Description of transmission type:

Type	PDO transmission				
	cyclic	acyclic	Sync related	Async.	Only on remote
0		X	X		
1-240	X		X		
241-251	Reserved				
252			X		X
253				X	X
254				X	
255				X	

Synchronous transmission types 0-240 and 252 mean that the transmission of the PDO shall be related to the SYNC object. Asynchronous means that the transmission of the PDO is not related to the SYNC object.
A transmission type of zero means that the message shall be transmitted synchronously with the SYNC object but not periodically but only in case of data change.
A value between 1 and 240 means that the PDO is transferred synchronously and cyclically, the transmission type indicating the number of SYNC signals, which are necessary to trigger PDO transmissions or receptions.
The transmission types 252 and 253 mean that the PDO is only transmitted on reception of a remote frame. At transmission type 252, the data is updated (but not sent) immediately after reception of the SYNC object. At transmission type 253 the data is updated at the reception of the remote frame. These values are only possible for transmit PDOs.

Transmission type 255 means, the application event is defined in the device profile. For receive PDOs the reception of a PDO will update the mapped data (normally the analog or digital outputs).
Sub-index 3h contains the inhibit time. This time is a minimum interval for PDO transmission. The value is defined as multiple of 100ms.

In mode 254/255 additionally an event time can be used for TPDO. If an event timer exists for a TPDO (value not equal to 0) the elapsed timer is considered to be an event. The event time is a multiple of 1 ms. This event will cause the transmission of this TPDO in addition to otherwise defined events.
The PDO communication parameter objects have the same structure for all PDOs. The following Objects are used.
Sub-index 4h is reserved.

Index	PDO
1400h	Receive PDO1
1401h	Receive PDO2
1402h	Receive PDO3
1403h	Receive PDO4
1800h	Transmit PDO1
1801h	Transmit PDO2
1802h	Transmit PDO3
1803h	Transmit PDO4

Index	14xxh / 18xxh
Name	Receive / Transmit PDOx Communication Parameters
Description	-
Data Type	Structure

Index	14xxh / 18xxh Subindex 0
Name	Largest SubIndex supported
Description	-
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	2 / 5

Index	14xxh / 18xxh Subindex 1	
Name	COB-ID	
Description	Identifier for CAN-Object for PDO	
Data Type	Unsigned 32	
Access modes	RW	
PDO Mapping	No	
Value Range	-	
Default Value	1400.01	Node-Id + 200h
	1401.01	Node-Id + 300h
	1402.01	Node-Id + 80000400h
	1403.01	Node-Id + 80000500h
	1800.01	Node-Id + 180h
	1801.01	Node-Id + 280h
	1802.01	Node-Id + 80000380h
	1803.01	Node-Id + 80000480h

An Identifier of 8xxxxxxxh means, that this PDO is disabled by default and must be enabled from the CANopen master by assigning a valid PDO ID.

Index	14xxh / 18xxh Subindex 2
Name	Transmission Type
Description	-
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0FFh / 01h

Index	14xxh / 18xxh Subindex 3
Name	Inhibit Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Index	14xxh / 18xxh Subindex 4
Name	Reserved
Description	-
Data Type	-
Access modes	-
PDO Mapping	No
Value Range	-
Default Value	-

Index	14xxh / 18xxh Subindex 5
Name	Event Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Attention: By default, only the transmit and receive PDO 1 is enabled. Transmit and receive PDO2..4 are disabled by default and must be activated by your CANopen Master.

PDO Mapping Objects

The following table shows the PDO Mapping Objects. The principle of PDO mapping is the same for all PDOs. The PDO Mapping table is the cross reference between the Object dictionary entries (for example the data of an digital output byte) and the data field inside an PDO data field (position in the data field of a CAN message for PDO transfer).

Subindex 0 determines the valid number of objects that have been mapped. The hipecs CIO allows a maximum of 8 mapped objects for each PDO. For changing the PDO mapping first subindex 0 must be set to 0 (mapping is deactivated). Then the objects can be remapped. When a new object is mapped by writing a subindex between 1 and 8, the device may check whether the object specified by index /subindex exists. If the object does not exist or the object cannot be mapped, the SDO transfer will be aborted.

Subindexes 1 to 8 keep the pointers of the mapped objects as unsigned 32 values. The value is 0 if there is no mapped object. The structure for these pointers is as follows.

MSB			LSB
Byte3	Byte2	Byte1	Byte0
Mapped index		Subindex	Length

Mapped Index and Subindex together are the Pointer to the Object dictionary data to be mapped at this location.
Length gives the length of the mapped object in bits.

Index	160xh / 1A0xh
Name	Receive / Transmit PDO Mapping Parameters
Description	-
Data Type	Array

Index	160xh / 1A0xh Subindex 0
Name	Largest Subindex supported
Description	Number of mapped objects
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	See table below

Index	160xh / 1A0xh Subindex 1 to 8
Name	Mapped object
Description	
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	See table below

Receive PDOs

The **hipecs CIO51** CANopen IO uses the following default mapping entries for receive PDO mapping:

Index	Entry	Explanation
Receive-PDO1		
1600.00	2	RPDO1: 2 mapped object
1600.01	62000108h	Digital Output Byte1 Control Full Bridge Driver 1
1600.02	62000208h	Digital Output Byte2 Control Full Bridge Driver 2
Receive-PDO2		
1601.00	2	RPDO2: 2 mapped object
1601.01	64110110h	Analog Output 1 PWM Duty for Full Bridge Driver 1
1601.02	64110210h	Analog Output 2 PWM Duty for Full Bridge Driver 2
Receive-PDO3		
1602.00	0	RPDO3: 0 mapped objects
Receive-PDO4		
1603.00	0	RPDO4: no mapped objects

Transmit PDOs

The **hipecs-CIO51** CANopen IO uses the following default mapping entries for transmit PDO mapping:

Index	Entry	Explanation
Transmit - PDO1		
1A00.00	2	TPDO1: 2 mapped object
1A00.01	60000108h	Digital Input Byte 1 Status of Driver 1
1A00.02	60000208h	Digital Input Byte 2 Status of Driver 2
Transmit – PDO2		
1A01.00	3	TPDO2: 3 mapped object
1A01.01	64010110	Analog Input 1 Output Current Feedback Driver 1
1A01.02	64010210	Analog Input 2 Output Current Feedback Driver 2
1A01.03	64010310	Analog Input 3 Internal Temperature
Transmit – PDO3		
1A02.00	0	TPDO3: 0 mapped object
Transmit – PDO4		
1A03.00	0	TPDO4: 0 mapped objects

Manufacturer Specific Profile Area

The Objects in this area offer special device specific functions in order to configure additional functions implemented in the devices firmware. These additional functions can not be edited within the standardized profile areas.

Index 2000 : Device Manufacturer

This Object shows “Frenzel + Berg” as visible string. If OEMs do not want to give access to this entry, it may be removed from the EDS (electronic data sheet).

Index	2000h
Name	Device Manufacturer
Description	-
Data Type	Visible String
Access modes	RO
PDO Mapping	No
Value Range	The maximum string length is 20 characters
Default Value	„FRENZEL + BERG“

Index 2009 : Serial Number 64 Bit

This Object shows the serial number of the device. The serial number is given as an unsigned 64 bit number and is devided into two sub objects.

Index	2009h
Name	Serial Number 64 Bit
Description	-
Data Type	Array

Index	2009h Subindex 0
Name	Largest SubIndex supported
Description	-
Data Type	Unsigned char
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	2

Index	2009h Subindex 1
Name	Serial Number 64 Bit Low Double Word
Description	Holds bits 0 .. 31 of the serial number
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	-

Index	2009h Subindex 1
Name	Serial Number 64 Bit High Double Word
Description	Holds bits 32 .. 63 of the serial number
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	-

Index 2101 : System Configuration

This Object returns the operation mode of the hipecs-CIO51.

Index	2101h
Name	System Configuration
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	0

Index 2102 : Remapping Enabled Info

This Object informs the user whether the system configuration enables remapping of the PDOs.
A value of 0 means that remapping is dsabled, all other values indicate that remapping of the PDOs is enabled.

Index	2102h
Name	Remapping Enabled Info
Description	-
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	1

Index 2103 : Enabled Guarding Warning

This Object enables/disables transmission of emergency messages in case of a node guarding warning.
The condition of a guarding warning is met, if the time between two node guarding frames increases the guarding time given in object 100C independent of the setting of the life time (object 100D). The node guarding warning does not cause any NMT state change or switching the output pins to the error state. It is implemented to give the CANopen master an early information that the guarding interval has already exceeded the predefined value.
0 : Guarding Warning is disabled
1 : Guarding Warning is enabled

Index	2103h
Name	Enable Guarding Warning
Description	-
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Index 2105 : Internal Error Code

This Object holds error information of the CANopen controller.

Index	2105h
Name	Internal Error Code
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	YES
Value Range	-
Default Value	0 (no error condition)

Index 2110 : Test Object

This Object is implemented for testing purposes and should not be used.
The test entry does not have any functional behaviour.

Index	2110h
Name	Test Object 01
Description	-
Data Type	Structure

Index	2110h Subindex 0
Name	Largest SubIndex supported
Description	-
Data Type	Unsigned char
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	0x01

Index	2110h Subindex 1
Name	Range Check Object
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	100 .. 1000
Default Value	500

Index 2180 : CAN Restart Time

This Object gives the restart time out for the CAN communication layer in case of bus off errors in milliseconds.
If the restart time is set to 0 automatic restart of the device in case of bus off is prohibited.

Index	2180h
Name	CAN Restart Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	0 .. 50000
Default Value	1000 (restart after one second)

Index 51F0 : Overheat Limit Temperature

This Object sets the limit temperature for the system. The system has an internal temperature sensor. If the internal temperature reaches or exceeds the limit temperature, the output channels are forced to the safe state and an emergency message is sent to the CAN bus line.

Index	51F0h
Name	Overheat Limit Temperature
Description	Value in Degrees Celsius
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	50 .. 85
Default Value	65

I/O Configuration Objects

The following objects are describing the objects for configuration of the input and output channels.

Digital Input Objects

The following objects are describing the functionality of the digital input objects. For the hipecs-CIO51 the digital input objects show the status of the PWM Full Bridge Driver channels.

Index 6000 : Read Digital Input 8 Bit

This object represents the digital input bytes. The value of the input lines is written to this object.

Index	6000h
Name	Digital Input 8 Bit Status of analog current output
Description	-
Data Type	Array

Index	Subindex 0
Name	Nr of Subobjects
Description	Nr of output current channels
Data Type	Unsigned 8
Access modes	ro
PDO Mapping	No
Value Range	-
Default Value	2h

Index	Subindex 1..2
Name	Digital Input 8 Bit Byte 1..2 Status of Full Bridge Driver 1..2
Description	Bit0=0 Channel is disabled by object 6200.xx Bit0=1 Channel is enabled by object 6200.xx Bit1=0 Channel does not drive output PWM Bit1=1 Channel drives output PWM
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	-

Index 6005 : Global Interrupt Enable

This object enables or disables globally the interrupt behaviour without changing the interrupt masks.
In event-driven mode the device transmits the input values depending on the interrupt masks in objects 6006h, 6007h, and 6008h and the PDO transmission type.
TRUE (1)= global interrupt enabled
FALSE (0)= global interrupt disabled

Index	6005h
Name	Global Interrupt Enable
Description	-
Data Type	Boolean
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	TRUE

Index 6006 : Interrupt Mask Any Change

This object determines, which input lines shall activate an interrupt by any change of the input line. Both negative and positive edge will cause an interrupt, if enabled.
An interrupt will cause a PDO transmission in case of event driven transmission mode.
1 = interrupt enabled
0 = interrupt disabled

Index	6006h
Name	Interrupt Mask any change
Description	-
Data Type	Array

Index	Subindex 0
Name	Nr of Subobjects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	Number of digital input bytes

Index	Subindex 1 to Nr of input bytes
Name	Interrupt Mask any change
Description	
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0FFh (interrupt enabled)

Index 6007 : Interrupt Mask Low to High

This object has the same structure and behaviour as object 6006h but will cause interrupts only on rising edge of object index 6000. Note that input lines are active low, so rising edge of input data (object 6000) means falling edge of input port line.
Default value is 0.

Index 6008 : Interrupt Mask High to Low

This object has the same structure and behaviour as object 6006h but will cause interrupts only on falling edge of object index 6000. Note that input lines are active low, so falling edge of input data (object 6000) means rising edge of input port line.
Default value is 0.

Index 6100 : Read Digital Input 16 Bit

This object enables 16-Bit access to the digital input bytes. The Object addresses the same data area as object 6000 but using unsigned integer data type. See Index 6000 for further details.

Index 6120 : Read Digital Input 32 Bit

This object enables 32-Bit access to the digital input bytes. The Object addresses the same data area as object 6000 but using unsigned long data type. See Index 6000 for further details.

Digital Output Objects

The following objects are describing the functionality of the digital output objects. For the hipecs-CIO51, the digital output objects control the PWM output of the Full Bridge Driver channels.

Index 5200 : Output Reset on Error Option

This Object selects the function for error handling if a critical error is detected.
If the value is 0, the Outputs objects 6200.xx will keep unchanged. The ports will be set to their error state given in object 6207 as long as the error is active. If error condition ends, the outputs will return to the state according to the output object 6200h.
If the value is 1, the Outputs error handling depends on the objects 6206h and 6207h and the output object 6200 will be overwritten with the error output state according to objects 6206 and 6207.

Index	5200h
Name	Output Reset on Error Option
Description	-
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	1

Index 6200 : Write to Digital Output

With object 6200, the digital outputs of the hipecs CIO can be written.

Index	6200h
Name	Write to digital output Control of current output
Description	-
Data Type	Array

Index	Subindex 0
Name	
Description	Number of mapped objects
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	NO
Value Range	-
Default Value	2h

Index	Subindex 1..2
Name	Write to digital output 1..2 Control of Full Bridge Driver 1..2
Description	Bit0=0 driver output channel is disabled Bit0=1 driver output channel is enabled
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	YES
Value Range	-
Default Value	0

Attention: When using the Full Bridge Driver output of the hipecs-CIO51, it is needed to control this output with the corresponding digital output Bit.

Index 6206 : Error Mode Output 8 Bit

This object indicates, whether an output is forced to a predefined value (given in object 6207) in case of a device error.

1 = Output will be forced to the value selected in object 6207

0 = Output will be unchanged even in case of an error condition.

Index	6206h
Name	Error Mode Output 8 Bit
Description	-
Data Type	Array

Index	Subindex 0
Name	Nr of Subobjects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	1h

Index	Subindex 1
Name	Error Mode Output 8 Bit Byte 0
Description	
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0FFh (Take error condition from object 6207)

Index 6207 : Error Value Output 8 Bit

This object selects the level the outputs are forced to in case of device error mode if the error mode (object 6206 is enabled)
1 = Output will be forced to active state
0 = Output will be forced to inactive state.

Index	6207h
Name	Error Value Output 8 Bit
Description	-
Data Type	Array

Index	Subindex 0
Name	Nr of Subobjects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	1h

Index	Subindex 1
Name	Error Value Output 8 Bit Byte n
Description	
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0 (Inactive, high level)

Index 6300 : Write Digital Output 16 Bit

This object enables 16-Bit access to the digital output bytes. The Object addresses the same data area as object 6200 but using unsigned integer data type. See Index 6200 for further details.

Index 6320 : Write Digital Output 32 Bit

This object enables 32-Bit access to the digital output bytes. The Object addresses the same data area as object 6200 but using unsigned long data type. See Index 6200 for further details.

Analog Input Objects

The following objects are describing the functionality of the analog input objects. For the hipecs-CIO51, the analog input objects are implemented as a feed back of the actual current of the Full Bridge Driver output channels and provide monitoring of the internal temperature.

Index 6401 : Analog Input

This object supports current feedback of the output driver channels and monitoring of the internal temperature.

Index	6401h
Name	Analog Input
Description	
Data Type	Array

Index	Sub index 0
Name	Nr of Sub objects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	3h

Index	Sub index 1..2
Name	Output Current Feed Back of Full Bridge Driver 1..2 in milliamps
Description	Returns the actual output current of channel 1..2 in milliamps
Data Type	Signed 16
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	-

Index	Sub index 3
Name	Internal Temperature Monitor in Degrees Celsius
Description	
Data Type	Signed 16
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	-

Index 6421 : Analog Input Interrupt Trigger

Object 6421 selects the event that shall cause a transmission interrupt for the selected analog channel.

There is one Subindex for each channel to enable individual setting according to application requirements.

Table of possible Trigger Conditions:

Bit Nr	Interrupt Trigger Selection
0	Input voltage greater than Upper Limit
1	Input voltage less than Lower Limit
2	Input changed by more than Delta
3	Input reduced more than Negative Delta
4	Input increased more than Positive Delta
5 to 7	Reserved (must be forced to zero)

Index	6421h
Name	Analog Input Interrupt Trigger
Description	-
Data Type	Array

Index	Subindex 0
Name	
Description	Number of mapped objects
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	NO
Value Range	-
Default Value	Number of analog input lines

Index	Subindex 1 to Nr of input lines
Name	Analog Input Interrupt Trigger
Description	Selects trigger condition
Data Type	Unsigned 8 (See Table of Trigger Conditions)
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	7

Index 6423 : Analog Input Interrupt Enable

This object enables or disables globally the interrupt behaviour without changing the interrupt masks.
The interrupt is disabled by default, in order to avoid transmission of analog input values.

TRUE (1)= global interrupt enabled
FALSE (0)= global interrupt disabled

Index	6423h
Name	Analog Input Interrupt Enable
Description	-
Data Type	Boolean
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	FALSE

Index 6424/5/6/7/8 : Analog Input Interrupt Limits

These objects give the Limit for generation of interrupts. All objects have the same structure.
The function of the interrupt limit is only enabled, if the corresponding bit of object 6421 is set.
All values of limit parameters are signed 32. So the user must take care not to exceed the range of the input data objects.

Note especially for limit calculations
For calculation whether an interrupt (PDO transmission) must be generated or not, the analog input data object (6401.xx) is always evaluated as signed value, even if an offset is set to simulate an unsigned value.

Table of Limit Function

Object	Object Name and Function
6424	Analog Input Upper Limit Generate interrupt if input voltage is greater than or equal to Upper Limit (6424)
6425	Analog Input Lower Limit Generate interrupt if input voltage is less than Lower Limit (6425)
6426	Analog Input Interrupt Delta Generate interrupt if input voltage changed by more than Interrupt Delta
6427	Analog Input Negative Delta Generate interrupt if input voltage reduced by more than Negative Delta
6428	Analog Input Positive Delta Generate interrupt if input voltage in-creased by more than Positive Delta

Index	6424/5/6/7/8/9
Name	See table above
Description	-
Data Type	Array

Index	Subindex 0
Name	
Description	Number of mapped objects
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	NO
Value Range	-
Default Value	Number of analog input lines

Index	Subindex 1 to Nr of input lines
Name	See table above
Description	
Data Type	Integer 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Analog Output Objects

The following objects are describing the functionality of the analog output objects. For the hipecs-CIO51, the analog output objects control the PWM duty cycle of the PWM Full Bridge Driver channels.

Index 5104 : Output Driver max. Current mA

This object limits the maximum output current of the output driver. The value is given in mili Amps. If the current limit is reached, the output driver stage enters a high frequency PWM mode.

Index	5104h
Name	Output Driver max Current.
Description	Limits the maximum changes of output current in milliamps
Data Type	Array

Index	Sub index 0
Name	Nr of Sub objects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	2h

Index	Sub index 1 .. n
Name	Maximum Output Current
Description	
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	0 .. 2000
Default Value	1000

Index 5107 : Output PWM Prescaler

The output PWM generation circuit works on a base frequency of 24 kHz. For PWM generation a Prescaler is used in order to achieve lower PWM base frequencies. The prescaler can be set in a range of 2 .. 48. This results in PWM base frequencies of 500 Hz up to 12 kHz.

Index	5107h
Name	Output PWM Prescaler
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	2 .. 48
Default Value	24 (1 kHz PWM base frequency)

Index 5108 : Output PWM Max Change per msec

This object limits the maximum change of the output PWM duty cycle in milliseconds in standard operation mode. This object may be used in order to use ramp generation for the output current.
Changes of the output current are calculated each millisecond, if not set an additional prescaler in object 5109

Index	5108h
Name	Output PWM Max Change per milliseconds.
Description	Limits the maximum changes of output current in milliamps
Data Type	Array

Index	Sub index 0
Name	Nr of Sub objects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	2h

Index	Sub index 1 .. n
Name	Output PWM Max Change per milliseconds for output current channel n
Description	
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	1 .. 1000
Default Value	1

Index 5109 : Output Current Max Change Prescaler

Additional prescaler for calculating the maximum change given in object 5108.

Index	5109h
Name	Output Current Max Change prescaler
Description	
Data Type	Array

Index	Sub index 0
Name	Nr of Sub objects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	2h

Index	Sub index 1 .. n
Name	Output Current Max Change prescaler for output PWM channel n
Description	
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	1 .. 100
Default Value	10

Index 5400 : Reset Output Object 6411 on Error

With object 5400 the error behaviour of object 6411 in case of an emergency, that causes output switch off, is configured.

Index	5400h
Name	Reset Output Object 6411 on Error
Description	-
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	0 .. 1
Default Value	1

In case of an emergency situation, that causes output switch off, the value of object 5400 works as follows:

0 The value of current output object 6411.nn is not modified and holds the previously set value. So if the error condition is reset, the output might drive the previously set current.

1 The value of current output object 6411.nn is switched to the error output value set in object 6444.nn. The output will hold the emergency output value, even if the error condition has removed. The CAN master must set a new output current value.

If there is no error condition, object 5400 has no effect.

Index 6411 : Write Analog Output

With object 6411, the PWM duty cycle for the Full Bridge Driver of the hipecs-CIO51 can be set. For the duty cycle a value range of –1000 .. +1000 is defined.
Positive values mean, that the output PWM is driven to pin OxH. Pin OxL is switched to ground.
Switching from positive to negative values will cause a DC motor to turn from clockwise to counter-clockwise rotation

Index	6411h
Name	Write to analog output
Description	Set ouput PWM
Data Type	Array

Index	Subindex 0
Name	
Description	Number of mapped objects
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	NO
Value Range	-
Default Value	2

Index	Sub index 1 to Nr of outputs
Name	Write to analog output
Description	Set output PWM for Full Bridge Driver 1..n
Data Type	Integer 16
Access modes	RW
PDO Mapping	YES
Value Range	-1000 .. +1000
Default Value	0

Index 6443 : Error Mode Output 16 Bit

This object indicates, whether an output is forced to a predefined value (given in object 6444) in case of a device error.
1 = Output will be forced to the value selected in object 6444
0 = Output will be unchanged even in case of an error condition.

Index	6443h
Name	Error Mode Output 16 Bit
Description	-
Data Type	Array

Index	Subindex 0
Name	Nr of Subobjects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	4 h

Index	Subindex 1 to Nr of outputs
Name	Error Mode Output 8 Bit n
Description	
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0001h (Take error condition from object 6444)

Index 6444 : Error Value Output 32 Bit

This object selects the level the outputs are forced to in case of device error mode if the error mode (object 6443 is enabled)

Index	6444h
Name	Error Value Output 32 Bit
Description	-
Data Type	Array

Index	Subindex 0
Name	Nr of Subobjects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	4 h

Index	Subindex 1 to Nr of outputs
Name	Error Value Output 32 Bit n
Description	
Data Type	Integer 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0 (Inactive, high level)

Emergency Messages

The hipecs-CIO51 module supports several emergency messages. All of them have the same structure.

Byte							
0	1	2	3	4	5	6	7
EMY-Code		1001	0	CIO-Code			

EMY-Code: emergency-Error-Code according to DS301
1001: content of object 1001
CIO-Code: Emergency-Error-Code as unsigned 32 value

CIO-XX-Code (hex)	changes:		description
	NMT	I/O	
8000 0000	X	X	CAN bus is bus off
4000 0000			CAN bus in error warning state
2000 0000			Node guarding warning
1000 0000	X	X	Heart beat consumer error
3000 0000	X	X	Life guarding error
0000 0002	X	X	System Overtemperature
0000 0100			Wake up from power down mode

Emergency 2000 0000 (Node guarding warning) must be enabled with object 2103.
If more than one error is active at the same time, the bitmap of the CIO-Codes for all active errors are combined with a logical or conjunction.
Some of the emergencies may cause a NMT state change and/or may force the output pins to the error state. This behaviour depends on the setting of object 1029.
The ID for emergency transmission is fixed to:
0x80 + $NodeID.

List of emergency messages:

Node-Guarding warning							
30	81	01	00	00	00	00	20

This warning occurs, if the masters fails to transmit the guarding remote frame within the specified Guard Time object 100C and if transmission is enabled in object 2103

Life-Guarding error							
30	81	11	00	00	00	00	30

This error occurs, if the masters fails to transmit the guarding remote frame within the specified Life Time (Guard Time object 100C multiplied with Life Time Factor object 100D)

Heartbeat Consumer Error							
30	81	11	00	00	00	00	10

This emergency message indicates that a heart beat producer, that has been configured within the heart beat consumer object 0x1016.xx has not sent it's heart beat message within the specified time.

System Overheat Error							
00	10	01	00	02	00	00	00

This emergency message indicates that the internal temperature has reached or exceeded the overheat limit temperature.

CAN Bus in error warning state							
00	81	01	00	00	00	00	40

This error occurs, if the chips internal CAN module is in error warning state.

return from CAN bus off							
40	81	01	00	00	00	00	C0

This message indicates a return from Bus OFF state.

Data Mapping to Dictionary

operation mode 0
EDS-file: hipecs_CIO-051.EDS

mapping I/O to dictionary

Index. SubIndex	mapped I/O signal bit/value 7	6	5	4	3	2	1	0
6000.01	Status Vollbrücken-Ausgang 1 Bit0 Ausgang Freigegeben Bit1 Ausgang gibt PWM aus							
6000.02	Status Vollbrücken-Ausgang 2 Bit0 Ausgang Freigegeben Bit1 Ausgang gibt PWM aus							
6200.01	Control Ausgang Treiber 1 Bit0 Ausgang Freigabe							
6200.02	Control Ausgang Treiber 1 Bit0 Ausgang Freigabe							
6401.01	Rückmeldung aktueller Ausgangsstrom von Treiber 1 in mA							
6401.02	Rückmeldung aktueller Ausgangsstrom von Treiber 2 in mA							
6401.03	Interne Betriebstemperatur in °C							
6411.01	Vorgabe PWM für Treiber 1							
6411.02	Vorgabe PWM für Treiber 2							

Default PDO Mapping

PDO	mapped data
RPDO1	6200.01 Control Ausgang 1 6200.02 Control Ausgang 2
RPDO2	6411.01 Vorgabe PWM Ausgang 1 6411.02 Vorgabe PWM Ausgang 2
TPDO1	6000.01 Status Ausgang 1 6000.02 Status Ausgang 2
TPDO2	6401.01 Feedback Ausgangs-strom Treiber 1 6401.02 Feedback Ausgangs-strom Treiber 2 6401.03 Monitor Temperatur

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