Allgemein

Das Modul hipecs-CIO58 ist ein sehr kompaktes CANopen I/O-System mit 2 analogen Ausgängen für Ströme von 4…20 mA. Es kann zur dezentralen Erweiterung von Steuerungssystemen eingesetzt werden.

Die Stromausgänge sind galvanisch vom Bus und auch zueinander getrennt, besitzen ein Auflösung von 12 Bit und sind mit Schutzschaltungen versehen, welche vor Verpolung, Überspannung und elektrostatischen Entladungen schützen.

Die Einstellung von Node-ID und CAN-Baudrate erfolgt mit DIP-Schaltern.

In diesem E/A-Modul sind die komplexen CANopen-Standards DS301 und DS401 implementiert. Alle üblichen Baudraten bis zu 1 MBit werden unterstützt. Das Modul unterstützt CAN-Nachrichten mit 11- und 29-Bit Identifier.

Funktionen

- **CANopen remote I/O Module entsprechend den CiA Draft Standards DS301 Version 4.2 und DS401 Version 3.0**
- **Spannungsversorgung für System (DC 24V)**
- **2 Stromausgänge 4…20 mA galvanisch voneinander getrennt, einschl. CAN**
- **Interne Ausgangsschutzschaltungen gegen Verpolung, Überspannung und elektrostatische Entladung**
- **Auflösung der Stromausgänge: 12 Bit**
- **Spannungsbereich für die Einspeisung der Stromausgänge: 9V bis 32V DC**
- **CAN-Baudraten bis 1MBit**
- **CAN-Bus nach ISO11898 mit Transceiver TJA1050**
- **2 Transmit und 2 Receive PDOs**
- **Dynamisches PDO Mapping**
- **Variable PDO Identifier**
- **CANopen PDO Übertragungsmodi: synchron, asynchron, ereignisgesteuert, zyklisch, azyklisch, 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**
- **Betriebstemperatur 0…+55 °C optional -40…+70 °C**

Bestellinformation

Bauteil	Best.-Nr.
hipecs-CIO58-i	EZ.00000.2158.00
CANopen I/O mit 2 analogen Stromausgängen galvanisch entkoppelte CAN-Schnittstelle Betriebs-Temperaturbereich 0…+55 °C	
hipecs-CIO58-ie	EZ.00000.3058.00
CANopen I/O mit 2 analogen Stromausgängen galvanisch entkoppelte CAN-Schnittstelle Betriebs-Temperaturbereich -40…+70 °C	

Technische Daten

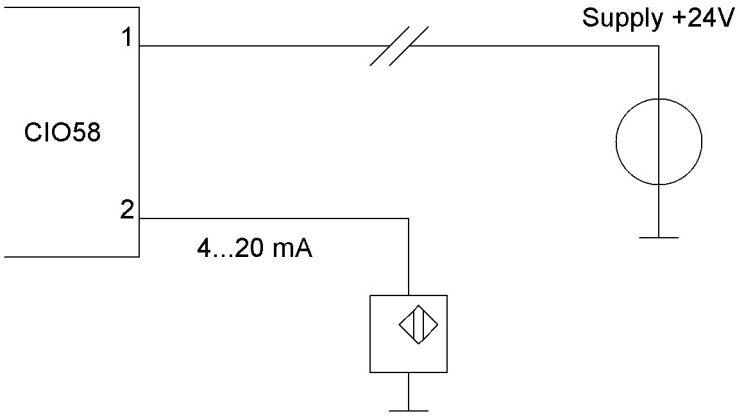
Spannungsversorgung System	Min.	Norm.	Max.
Nominale System/Bus Versorgungsspannung	16V	24V	32V
CAN bus Norm	ISO11898		
CiA Draft Standards	DS301 Version 4.2 und DS401 Version 3.0		
Isolation zwischen Bus und Stromausgängen	60V		
Isolation zwischen Bus und Versorgung/System	60V		
Konformitätserklärung	CE		

Stromausgänge	
Anzahl Ausgänge	2
Eigenstrombedarf der Ausgänge	ca. 2 mA
nominaler Ausgangs-/Messbereichsstrom	4…20 mA
Auflösung	12 Bit
Verpolungsschutz, Überspannungsschutz und Schutz vor elektrostatischen Entladungen	Verpolgeschützt, Schutz vor dauerhafter Überspannung bis 36V und vor elektrostatischen Entladungen
max. zulässige Spannung an den Stromausgängen (an den Klemmen der hipecs-CIO58 anliegend über die externe Versorgungsquelle)	32V DC
max. zulässige Verlustleistung modulseitig an den Stromausgängen des hipecs-CIO58-Moduls	500 mW Grobe Berechnung: (USupply – ULoadResist) * ILoad USupply: Spannung der externen Versorgungsquelle ULoadResist: Spannungsabfall an der externen Last ILoad: eingestellter Ausgangsstrom (4…20 mA) Zur genaueren Ermittlung der Verlustleistung am hipecs-CIO58-Modul sollte auch der Innenwiderstand der externen Versorgungsquelle mit berücksichtigt werden. Sämtliche Verlust-leistung außerhalb des hipecs-CIO58-Moduls reduziert die modulseitige Verlustleistung.
Abschaltung bei thermischer Überlastung	Bei thermischer Überlastung der Stromausgänge erfolgt eine automatische Abschaltung. Die Zeit bis zur Abschaltung hängt von der Höhe der Überlastung ab.
Wiederanlauf nach thermischer Überlastung	typ. 60 s
Verzögerungszeit (CAN reaction time)	2 ms (typisch < 1 ms)
Isolation zum Bus	60V

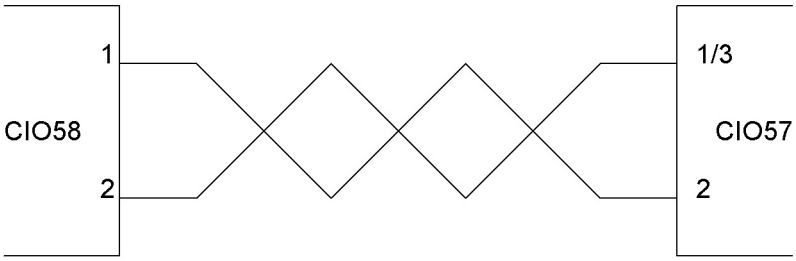
Stecker und Abmessungen	
Stecker	Schraubklemmen
Leitungsquerschnitt [mm²]	0,08 bis 1,5 mm²
Leitungsquerschnitt [AWG]	14 bis 28 AWG
Leiterlänge	7 mm
Abmessung CIO58 Gehäuse	17,8 x 90 x 62 mm (siehe Abschnitt Abm. Kunststoffgehäuse)
Betriebstemperatur	0…+55 °C / -40…+70 °C

Prinzipschaltbild der Stromausgänge 4…20mA

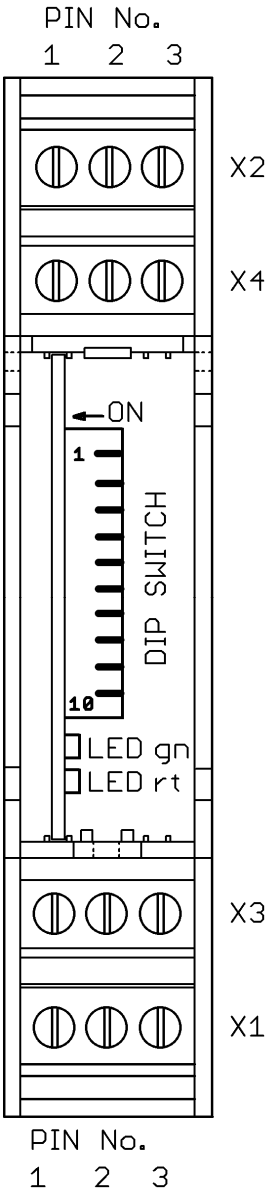
standard connection diagramm



connection diagramm CIO58 with CIO57



Anschlussklemmen



Klemmenbelegung X1 (Versorgung)

Pin Nr.	Name	Funktion
1	U1	Versorgungsspannung DC +24V für System
2	GND	Masse für System
3	U1	Versorgungsspannung DC +24V für System

Klemmenbelegung X2 (CAN)

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

Klemmenbelegung X3 (Ausgang 1)

Pin Nr.	Name	Funktion
1	O1	Stromausgang 1 + , pos. Anschl. (technischer Stromrichtungs-eingang in die hipecs-CIO58)
2	O2	Stromausgang 1 - , neg. Anschl. (technischer Stromrichtungs-ausgang zurück zur externen Versorgungsquelle)
3		nicht angeschlossen

Klemmenbelegung X4 (Ausgang 2)

Pin Nr.	Name	Funktion
1	O3	Stromausgang 2 + , pos. Anschl. (technischer Stromrichtungs-eingang in die hipecs-CIO58)
2	O4	Stromausgang 2 - , neg. Anschl. (technischer Stromrichtungs-ausgang zurück zur externen Versorgungsquelle)
3		nicht angeschlossen

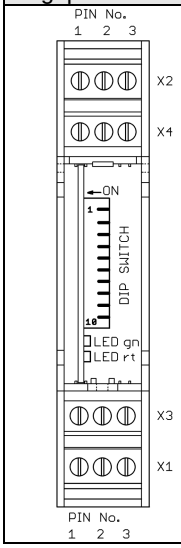
Konfiguration Dip-Schalter

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

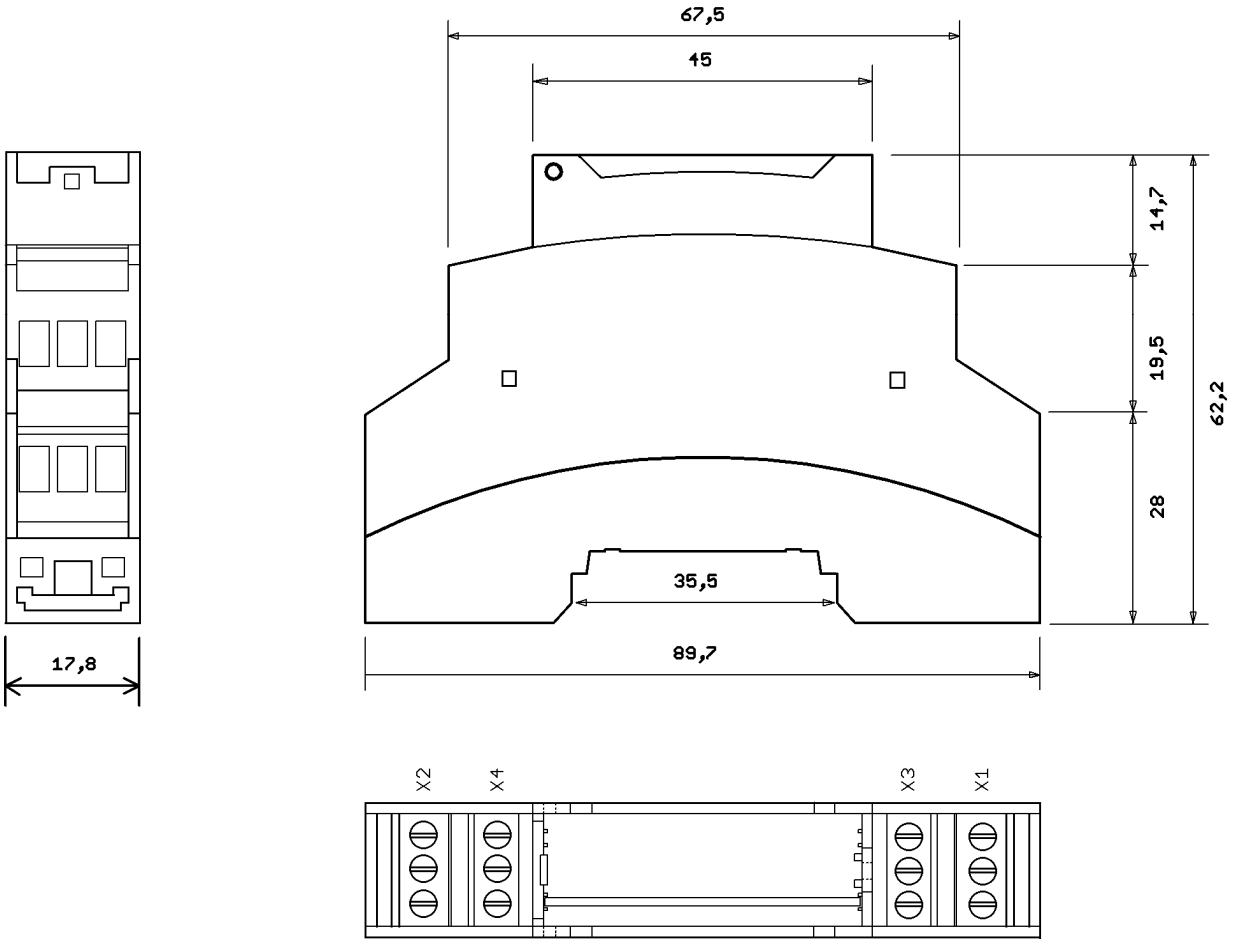
Switch Nummer										Funktion
1	2	3	4	5	6	7	8	9	10	
RT										RT Abschluss-Widerstand CAN-Bus
	BD2	BD1	BD0							BDx Baudrate CAN-Bus
				ID5	ID4	ID3	ID2	ID1	ID0	IDx Einstellung Node-ID
ON										CAN-Terminierung ein (120 Ohm)
OFF										CAN-Terminierung aus
	OFF	OFF	OFF							1 MBit/s
	OFF	OFF	ON							800 kBit/s
	OFF	ON	OFF							500 kBit/s
	OFF	ON	ON							250 kBit/s
	ON	OFF	OFF							125 kBit/s
	ON	OFF	ON							50 kBit/s
	ON	ON	OFF							20 kBit/s
	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 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



Alle Maße in mm

CANopen Objektverzeichnis

Im hipecs-CIO58 Controller ist das komplexe Objektverzeichnis für CANopen E/A-Geräte implementiert.

hipecs-CIO58 Objekte

Alle Werte dieser Tabelle sind in hexadezimaler Schreibweise notiert.
Als Zugriffsberechtigungen sind folgende Typen definiert:
ro read only / nur lesen
wo write only / nur schreiben
rw read and write access enabled / lesen 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	0004 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	"hipecs-CIO58"	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	-	no	-	Global
	0	Nr of Subobjects	Unsigned 8	ro	no	4 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	4 h	Global
	1	Vendor ID	Unsigned 32	ro	no	0000 0058 h	Global
	2	Product Code	Unsigned 32	ro	no	0300 5800 h	Global
	3	Revision Number	Unsigned 32	ro	no	active 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 PDO0 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	PDO
	1	COB-ID	Unsigned 32	rw	no	0x80000200 + 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
1401		Receive PDO1 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	PDO
	1	COB-ID	Unsigned 32	rw	no	300h + Node-ID	PDO
	2	Transmission Type	Unsigned 8	rw	no	FF h	PDO
1402		Receive PDO2 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	PDO
	1	COB-ID	Unsigned 32	rw	no	8000 0400h + Node-ID	PDO
	2	Transmission Type	Unsigned 8	rw	no	FF h	PDO
1403		Receive PDO3 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	PDO
	1	COB-ID	Unsigned 32	rw	no	8000 0500 h + Node-ID	PDO
	2	Transmission Type	Unsigned 8	rw	no	FF h	PDO
1600		Receive PDO0 - Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	0 h	PDO
1601		Receive PDO1 - 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 AOUT0	PDO
	2	Mapped object	Unsigned 32	rw	no	6411 0210 h AOUT1	PDO
1602		Receive PDO2 – Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	0 h	PDO
1603		Receive PDO3 - Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	0 h	PDO
1800		Transmit PDO0 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	5 h	PDO
	1	COB-ID	Unsigned 32	rw	no	8000 0180 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 PDO1 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	5 h	PDO
	1	COB-ID	Unsigned 32	rw	no	8000 0280 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 PDO2 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	5 h	PDO
	1	COB-ID	Unsigned 32	rw	no	8000 0380 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
1803		Transmit PDO2 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	5 h	PDO
	1	COB-ID	Unsigned 32	rw	no	80000480 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
1A00		Transmit PDO0 – Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	0 h	PDO
1A01		Transmit PDO1 – Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	0 h	PDO
1A02		Transmit PDO2 – Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	0 h	PDO
1A03		Transmit PDO3 – 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	2 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
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
2FFF	-	Factory Test Object	Unsigned 32	rw	no	0	Test
5400	-	Analog Output Reset on Error	Unsigned 8	rw	no	1	Global
5410	-	Analog Output Scaling Mode	Unsigned 16	rw	no	0	Global
6411		Analog Output 16Bit	Array				
	0	Nr of Subobjects	Unsigned 8	ro	no	2	
	1	Analog Output 0 16Bit	Integer 16	rww	yes		Global
	2	Analog Output 1 16Bit	Integer 16	rww	yes		Global

Index	Sub-Index	Name	Data type	Acc.	Map-pable	Default Value / Note	Object Category
6443		Analog Output Error Mode					
	0	Nr of Subobjects	Unsigned 8	ro	no	2	
	1	Analog Output Error Mode 1	Integer 16	rw	no	1	Global
	2	Analog Output Error Mode 2	Integer 16	rw	no	1	Global
6444		Analog Output Error Value					
	0	Nr of Subobjects	Unsigned 8	ro	no	2	
	1	Analog Output Error Value 1	Integer 32	rw	no	0	Global
	2	Analog Output Error Value 2	Integer 32	rw	no	0	Global

Bemerkung: DS301 PDO Parameter Objekte

Beschreibung der PDO-Parameter-Objekte
Diese Objekte ermöglichen ein dynamisches PDO-Mapping, variable PDO-Identifier Einstellungen, das Einstellen der Übertragungsmodi, sowie inhibit und event time Konfiguration.
Die Einstellungen für diese CIO58 Parameter können alle im CANopen-Zustand „operational“, als auch im Zustand „pre-operational“ erfolgen.

Description of Object Dictionary

DS301: Global Objects

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

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	0004 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-CIO58”

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 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

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	Revision of the device

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.
See additional brochure for further information about heartbeat protocol.

Index 1018: Identity Object

The object at index 1018h keeps general information about the device and the manufacturer frenzel + berg elektronik. 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 hipecs CIO at frenzel + berg electronic
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	0300 5700 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 + 80000200h
	1401.01	Node-Id + 80000300h
	1402.01	Node-Id + 80000400h
	1403.01	Node-Id + 80000500h
	1800.01	Node-Id + 80000180h
	1801.01	Node-Id + 280h
	1802.01	Node-Id + 80000380h
	1803.01	Node-Id + 80000480h

An identifier of 80000X00h 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

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

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-CIO58** CANopen IO uses the following default mapping entries for receive PDO mapping:

Index	Entry	Explanation
Receive-PDO1		
1600.00	0	RPDO1: no mapped objects
Receive-PDO2		
1601.00	2	RPDO2: 2 mapped objects
1601.01	64110110h	Analog Output 0
1601.02	64110210	Analog Output 1
Receive-PDO3		
1602.00	0	RPDO3: no mapped objects
Receive-PDO4		
1603.00	0	RPDO4: no mapped objects

Transmit PDOs
The **hipecs-CIO58** CANopen IO uses the following default mapping entries for receive PDO mapping:

Index	Entry	Explanation
Transmit - PDO1		
1A00.00	0	TPDO1: no mapped objects
Transmit – PDO2		
1A01.00	0	TPDO2: no mapped objects
Transmit – PDO3		
1A02.00	0	TPDO3: no mapped objects
Transmit – PDO4		
1A03.00	0	TPDO4: no 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 divided 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 CIO.

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	Test Object 01
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 2FFF: Factory Test Object

This Object is used for factory test purposes. Do not access.

Index	2FFFh
Name	Factory Test Object
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	
Default Value	0

DS401: Analog Input Objects

The following objects are describing the functionality of the analog input lines of the hipecs-CIO58.
Please note:
If the hipecs-CIO58 detects an overload condition at an input pin, the associated output value in Object 6401.x is set to –1.

Index 5400: Analog Output Reset on Error

This object is used to control the behavior of the outputs in case of an error (shutdown).

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

Index 5410: Analog Output Scaling Mode

This object is used to choose between a display of the output values in integer format or in microampere.

Index	5410h
Name	Analog Output Scaling Mode
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	0: output value in microampere range: 0…20.000 1: output value in hex for 0…20 mA range: 0x0000…0x7FFF 2: output value in hex for 4…20 mA range: 0x0000…0x7FFF
Default Value	0

Note:
The module has a power consumption of its own of approx. 2 mA, hence the lowest possible current value in mode 0 and 1 is approx. 2 mA.
In mode 2 the lowest possible value is 4 mA.

Index 6411: Analog Output 16 Bit

Object 6411, represents the value of the analog channels. The 16 bit conversion result of the analog input current is a signed value.

The mapping of the I/O lines to object 6411 is explained in chapter "Mapping I/O to Object Dictionary"

Index	6411h
Name	Analog Output 16 Bit
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	2

Index	Subindex 1 to Nr of output lines
Name	Write Analog Output
Description	
Data Type	Integer 16
Access modes	RWW
PDO Mapping	YES
Value Range	0…20.000/0x000…0x7FFF (depending on object 5410)
Default Value	-

Index 6443: Analog Output Error Mode

This object determines whether an output line enters a special error mode in case of emergency or not.

Index	6443h
Name	Analog Output Error Mode
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	2

Index	Subindex 1 to Nr of output lines
Name	Analog Output Error Mode
Description	
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	NO
Value Range	0: don't enter error mode 1: enter error mode
Default Value	1

Index 6444: Analog Output Error Value

This object holds the values, which have to be selected and displayed in case of an error.

Index	6444h
Name	Analog Output Error Value
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	2

Index	Subindex 1 to Nr of output lines
Name	Analog Output Error Value
Description	
Data Type	Integer 32
Access modes	RW
PDO Mapping	NO
Value Range	0…20.000/0x000…0x7FFF (depending on object 5410)
Default Value	0

Emergency Messages

Das hipecs-CIO58 Modul unterstützt diverse Emergency Messages. Für alle Emergencys wird die selbe Struktur angewendet.

Byte							
0	1	2	3	4	5	6	7
EMY-Code		1001	OVL	CIO58-Code			

EMY-Code: Emergency-Error-Code nach DS301
1001: Inhalt von Object 1001
OVL: Overload Indication
CIO58-Code: Emergency-Error-Code CIO58 als unsigned 32 Wert

CIO-XXX-Code (hex)	ändert:		Beschreibung
	NMT	I/O	
8000 0000	X	X	CAN bus ist bus off
4000 0000			CAN bus in error warning state
2000 0000			Node guarding Warnung
3000 0000	X	X	Life guarding error
1000 0000			Heartbeat error
0000 0100			Wake up vom Power down Modus

Die Emergency 2000 0000 (Node guarding Warnung) muss über das Objekt 2103 freigeschalten werden.
Wenn mehr als eine Fehlermeldung zur selben Zeit aktiv sind, wird das CIO58-Code Bitmuster durch eine logische ODER-Verknüpfung der einzelnen Codes gebildet.
Manche der Emergencys können einen NMT-State-Wechsel bewirken oder die Ausgänge in den Fehlerzustand setzten. Das jeweiligen Verhalten hängt von den Einstellungen im Objekt 1029 ab.
Der Identifier für die Emergency-Nachrichten ist festgelegt auf: **0x80 + Knotennummer**

Liste der Emergency-Nachrichten:

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

Diese Nachricht wird vom Knoten gesendet, wenn der Master nicht innerhalb der spezifizierten „guard time“ (Objekt 100C) einen “guarding remote frame” sendet. Diese Funktion wird im Objekt 2103 eingestellt.

Life-Guarding Fehler							
30	81	11	00	00	00	00	30

Dieser Fehler tritt auf, wenn der Master nicht innerhalb der eingestellten “Life Time” einen “guarding remote frame” sendet. (Guard Time im Objekt 100C multipliziert mit dem Lifetime-Faktor Objekt 100D)

CAN Bus im Error Warning state							
00	81	01	00	00	00	00	40

Fehlermeldung wenn sich das chipinterne CAN-Modul im „error warning state“ befindet.

Heartbeat Fehler							
30	81	11	00	00	00	00	10

Fehlermeldung, wenn ein Heartbeat Fehler vorliegt.

Bus-Off Fehler							
40	81	11	00	00	00	00	80

Fehlermeldung, wenn sich das CAN-Modul im Zustand „Bus-Off“ befindet.

Daten-Mapping im Objektverzeichnis

operating mode 0 2 analog current outputs (4…20 mA) EDS-file: hipecs_CIO-058.EDS								
mapping in object dictionary								
Index.SubIndex	mapped I/O signal bit/value							
	7	6	5	4	3	2	1	0
6411.01	AOUT0							
6411.02	AOUT1							
default PDO mapping								
PDO	mapped data							
RPDO1	no mapped data							
RPDO2	6411.01 analog output AOUT0 6411.02 analog output AOUT1							
RPDO3	no mapped data							
RPDO4	no mapped data							
TPDOx	no mapped data							

Version History

Version	Datum	Änderung
1.540-R-00	31.07.2014	Erste Version
1.550-R-02	09.09.2014	Aktualisierung
1.601-R-00	01.10.2014	Aktualisierung Fehlermeldungen
1.650-R-00	05.03.2015	Release Version
1.650-R-01	28.07.2015	Aktualisierung technische Daten

Inhaltsverzeichnis