

Allgemein

Das Modul hipecs-CIO57 ist ein sehr kompaktes CANopen I/O-System mit 4 analogen Eingängen für Ströme von 0...20 bzw. 4...20 mA. Es kann zur dezentralen Erweiterung von Steuerungssystemen eingesetzt werden.

Die Stromeingänge sind galvanisch vom Bussystem getrennt. Die Auflösung des Messwandlers beträgt 16 Bit. Alle Eingänge sind mit einer Schutzschaltung versehen, die die Eingänge bei Kurzschluss gegen 24V oder sonstigen Überströmen schützt.

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 DS401 Version 3.0
- Spannungsversorgung für System/Bus (DC24V)
- 4 Stromeingänge 0...20 mA / 4...20 mA galvanisch gegenüber dem CAN- Bus isoliert
- Interne Schutzschaltung gegen Überstrom und Kurzschluss an den Eingängen
- Auflösung A/D-Wandler: 16 Bit
- Speisung für externe Sensoren mit Stromausgang: DC24V
- CAN-Baudraten bis 1Mbit
- CAN-Bus nach 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
- Betriebstemperatur 0...55 °C optional -40...+70 °C

Bestellinformation

| Bauteil | Best.-Nr. |
|---|------------------|
| hipecs-CIO57-i | EZ.00000.2157.00 |
| CANopen I/O mit 4 analogen Stromeingängen galvanisch entkoppelte CAN-Schnittstelle Betriebs-Temperaturbereich 0...55 °C | |
| hipecs-CIO57-ie | EZ.00000.3057.00 |
| CANopen I/O mit 4 analogen Stromeingängen galvanisch entkoppelte CAN-Schnittstelle Betriebs-Temperaturbereich -40...70 °C | |

Technische Daten

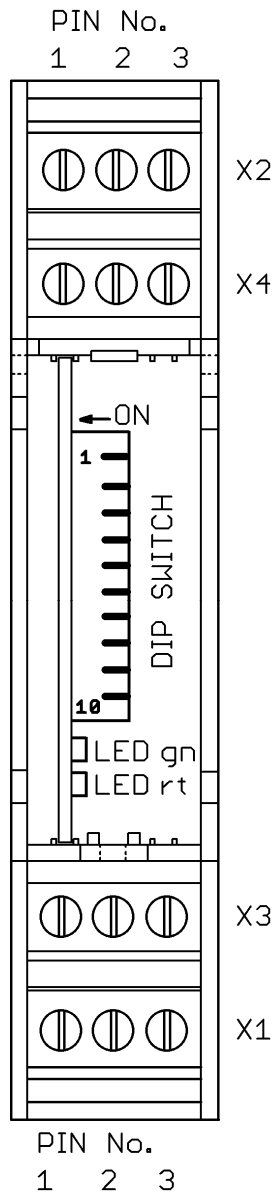
| Spannungsversorgung System | Min. | Norm. | Max. |
|--|---|-------|------|
| Nominale System/Bus Versorgungsspannung | 16 V | 24 V | 32 V |
| CAN bus Norm | ISO11898 | | |
| CiA Draft Standards | DS301 Version 4.2 und DS401 Version 3.0 | | |
| Isolation zwischen Bus und Stromeingängen | 60 V | | |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

| | |
|---|---|
| Stromeingänge | |
| Anzahl Eingänge | 4 |
| nominaler Eingangs-/ Messbereichsstrom | 0...20 mA oder 4...20 mA wählbar |
| Auflösung A/D-Wandler | 16 Bit |
| Messfrequenz der analogen Eingänge | 1 kHz |
| Eingangsimpedanz | ca. 200 Ohm |
| Kabelbrucherkennung | ja, bei Eingangsstrom < 4mA |
| Überlastungsschutz | kurzschlussfest, automatische Abschaltung bei Eingangsstrom > 28 mA nach ca. 0.2 Sekunden |
| max. zulässige Spannung an den Stromeingängen | +/- 32 Volt |
| max. Eingangsstrom | 30 mA mit interner Begrenzung (automatische Abschaltung nach ca. 0.2 Sekunden) |
| Wiederanlauf nach Eingangskurzschluss | typ. 3 sec |
| Verzögerungszeit (CAN reaction time) | 2 ms (typisch < 1ms) |
| Isolation zum Bus | 60 V |

| Speisung für externe Sensoren (gemeinsamer Anschluss für je zwei Sensoren pro Klemme) | |
|---|---|
| Speisesspannung | Spannungsversorgung System – 0.5 Volt (z.B. 23,5 V bei Spannungsversorgung System 24 V) |
| nominaler Speisestrom je Sensor | 20 mA |
| max. Speisestrom je Speiseklemme (X3 Pin2 und X4 Pin2) | 60 mA (gemeinsamer Anschluss für je zwei Sensoren pro Klemme) |
| kurzschlussfest gegenüber den Stromeingängen | ja, automatische Abschaltung nach ca. 0.2 Sekunden |
| kurzschlussfest gegenüber System Ground/Masse | Nein |

| | |
|---------------------------|--|
| Stecker und Abmessungen | |
| Stecker | Schraubklemmen |
| Leitungsquerschnitt [mm²] | 0,08 bis 1,5 mm² |
| Leitungsquerschnitt [AWG] | 14 bis 28 AWG |
| Leiterlänge | 7 mm |
| Abmessung CIO57 Gehäuse | 17,8 x 90 x 62 mm (siehe Abschnitt Abm. Kunststoffgehäuse) |
| Betriebstemperatur | 0...55°C / -40...70°C |

Anschlussklemmen



Klemmenbelegung X1 (Versorgung)

| Pin Nr. | Name | Funktion |
|---------|------|---|
| 1 | U | Versorgungsspannung DC +24V für System |
| 2 | GND | Masse für System |
| 3 | - | nicht angeschlossen |

Klemmenbelegung X2 (CAN)

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

Klemmenbelegung X3 (Eingang 1 & 2)

| Pin Nr. | Name | Funktion |
|---------|------|--|
| 1 | I1 | Stromeingang 1 , für externen Sensor |
| 2 | S+ | Versorgungsanschluss für 2 externe Sensoren, positive Anschlüsse |
| 3 | I2 | Stromeingang 2 , für externen Sensor |

Klemmenbelegung X4 (Eingang 3 & 4)

| Pin Nr. | Name | Funktion |
|---------|------|--|
| 1 | I3 | Stromeingang 3, für externen Sensor |
| 2 | S+ | Versorgungsanschluss für 2 externe Sensoren, positive Anschlüsse |
| 3 | I4 | Stromeingang 4 , für externen Sensor |

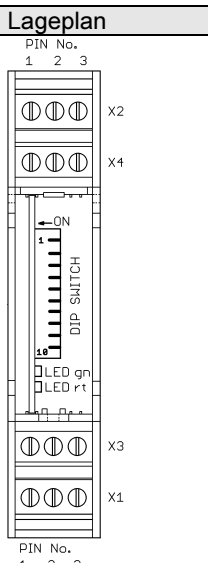
Konfiguration Dip-Schalter

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

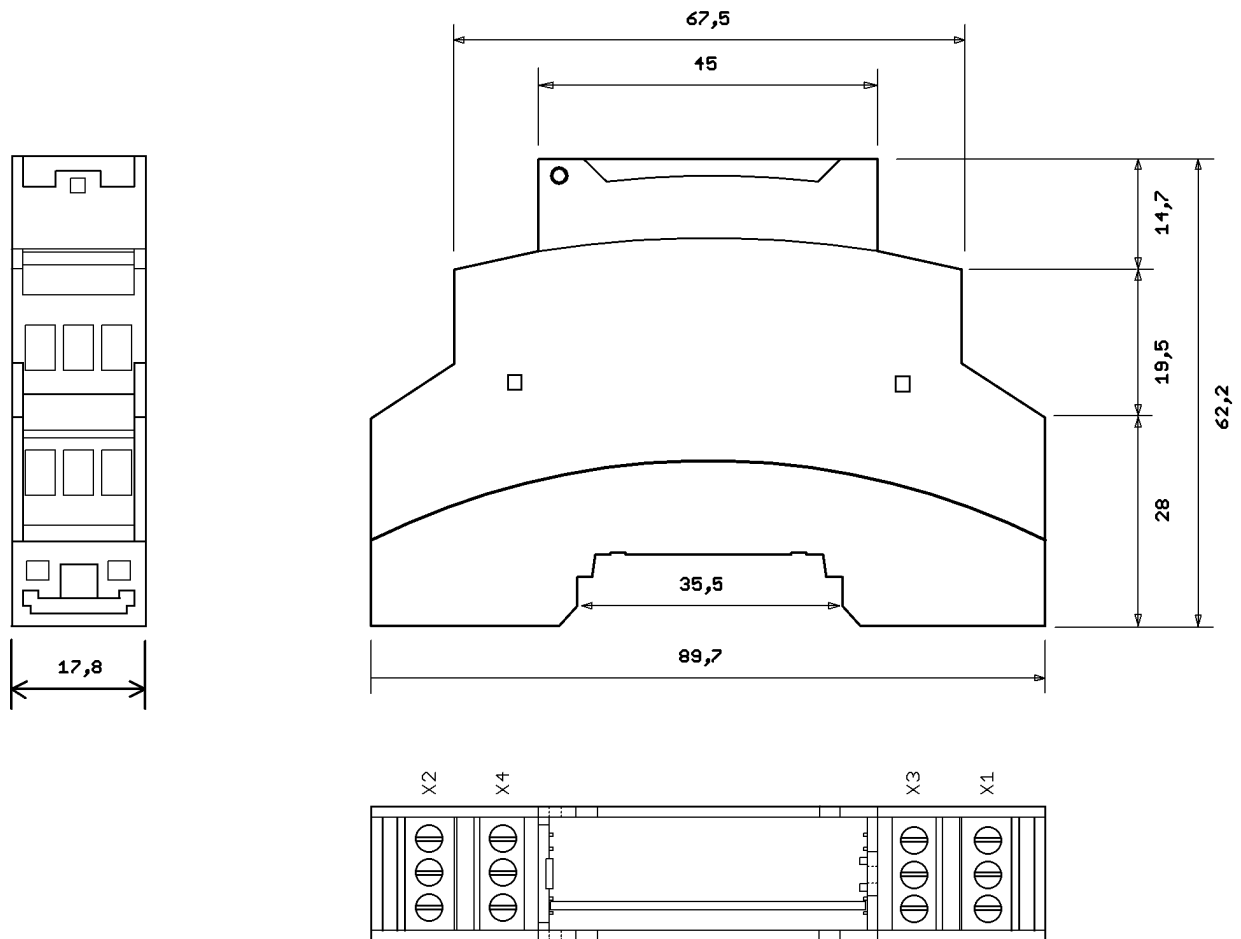
| Switch Nummer | | | | | | | | | | Funktion |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| RT | | | | | | | | | | RT Abschluss-Widerstand CAN-Bus |
| | | | | | | | | | | Baudrate CAN-Bus |
| | | | | 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 Flackern 1 x Flashen (kurzes Aufblitzen) Blinken Ein Betriebsspannung fehlt oder Defekt CAN nicht gestartet Stopped Preoperational Operational |
| | ERR-LED | rot | Die Error-LED zeigt den Fehlerzustand entsprechend DRP303-3 an Aus 1 x Flashen 2 x Flashen Ein Kein Fehler CAN-Modul ist im Error-Warning-Zustand Node-Guarding-Fehler Bus-Off-Zustand des Knoten |

Abmessungen Kunststoffgehäuse



Alle Maße in mm

CANopen Objektverzeichnis

Im hipecs CIO57 Controller ist das komplexe Objektverzeichnis für CANopen E/A-Geräte implementiert.

hipecs CIO57 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-CIO57" | 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 | 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 5700 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 | 8000 0300h + 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 | 0 h | 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 |
| 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 | 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 |
| 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 |

| Index | Sub-Index | Name | Data type | Acc. | Map- pable | Default Value / Note | Object Category |
|-------|-----------|---|----------------|------|---------------|--|--------------------|
| 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 | 4 h | PDO |
| | 1 | Mapped Object | Unsigned 32 | rw | no | 6401 01 10 h analog AIN0 | PDO |
| | 2 | Mapped Object | Unsigned 32 | rw | no | 6401 02 10 h analog AIN1 | PDO |
| | 3 | Mapped Object | Unsigned 32 | rw | no | 6401 03 10 h analog AIN2 | PDO |
| | 4 | Mapped Object | Unsigned 32 | rw | no | 6401 04 10 h analog AIN3 | 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 |
| 5300 | | Analog Input Mode | Unsigned 16 | rw | no | 3 | Global |
| 5301 | | Analog Input Filter Level | Unsigned 16 | rw | no | 10 | Global |
| 5310 | | Input Calibration | Record | - | - | - | Global |
| | 0 | Nr of Subobjects | Unsigned 8 | ro | no | 4 h | Global |
| | 1 | Input Calibration Key | Unsigned 32 | rw | no | 0 h | Global |
| | 2 | Input Calibration Command | Unsigned 32 | wo | no | 0 h | Global |
| | 3 | Input Calibration Result | Unsigned 16 | ro | no | - | Global |
| | 4 | Input Calibration Step | Unsigned 16 | ro | no | - | Global |

| Index | Sub-Index | Name | Data type | Acc. | Map- pable | Default Value / Note | Object Category |
|-------|-----------|--------------------------------|------------|------|---------------|-------------------------|--------------------|
| 6401 | - | Analog Input 16bit | Array | - | - | | Global |
| | 0 | Nr of Subobjects | Unsigned 8 | ro | no | 4 h | Global |
| | 1 | Analog Input 16bit1 | Integer 16 | ro | yes | | Global |
| | 2 | Analog Input 16bit2 | Integer 16 | ro | yes | | Global |
| | 3 | Analog Input 16bit3 | Integer 16 | ro | yes | | Global |
| 6421 | 4 | Analog Input 16bit4 | Integer 16 | ro | yes | | Global |
| | - | Ana. Input Trigger Selection | Array | - | - | | Global |
| | 0 | Nr of Subobjects | Unsigned 8 | ro | no | 4 h | Global |
| | 1 | Ana. Input Trigger Selection1 | Unsigned 8 | rw | no | 7 h | Global |
| | 2 | Ana. Input Trigger Selection2 | Unsigned 8 | rw | no | 7 h | Global |
| 6423 | 3 | Ana. Input Trigger Selection3 | Unsigned 8 | rw | no | 7 h | Global |
| | 4 | Ana. Input Trigger Selection4 | Unsigned 8 | rw | no | 7 h | Global |
| | - | Analog Input Interrupt Enable | Unsigned 8 | rw | no | | Global |
| 6424 | - | Ana Input Interrupt Upper L. | Array | - | - | | Global |
| | 0 | Nr of Subobjects | Unsigned 8 | ro | no | 4 h | Global |
| | 1 | Ana. Input Irq Upper Limit1 | Integer 32 | rw | no | 0 h | Global |
| | 2 | Ana. Input Irq Upper Limit2 | Integer 32 | rw | no | 0 h | Global |
| | 3 | Ana. Input Irq Upper Limit3 | Integer 32 | rw | no | 0 h | Global |
| 6425 | 4 | Ana. Input Irq Upper Limit4 | Integer 32 | rw | no | 0 h | Global |
| | - | Ana Input interrupt Lower L. | Array | - | - | | Global |
| | 0 | Nr of Subobjects | Unsigned 8 | ro | no | 4 h | Global |
| | 1 | Ana. Input Irq Lower Limit1 | Integer 32 | rw | no | 0 h | Global |
| | 2 | Ana. Input Irq Lower Limit2 | Integer 32 | rw | no | 0 h | Global |
| 6426 | 3 | Ana. Input Irq Lower Limit3 | Integer 32 | rw | no | 0 h | Global |
| | 4 | Ana. Input Irq Lower Limit4 | Integer 32 | rw | no | 0 h | Global |
| | - | Ana Input interrupt Delta | Array | - | - | | Global |
| | 0 | Nr of Subobjects | Unsigned 8 | ro | no | 4 h | Global |
| | 1 | Ana. Input Interrupt Delta 1 | Integer 32 | rw | no | 0 h | Global |
| 6427 | 2 | Ana. Input Interrupt Delta 2 | Integer 32 | rw | no | 0 h | Global |
| | 3 | Ana. Input Interrupt Delta 3 | Integer 32 | rw | no | 0 h | Global |
| | 4 | Ana. Input Interrupt Delta 4 | Integer 32 | rw | no | 0 h | Global |
| | - | Ana Input interrupt Neg. Delta | Array | - | - | | Global |
| | 0 | Nr of Subobjects | Unsigned 8 | ro | no | 4 h | Global |
| 6428 | 1 | Ana. Input Irq Neg. Delta 1 | Integer 32 | rw | no | 0 h | Global |
| | 2 | Ana. Input Irq Neg. Delta 2 | Integer 32 | rw | no | 0 h | Global |
| | 3 | Ana. Input Irq Neg. Delta 3 | Integer 32 | rw | no | 0 h | Global |
| | 4 | Ana. Input Irq Neg. Delta 4 | Integer 32 | rw | no | 0 h | Global |
| | - | Ana Input interrupt Pos. Delta | Array | - | - | | Global |
| 6428 | 0 | Nr of Subobjects | Unsigned 8 | ro | no | 4 h | Global |
| | 1 | Ana. Input Irq Pos. Delta 1 | Integer 32 | rw | no | 0 h | Global |
| | 2 | Ana. Input Irq Pos. Delta 2 | Integer 32 | rw | no | 0 h | Global |
| | 3 | Ana. Input Irq Pos. Delta 3 | Integer 32 | rw | no | 0 h | Global |
| | 4 | Ana. Input Irq Pos. Delta 4 | Integer 32 | rw | no | 0 h | 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 CIO57 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-CIO57" |

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 milliseconds) 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 milliseconds) 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 |

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 | <table border="1"> <tbody> <tr> <td>1400.01</td> <td>Node-Id + 80000200h</td> </tr> <tr> <td>1401.01</td> <td>Node-Id + 80000300h</td> </tr> <tr> <td>1402.01</td> <td>Node-Id + 80000400h</td> </tr> <tr> <td>1403.01</td> <td>Node-Id + 80000500h</td> </tr> <tr> <td>1800.01</td> <td>Node-Id + 80000180h</td> </tr> <tr> <td>1801.01</td> <td>Node-Id + 280h</td> </tr> <tr> <td>1802.01</td> <td>Node-Id + 80000380h</td> </tr> <tr> <td>1803.01</td> <td>Node-Id + 80000480h</td> </tr> </tbody> </table> | 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 |
| 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-CIO57 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 | 0 | RPDO2: no mapped objects |
| Receive-PDO3 | | |
| 1602.00 | 0 | RPDO3: no mapped objects |
| Receive-PDO4 | | |
| 1603.00 | 0 | RPDO4: no mapped objects |

Transmit PDOs

The hipecs-CIO57 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 | 4 | TPDO2: 4 mapped objects |
| 1A01.01 | 64010110h | Analog Input Integer 0 |
| 1A01.02 | 64010210h | Analog Input Integer 1 |
| 1A01.03 | 64010310h | Analog Input Integer 2 |
| 1A01.04 | 64010410h | Analog Input Integer 3 |
| 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 disabled, 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-CIO57.

Please note:

If the hipecs-CIO57 detects an overload condition at an input pin, the associated output value in Object 6401.x is set to -1.

Index 5300 : Analog Input Mode

This object is used to set the operation mode for the analog input channels

| | |
|---------------|--|
| Index | 5300h |
| Name | Analog Input Mode |
| Description | - |
| Data Type | Unsigned 16 |
| Access modes | RW |
| PDO Mapping | No |
| Value Range | Bit0 Input range 0 : 0 .. 20mA 1 : 4 .. 20mA Bit 0 is only relevant for full hex range (Bit1 = 0) Bit 1 Scaling of analog input data for object 6401 0 : full hex range 0 .. 0x7FFF for 0 .. 20mA or 4 .. 20mA 1 : current in uA 0 .. 28000 |
| Default Value | 3 |

Index 5301 : Analog Input Filter Level

This object sets the size of the internal filter for the analog input channels

| | |
|---------------|---------------------------|
| Index | 5301h |
| Name | Analog Input Filter Level |
| Description | - |
| Data Type | Unsigned 16 |
| Access modes | RW |
| PDO Mapping | No |
| Value Range | 0 .. 20 |
| Default Value | 10 |

Index 5310 : Input Calibration

This object is used for factory purposes and must not be used.

Index 6401 : Read Analog Input 16 Bit

Object 6401, 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 6401 is explained in chapter "Mapping I/O to Object Dictionary"

| | |
|-------------|-------------------|
| Index | 6401h |
| Name | Read Analog Input |
| 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 channels |

| | |
|---------------|---------------------------------|
| Index | Subindex 1 to Nr of input lines |
| Name | Read Analog Input |
| Description | |
| Data Type | Signed 16 |
| Access modes | RO |
| PDO Mapping | YES |
| Value Range | - |
| Default Value | - |

Please note:

If the hipecs-CIO57 detects an overload condition at an input pin, the associated output value in Object 6401.x is set to -1.

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 current greater than Upper Limit |
| 1 | Input current 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 current is greater than or equal to Upper Limit (6424) |
| 6425 | Analog Input Lower Limit Generate interrupt if input current is less than Lower Limit (6425) |
| 6426 | Analog Input Interrupt Delta Generate interrupt if input current changed by more than Interrupt Delta |
| 6427 | Analog Input Negative Delta Generate interrupt if input current reduced by more than Negative Delta |
| 6428 | Analog Input Positive Delta Generate interrupt if input current increased 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 (4) |
| Name | See table above |
| Description | |
| Data Type | Integer 32 |
| Access modes | RW |
| PDO Mapping | No |
| Value Range | - |
| Default Value | 0 |

Emergency Messages

Das hipecs-CIO57 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 | CIO57-Code | | | | | |

EMY-Code: Emergency-Error-Code nach DS301
 1001: Inhalt von Object 1001
 OVL: Overload Indication
 CIO57-Code: Emergency-Error-Code CIO57 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 0010 | | | Überlast am Eingang |
| 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 CIO57-Code Bitmuster durch eine logische Verknüpfung der einzelnen Codes gebildet.

Manche der Emergencys können einen NMT-State-Wechsel bewirken oder die Ausgänge in den Fehlerzustand setzen. 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.

| Überlast an einem Stromeingang | | | | | | | |
|--------------------------------|----|----|-----|----|----|----|----|
| 00 | 10 | 01 | OVL | 10 | 00 | 00 | 00 |

An mindestens einem Eingang wurde eine Überlastsituation oder ein Kurzschluss des Eingangs festgestellt. Im Byte OVL werden die Kanäle, an denen die Überlastsituation besteht, bitweise markiert.

- OVL Bit 0 = 1 : Überlast am Stromeingang 1
- OVL Bit 1 = 1 : Überlast am Stromeingang 2
- OVL Bit 2 = 1 : Überlast am Stromeingang 3
- OVL Bit 3 = 1 : Überlast am Stromeingang 4

Daten-Mapping im Objektverzeichnis

| | | | | | | | | |
|------------------------------|--|---|---|---|---|---|---|---|
| Betriebsmodus 0 | | | | | | | | |
| 4 Strommesseingänge | | | | | | | | |
| EDS-file: hipecs_CIO-057.EDS | | | | | | | | |
| Mapping im Objektverzeichnis | | | | | | | | |
| Index. | gemapptes I/O Signal Bit/Wert | | | | | | | |
| SubIndex | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 6401.01 | AIN0 | | | | | | | |
| 6401.02 | AIN1 | | | | | | | |
| 6401.03 | AIN2 | | | | | | | |
| 6401.04 | AIN3 | | | | | | | |
| Default PDO Mapping | | | | | | | | |
| PDO | gemappte Daten | | | | | | | |
| RPDOx | keine gemappte Daten | | | | | | | |
| TPDO1 | keine gemappte Daten | | | | | | | |
| TPDO2 | 6401.01 analog Eing. AIN0 6401.02 analog Eing. AIN1 6401.03 analog Eing. AIN2 6401.04 analog Eing. AIN3 | | | | | | | |
| TPDO3 | keine gemappte Daten | | | | | | | |
| TPDO4 | keine gemappte Daten | | | | | | | |

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 |
| 1.601-R-01 | 04.11.2015 | CAN Baudrate 10 kBit/s entfernt (nicht unterstützt) |
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