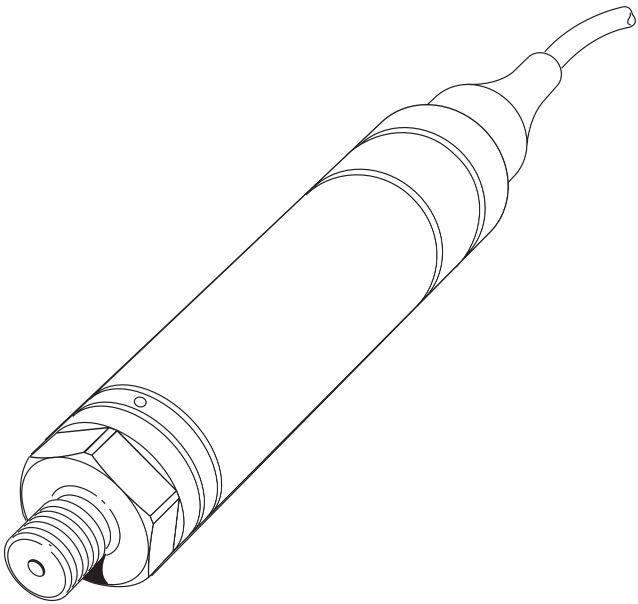
Druck
a Baker Hughes business

DPS8000 Series

CAN bus Pressure Transducer

Instruction Manual



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Safety

WARNING Do not use with media that has an oxygen concentration > 21 % or other strong oxidizing agents.

This product contains materials or fluids that may degrade or combust in the presence of strong oxidizing agents.

Do not apply pressure greater than the maximum safe working pressure to the sensor.

The manufacturer has designed this sensor to be safe when operated using the procedures detailed in this manual. Do not use this sensor for any other purpose than that stated.

This publication contains operating and safety instructions that must be followed for safe operation and to maintain the sensor in a safe condition. The safety instructions are either warnings or cautions issued to protect the user and the equipment from injury or damage.

Use qualified[1] personnel and good engineering practice for all procedures in this publication.

Maintenance

The sensor must be maintained using the manufacturer's procedures and these should be carried out by authorized service agents or the manufacturer's service departments.

https://druck.com/service

Technical Advice

For technical advice contact the manufacturer.

1. A qualified technician must have the necessary technical knowledge, documentation, special test equipment and tools to carry out the required work on this equipment.

Symbols

Symbol	Description
CE	This equipment meets the requirements of all relevant European safety directives. The equipment carries the CE mark.
UK CA	This equipment meets the requirements of all relevant UK Statutory Instruments. The equipment carries the UKCA mark.
	This symbol, on the equipment, indicates a warning and that the user should refer to the user manual.
	Druck is an active participant in the UK and EU Waste Electrical and Electronic Equipment (WEEE) take-back initiative (UK SI 2013/3113, EU directive 2012/19/EU). The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment. In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way. The crossed-out wheeled bin symbol invites you to use those systems. If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration. Please visit the link below for take-back instructions and more information about this initiative. **https://druck.com/weee**

Abbreviations

The following abbreviations are used in this manual.

Note: Abbreviations are the same in the singular and plural.

Abbreviation	Description
a	Absolute (Pressure version)
ASCII	American Standard Code for Information Interchange
°C	Celsius (Degrees)
CAN	Controller Area Network
CANopen	A set of standards that defines the operation of devices across a CAN system.
CiA	CAN in Automation international users and manufacturers group (CiA e.V.)

Abbreviation	Description
COB	Communication Object (CAN Message): Data is sent across a CAN Network inside a COB.
COB-ID	COB-Identifier. Identifies a COB uniquely in a Network and determines the priority of the COB.
dc	Direct Current
DPS	Digital Pressure Sensor
EMC	Electromagnetic Compatibility
EN	European Norm
°F	Fahrenheit (Degrees)
FP	Floating Point
FS	Full-scale. Refers to a full-scale value from a transducer or instrument.
FV	Field Value
g	Acceleration of Gravity
g	Gauge (Pressure version)
g	Gram
Hz	Hertz
ID	Identifier
kbits/s	Kilobits per second
LSS	Layer Setting Services
max	Maximum
mbar	Millibar
min	Minimum
mm	Millimetre
ms	Millisecond
MΩ	Megohm
NMT	Network Management: One of the service elements of the CAN Application Layer
NPT	National Pipe Taper (a thread standard)
PDO	Process Data Object
PIN	Personal Identification Number
psi	Pound-force per square inch
PV	Process Value
SDO	Service Data Object
SDS	Sales Data Sheet

Abbreviation	Description
SI	Système International
S/N	Serial Number
V	Volt

Contents

1. Introduction

This manual is applicable to 8000 family pressure sensors consisting of the following product series:

- [TERPS] 8000, 8100, 8200 and 8300

The original language of this manual is English.

1.1 Manufacturer

The identified manufacturer of this equipment is:

“Druck Limited”

Fir Tree Lane, Groby, Leicester, LE6 0FH, United Kingdom.

Telephone: +44 116 231 7100; Fax: +44 116 231 7103

Internet: **https://druck.com**

2. Description

2.1 Purpose

The DPS8000 family pressure sensors use TERPS (trench etched resonant pressure sensor) technology and are designed for continuous measurement and conversion of pressure into an electronic output.

The DPS8000 measures absolute pressure to produce fast, accurate pressure data through a Controller Area Network (CAN) bus interface. All these transducers include:

- CANopen software standards.
- Digital output.
- CAN bus serial communications interface.

Note: The prerequisites for this instruction manual are prior knowledge of the CANopen protocols and standards. See Appendix C, “Bibliography,” on page 51 for more details.

2.1.1 Applications

The DPS8000 series is for automated systems using a CAN bus network and CANopen software standards. The pressure transducers in the DPS8000 series are ideal for automated systems with:

- A large amount of digital pressure data.
- A high level of accuracy over a wide temperature range.
- A sophisticated level of software control.

2.1.2 Summary of Facilities

Because all the transducers in the DPS8000 series use CANopen software standards, each transducer includes a CANopen Object Dictionary. Use the CANopen Object Dictionary to do these primary tasks:

- Monitor the current pressure and temperature data.
- Tag the type of data. For example: Oil-mbar, H2O-mbar.
- Read the factory defined operating data. For example, the pressure range, and the type of sensor.
- Set the update frequency for the pressure and temperature data.
- Set the pressure units.
- Monitor the current status.

- Read and set the last and next calibration date.
- Set new calibration values.
- Set local pressure and temperature limits for use with the internal out-of-limit counters.
- Monitor the number of times the pressure is not in the specified limits.
- Monitor the number of times the temperature is not in the specified limits.
- Restore all the factory default values for the CANopen Object Dictionary.

Use a standard CANopen software package to access the contents of the CANopen Object Dictionary.

2.1.3 Summary of the CANopen Set of Functions

Table 1: CANopen Functions

Function	Comment
NMT	Slave
Error Control	Node Guarding or Heartbeat.
Node ID	LSS (DSP-305 V1.0)
Number of PDO	1 transmit PDO, no receive PDOs.
PDO Modes	Event triggered or Remotely requested.
PDO Linking	Yes
PDO Mapping	Default
Emergency Message	Yes
CANopen Version	DS-301 V4.01
Framework	No
Certified	No
Device Profile	DSP-404 V1.0
Maximum Baud Rate	1 Mbit/s

2.2 Technical Specifications

The sensor has a model number of the form ‘DPS8##C-T#-A#-C#-##-##’.

Refer to the appropriate 8000, 8100, 8200 or 8300 data sheet for technical specifications and explanation of the sensor's model number.

Model numbers appended with a four or eight-digit alphanumeric string denote the use of a customer-specific specification drawing indicating the use of additions or deviations to the data sheet specification. Refer to the specification drawing if applicable.

2.3 Design and Principle of Operation

The sensor consists of a pressure connector, pressure measuring module, a partially encapsulated electronics module, and electrical connection facilities, structurally combined in a cylindrical metal housing.

The pressure connector allows the sensor to be mounted to a pressurized vessel or pipework.

The pressure measuring module consists of a welded metal construction, featuring a metal diaphragm[1] (providing a flexible barrier to harsh process media), a glass-to-metal seal (for

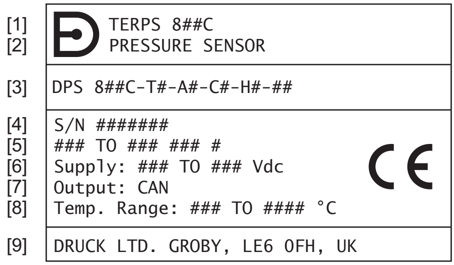
1. 80##, 82## and 83## models only. 81## models provide no harsh process media isolation.

electrical connections) and a fluid filled cavity containing a silicon-based micro-machined resonant structure.

The DPS variants provide a digitally encoded signal derived from the measured frequency of the resonant structure as it responds to applied pressure. A variety of digital encoding and physical interface options are available.

2.4 Markings

The markings applied to the pressure sensors are in English, see Figure 1:



1 Product name: 'TERPS8##C'.
2 Product description: 'PRESSURE SENSOR'.
3 Model number - To identify the meaning, refer to the product data sheet. If the model number is followed by four or eight numbers, '-####' or '-########', refer to the manufacturer's specification drawing E-A3-#### or ########.
4 Serial number.
5 Pressure range limits and unit of measurement.
6 Power supply voltage range.
7 Output: 'CAN'.
8 Ambient temperature range.
9 Manufacturer's name and address.

Figure 1: Identification, Electrical and Pressure Markings

Other data is possible, which the manufacturer can reflect in the marking, if required by technical documentation.

3. Installation & Operation

CAUTION Until installation, keep the unit in the original container with all the covers in position. The container and covers prevent contamination and damage. When not in use, keep the connections clean at all times, and put the covers on the open connections.

3.1 General Requirements

When the sensor is received, check for completeness.

To identify the electrical and pressure connections, refer to the product data sheet or, if applicable, the specification drawing.

Do not use force when installing the sensor. Do not tighten the sensor by rotating the housing. For this purpose, a hexagon socket for the wrench is provided on the housing.

The ambient temperature and the process media to be measured must not exceed the ranges specified in the sensor specification.

In the negative temperature range it is necessary to exclude the accumulation and freezing of condensate in the working chambers and inside the connecting pipelines for gaseous media and freezing, crystallization of the medium or crystallization from it, of the individual components for liquid media.

The materials used for the primary enclosure and pressure bearing surfaces are identified in the product data sheet or, if applicable, the specification drawing. Make sure that the materials are applicable for the installation.

Before using the equipment, remove the plastic/rubber protection cap from the pressure connector.

The 80##, 82## and 83## are harsh media isolated product. Isolation is achieved by hermetically sealing the sensor element, see Figure 2, in an oil filled chamber. The weight of this oil gives a g sensitivity as a pressure offset error.

The 81## is not a harsh media isolated product. The pressure media comes directly into contact with the sensor element. Care must be taken to ensure the pressure media does not damage the sensor element. There is negligible change in offset due to mounting position and vibration.

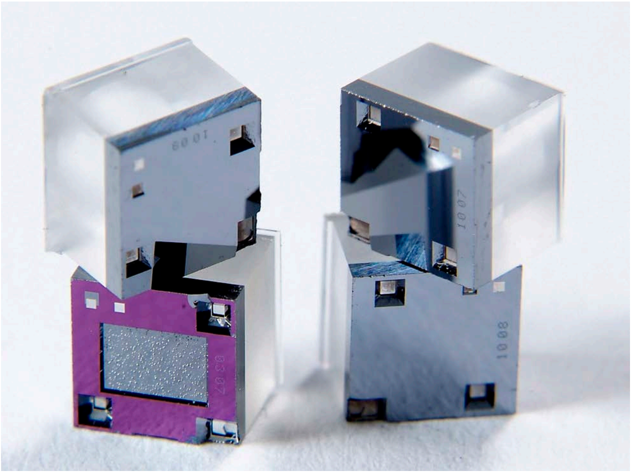


Figure 2: TERPS Sensor Element

To calibrate the 8### Series, the unit is mounted vertically with the pressure port at the lowest point. Orientation other than this produces a pressure offset error as specified in the data sheet. The error is most noticeable at lower pressure ranges.

Note: The g-sensitivity will also create an error in a high vibration environment and the unit should be mounted accordingly.

3.2 Safety Measures

The operation of sensors in systems whose pressure may exceed the overload values specified in the data sheet or customer-specific specification drawing is not allowed.

Connection and detachment of sensors from the mains supplying the pressure of the medium to be measured must be done after the shutoff valve is closed from the process and the pressure in the working chamber is made equal to atmospheric.

The connecting pipes must have a one-way slope (not less than 1:10) from the pressure collection point up to the sensor, if the medium to be measured is gas, and down to the sensor if the medium is liquid. If this is not possible, when measuring gas pressure at the lower points of the connecting lines, it is necessary to install sludge vessels, and when measuring the liquid pressure at the highest points, install gas collectors.

Selected devices for mounting sensors should be mounted on straight sections, at the maximum possible distance from pumps, locking devices, elbows, expansion joints and other hydraulic devices. It is especially not recommended to install sensors in front of the shut-off device if the medium to be measured is liquid. If there are water hammer effects in the system, it is recommended to use a sensor complete with a hydraulic shock dampener.

To reduce the temperature acting on the isolation diaphragm when measuring vapor pressure, it is recommended to use impulse tubes. The impulse tube must first be filled with water.

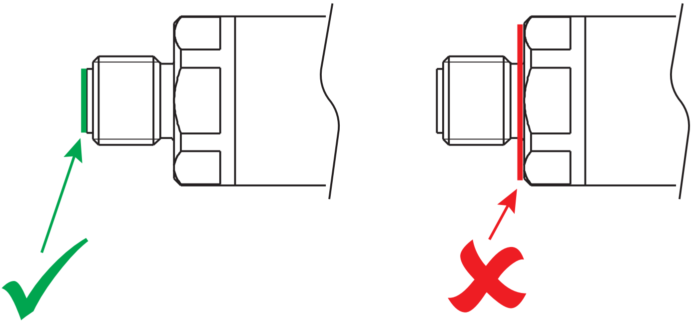
Attach the equipment in a safe configuration that prevents unwanted stress (vibration, physical impact, shock, mechanical and thermal stresses). Do not install the equipment where it can be damaged by a material that causes corrosion. Provide additional protection for the equipment if it may be damaged in service.

When installing power supply and signal wiring, the possibility of condensate entering the sensor cable entry should be avoided.

3.3 Connecting to a Pressure Source

When mounting the sensor, seal the mating surfaces. Failure to properly seal may affect performance or calibration accuracy.

Male threaded pressure connectors must not be sealed or constrained against the face at the base of the thread. The forward cone or flat face should always be used as indicated below.



Depth versions should not be used at hyperbaric pressures above 70 bar (1000 psi), approximately 700 m (2300 ft) of water.

3.3.1 Media Compatibility

The media compatibility of the sensors is shown in Table 2.

Table 2: Media Compatibility

Product	Pressure Range	Media Compatibility
81##	0 to 3.5 bar 0 to 50 psi	Non-condensing dry gases compatible with silicon dioxide, fluorosilicone RV adhesive, stainless steel 316L and glass.
80##	0 to 70 bar 0 to 1000 psi	Fluids compatible with stainless steel 316L and Hastelloy C276.
82## 83##	0 to 70 bar 0 to 1000 psi	Fluids compatible with Hastelloy C276.

Note: Fluid classification complies with European Regulation (EC) No 1272/2008. Statements comply with European Pressure Equipment Directive 2014/68/EU.

3.3.2 Pressure Containment

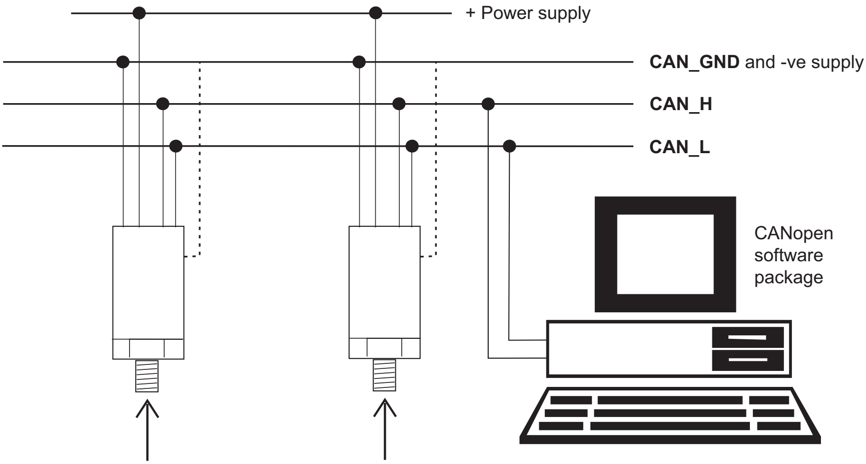
The pressure containment of the sensors is shown in Table 3.

Table 3: Pressure Containment

Product	Pressure Range	Pressure Containment
81##	0 to 3.5 bar 0 to 50 psi	7 bar maximum 100 psi maximum
80## 82## 83##	0 to 7 bar 0 to 100 psi	70 bar maximum 1000 psi maximum
	>7 to 70 bar >100 to 1000 psi	200 bar maximum 2900 psi maximum

3.4 Connection to CAN bus System

Figure 3 shows an example CAN bus system.



CAN_X Identifies the signal line connections on the CAN bus.
Cable screen to CAN_GND or an applicable earth.
Represents the different pressure conditions in the example system.

Figure 3: Example CAN bus System

A typical CAN bus system must have these items:

- A CAN bus with an applicable input/output device for the signal lines (applicable to the electrical connection on the pressure transducer).
- Power supply. Refer to Section 3.5 on page 7.
- All applicable tools to connect the pressure and electrical connections, as detailed in the applicable system installation manual.

3.5 Power Requirements

The sensor should be connected to a stable power supply. The power supply requirements are shown in Table 4.

Table 4: Power Supply Requirements

Product	Supply Voltage (V dc)	Supply Current
DPS Versions	7.5 to 30	25 mA nominal 35 mA peak

3.6 Maintenance

WARNING High pressures and temperatures are dangerous and can cause injury (Refer to pressure limits in the sales data sheet). Be careful when working on components connected to lines that have high pressures and heat. Use the applicable protection and obey all safety precautions.

3.6.1 Visual Inspection

Inspect the product for damage and corrosion. Any damage to the product must be assessed. If the housing is no longer sealed against water and/or dust, the product must be replaced.

3.6.2 Error Register Status

To monitor the current status of the unit, use this source of error data:

- The Error Register (object 0x1001). Refer to Appendix A, “CANopen Object Dictionary,” on page 19.

If there is an error:

- Do the Network Initialization Process (the boot-up process) again.
- Examine the electrical connections. Do all the applicable tests and checks. Refer to the System Installation Manual.
- If necessary, install a new pressure transducer.

3.6.3 Cleaning

Clean the case with a damp lint-free cloth and mild detergent.

If the product has been in contact with hazardous or toxic materials, obey all the applicable Control of Substances Hazardous to Health (COSHH) or Material Safety Data Sheet (MSDS) references and precautions when handling.

3.6.4 Adjustment

WARNING Output Calibration, Full-Scale and Offset adjustment may be subject to state requirements for verification of metrological equipment.

Druck supplies a calibration certificate with the pressure transducer. When it is necessary to recalibrate the pressure transducer, use the procedure that appears below (Druck recommends a minimum interval of once a year).

Note: Druck can provide a calibration service that is traceable to international standards.

3.6.4.1 Calibration – Equipment

Druck recommends the use of these items of equipment to calibrate the unit:

- Pressure source - minimum accuracy: 0.01% of reading
- Digital thermometer - minimum accuracy: 1 °C

- A CANopen software package to get access to the contents of the CANopen Object Dictionary. Refer to Appendix A, “CANopen Object Dictionary,” on page 19.

3.6.4.2 Two-Point Pressure Calibration – Procedure

To get accurate results, calibrate in conditions where the pressure and temperature are stable.

1. Record the current values for the calibration data:
    - Object 0x2207 00 (Pressure Gain) = GAIN

      Default value = 1
    - Object 0x2208 00 (Pressure Offset) = OFFSET

      Default value = 0 mbar
2. First calibration point:
    a. Apply Pressure (AP1) at 10% of the full-scale pressure (in mbar) and allow the pressure to become stable.
    b. Record the Field Value (FV1) that appears in object 0x6100 01 (Pressure Value). Record the value in mbar.
3. Second calibration point:
    a. Apply Pressure (AP2) at 90% of the full-scale pressure (in mbar) and allow the pressure to become stable.
    b. Record the Field Value (FV2) that appears in object 0x6100 01 (Pressure Value). Record the value in mbar.
4. Calculate the new values for the calibration data:
    - NEW GAIN = [GAIN] * [(AP1 - AP2) / (FV1 - FV2)]
    - NEW OFFSET = [(OFFSET) - FV1] + [(AP1) * [(AP1 - AP2) / (FV1 - FV2)]]

      The value for the NEW OFFSET is in mbar.
5. Write the new values for the calibration data back to the CANopen Object Dictionary:
    a. Set object 0x2200 00 (calibration access pin) to 4118.
    b. Set object 0x2207 00 (pressure gain) to the NEW GAIN value.
    c. Set object 0x2208 00 (pressure offset) to the NEW OFFSET value. The value for the NEW OFFSET is in mbar.
    d. Set object 0x2200 00 (calibration access pin) to 0.
6. Confirm that the new values for the calibration data are correct:
    a. Repeat steps 2 and 3.
7. Write the new values for the last and next calibration dates back to the CANopen Object Dictionary:
    a. Set object 0x2200 00 (Calibration Access Pin) to 4118.
    b. Set objects 0x2201 00 to 0x2203 00 to the new values for the last calibration year, month, day.
    c. Set objects 0x2204 00 to 0x2206 00 to the new values for the next calibration year, month, day.
    d. Set object 0x2200 00 (Calibration Access Pin) to 0.
8. If applicable, reset the values for the out-of-limit counters (objects 0x2006 to 0x2009).

3.6.4.3 Two-Point Pressure Calibration – Results

For correct operation, the value for the NEW GAIN is in the range 0.9 to 1.1. If the value is not in this range, this shows either a defective unit or defective calibration equipment.

3.7 Returned Goods Procedure

To repair or calibrate the sensor, return it to the applicable Druck Service Department.

Please contact our Service Department, and get a Return Authorization number.

Please supply these details:

- Product (e.g. TERPS820C Pressure Sensor)
- Pressure range
- Serial number
- Details of defect / work to be undertaken
- Calibration traceability requirements
- Operating conditions

3.7.1 Safety Precautions

To prevent possible injury when we receive the product, you must also tell us if the product has been in contact with hazardous or toxic materials. Please supply the applicable Control of Substances Hazardous to Health (COSHH) or Material Safety Data Sheet (MSDS) references and precautions.

3.7.2 Important Notice

Service or calibration by unauthorized sources will affect the warranty and may not guarantee further performance.

3.8 Electromagnetic Compatibility

The pressure sensor complies with the European Electromagnetic Compatibility Directive 2014/30/EU.

When appropriately installed the sensors meet and exceed the Commercial and Industrial specifications indicated in Table 5:

Table 5: EMC Standards

TERPS8#00 Series Models DPS8###-T#-A#-C#-##-##[-…]
EN 61000-6-1:2007
EN 61000-6-2:2005
EN 61000-6-3:2007 + A1:2011
EN 61000-6-4:2007 + A1:2011
EN 61326-1:2013
EN 61326-2-3:2013

3.8.1 Power Supply and Metering

The quality of the power supply and monitoring equipment will directly affect the EMC performance of the entire system. Since “Druck Limited” has no control over the installation of the sensor it must remain the responsibility of the user to ensure that the EMC performance of the system is adequate.

To maintain good immunity from electromagnetic disturbances present on the system power supply, the power supply should filter any transient interference from the incoming line and present a clean regulated DC supply to the sensor. The monitoring equipment should likewise be immune from the effects of electromagnetic disturbances and not impart disruptive signals on the connections to the sensor.

The sensor is not intended for connection to a DC distribution network.

3.8.2 Cable Type

Due to the small size of the sensor it is unlikely to be directly affected by radiated RF energy. Any RF energy that gets into the circuit will probably enter via the interconnecting cable.

To minimize the effect of nearby circuits and events, it is necessary to use screened cable between the sensor and power supply / monitoring equipment. Failure to do so will invalidate the EMC tests conducted by “Druck”.

The choice of cable type should reflect the environment through which it is going to run. Screened cable should always be used where electrical noise is present. Good cabling practice will be reflected in signal quality.

3.8.3 Earthing

For the screening of the cable to be effective, it is essential that the screen or drain conductor is permanently bonded to earth (ground). This should take place at the monitoring end of the cable as close to the power supply as practical. Protection should be afforded to any unscreened section of cable or circuit by means of a screened enclosure.

4. Operation

This section includes:

- The procedures to start and change the operation of the pressure transducer.
- The available data from the pressure transducer.

4.1 Start Operating

After a successful installation (refer to Chapter 4, “Operation,” on page 10) and to start operating requires:

- A CANopen software package to access the CANopen Object Dictionary.
- Operation of the CANopen network, including the Network Initialization Process (the Boot-up process) and/or the applicable configuration procedures.

4.2 Procedures

1. Complete the boot-up procedure (defined in the CANopen standard) for the CAN bus network. After boot-up the pressure transducer enters a “pre-operational” mode and in this mode responds to SDO and LSS messages.
2. The pressure transducer must be set to its operational state to respond to sync messages and to be fully operational.

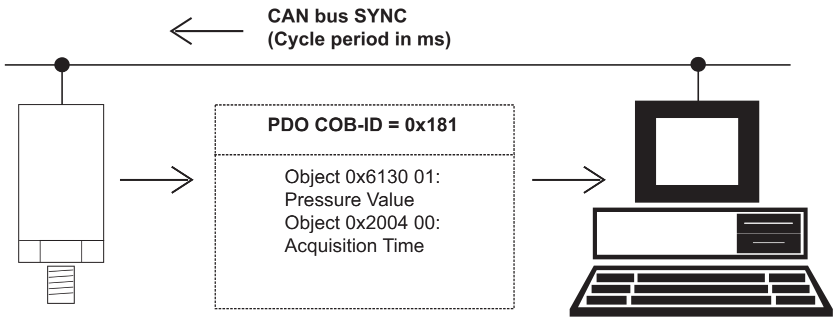


Figure 4: Default ‘Transmit PDO’ Operation

Note: This shows how the pressure transducer uses the default values to transmit a Process Data Object (PDO).

The readings can be filtered by a range of preset finite impulse response (FIR) filters. Refer to "0x220D to 0x2218 – The Filter System" on page 14.

Use the CANopen software package to receive the PDO and get access to the CANopen Object Dictionary.

Use the CANopen software package to change these values:

- Values set with the Layer Setting Services (LSS).
- Values in the CANopen Object Dictionary.

4.3 Quick Start

Get the current pressure and temperature values by using object 0x6130:

- Sub-item 01 returns the pressure value in the default pressure units.
- Sub-item 02 returns the temperature in degrees Celsius.

4.4 Primary Objects

The following procedures identify the primary objects that can be changed and monitored. Refer to Appendix A, "CANopen Object Dictionary," on page 19 for a complete list.

4.5 To Change the Operation - Node ID and Baud Rate

Use the CANopen Layer Setting Services (LSS) to change these primary objects in the pressure transducer:

Note: To respond to LSS messages the pressure transducer must be in pre-operational mode.

- The node ID (default value = 2).
- The baud rate (default value = 250 kbits/s).

In addition, object 0x210C can be used to modify the node ID. Object 0x210D holds the baud rate.

To make changes to these and other data dictionary objects permanent, save them and cycle the power to the sensor.

When using the LSS, the device must be identified. Object 0x1018 (identity) contains the identification data. Refer to Appendix C, "Bibliography," on page 51.

4.6 To Change the Operation - Objects: 0x1000 - 0x1FFFF

4.6.1 0x100C to 0x100E - Error Control: Node Guarding Option

To use Node Guarding for error control, set applicable values for these objects:

- 0x100C (Guard Time).
- 0x100D (Life Time Factor).
- 0x100E (Node Guarding Identifier).

Refer to Appendix C, "Bibliography," on page 51.

4.6.2 0x1017 – Error Control: Heartbeat Option

To use Heartbeat for error control, set applicable values for these objects:

- 0x100E (Node Guarding Identifier).
- 0x1017 (Heartbeat Time).

Refer to Appendix C, "Bibliography," on page 51.

4.6.3 0x1010 01 – To Save Changes to the Data Dictionary

Use object 0x1010 01 (Store Parameter Field) to save the data dictionary to non-volatile storage.

Example:

Set the value to 0x65766173 = evas (in ASCII)

Note: This does not overwrite the factory data and the sensor can be returned to its factory state by using 0x1011 as described below.

4.6.4 0x1011 01 – To Re-apply the Factory Values

Use object 0x1011 01 (Restore Default Parameters) to re-apply all the factory values.

Example:

Set the value to 0x64616F6C = daol (in ASCII)

Having re-applied the factory values, the sensor should be power cycled for the values to be applied.

4.6.5 0x1800 02 – The PDO Transmission (Type or Period)

Use object 0x1800 02 (Transmission Type) to change the type of PDO transmission or the period between each PDO transmission. Refer to Appendix C, “Bibliography,” on page 51.

4.6.6 0x1A00 – The Data in the ‘Transmit PDO’

Use object 0x1A00 (Transmit PDO Mapping) to change the data sent in the ‘Transmit PDO’ (maximum size = 8 bytes).

To change the transmit PDO, set bit 31 of 0x 1800 1 “COB-ID” to 1 and set 0x IA00 1 to 0.

After changing the PDO the process should be reversed.

Example:

To monitor the current status of the pressure value, set Sub-index 0x02 to 0x61500108 = Object 0x6150 01, 1 byte of data.

Status	Description
0	The value is in the limits of 0x6148 and 0x6149.
1	The value is more than the limit of 0x6149.
2	The value is less than the limit of 0x6148.

4.7 To Change the Operation – Objects: 0x2000 – 0x2FFFF

4.7.1 0x210C– Node ID

Valid node ID can be in the range 0x01 to 0x7F. Changes to this value do not take effect unless saved and the power cycled.

4.7.2 0x210D – Bit Rate

The bit rate at which the sensors communicate can be one of the following values:

Value	Baud Rate
10	10 kbit/s
20	20 kbit/s
50	50 kbit/s
125	125 kbit/s
250	250 kbit/s
500	500 kbit/s
800	800 kbit/s
1000	1000 kbit/s

Changes to the bit rate value does not take effect unless saved and the power cycled.

4.7.3 0x2200 – To Change the Calibration Data

To write new calibration values in objects 0x2201 to 0x220A, set object 0x2200 (Calibration Access Pin) to 4118.

To prevent accidental changes to the calibration data, set the value to 0 after completing all the changes.

4.7.4 0x2201 to 0x2203 – The Last Calibration Year, Month, Day

Refer to “0x2200 – To Change the Calibration Data” on page 13. The initial values identify the date of the factory calibration. After each calibration, set a new date. Refer to Chapter 3.6.4, “Adjustment,” on page 7.

4.7.5 0x2204 to 0x2206 – The Next Calibration Year, Month, Day

Refer to “0x2200 – To Change the Calibration Data” on page 13. The initial values identify the date of the factory calibration + one year. After each calibration, set a new date. Refer to Chapter 3.6.4, “Adjustment,” on page 7.

4.7.6 0x2207 – The Pressure Calibration Gain

Refer to “0x2200 – To Change the Calibration Data” on page 13. Use 0x2207 (Pressure Gain) to apply a correction to the compensated source pressure. Refer to Chapter 3.6.4, “Adjustment,” on page 7.

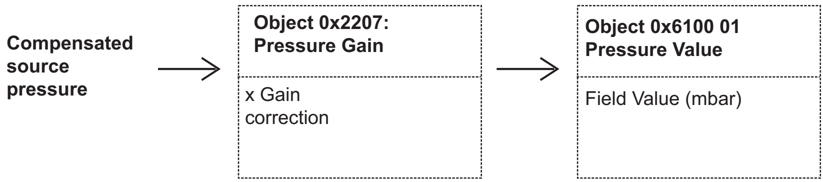


Figure 5: Pressure Calibration Gain

4.7.7 0x2208 – The Pressure Calibration Offset

Refer to “0x2200 – To Change the Calibration Data” on page 13. Use 0x2208 (Pressure Offset) to apply a correction to the compensated source pressure. Refer to Chapter 3.6.4, “Adjustment,” on page 7.

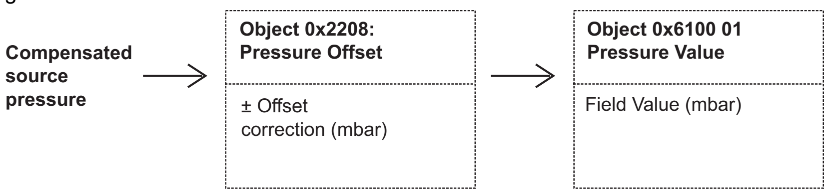


Figure 6: Pressure Calibration Offset

4.7.8 0x2209 – The Temperature Calibration Gain

Refer to "0x2200 – To Change the Calibration Data" on page 13. Use 0x2209 (Temperature Gain) to apply a correction to the compensated source temperature.

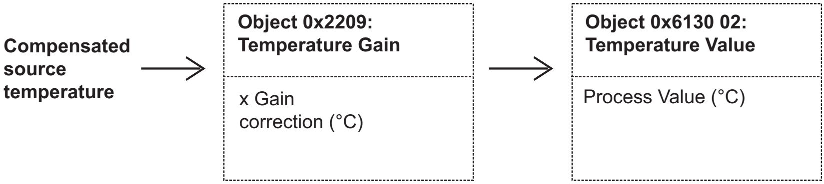


Figure 7: Temperature Calibration Gain

4.7.9 0x220A – The Temperature Calibration Offset

Refer to "0x2200 – To Change the Calibration Data" on page 13. Use 0x220A (Temperature Offset) to apply a correction to the compensated source temperature.

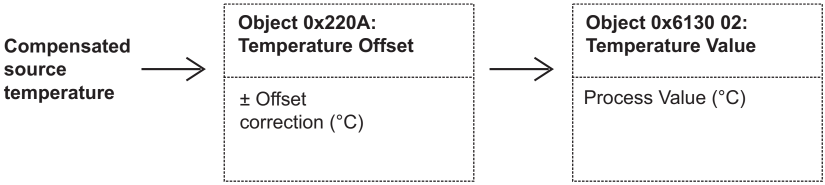


Figure 8: Temperature Calibration Offset

4.7.10 0x220D to 0x2218 – The Filter System

The DPS8000 sensor can support a wide range of sample rates and filters to give a choice of speed and accuracy. There are five filters, preset to a selection of values. Each filter is built of two parts; a pre-scaler and a group of coefficients. It is beyond the scope of this manual to describe the creation of these values.

The data dictionary item "Selected FIR Filter" at 0x2217 is used to choose a filter. When changing to another filter, be aware of the 3 dB settling times below before taking new values.

Filter Preset	Filter Type	Cut-off Frequency	3 dB Settling Time
1	Averaging 10 samples.	44.3 Hz	22 ms
2[a]	Averaging 50 samples.	8.86 Hz	100 ms
3	Butterworth low pass.	1 Hz	1000 ms
4	Butterworth low pass.	10 Hz	100 ms
5	Butterworth low pass.	17.18 Hz	60 ms

a. Factory set default filter setting.

4.7.11 0x2304 – The Tag for the Type of Data

Use object 0x2304 (Tag) to identify the type of data that the pressure transducer supplies (maximum: 10 characters). For example: Oil-mbar.

4.8 To Change the Operation – Objects: 0x6000 – 0x6FFFF

4.8.1 0x6120 to 0x6124 – The Scale Data for Pressure and Temperature Output

The pressure transducer uses a two-point calibration to calculate the pressure output. The two-point calibration includes the relation between the Field Value (FV) units and the Process Value

(PV) units. To change the relation between FV and PV, use the scale-factor objects and the zero offset. This allows the reading of the pressure output in one of the alternative pressure units.

Example:

Set object 0x6123 01 to 100 (the scale-factor for pascal).

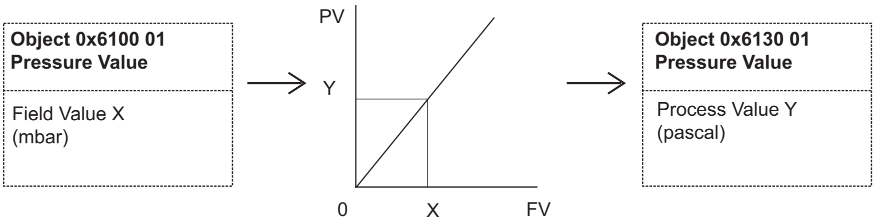


Figure 9: Scale of Pressure and Temperature Output

For a list of values of the alternative pressure units, refer to Appendix B, “Alternative Pressure Units,” on page 49.

To change the scale data for temperature use the information above but with sub-index 02 replacing 01.

4.8.2 0x6131 01 – The Units for the Pressure Output

Use object 0x6131 01 (Pressure Value) to change the units for the pressure output.

Example:

Set Sub-index 0x01 to 0x00220000 = CANopen value for pascal.

For a list of values of the alternative pressure units, refer to Appendix B, “Alternative Pressure Units,” on page 49.

4.8.3 0x6148 – The Local Limits (Minimum Pressure and Temperature)

Use object 0x6148 (Span Start – FP) to set the local limits for the pressure transducer operation. Set the applicable minimum values for the pressure and temperature. Refer to “0x2007 – The Count: Pressure is Less than the Limit” on page 16 and “0x2009 – The Count: Temperature is Less than the Limit” on page 17.

4.8.4 0x6149 – The Local Limits (Maximum Pressure and Temperature)

Use object 0x6149 (Span End – FP) to set the local limits for the pressure transducer operation. Set the applicable maximum values for the pressure and temperature. Refer to “0x2006 – The Count: Pressure is More than the Limit” on page 16 and “0x2008 – The Count: Temperature is More than the Limit” on page 16.

- Sub-index 01 sets the pressure.
- Sub-index 02 sets the temperature limit.

4.9 To Monitor the Operation – Objects: 0x1000 – 0x1FFFF

4.9.1 0x1001 – The Status of the Unit

Use object 0x1001 (Error Register) to monitor the current status of the unit. Also see “0x6150 – The Pressure and Temperature Status” on page 17.

4.10 To Monitor the Operation – Objects: 0x2000 – 0x2FFFF

4.10.1 0x2006 – The Count: Pressure is More than the Limit

Use object 0x2006 (Pressure Span Overflow Count) to monitor the pressure history. The count increments one each time the process value is more than the span end value.

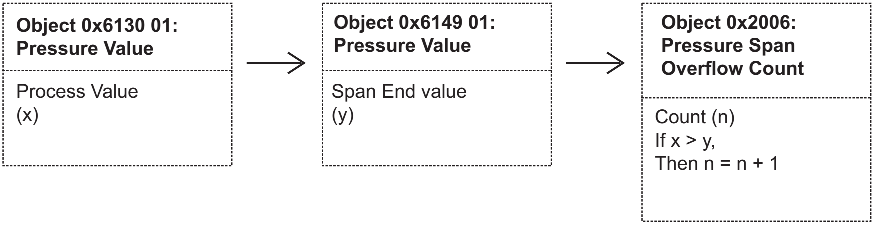


Figure 10: Pressure Span Overflow Count

Reset the count when applicable. For example, after calibration.

4.10.2 0x2007 – The Count: Pressure is Less than the Limit

Use object 0x2007 (Pressure Span Underflow Count) to monitor the pressure history. The count increments one each time the process value is less than the span start value.

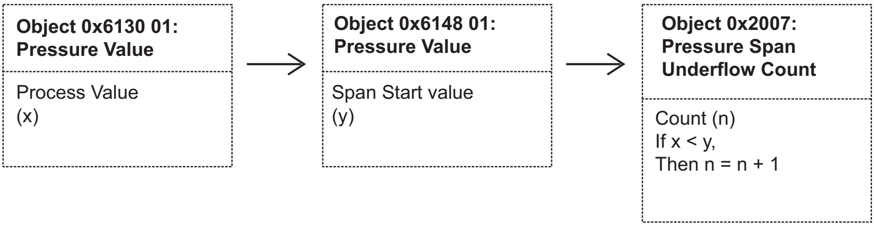


Figure 11: Pressure Span Underflow Count

Reset the count when applicable. For example, after calibration.

4.10.3 0x2008 – The Count: Temperature is More than the Limit

Use object 0x2008 (Temperature Span Overflow Count) to monitor the temperature history. The count increments one each time the process value is more than the span end value.

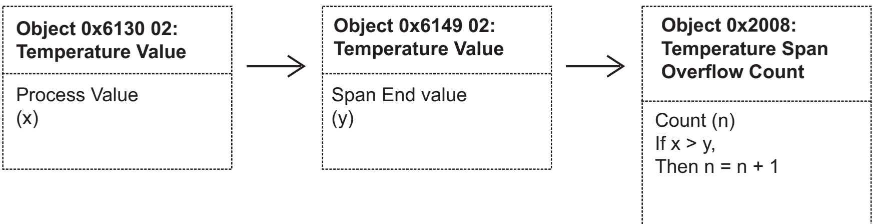


Figure 12: Temperature Span Overflow Count

Reset the count when applicable. For example, after calibration.

4.10.4 0x2009 – The Count: Temperature is Less than the Limit

Use object 0x2009 (Temperature Span Underflow Count) to monitor the temperature history. The count increments one each time the process value is more than the span end value.

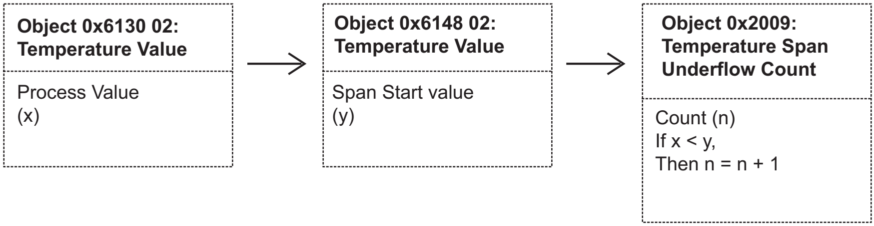


Figure 13: Temperature Span Underflow Count

Reset the count when applicable. For example, after calibration.

4.11 To Monitor the Operation – Objects: 0x6000 – 0x6FFFF

4.11.1 0x6130 01/0x6130 02 – The Pressure and Temperature

Use object 0x6130 01 (Pressure Value) and object 0x6130 02 (Temperature Value) to monitor the current process values. The process values include the calibration corrections (objects 0x2207 to 0x220A), and the applicable scale-factor (object 0x6123 01).

Use object 0x1A00 (Transmit PDO Mapping) to put the applicable data in the ‘Transmit PDO’.

4.11.2 0x6150 – The Pressure and Temperature Status

Use object 0x6150 (Status) to monitor the current status of the pressure and temperature output.

The individual bits of the status byte are used as follows:

- Data is not valid.
- Value more than the limit.
- Value less than the limit.

The status of the pressure is linked to the temperature. If the temperature is out of range, bit 0 of the pressure status will be set.

Status	Description
0	The value is in the limits of 0x6148 and 0x6149.
1	The value is more than the limit of 0x6149.
2	The value is less than the limit of 0x6148.

Appendix A. CANopen Object Dictionary

This appendix contains data for the primary objects that appear in the following areas of the CANopen Object Dictionary:

Index	Area
0x1000 to 0x1FFF	Communications profile area.
0x2000 to 0x2FFF	Manufacturer specific profile area.
0x6000 to 0x6FFF	Standardized device profile area.

A.1 Communication Segment

A.1.1 Object 1000h: Device Type

The device type specifies the kind of device. The lower 16-bit contain the device profile number and the upper 16-bit an additional information.

OBJECT DESCRIPTION

INDEX	1000
Name	Device Type
Object Code	Variable
Data Type	UNSIGNED32

ENTRY DESCRIPTION

Access	CONST
PDO Mapping	No
Default Value	0x00020194

A.1.2 Object 1001h: Error Register

The error register is a field of 8-bits, each for a certain error type. If an error occurs the bit has to be set.

Bit	Meaning
0	Generic error.
1	Current
2	Voltage
3	Temperature
4	Communication error (overrun, error state).
5	Device profile specific.
6	Reserved
7	Manufacturer specific.

OBJECT DESCRIPTION

INDEX	1001
Name	Error Register
Object Code	Variable
Data Type	UNSIGNED8

ENTRY DESCRIPTION

Access	RO
PDO Mapping	No
Default Value	0x00

A.1.3 Object 1003h: Pre-defined Error Field

This object holds errors that have occurred on the device and have been signaled via Emergency Object. It is an error history. Writing to sub-index 0 deletes the entire error history.

OBJECT DESCRIPTION

INDEX	1003
Name	Pre-defined Error Field
Object Code	Array
Data Type	UNSIGNED32

ENTRY DESCRIPTION

Sub-Index	000
Description	Number of Errors
Access	RW
PDO Mapping	No
Default Value	0x00000000

Sub-Index	001
Description	Standard Error Field
Data Type	UNSIGNED32
Access	RO
PDO Mapping	No
Default Value	0x00000000

A.1.4 Object 1005h: COB-ID SYNC

COB-ID of the Synchronization object. The device generates a SYNC message if bit 30 is set. The meaning of other bits is equal to the other communication objects.

OBJECT DESCRIPTION

INDEX	1005
Name	COB-ID SYNC
Object Code	Variable
Data Type	UNSIGNED32

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x080

A.1.5 Object 1007h: Synchronous Window Length

It contains the length of the time window for synchronous messages in µs. When not used it is 0.

OBJECT DESCRIPTION

INDEX	1007

Name	Synchronous Window Length
Object Code	Variable
Data Type	UNSIGNED32

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00000000
Unit	µs

A.1.6 Object 1008h: Manufacturer Device Name

Contains the device name.

OBJECT DESCRIPTION

INDEX	1008
Name	Manufacturer Device Name
Object Code	Variable
Data Type	VISIBLE_STRING

ENTRY DESCRIPTION

Access	CONST
PDO Mapping	No
Default Value	DPS8000 DK410 V00.00

A.1.7 Object 100Ch: Guard Time

This entry contains the guard time in milli-seconds. When not used it is 0.

OBJECT DESCRIPTION

INDEX	100C
Name	Guard Time
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00000000

A.1.8 Object 100Dh: Life Time Factor

The life time factor multiplied with the guard time gives the life time for the device. When not used it is 0.

OBJECT DESCRIPTION

INDEX	100D
Name	Life Time Factor
Object Code	Variable
Data Type	UNSIGNED8

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x0

A.1.9 Object 1010h: Store Parameter Field

This entry supports saving of parameters in non volatile memory. With a read access the device provides information about its saving capabilities.

Several parameter groups are distinguished:

Sub-Index	Parameter Groups
1	All parameters.
2	Communication parameters.
3	Application parameters.
4 to 127	Manufacturer defined parameters.

For saving the signature “save” (0x65766173) must be written.

OBJECT DESCRIPTION

INDEX	1010
Name	Store Parameter Field
Object Code	Array
Data Type	UNSIGNED32

ENTRY DESCRIPTION

Sub-Index	000
Description	Number of Entries
Access	RO
PDO Mapping	No
Default Value	0x1

Sub-Index	001
Description	Save all Parameters
Data Type	UNSIGNED32
Access	RW
PDO Mapping	No
Default Value	0x1

A.1.10 Object 1011h: Restore Default Parameters

This entry supports restoring of default parameters. With a read access the device provides information about its capabilities to restore these values.

Several parameter groups are distinguished.

Sub-Index	Parameter Group
1	All parameters.
2	Communication parameters.
3	Application parameters.
4 to 127	Manufacturer defined parameters.

For restoring the signature “load” (0x64616f6c) must be written.

OBJECT DESCRIPTION

INDEX	1011
Name	Restore Default Parameters
Object Code	Array
Data Type	UNSIGNED32

ENTRY DESCRIPTION

Sub-Index	000
Description	Number of Entries
Access	RO
PDO Mapping	No
Default Value	0x1

Sub-Index	001
Description	Restore all Default Parameters
Data Type	UNSIGNED32
Access	RW
PDO Mapping	No
Default Value	0x0

A.1.11 Object 1012h: COB-ID Time Stamp

COB-ID of the Time Stamp Object (TIME). If bit 31 is set the device consumes the Time Stamp message and if bit 30 is set the device produces the Time Stamp message. The meaning of the other bits is equal to the other communication objects.

OBJECT DESCRIPTION

INDEX	1012
Name	COB-ID Time Stamp
Object Code	Variable
Data Type	UNSIGNED32

ENTRY DESCRIPTION

Access	RO
PDO Mapping	No
Default Value	0x0100

A.1.12 Object 1014h: COB-ID EMCY

COB-ID used for emergency message (emergency producer).

OBJECT DESCRIPTION

INDEX	1014
Name	COB-ID EMCY
Object Code	Variable
Data Type	UNSIGNED32

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x80

A.1.13 Object 1015h: Inhibit Time Emergency

Inhibit Time used for emergency message (emergency producer). The time has to be a multiple of 100 µs.

OBJECT DESCRIPTION

INDEX	1015
Name	Inhibit Time Emergency
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x0000

A.1.14 Object 1017h: Producer Heartbeat Time

The producer heartbeat time defines the cycle time of the heartbeat. When not used, the time is 0. The time has to be a multiple of 1 msec.

OBJECT DESCRIPTION

INDEX	1017
Name	Producer Heartbeat Time
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00000000

A.1.15 Object 1018h: Identity Object

This object contains general information about the device.

Sub-Index	Identity Object
1	Contains a unique value allocated each manufacturer.
2	Identifies the manufacturer specific product code (device version).
3	Contains the revision number. Bit 31-16 is the major revision number and bit 15-0 the minor revision number.
4	Identifies a manufacturer specific serial number.

OBJECT DESCRIPTION

INDEX	1018
Name	Identity Object
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No
Default Value	0x4

Sub-Index	001
Description	Vendor Id
Data Type	UNSIGNED32
Access	RO
PDO Mapping	No
Default Value	0x50

Sub-Index	002
Description	Product Code
Data Type	UNSIGNED32
Access	RO
PDO Mapping	No
Default Value	0x1F40

Sub-Index	003
Description	Revision number
Data Type	UNSIGNED32
Access	RO
PDO Mapping	No
Default Value	0x6

Sub-Index	004
Description	Serial number
Data Type	UNSIGNED32
Access	RO
PDO Mapping	No
Default Value	0x22B8

A.1.16 Object 1019h: Synchronous Counter Overflow Value

The synchronous counter defines if a counter is mapped into the SYNC message and the highest value the counter can reach.

Value	Meaning
0	SYNC message transmitted with length 0.
1	Reserved
2 to 240	SYNC message transmitted with length 1, first data byte contains the counter value.
241 to 255	Reserved

OBJECT DESCRIPTION

INDEX	1019
Name	Synchronous counter overflow value
Object Code	Variable
Data Type	UNSIGNED8

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00000000

A.1.17 Object 1800h: Transmit PDO Communication Parameter 1

It contains the communication parameters of the current PDO the device is able to transmit.

Sub-Index	Identity Object
0	Contains the number of PDO-parameters implemented.
1	Describes the COB-ID. If bit 31 is set the PDO is disabled. The transmission mode is defined by sub-index 2. An inhibit time can be defined on sub-index 3 in 100 µs. At the 5th sub-index can be defined a event time for asynchronous PDO’s.

OBJECT DESCRIPTION

INDEX	1800
Name	Transmit PDO Communication Parameter 1
Object Code	Record
Data Type	PDO_COMM_PAR

ENTRY DESCRIPTION

Sub-Index	000

Description	Number of Entries
Access	RO
PDO Mapping	No
Default Value	0x02

Sub-Index	001
Description	COB-ID
Data Type	UNSIGNED32
Access	RO
PDO Mapping	No
Default Value	0x00000180

Sub-Index	002
Description	Transmission Type
Data Type	UNSIGNED8
Access	RW
PDO Mapping	No
Default Value	0x1

A.1.18 Object 1A00h: Transmit PDO Mapping Parameter 1

Contains the mapping for the PDO the device is able to transmit.

The type of the PDO mapping parameter is at index 21h. The sub-index 0h contains the number of valid entries within the mapping record. This number of entries is also the number of the application variables which shall be transmitted with the corresponding PDO. The sub-index from 1h to number of entries contain the information about the mapped application variables. These entries describe the PDO contents by their index, sub-index and length. All three values are hexadecimal coded. The length entry contains the length of the object in bits (1 to 40h). This parameter can be used to verify the overall mapping length.

OBJECT DESCRIPTION

INDEX	1A00
Name	Transmit PDO Mapping Parameter 1
Object Code	Record
Data Type	PDO_MAPPING

ENTRY DESCRIPTION

Sub-Index	000
Description	Number of Entries
Access	RW
PDO Mapping	No
Default Value	0x02

Sub-Index	001
Description	Mapping Entry 1
Data Type	UNSIGNED32
Access	RW
PDO Mapping	No

Default Value	0x61300120

Sub-Index	002
Description	Mapping Entry 2
Data Type	UNSIGNED32
Access	RW
PDO Mapping	No
Default Value	0x20040020

Sub-Index	003
Description	Mapping Entry 3
Data Type	UNSIGNED32
Access	RW
PDO Mapping	No
Default Value	0x00000000

Sub-Index	004
Description	Mapping Entry 4
Data Type	UNSIGNED32
Access	RW
PDO Mapping	No
Default Value	0x00000000

A.2 Manufacturer Segment

A.2.1 Object 2003h: Current Time

Current Time is 6 bytes TIME_OF_DAY.

OBJECT DESCRIPTION

INDEX	2003
Name	Current Time
Object Code	Variable
Data Type	UNSIGNED48

ENTRY DESCRIPTION

Access	RO
PDO Mapping	No
Default Value	0x00

A.2.2 Object 2004h: Acquisition Time

The time that the last sample was taken. This is in milliseconds since start-up.

OBJECT DESCRIPTION

INDEX	2004
Name	Acquisition Time
Object Code	Variable
Data Type	UNSIGNED32

ENTRY DESCRIPTION

Access	RO
PDO Mapping	Yes
Default Value	0x00

A.2.3 Object 2005h: Acquisition Interval

The length of time between the current and previous samples in milliseconds.

OBJECT DESCRIPTION

INDEX	2005
Name	Acquisition Interval
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RO
PDO Mapping	No
Default Value	0x00

A.2.4 Object 2006h: Pressure Span Overflow Count

Used in the calculation of 6150 (AI Status).

OBJECT DESCRIPTION

INDEX	2006
Name	Pressure Span Overflow Count
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.5 Object 2007h: Pressure Span Underflow Count

Used in the calculation of 6150 (AI Status).

OBJECT DESCRIPTION

INDEX	2007
Name	Pressure Span Underflow Count
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.6 Object 2008h: Temperature Span Overflow Count

Used in the calculation of 6150 (AI Status).

OBJECT DESCRIPTION

INDEX	2008
Name	Temperature Span Overflow Count
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.7 Object 2009h: Temperature Span Underflow Count

Used in the calculation of 6150 (AI Status).

OBJECT DESCRIPTION

INDEX	2009
Name	Temperature Span Underflow Count
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.8 Object 210Ch: Node ID

The CAN node ID.

OBJECT DESCRIPTION

INDEX	210C
Name	Node ID
Object Code	Variable
Data Type	UNSIGNED8

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x2

A.2.9 Object 210Dh: Bit Rate

The CAN bit rate.

OBJECT DESCRIPTION

INDEX	210D
Name	Bit Rate
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0xFA

A.2.10 Object 2200h: Calibration Access Pin

The PIN to enable calibration.

OBJECT DESCRIPTION

INDEX	2200
Name	Calibration Access Pin
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x0

A.2.11 Object 2201h: Last Calibration Year

Requires calibration PIN (refer to “Object 2200h: Calibration Access Pin” on page 31).

OBJECT DESCRIPTION

INDEX	2201
Name	Last Calibration Year
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.12 Object 2202h: Last Calibration Month

Requires calibration PIN (refer to “Object 2200h: Calibration Access Pin” on page 31).

OBJECT DESCRIPTION

INDEX	2202
Name	Last Calibration Month
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.13 Object 2203h: Last Calibration Day

Requires calibration PIN (refer to “Object 2200h: Calibration Access Pin” on page 31).

OBJECT DESCRIPTION

INDEX	2203
Name	Last Calibration Day
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.14 Object 2204h: Next Calibration Year

Requires calibration PIN (refer to “Object 2200h: Calibration Access Pin” on page 31).

OBJECT DESCRIPTION

INDEX	2204
Name	Next Calibration Year
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.15 Object 2205h: Next Calibration Month

Requires calibration PIN (refer to “Object 2200h: Calibration Access Pin” on page 31).

OBJECT DESCRIPTION

INDEX	2205
Name	Next Calibration Month
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.16 Object 2206h: Next Calibration Day

Requires calibration PIN (refer to “Object 2200h: Calibration Access Pin” on page 31).

OBJECT DESCRIPTION

INDEX	2206
Name	Next Calibration Day
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.17 Object 2207h: Pressure Gain

Requires calibration PIN (refer to "Object 2200h: Calibration Access Pin" on page 31).

OBJECT DESCRIPTION

INDEX	2207
Name	Pressure Gain
Object Code	Variable
Data Type	REAL32

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	1.0

A.2.18 Object 2208h: Pressure Offset

Requires calibration PIN (refer to "Object 2200h: Calibration Access Pin" on page 31).

OBJECT DESCRIPTION

INDEX	2208
Name	Pressure Offset
Object Code	Variable
Data Type	REAL32

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0.0

A.2.19 Object 2209h: Temperature Gain

Requires calibration PIN (refer to "Object 2200h: Calibration Access Pin" on page 31).

OBJECT DESCRIPTION

INDEX	2209
Name	Temperature Gain
Object Code	Variable
Data Type	REAL32

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	1.0

A.2.20 Object 220Ah: Temperature Offset

Requires calibration PIN (refer to "Object 2200h: Calibration Access Pin" on page 31).

OBJECT DESCRIPTION

INDEX	220A
Name	Temperature Offset
Object Code	Variable
Data Type	REAL32

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0.0

A.2.21 Object 220Dh: FIR Samples Size

The number of samples in the Finite Impulse Response filter.

OBJECT DESCRIPTION

INDEX	220D
Name	FIR Samples size
Object Code	Variable
Data Type	UNSIGNED8

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.22 Object 220Eh: FIR Sample Data

Data for the Finite Impulse Response filter.

OBJECT DESCRIPTION

INDEX	220E
Name	FIR Sample Data
Object Code	Variable
Data Type	DOMAIN

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	NULL

A.2.23 Object 220Fh: FIR2 Samples Size

The number of samples in the Finite Impulse Response filter.

OBJECT DESCRIPTION

INDEX	220F
Name	FIR2 Samples size
Object Code	Variable
Data Type	UNSIGNED8

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.24 Object 2210h: FIR2 Sample Data

Data for the Finite Impulse Response filter.

OBJECT DESCRIPTION

INDEX	2210
Name	FIR2 Sample Data
Object Code	Variable
Data Type	DOMAIN

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	NULL

A.2.25 Object 2211h: FIR3 Samples Size

The number of samples in the Finite Impulse Response filter.

OBJECT DESCRIPTION

INDEX	2211
Name	FIR3 Samples size
Object Code	Variable
Data Type	UNSIGNED8

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.26 Object 2212h: FIR3 Sample Data

Data for the Finite Impulse Response filter.

OBJECT DESCRIPTION

INDEX	2212
Name	FIR3 Sample Data
Object Code	Variable
Data Type	DOMAIN

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	NULL

A.2.27 Object 2213h: FIR4 Samples Size

The number of samples in the Finite Impulse Response filter.

OBJECT DESCRIPTION

INDEX	2213
Name	FIR4 Samples size
Object Code	Variable
Data Type	UNSIGNED8

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.28 Object 2214h: FIR4 Sample Data

Data for the Finite Impulse Response filter.

OBJECT DESCRIPTION

INDEX	2214
Name	FIR4 Sample Data
Object Code	Variable
Data Type	DOMAIN

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	NULL

A.2.29 Object 2215h: FIR5 Samples Size

The number of samples in the Finite Impulse Response filter.

OBJECT DESCRIPTION

INDEX	2215
Name	FIR5 Samples size
Object Code	Variable
Data Type	UNSIGNED8

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x00

A.2.30 Object 2216h: FIR5 Sample Data

Data for the Finite Impulse Response filter.

OBJECT DESCRIPTION

INDEX	2216
Name	FIR5 Sample Data
Object Code	Variable
Data Type	DOMAIN

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	NULL

A.2.31 Object 2217h: Selected FIR Filter

OBJECT DESCRIPTION

INDEX	2217
Name	Selected FIR filter
Object Code	Variable
Data Type	UNSIGNED8

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x02

A.2.32 Object 2218h: FIR Pre-scaler

OBJECT DESCRIPTION

INDEX	2218
Name	FIR Prescaler
Object Code	Array
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Sub-Index	000
Description	Number of Entries
Access	RO
PDO Mapping	No
Default Value	0x05

Sub-Index	001
Description	FIR pre-scaler
Data Type	UNSIGNED16
Access	RW
PDO Mapping	No
Default Value	0x0

Sub-Index	002
Description	FIR2 pre-scaler
Data Type	UNSIGNED16
Access	RW
PDO Mapping	No
Default Value	0x0

Sub-Index	003
Description	FIR3 pre-scaler
Data Type	UNSIGNED16
Access	RW
PDO Mapping	No
Default Value	0x0

Sub-Index	004
Description	FIR4 pre-scaler
Data Type	UNSIGNED16
Access	RW
PDO Mapping	No
Default Value	0x0

Sub-Index	005
Description	FIR5 pre-scaler
Data Type	UNSIGNED16
Access	RW
PDO Mapping	No
Default Value	0x0

A.2.33 Object 2300h: PDCR Min Pressure

OBJECT DESCRIPTION

INDEX	2300
Name	PDCR Min Press
Object Code	Variable
Data Type	INTEGER32

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x0

A.2.34 Object 2301h: PDCR Max Pressure

OBJECT DESCRIPTION

INDEX	2301
Name	PDCR Max Pressure
Object Code	Variable
Data Type	INTEGER32

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x14331

A.2.35 Object 2302h: PDCR Type

OBJECT DESCRIPTION

INDEX	2302
Name	PDCR Type
Object Code	Variable
Data Type	UNSIGNED8

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0x80

A.2.36 Object 2303h: PDCR Acquisition Period

OBJECT DESCRIPTION

INDEX	2303
Name	PDCR Acquisition Period
Object Code	Variable
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Access	RO
PDO Mapping	No
Default Value	0x64

A.2.37 Object 2304h: PDCR Text

OBJECT DESCRIPTION

INDEX	2304
Name	PDCR Text
Object Code	Variable
Data Type	VISIBLE_STRING

ENTRY DESCRIPTION

Access	RW
PDO Mapping	No
Default Value	0

A.3 Device Profile Segment

A.3.1 Object 6100h: AI Input FV

This object represents the converted value of an analogue input module, it is not yet scaled to the physical measurement units. Scaling could be e.g. digits of the analog-to-digital converter or Ohms for Pt100 temperature measurement.

The value is left adjusted with the remaining bits to the right side of the LSB set to zero.

Value	Description
1	Pressure
2	Temperature

OBJECT DESCRIPTION

INDEX	6100
Name	AI Input FV
Object Code	Array
Data Type	REAL32

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No
Default Value	0.0

Sub-Index	001
Description	AI Input FV 1
Data Type	REAL32
Access	RO
PDO Mapping	Yes
Default Value	0.0

Sub-Index	002
Description	AI Input FV 2
Data Type	REAL32
Access	RO
PDO Mapping	Yes
Default Value	0.0

A.3.2 Object 6101h: AI Input Unit

OBJECT DESCRIPTION

INDEX	6101
Name	AI Input Unit
Object Code	Array
Data Type	UNSIGNED32

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No

Default Value	0x2

Sub-Index	001
Description	AI Input Unit 1
Data Type	UNSIGNED32
Access	RO
PDO Mapping	No
Default Value	0xfd4e0000

Sub-Index	002
Description	AI Input Unit 2
Data Type	UNSIGNED32
Access	RO
PDO Mapping	No
Default Value	0x00000000

A.3.3 Object 6110h: AI Sensor Type

Specifies the type of sensor connected to the analogue input.

OBJECT DESCRIPTION

INDEX	6110
Name	AI Sensor type
Object Code	Array
Data Type	UNSIGNED16

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No
Default Value	0x2

Sub-Index	001
Description	AI Sensor type 1
Data Type	UNSIGNED16
Access	RW
PDO Mapping	No
Default Value	0x5A

Sub-Index	002
Description	AI Sensor type 2
Data Type	UNSIGNED16
Access	RW
PDO Mapping	No
Default Value	0x64

A.3.4 Object 6120h: AI Input Scaling 1 FV

This object defines the field value of the first calibration point for the analogue input channel. It is scaled in physical unit of field value.

OBJECT DESCRIPTION

INDEX	6120
Name	AI Input scaling 1 FV
Object Code	Array
Data Type	REAL32

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No
Default Value	0.0

Sub-Index	001
Description	AI Input scaling 1 FV 1
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	0.0

Sub-Index	002
Description	AI Input scaling 1 FV 2
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	0.0

A.3.5 Object 6121h: AI Input Scaling 1 PV

This object defines the process value of the first calibration point for the analogue input channel. It is scaled in physical unit of the process value.

OBJECT DESCRIPTION

INDEX	6121
Name	AI Input scaling 1 PV
Object Code	Array
Data Type	REAL32

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No
Default Value	0.0

Sub-Index	001
Description	AI Input scaling 1 PV 1
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	0.0

Sub-Index	002
Description	AI Input scaling 1 PV 2
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	0.0

A.3.6 Object 6122h: AI Input Scaling 2 FV

This object defines the field value of the second calibration point for the analogue input channel. It is scaled in physical unit of field value.

OBJECT DESCRIPTION

INDEX	6122
Name	AI Input scaling 2 FV
Object Code	Array
Data Type	REAL32

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No
Default Value	0.0

Sub-Index	001
Description	AI Input scaling 2 FV 1
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	1.0

Sub-Index	002
Description	AI Input scaling 2 FV 2
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	1.0

A.3.7 Object 6123h: AI Input Scaling 2 PV

This object defines the process value of the second calibration point for the analogue input channel. It is scaled in physical unit of process value.

OBJECT DESCRIPTION

INDEX	6123
Name	AI Input scaling 2 PV
Object Code	Array
Data Type	REAL32

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No
Default Value	0.0

Sub-Index	001
Description	AI Input scaling 2 PV 1
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	1.0

Sub-Index	002
Description	AI Input scaling 2 PV 2
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	1.0

A.3.8 Object 6124h: AI Input Offset

This object defines the additional offset value for the analogue input channel. It is scaled in physical unit of process value.

OBJECT DESCRIPTION

INDEX	6124
Name	AI Input offset
Object Code	Array
Data Type	REAL32

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No
Default Value	0.0

Sub-Index	001
Description	AI Input offset 1
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	0.0

Sub-Index	002
Description	AI Input offset 2
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	0.0

A.3.9 Object 6130h: AI Input PV

This object represents the result of the input scaling block and gives the measured quantity scaled in the physical unit of process values (e.g. degrees centigrade, kg, kN, mm etc.).

OBJECT DESCRIPTION

INDEX	6130
Name	AI Input PV
Object Code	Array
Data Type	REAL32

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No
Default Value	0.0

Sub-Index	001
Description	AI Input PV 1
Data Type	REAL32
Access	RO
PDO Mapping	Yes
Default Value	0.0

Sub-Index	002
Description	AI Input PV 2
Data Type	REAL32
Access	RO
PDO Mapping	Yes
Default Value	0.0

A.3.10 Object 6131h: AI Physical Unit PV

This object assigns SI units and prefixes for the process values within the analogue input function block. The coding of the physical units listed in Appendix B, "Alternative Pressure Units," on page 49.

OBJECT DESCRIPTION

INDEX	6131
Name	AI Physical unit PV
Object Code	Array
Data Type	UNSIGNED32

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No
Default Value	0x2

Sub-Index	001
Description	AI Physical unit PV 1
Data Type	UNSIGNED32
Access	RW
PDO Mapping	No
Default Value	0xFD4E0000

Sub-Index	002
Description	AI Physical unit PV 2
Data Type	UNSIGNED32
Access	RW
PDO Mapping	No
Default Value	0x002D0000

A.3.11 Object 6148h: AI Span Start

This value specifies the lower limit where process values are expected. Process values, lower than this limit, are marked as negative overloaded.

OBJECT DESCRIPTION

INDEX	6148
Name	AI Span start
Object Code	Array
Data Type	REAL32

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No

Default Value	0.0
Sub-Index	001
Description	AI Span start 1
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	0.0
Sub-Index	002
Description	AI Span start 2
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	0.0

A.3.12 Object 6149h: AI Span End

This value specifies the upper limit where process values are expected. Process values exceeding this limit are marked as positive overloaded.

OBJECT DESCRIPTION

INDEX	6149
Name	AI Span end
Object Code	Array
Data Type	REAL32

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No
Default Value	0.0
Sub-Index	001
Description	AI Span end 1
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	0.0
Sub-Index	002
Description	AI Span end 2
Data Type	REAL32
Access	RW
PDO Mapping	No
Default Value	0.0

A.3.13 Object 6150h: AI Status

This read-only object reflects the status of the analogue input channels. The combination of bit 1 and bit 2 has not to be possible.

OBJECT DESCRIPTION

INDEX	6150
Name	AI Status
Object Code	Array
Data Type	UNSIGNED8

ENTRY DESCRIPTION

Sub-Index	000
Description	number of entries
Access	RO
PDO Mapping	No
Default Value	0x02

Sub-Index	001
Description	AI Status 1
Data Type	UNSIGNED8
Access	RO
PDO Mapping	Yes
Default Value	0x0

Sub-Index	002
Description	AI Status 2
Data Type	UNSIGNED8
Access	RO
PDO Mapping	Yes
Default Value	0x0

Appendix B. Alternative Pressure Units

This appendix contains data for the alternative pressure units.

The basic operation of the pressure transducer uses mbar for the pressure calculations. Druck uses the Customer Ordering Information to set the default units for the pressure output. The default units can be: mbar, bar, or psi.

The table below shows the values to get an output in one of the alternative pressure units.

Pressure Units		CANopen Value (Units) (Object: 0x6131 01)	Scale-Factor (Object: 0x6123 01)
mbar	millibar	0xFD4E0000	1
bar	bar	0x004E0000	0.001
Pa (N/m^2)	pascal (newton per square metre)	0x00220000	100
hPa	hectopascal	0x02220000	1
kPa	kilo pascal	0x03220000	0.1
Mpa	Mega pascal	0x06220000	0.0001
mmHg	millimetre of mercury	0x00A00000[a]	0.7500616
cmHg	centimetre of mercury	0x00A00000[a]	0.07500616
mHg	metre of mercury	0x00A00000[a]	0.0007500616
inHg	inch of mercury	0x00A00000[a]	0.02953
kg/cm^2	kilogram-force per square centimetre	0x00A00000[a]	0.001019716
kg/m^2	kilogram-force per square metre	0x00A00000[a]	10.19716
mmH_2O	millimetre of water	0x00A00000[a]	10.19716
cmH_2O	centimetre of water	0x00A00000[a]	1.019716
mH_2O	metre of water	0x00A00000[a]	0.01019716
torr	torr	0x00A00000[a]	0.7500616
atm	atmosphere	0x00A00000[a]	0.000986923
psi	pound-force per square inch	0x00A00000[a]	0.01450377
lb/ft^2	pound-force per square foot	0x00A00000[a]	2.088543
inH_2O 4°C	inch of water at 4 °C	0x00A00000[a]	0.4001775
inH_2O 60°F	inch of water at 60 °F	0x00A00000[a]	0.4021858
ftH_2O 4°C	foot of water at 4 °C	0x00A00000[a]	0.03345526
ftH_2O 60°F	foot of water at 60 °F	0x00A00000[a]	0.03351545

a. The CANopen value 0x00A00000 shows that the pressure unit is not an SI unit (refer to Appendix C, "Bibliography," on page 51).

If other units are necessary, set the applicable values to agree with local conditions.

Appendix C. Bibliography

For more data, refer to the following publications:

1. CANopen Application Layer and Communication Profile
    - CiA Draft Standard DS-301 (Version 4.01)
2. CANopen Device Profile for Measurement Devices and Closed Loop Controllers
    - CiA Draft Standard Proposal DSP-404 (Version 1.0)
3. CANopen Layer Setting Services and Protocol (LSS)
    - CiA Draft Standard Proposal DSP-305 (Version 1.0)
4. CANopen Representation of SI Units and Prefixes
    - CiA Draft Recommendation DRP-303-2 (Version 1.1)

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