Kalibox

Commands

Dokument Revisionen

| **Rev.** | **Änderungen** | **Author** | **Datum** |
| --- | --- | --- | --- |
| 1 | Herstellung | P. Miguelito | 08.01.2019 |
| 2 | Protocoll Implentation | A.Möbius | 31.01.2019 |
| 3 | Protocoll extention | A.Möbius | 24.06.2019 |
|  |  |  |  |
|  |  |  |  |

**Inhalt**

1 Ansprechspartern 3

1.1 Hersteller / Lieferant 3

1.2 IE MTPRO 3

1.3 IT MTPRO 3

1.4 F&E MTPRO 3

2 Firmware Versionierung 4

3 Software Vorbereitung 5

3.1 Laufwerke Verbindung 5

3.2 ODBC Verbindung 5

4 Hardware 6

4.1 Treiber 6

4.1.1 Installation 6

4.1.2 Konfiguration 6

5 Firmware 7

5.1 Installation 7

5.2 Konfiguration 7

6 Commands 10

6.1 Commands in calibration Mode 10

6.1.1 Get BoxStatus G100 10

6.1.2 Get Page G015 12

6.1.3 Finalise Aktive Senor S200 12

6.1.4 Get Errovalues G200 12

6.1.5 BoxReset S999 12

6.1.6 S100 13

6.1.7 S500 13

6.1.8 Debug G901 13

6.1.9 Debug G902 13

6.1.10 Debug G903 14

6.1.11 Debug G904 14

6.1.12 Debug G905 14

6.1.13 Debug G906 14

6.1.14 Debug G907 14

6.1.15 Debug G908 14

6.1.16 Debug G909 15

6.1.17 Debug G910 15

6.1.18 Debug G911 15

6.1.19 Read Page from Sensor 16

6.1.20 Write Page To Sensor 16

7 Change History 17

7.1 Wichtig: 17

# Ansprechspartern

## Hersteller / Lieferant

## IE MTPRO

## IT MTPRO

## F&E MTPRO

# Firmware Versionierung

| **Versionsnummer** | **Beschreibung** | **Datum** |
| --- | --- | --- |
| 1.0.0.0 | Erste Version (Demo) |  |
| 01.01.01-9 |  |  |
| 02.01.00-0 | Implementation of Communcation Protocoll Complile: Feb 1 2019, 08:51:11 | 01.02.2019 |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

# Software Vorbereitung

## Laufwerke Verbindung

| **Nr** | **Bemerkung** | **Printscreens** |
| --- | --- | --- |
|  | X: | \\ch04sf0000\......... |

## ODBC Verbindung

| **Nr** | **Bemerkung** | **Printscreens** |
| --- | --- | --- |
|  | TEST |  |
|  | Produktion |  |
|  | Service |  |

# Hardware

## Treiber

### Installation

| **Nr** | **Bemerkung** | **Printscreens** |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

### Konfiguration

| **Nr** | **Bemerkung** | **Printscreens** |
| --- | --- | --- |
|  |  |  |
|  |  |  |

# Firmware

## Installation

| **Nr** | **Bemerkung** | **Printscreens** |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

## Konfiguration

| **Nr** | **Bemerkung** | **Printscreens** |
| --- | --- | --- |
|  |  |  |
|  |  |  |

State Diagramme for Calibration



# Commands

BaudRate = 19200Baud

## Commands in calibration Mode

### Get BoxStatus G100

Values appear comma separated- e.g."g100;3A;01;"

| **Command** | **Code** | **Reply** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Get Status | "G100" | "g100" | none | 2 |  |
|  |  | BoxStatus |  | 1 | Hex |
|  |  | CalibrationStatus |  | 1 | Hex |

CalibrationStatus=0 a 6850i Calibration will be performed with Upol=674 and 500mV

CalibrationStatus=1- a Upol=674mV Calibration will be performed

CalibrationStatus=2- a Upol=500mV Calibration will be performed

//\*\*\*\*\*\*\*\*\* BoxStatus definitions

#define CalibMode\_674mV\_Low\_1 0

#define CalibMode\_674mV\_Low\_2 1

#define CalibMode\_674mV\_High\_1 2

#define CalibMode\_674mV\_High\_2 3

#define CalibMode\_500mV\_Low\_1 4

#define CalibMode\_500mV\_Low\_2 5

#define CalibMode\_500mV\_High\_1 6

#define CalibMode\_500mV\_High\_2 7

#define VerifyMode\_674mV\_Low\_1 8

#define VerifyMode\_674mV\_Low\_2 9

#define VerifyMode\_674mV\_High\_1 10

#define VerifyMode\_674mV\_High\_2 11

#define VerifyMode\_500mV\_Low\_1 12

#define VerifyMode\_500mV\_Low\_2 13

#define VerifyMode\_500mV\_High\_1 14

#define VerifyMode\_500mV\_High\_2 15

#define VerifyTemp 16

#define CalibMode\_674CalculationLow 51

#define CalibMode\_674CalculationHigh 52

#define CalibMode\_500CalculationLow 53

#define CalibMode\_500CalculationHigh 54

#define SuccessfullSensorCalibration 55

#define Box\_SensorCheckUpol\_500 56

#define ShowErrorValues 57

#define DebugUpolOnCathode 58

#define DebugUpolOnAnode 59

#define ReadPage16 60

#define RS232\_OW\_ACCESS 61

#define Box\_Idle 50

#define Box\_WritePage\_00 17

#define Box\_WritePage\_01 18

#define Box\_WritePage\_12 19

#define Box\_WritePage\_15 20

#define Box\_SensorCheckUpol\_674 21

#define Box\_SensorVerification 22

#define Box\_SensorError 23

#define Box\_SensorWriteCalData674 24

#define Box\_SensorWriteCalData500 25

#define Box\_StartSensorCalibration26

#define SensorFail 27

#define SensorCalibFinalise 28

#define Box\_Calibration 29

#define WEP\_Test 30

#define WEP\_674mV\_Low\_1 31

#define WEP\_674mV\_Low\_2 32

#define WEP\_500mV\_Low\_1 33

#define WEP\_500mV\_Low\_2 34

#define WEP\_674mV\_High\_1 35

#define WEP\_674mV\_High\_2 36

#define WEP\_500mV\_High\_1 37

#define WEP\_500mV\_High\_2 38

#define WEP\_SensorError 39

#define WEPSensorFail 40

#define SensorWepFinalise 41

#define WEP\_SensorCheckUpol 42

#define WEP\_TempCheck 43

/\*\*\*\*\*\* Error Tolerances as RAW Values for Calibration \*\*\*\*\*\*/

//#define RawErrorCurrLow\_1 1000

#define RawErrorCurrLow\_1 1000 //1 increment= 4pA

#define RawErrorCurrLow\_2 4000 //1 increment= 4pA

//#define RawErrorCurrHigh\_1 1000

#define RawErrorCurrHigh\_1 2000 //1 increment= 200pA

//#define RawErrorCurrHigh\_2 4000

#define RawErrorCurrHigh\_2 10000 //1 increment= 200pA

#define RawErrorUpol\_674 25

#define RawErrorUpol\_500 25

#define RawErrorNTC\_25 4000//2500 //Value 25 incr \* 100 scaling!!!

/\*\*\*\*\*\* Error Tolerances after Calibration \*\*\*\*\*\*/

#define VerifyErrorCurrLow\_1 4 //12 //Old-3 //1 increment= 4pA

#define VerifyErrorCurrLow\_2 40 //200 //Old-40 //1 increment= 4pA

#define VerifyErrorCurrHigh\_1 5 //10 //Old-2 //1 increment= 200pA

#define VerifyErrorCurrHigh\_2 25 //100 //Old-20 //1 increment= 200pA

#define VerifyErrorNTC\_25 1000//2500 //Value 25 incr \* 100 scaling!!!

/\*\*\*\*\*\* Error Tolerances as RAW Values for WEP \*\*\*\*\*\*/

#define WEPErrorCurrLow\_1 1000 // old: +/-2nA

#define WEPErrorCurrLow\_2 6000 // old: 15% -> 6562.5

#define WEPErrorCurrHigh\_1 1000 // old: 15% -> 131.5

#define WEPErrorCurrHigh\_2 4000 //

#define WEPErrorUpol\_674 25

#define WEPErrorUpol\_500 25

#define WEPErrorNTC\_25 3000 //Value 25 incr \* 100 scaling!!!

### Get Page G015

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
|  | "G015" | Reads Page 15 in State:  Box\_StartSensorCalibration!!! | ascii | 32 |  |

### Finalise Aktive Senor S200

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Finalise | "S200" | Prepare for next calibration | ascii | None |  |

### Get Errovalues G200

Values appear comma separated

If ErrorCode = 0 - NoError

If ErrorCode = 1 - Standard Deviation was out of range (Noisy Signal)

If ErrorCode = 2 - Calculated Mean was out of range (Offset Error)

If ErrorCode = 3 - Standard Deviation & Calculated Mean were out of range

If ErrorCode = 4 - Timeout!!!

If ErrorCode = 8 - Tempertur Fehler

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
|  | "G200" | Get error values | ascii | 2 |  |
|  |  | BoxStatus | ascii | 1 | Hex |
|  |  | ErrorCode | ascii | 1 | Hex |
|  |  | ReferenzValue | ascii |  | Float |
|  |  | Mean of Measured Value | ascii |  | Float |
|  |  | StdDeviation | ascii |  | Float |
|  |  | Error (abs(Mean-Ref)) | ascii |  | Float |

### BoxReset S999

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Reset | "S999" | Box Reset | ascii | None |  |

### S100

| **Command** | **Send** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
|  | "S100" | A Inpro6850i will be Calibrated. Two Calibration Sets (Upol=674mV and Upol=500mV) will be generated  Set CalibrationStatus = 0 | ascii | None |  |

### S500

| **Command** | **Send** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Reset | "S500" | A Inpro69xxi will be Calibrated. (Upol=500mV)  Set CalibrationStatus = 2 | ascii | None |  |

### Debug G901

Enables and Disables the print out of Calculated Mean /StdDev and Error while Calibration very second.

All Values are separated by a Semocolon.

| **Command** | **Send** | **Receive** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Debug | "G901" | g901 | ascii | 4 |  |
|  |  | BoxStatus | ascii | 1 | Byte |
|  |  | CalibrationStatus | ascii | 1 | Byte |
|  |  | O2Current ReferenzValue | ascii |  | Float |
|  |  | Mean of Measured O2 Value | ascii |  | Float |
|  |  | O2Current StdDeviation | ascii |  | Float |
|  |  | Error (abs(Mean-Ref)) | ascii |  | Float |
|  |  | TempCurrent ReferenzValue | ascii |  | Float |
|  |  | Mean of Measured TempValue | ascii |  | Float |
|  |  | Temp StdDeviation | ascii |  | Float |
|  |  | TempRawError (abs(Mean-Ref)) | ascii |  | Float |

g901;BoxStatus;CalibStatus;I\_rawSoll;I\_rawIst;I\_StdDev;T\_rawSoll;T\_rawIst;T\_StdDev;T\_Error;

### Debug G902

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Debug | "G902" | Enables the print out of Measurment Data while Calibration every second | ascii | None |  |

### Debug G903

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Debug | "G903" | g903 | ascii | None |  |
|  |  | BoxStatus | ascii |  |  |
|  |  | CalibrationStatus | ascii |  |  |
|  |  | O2Current ReferenzValue | ascii |  | Float |
|  |  | Mean of Measured O2 Value | ascii |  | Float |
|  |  | O2Current StdDeviation | ascii |  | Float |
|  |  | Error (abs(Mean-Ref)) | ascii |  | Float |
|  |  | TempCurrent ReferenzValue | ascii |  | Float |
|  |  | Mean of Measured TempValue | ascii |  | Float |
|  |  | Temp StdDeviation | ascii |  | Float |
|  |  | TempRawError (abs(Mean-Ref)) | ascii |  | Float |

Enables and Disables the print out of Calculated Mean /StdDev and Error while Calibration very second.

All Values are separated by a Semocolon.

g903;15;01;+674.00000;+674.00000;+1000000.0;+0.0000000;

g903;BoxStatus;CalibStatus;I\_rawSoll;I\_rawIst;I\_StdDev;T\_rawSoll;T\_rawIst;T\_StdDev;T\_Error;

### Debug G904

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Debug | "G904" | Measures the Polarization Voltage on Cathode to GND | ascii | None |  |

### Debug G905

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Debug | "G905" | Measures the Polarization Voltage on Anode to GND | ascii | None |  |

### Debug G906 / Read Sensor Page 16

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Debug | "G906" | G906 | ascii | None |  |
|  |  | Current |  |  |  |
|  |  | Current Raw |  |  |  |
|  |  | Temperature |  |  |  |
|  |  | Temp Voltage |  |  |  |
|  |  | Upol |  |  |  |
|  |  | U Anode |  |  |  |
|  |  | MB Range |  |  |  |

Format:

Current[nA];(Current[incr]);Temperature[°C];(TempVoltage[incr]);Upol;Uanode;MB Range;

### Debug G907 Set Box to 0 pA

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Debug | "G907" | g907 | ascii | None |  |

### Debug G908 Set Box to 175 nA

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Debug | "G908" | g908 | ascii | None |  |

### Debug G909 Set Box to 4700 nA

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Debug | "G909" | g909 | ascii | None |  |

### Debug G910 Perform a Polarizations Voltage (Upol) Test

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Debug | "G910" | g910 | ascii | None |  |
|  |  | Box Status |  |  |  |
|  |  | Calibration Status |  |  |  |
|  |  | Upol ReferenzValue | ascii |  |  |
|  |  | Mean of Measured Value | ascii |  |  |
|  |  | Upol StdDeviation | ascii |  |  |
|  |  | Error (abs(Mean-Ref)) | ascii |  |  |

P

### Debug G911 Perform Temperature Test

| **Command** | **Code** | **Description** | **Parameters** | **No. Of bytes** | **Format** |
| --- | --- | --- | --- | --- | --- |
| Debug | "G911" | g911 | ascii | None |  |
|  |  | Box Status |  |  |  |
|  |  | Calibration Status |  |  |  |
|  |  | Temp ReferenzValue |  |  |  |
|  |  | Mean of Measured Value |  |  |  |
|  |  | Temp StdDeviation |  |  |  |
|  |  | Error (abs(Mean-Ref)) |  |  |  |

# Commands witch access to Box and Sensor

## Commands with Sensor access

### #RDPG Read Page from Sensor

Master Request to read Page 10 from Sensor:

"#RDPG 10 "

CalibBox Answer:

"#rdpg 0A 1F0102030405060708090A0B0C0D0E0F101112131415161718191A1B1C1D1E10"

### #WRPG Write Page To Sensor

Master command to overwrite page 10 of connected Sensor:

"#WRPG 10 1F0102030405060708090A0B0C0D0E0F101112131415161718191A1B1C1D1E10"

CalibBox Answer:

Correct communication and corect checksum

#wrpg 0A 1F0102030405060708090A0B0C0D0E0F101112131415161718191A1B1C1D1E10 - CS OK

If there is a wrong Checksum !

#wrpg 0A 110102030405060708090A0B0C0D0E0F101112131415161718191A1B1C1D1E1F - CS Error: 11 expected CS: 10

If there is a wrong length of data's !

#wrpg 0A Wrong Data length

## Commands to read and change Box Parameter

Similar like the ISM Sensor the Box Parameter are structured page wise. If a "#RDBX Page" command is send, the box will read and send 32Bytes in ascii format from that Page.

### #RDBX 10 Read Page from Calibration Box

Master Request to read Page 10 from Box: **"#RDPG 10 "**

CalibBox Answer:

**"#rdbx 0A 1F0102030405060708090A0B0C0D0E0F101112131415161718191A1B1C1D1E10"**

#### Data Structur of Page 10:

//-- Flash-Page 10 -- Adr. x220 --

%ErrCurrCalMB1\_000nA, "ErrCurrCalMB1\_000nA", CAL, 16, UnInt, , , "PAR", "incr"

%ErrCurrCalMB1\_175nA, "ErrCurrCalMB1\_175nA", CAL, 16, UnInt, , , "PAR", "incr"

%ErrCurrCalMB2\_175nA, "ErrCurrCalMB2\_175nA", CAL, 16, UnInt, , , "PAR", "incr"

%ErrCurrCalMB2\_4700nA,"ErrCurrCalMB2\_4700nA", CAL, 16, UnInt, , , "PAR", "incr"

%ErrCurrVerMB1\_000nA, "ErrCurrVerMB1\_000nA", CAL, 16, UnInt, , , "PAR", "incr"

%ErrCurrVerMB1\_175nA, "ErrCurrVerMB1\_175nA", CAL, 16, UnInt, , , "PAR", "incr"

%ErrCurrVerMB2\_175nA, "ErrCurrVerMB2\_175nA", CAL, 16, UnInt, , , "PAR", "incr"

%ErrCurrVerMB2\_4700nA, "ErrCurrVerMB2\_4700nA", CAL, 16, UnInt, , , "PAR", "incr"

%ErrStdDevMB1\_000nA, "ErrStdDevMB1\_000nA", CAL, 8, UnInt, , , "PAR", "incr"

%ErrStdDevMB1\_175nA, "ErrStdDevMB1\_175nA", CAL, 8, UnInt, , , "PAR", "incr"

%ErrStdDevMB2\_175nA, "ErrStdDevMB2\_175nA", CAL, 8, UnInt, , , "PAR", "incr"

%ErrStdDevMB2\_4700nA, "ErrStdDevMB2\_4700nA", CAL, 8, UnInt, , , "PAR", "incr"

### #RDBX 31 Read Page from Calibration Box

Master Request to read Page 10 from Box: **"#RDPG 31 "**

CalibBox Answer:

**"#rdbx 20 1F0102030405060708090A0B0C0D0E0F101112131415161718191A1B1C1D1E10"**

#### Data Structur of Page 31

//-- Flash-Page 31 -- Adr. x240 --

%RefCurrMB1\_000nA, "RefCurrMB1\_000nA", CAL, 16, UnInt, , , "PAR", "nA"

%RefCurrMB1\_175nA, "RefCurrMB1\_175nA", CAL, 16, UnInt, , , "PAR", "nA"

%RefCurrMB2\_175nA, "RefCurrMB2\_175nA", CAL, 16, UnInt, , , "PAR", "nA"

%RefCurrMB2\_4700nA, "RefCurrMB2\_4700nA", CAL, 16, UnInt, , , "PAR", "nA"

%RefTemp\_25Deg, "RefTemp\_25Deg", CAL, 16, UnInt, , , "PAR", "incr"

%ErrUpol\_mV, "ErrUpol\_mV", CAL, 16, UnInt, , , "PAR", "mV"

%BoxNumber, "BoxNumber", CAL, 8, UnInt, , , "PAR", ""

%RefTemp\_5Deg, "RefTemp\_5Deg", CAL, 16, UnInt, , , "PAR", "incr"

%RefTemp\_50Deg, "RefTemp\_50Deg", CAL, 16, UnInt, , , "PAR", "incr"

%ErrTemp, "ErrTemp", CAL, 8, UnInt, , , "PAR", "°C"

### #WRBX Change Calibration Parameter of Calibration Box

Write Page 10

#WRBX 10 1F0102030405060708090A0B0C0D0E0F101112131415161718191A1B1C1D1E10

CalibBox Answer:

Correct communication and corect checksum

#wrpg 0A 1F0102030405060708090A0B0C0D0E0F101112131415161718191A1B1C1D1E10 - CS OK

If there is a wrong Checksum ! it will show

#wrpg 0A 110102030405060708090A0B0C0D0E0F101112131415161718191A1B1C1D1E1F - CS Error: 11 expected CS: 10

## Box Configuration

## Beispiel für den Ablauf und deren Werte einer Calibration



# Change History

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date | HW\_ID | HW Variante | FW | Changes |
| 05.08.19 | 1 | 1 | 2.2.0 | Initial Version |
| 05.02.20 | 1 | 2 | 2.2.1 | Bestückungs Änderung: Q110 Removed, R120=120Ohm,  R142=220k R109=56000 / 0.01% / 5ppm R104=22000 / 0.01%/ 5ppm R101=3300 / 0.01% 5ppm IC103 2048mV statt 3V 10Mohm 0.1% zwischen Anode und Kathode für prezisinsmessung Upol.  Firmware Änderung:   1. 1-Wire Signal improvement using Strong PullUp Resistor 2. Änderung der mindest Messdauer für Kalibration von 30 auf min. 60s erhöht. 3. Änderung der mindest Messdauer für Kalibration von 30 auf min. 20s veringert. 4. Einführung des TimeOut Errors in Kalibration und Verifikation siehe Kapitel 6.1.4 |

## Wichtig:

Page 30 darf im Fall des Inpro6850i nicht verändert werden!