1. Startup / Calibration

2. Technical Details

3. Where can I measure what?

4. Common problems

5. Service Connector

6. Contact
### Easy Startup:

- **Check correct connection / installation**
- **Carry out automatic zero-adjustment in the menu**
- **Units and impuls-width selected according to order**

### Detailed startup routine:

**manual section 8**
Connect impulses terminals 51 / 52 with 100Ω burden
Choose Service-level, Code 4000
Select correct meter size
Default Option -> destroy calibration
Submenu Driver
Current limit 350mA or 160mA (Eex)
Primary gain acc. Table
Ktqm = -0.451
Ktfreq = 0.24
Ki and kp according to table
Amplitude acc. table

Ensure FRAM – Converter use same data
Initialize FRAM (data) (in case of empty FRAM: error, restart)
Calibration

- Fix density-frequency pair 1 empty pipe (Submenu Density)
- Fix density-frequency pair 2 filled pipe (Submenu Density)
- Set zero AB (internal zero point)
- Submenu Flow
  - Tm calib. Zero -> do not touch
  - Tm calib span -> Temp. During calib.
  - Span Forward -> adjusting through calibration
  - Zero -> internal zero adjustment (min. 3 times)
  - Span Reverse -> add. Calib. Or as Span Forward
- Insert customer specific units etc.
1. Startup / Calibration

2. Technical Details

3. Where can I measure what?

4. Common problems

5. Service Connector

6. Contact
FCM2000 Technology

Cut-away model

PT 100 for temperature compensation

Inductive sensors generate large signal amplitudes
The name DSP-ELCO FCM2000

It is the name of the Electronic Converter

- **DSP:**
  - A Digital Signal Processor for excitation and data acquisition is implemented

- **ELCO:**
  - Electronic Converter
What is measured?

- **Directly measured values:**
  - Phase shift between the motion sensors
  - Pipe frequency
  - Temperature
  - Driver current

- **Calculated Values:**
  - Mass flow
    - calculated by help of phase shift and temperature
  - Density
    - calculated by help of pipe frequency and temperature
  - Volume flow
    - calculated by help of mass flow and density
  - Concentration (only Densi-Mass)
    - calculated by help of density and temperature
Coarse Block Diagram

Primary

Signal Conditioning

A/D

DSP-Part

Signal Processing:
- Data Acquisition Algorithm
- Excitation Algorithm

μ P-Part

- Flow calculation
- Menu system
- Communication
- I/O handling
- Error handling

I/O Interface

- Keyboard
- Display
- Current Outputs
- Pulse Output
- Contact Input
- Contact Output
- Communication

Power Supply

Secondary

A/D

D/A

© ABB Göttingen, -Wg - 10

www.plcworld.cn
Interconnection of the PCB´s

- Primary Trio Mass
  - 10 Sensorlines
  - 2 Driverlines

- Sensor A: 85(A+), 85(A-)
- Sensor B: 87(B+), 87(B-)
- Sensor C: 89(C+), 90(C-)
- PT100: 83(Ut+), 81(It+), 84(Utz), 82(ITz)
- Driver: 91(D+), 92(D-)

- FCM2000

- EEx protection Board (Only for Eex)

- Front End Board Trio-Mass
  - E870
  - SP-501741 (5xx)
  - BA500810

- DSP - up Board
  - E872
  - SP-501742 (3xx)
  - BA500816

- I/O Board
  - E878
  - SP-501745 (2xx)
  - BA500839

- Power Supply Board
  - E877
  - SP-501744 (1xx)
  - BA500835

- Electronic Converter
  - DSP-ELCO Eex-Integral Converter
  - InterConnection of the PCB’s

- "i", intrinsically safe
- "d", explosion proof
Electronic Converter

- The Converter is interchangeable without any recalibration (data stored in EEPROM)

- The Converter consists of 5 boards (+1 for Ex/FM)
  - Power Supply Board
    - High voltage version and low voltage version
  - I/O Board
    - Interface to the customer with 10 terminals
  - DSP-Board
    - Brain Board with 2 processors and digital signal processing
  - Front End Board
    - Interface to the primary
  - Display Board
    - Display and keyboard for the customer
  - EEx Board (Only for Ex/FM)
    - Ex/FM protection
Eex Board (FM-Certification)

Sensor A
Us = 50mV to 500mV
f = 50Hz to 500Hz

Driver

PT100

Sensor B
Us = 50mV to 500mV
f = 50Hz to 500Hz

Sensor C
Us = 50mV to 500mV
f = 50Hz to 500Hz

Zener Barrier

TrioMass Primary

"is", intrinsically safe

Ex Board (Optional)

Zener Barrier

Zener Barrier

Zener Barrier

Zener Barrier

explosion proof
Front End Board: Description

- Signal conditioning of the three sensor coils
  - Preamplifier
  - 10kHz Anti Alias Filter

- Signal conditioning of the temperature
  - PT100 in 4wire technique
  - 1mA current source

- Excitation for the driver coil
  - The DSP generates the driver signal by help of a DAC
  - max. voltage output signal: $\pm 13V_{ss}$
  - Software controlled driver enable/disable
  - Driver current measurement
  - Thermal shutdown
  - Driver current limitation
    - standard: max Driver Current=350mA; Pmax=13V*0,35A=4,5W
    - Ex/FM >DN10C :max Driver Current=160mA; Pmax=13V*0,16A=2,1W
    - Ex/FM <=DN10C: max Driver Current=100mA; Pmax=13V*0,10A=1,3W
Front End Board: Measurement Points

MP501 AGND1

5x9.1
85(A+) (1)
87(B+) (4)
89(C+) (7)
83(UT+) (11)
82(UT-) (12)

5x9.2
91(D+) (1)

5x3
-15V (20)
+15V (21)
+3VD3 (23)
+5VD (24)
+5VA (26)
-5VA (27)

5x3
AD_IN_A (29)
AD_IN_B (30)
AD_IN_C (31)
AD_IN_D (32)
Front End Board: Plot of the Sensor Signals

Sensor A+ 5x9.1 pin1
Sensor B+ 5x9.1 pin3
Sensor C+ 5x9.1 pin5
Front End Board: Plot of the ADC Inputs

- AD_IN_A 5x3 pin29
- AD_IN_B 5x3 pin30
- AD_IN_C 5x3 pin31

V_{rms}(1)=871.8mV  V_{rms}(2)=648.9mV  V_{rms}(3)=870.4mV
DSP-Board: Description

- 16-Bit fixed point DSP for signal processing
  - 33 MIPS (Million Instructions per second)
- 2 Simultaneous 14-Bit sampling ADC’s
  - Sensor A and sensor B are sampled simultaneous
  - Advantage: no sampling phase shift, additive errors are sampled simultaneous
    -> good change to figure it out
- 4M-Bit flash for storing the DSP and uP program
  - Software update via the service connector
- 16kBit FRAM for non volatile storing (internal data memory)
  - storing of the primary, converter and customer data
  - storing of the counter values
- Supervisor circuit for 3,3V and 5V power supply
- 3,3V Power supply on board
Display Board: Block Diagram

- 3 Key Keyboard+
- Read Relais
- 2*16 LCD Display
- External FRAM Pluggable Modul

4x5 (to the DSP Board)
Display Board: Description

- 3 Key keyboard
  - Operation without opening the housing by help of a magnetic pencil

- 2*16 LCD display
  - Illuminated

- External data memory
  - Pluggable module (like the XE)
  - 16kbit nonvolatile FRAM
I/O- Board: Block Diagram

- Contact Input: 2
- Contact Output: 2
- Current Output II passive: 3
- Current Output I Option: HART: 2
- Impuls Output activ / passiv: 1
- 2x4 (to the customer Terminals)
- 2x2 (to the DSP Board)
- 2x1 (to the Power Supply Board)

Power Connections:
- +24V
- AGND5
- +25V
- DGND2
- +5VD

© ABB Göttingen -Wg - 24
I/O-Board: Specification I

Current output 1: Active output
0 mA to 24 mA
560 Ohm maximum load

Current output 2: Passive output
Supply voltage 12 V to 30 V
3.25 mA to 22 mA
1000 Ohm maximum load

Supply Voltage [V] vs. Maximum Load [Ohm]
I/O-Board: Specification II

**Pulse output:**  
Active or passive output (user selectable)  
16 V - 30 V  
220 mA maximum current  
5000 Hz maximum frequency

**Contact output:**  
Passive output  
Supply voltage 16 V to 30 V  
220 mA maximum current  
500 Hz maximum frequency  
output function is software programmable
Contact input: Passive input
Supply voltage 16 V to 30 V
input function is software programmable

HART: Superimposed on current output 1
1.2 mA current modulation
250 Ohm to 560 Ohm load
Frequency: 1200Hz / 2200Hz
Power Supply Board: Block Diagram

- ±5V
- +15V
- -15V
- +25V
- +24V
Power Supply Board: Specification

Power supply:

- **AC-high**
  - Input voltage: 85 V to 253 V
  - Input frequency: 47Hz to 64Hz

- **AC-low**
  - Input voltage: 16.8 V to 26.4 V
  - Input frequency: 47Hz to 64Hz

- **DC**
  - Input voltage: 16.8 V to 31.2V

Same pcb
## Variants of the Electronic Converter

<table>
<thead>
<tr>
<th>No.</th>
<th>Power Supply</th>
<th>I/O-Board</th>
<th>EEx/FM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AC/DC Low</td>
<td>Standard</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>AC/DC Low</td>
<td>HART</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>AC-High</td>
<td>Standard</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>AC-High</td>
<td>HART</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>AC/DC Low</td>
<td>Standard</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>AC/DC Low</td>
<td>HART</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>AC-High</td>
<td>Standard</td>
<td>Yes</td>
</tr>
<tr>
<td>8</td>
<td>AC-High</td>
<td>HART</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Data Memory Management

- External Data Memory (pluggable Module)
- Internal Data Memory
- Flash
- Factory Delivery State
- Electronic Converter (Interchangeable)
- RAM
- uP
- Tastatur/Displa-Board
- DSP-Board

Secondary
Three different menu structures can be selected in the Program Level Menu:

- **Prog. Level Blocked**
  - Standard Menu, data cannot be entered

- **Prog. Level Standard**
  - Standard Menu with all customer specific entries required for operating the instrument available

- **Prog. Level Special**
  - Special Menu with the complete customer specific entries available

- **Prog. Level Service**
  - Additional values are displayed after the correct Service Code number has been entered
DSP: Advantage of the DSP

- Reduced Analog Hardware
  - only input amplifier, output amplifier and anti alias filter are analog
  - decreased temperature effects
  - decreased changing over the time

- Parts of the Analog Hardware are moved to the Software
  - Filter Algorithm (Possibility to design ideal filters)
  - Software PD-Controller

- Complex Algorithms are possible
  - e.g Fourier Transformation and Correlation

- No changing of the hardware to get another behavior
  - only the algorithms have to be changed

- Increasing of the self diagnostic
  - diagnostic of the installation
  - diagnostic of the primary
1. Startup / Calibration

2. Technical Details

3. Where can I measure what?

4. Common problems

5. Service Connector

6. Contact
Typical sensor data

- Typical resistance driver coil: ca. 10 - 40Ω
- Typical resistance sensor coils: ca. 90 Ω (A and B must have ca. equal value)

- Check M6 - M7
- Check S1 - S2
- Check S3 - S4
- Check S5 - S6
- Results in Ω not kΩ area.
- UT+ and UT- ca. 110 Ω
- IT+ and IT- ca. 110 Ω
- UT+ and IT+ ca. 0 Ω
- UT- and IT- ca. 0 Ω

With 3 X PT-100 (normally not in used)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IT+</td>
<td>95</td>
<td>IT- &amp; UT- = 0 d</td>
</tr>
<tr>
<td>IT-</td>
<td>96</td>
<td>UT- &amp; IT+ = 110 d</td>
</tr>
<tr>
<td>UT+</td>
<td>93</td>
<td>IT+ &amp; IT- = 110 d</td>
</tr>
<tr>
<td>UT-</td>
<td>94</td>
<td>UT+ &amp; IT+ = 220 d</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UT+ &amp; UT- = 330 d</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UT+ &amp; IT- = 330 d</td>
</tr>
</tbody>
</table>

Standard

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>M7</td>
<td>M6 black</td>
</tr>
<tr>
<td>S1</td>
<td>red</td>
</tr>
<tr>
<td>S2</td>
<td>blue</td>
</tr>
<tr>
<td>S3</td>
<td>yellow</td>
</tr>
<tr>
<td>S4</td>
<td>green</td>
</tr>
<tr>
<td>S5</td>
<td>brown</td>
</tr>
<tr>
<td>S6</td>
<td>grey</td>
</tr>
<tr>
<td>IT+</td>
<td>violet</td>
</tr>
<tr>
<td>IT-</td>
<td>orange</td>
</tr>
<tr>
<td>UT+</td>
<td>violet or brown</td>
</tr>
<tr>
<td>UT-</td>
<td>orange</td>
</tr>
</tbody>
</table>

EEX

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>M7</td>
<td>black (11)</td>
</tr>
<tr>
<td>M6</td>
<td>black (12)</td>
</tr>
<tr>
<td>IT+</td>
<td>black (4)</td>
</tr>
<tr>
<td>IT-</td>
<td>black (3)</td>
</tr>
<tr>
<td>UT+</td>
<td>black (2)</td>
</tr>
<tr>
<td>UT-</td>
<td>black (1)</td>
</tr>
<tr>
<td>S6</td>
<td>black (5)</td>
</tr>
<tr>
<td>S5</td>
<td>black (6)</td>
</tr>
<tr>
<td>S4</td>
<td>black (7)</td>
</tr>
<tr>
<td>S3</td>
<td>black (8)</td>
</tr>
<tr>
<td>S2</td>
<td>black (9)</td>
</tr>
<tr>
<td>S1</td>
<td>black (10)</td>
</tr>
</tbody>
</table>
Density correction

Submenu Instrument

- Submenu Primary Calibr.
- Output data

Submenu Database

Submenu Service connector

Rest

- Submenu Density
  - selection kFreg
  -_submenu Density
    -_submenu Flow

D Correction

F1 /20 °C empty

D1 (empty)

F2 /20 °C filled

D2 (filled)

new FCM2000 reading

D Correction = reading reference - reading FCM 2000

Enter

0,0000 kg/l

D Correction = reading reference - reading FCM 2000

Enter

0,01

0,00999 kg/l

feedback by FCM 2000

example reading reference 1,120 kg/l

eXample reading FCM 2000 1,110 kg/l

D Correction = reading reference - reading FCM 2000

Enter

0,01

0,120 kg/l
Density calibration on site

- **Conditions on site:**
  - Filled pipes
  - Stable temp.
  - Known density in the pipe
  - Data storage of original data

### Flowchart

1. **Choose the service code area**
2. Code number 4000
   - Attention, you are in the Service Area!
3. Submenu Primary Calib.
4. Submenu Density
5. **Choose automatic and push enter to start the automatic frequency measurement**
6. **D2 (filled) 0.997633 kg/l**
7. Code number
   - Type in another number than 4000 to quit the service area
1. Startup / Calibration
2. Technical Details
3. Where can I measure what?
4. Common problems
5. Service Connector
6. Contact
Common Problems

- Installation problems:
  - Air in medium (gas phase, bubbles etc.)
    - Air must be avoided, maybe vertical installation
    - Increase backpressure (data sheet: at least 0.2 bar)
    - Check driver current and density – may not be stable (service code req.)
  - Medium might develop gas phase under certain conditions (no flow, high temp. etc.)
    - Turn meter 90° might help, if connect. Box was on top

- Process vibrations
  - Problem only in case of process noise = resonance frequency
    - Compensators for damping process noise, for all fittings and support of meter
    - Good support of meter directly in front and behind of fitting

- Process problems:
  - Piston pumps: creating noise at resonance frequency
  - Sedimentation: cleaning of meter might be required
  - Abrasion: flow velocity not more than 1 m/s (3.3 ft/sec), vertical installation
Common problems

- Electrical problems:
  - Ensure correct grounding of meter (primary and converter)
  - Check outputs with simulation mode
  - Impuls outputs: check jumper for active/passive (Ex: jumper on position active, although working as passive)
  - Faulty sensor amplitudes / reverse measurement / Temp. Measurement
    - Check sensor amplitudes on display (service code 4000 required)
    - Coils / PT100 may be broken -> Check resistance
    - Wrong values: meter must be sent to Göttingen factory
1. Startup / Calibration
2. Technical Details
3. Where can I measure what?
4. Common problems
5. Service Connector
6. Contact
Bootloader: Tasks and Advantages

Advantages in opposite to „normal“ eproms
- Very fast software update
- No replacement of the old eprom
- No additional hardware costs for a software update
- Update can sent via E-Mail

Tasks
- Load new converter programs into flash memory
- Start up the real converter program
- Store converter data and store process data
Boostrap: Before starting a Software Update

You need
- Computer with a terminal program (for example HyperTerminal)
- TTL-Box
- New converter program

You have to
- Connect the TTL-Box to the computer and to the service connector of the converter
- Start the terminal program with appropriate settings
Bootloader: Terminal Settings (HyperTerminal)

Eigenschaften von DSP ELCO

- Verbinden mit Einstellungen
- Verbinden über COM1
- Konfigurieren
- Landeskennzahl: Deutschland (43)
- Ortsteilwahl:
- Telefonnummer:
- Emulation: ANSI
- Zeilen im Bildlaufpuffer: 500
- Akustisches Signal beim Verbinden oder beim Trennen.
Bootloader: Terminal Settings (HyperTerminal)

possible Baudrates:
- 2400 bit/s
- 4800 bit/s
- 9600 bit/s
- 19200 bit/s
- 38400 bit/s
- 57600 bit/s
Power on the converter

Bootloader starts up and checks the service connector

TTL-Converter plugged in

No

Yes

Waiting for "Space"-Character while switching the baudrate

Bootloader start screen

Start converter program
Bootloader: Start Screen

*************** Fischer & Porter ***************

*** No software information available ! ***

Type for

Menu ............................................ "M"
Start converter program .................................. "S"
Bootloader: new software

*************** Fischer & Porter ***************

Type for:

- Store new software into the converter .................. "U"
- Display converter software information ............ "I"
- Display bootloader and flash information ........ "B"
- Start converter program ............................. "S"
- Reset converter .......................... "R"

© ABB Göttingen, Wg - 48
Bootloader: new software

*************** Fischer & Porter ***************

------------------------------
*    Warning !                      *
*                             *
*    You will overwrite the actual software ! *
*    Be sure to send the correct file to the converter. *
*                             *
*    To cancel, press any key.       *
*                             *
------------------------------

To save the file in the converter, send it via XModem.

CCCC
Bootloader: File Transfer Menu
Bootloader: File Transfer

Xmodem Dateiübersendung für DSP ELCO

- Senden: D:\mm4000.elco
- Paket:  
- Fehlerprüfung: CRC
- Wdh.: 0  Wdh. gesamt: 0
- Letzter Fehler:
- Datei: 
- Dauer bisher: 00:00:18  Restdauer: 00:00:04  Durchsatz: 21330 bps

Abbrechen  cps/bps

Verbunden 0:18:30  ANSI  38400 8-N-1  RF  GROSS  NF  Aufzeichnen  Druckerecho
Bootloader: new software

*************** Fischer & Porter ***********************

******************************************************************************
* * *
* SUCCESS * *
* * The file was correctly stored in the converter! * *
* * *
******************************************************************************

Verbunden 2:13:27   ANSI  38400 8-N-1   RF GROSS NF Aufzeichnen Druckerecho
Bootloader: new software

*************** Fischer & Porter ***************

Type for:

Store new software into the converter ............... "U"
Display converter software information ............ "I"
Display bootloader and flash information .......... "B"
Start converter program ............................. "S"
Reset converter ........................................ "R"
Fischer & Porter

Software: MM4000
Version: D699F001U01
Revision: A.XX
Date: 22.04.1999
Bootloader: Check Flash

Type for:
- Store new software into the converter ............. "U"
- Display converter software information .......... "I"
- Display bootloader and flash information .......... "B"
- Start converter program .................................. "S"
- Reset converter ........................................... "R"
Bootloader and Flash Information

*************** Fischer & Porter ***************

ELCO-DSP-Bootloader information

Version : D699F002U01   Revision : A.00
Date : 21.04.1999
Checksum : *** O K ! ***

Flash information

Manufacturer : AMD
Device type : Am29DL400B T
Sector : 0 1 2 3 4 5
Protection : No No No No No
Hardware key : ED 53 22 42 DF

Verbunden: 1:20:20 | ANSI 38400 8-N-1 RF GROSS NF Aufzeichnen Druckerecho
Bootloader: Converter access

Keep pressed until converter shows Software version
Bootloader: Converter access

- Access converter through following keys:
  - „tab“, equ, to C/CE on converter
  - Arrow keys: up and down
  - Return key
  - Number keys

- Data storage:
  - First choose Transfer -> Capture Text
  - Choose in converter menu „output data“ variables to be stored
  - Start capture with „CTRL O“
DSP: Driver Algorithm

ADC

Sampled Values
Sensor Coil C

Mean average value (Istwert)
(corresponds to the mechanical amplitude)
=actual value
(Display:"I Driver+Amp C" "I Treiber+Amp C")

Nominal Value (Sollwert)
depending on the meter size
(menu:Driver ->"Amplitude")

DAC

Primary

Multiplier

PI Controller Algorithm

(menu: Driver-> "kp"
menu:Driver-> "ki"

Driver DSP Algorithm
DSP: Sensor Difference Algorithm

- ADC
- Sampled Values
  - Sensor Coil A
  - Sensor Coil B
  - Sensor Coil C

Band Pass Filtering
FIR-Filter
Data Reduction

Amp A = Amp B

Mean average value
Diff = A - B
Sum = A + B

Qm = k * Diff / Sum - AZ

k = Proportionality Constant
AZ = AutoZero
DSP: Sensor Multiplication Algorithm

ADC

Sampled Values
Sensor Coil A B C

Band Pass Filtering
FIR-Filter

Flow direction
Driver Coil D

Sensor Coil A

Sensor Coil B

Sensor Coil C

90° shifter

B

A

Mean average value
\( \text{Mul} = A \times \cos B \)

Mean average value
\( \text{Sum} = A + B \)

Qm = \( k \times \text{Mul} / \text{Sum} - \text{AZ} \)

k = Proportionality Constant
AZ = AutoZero

k=ProportionalityConstant
AZ=AutoZero
## Appendix A: Design Documents

<table>
<thead>
<tr>
<th>Component</th>
<th>Standard</th>
<th>Leiterplatte</th>
<th>Bauanweisung</th>
<th>Schaltplan</th>
<th>ERP Code</th>
<th>Order Code</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Einschub U-Gross</td>
<td>HART RS_485 EEx EEx HART</td>
<td>D674A848U01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Einschub 24V</td>
<td>HART RS_485 EEx EEx HART</td>
<td>D674A849U01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSP Board</td>
<td></td>
<td>D685A956U03</td>
<td>Leiterplatte</td>
<td>Bauanweisung</td>
<td>D358E872U01</td>
<td>BA-50-0816</td>
<td>SP-50-1742</td>
</tr>
<tr>
<td>Front End Board</td>
<td></td>
<td>D685A959U03</td>
<td>Leiterplatte</td>
<td>Bauanweisung</td>
<td>D358E870U01</td>
<td>BA-50-0810</td>
<td>SP-50-1741</td>
</tr>
<tr>
<td>Power Supply Board</td>
<td>U-Gross EEx U-Gross EEx 24V</td>
<td>D685A971U03</td>
<td>Leiterplatte</td>
<td>Bauanweisung</td>
<td>D358E877U01</td>
<td>BA-50-0835</td>
<td>SP-50-1744</td>
</tr>
<tr>
<td>I/O Board</td>
<td>Standard HART RS_485 EEx EEx</td>
<td>D685A972U04</td>
<td>Leiterplatte</td>
<td>Bauanweisung</td>
<td>D358E896U01</td>
<td>BA-50-0839</td>
<td>SP-50-1745</td>
</tr>
<tr>
<td>EEx Board</td>
<td>Standard FM-Zulassung</td>
<td>D685A964U03</td>
<td>Leiterplatte</td>
<td>Bauanweisung</td>
<td>D358E884U01</td>
<td>BA-50-0827</td>
<td>SP-50-1750</td>
</tr>
<tr>
<td>Displayplatte (<em>XE</em>)</td>
<td></td>
<td>D685A667U15</td>
<td>Leiterplatte</td>
<td>Bauanweisung</td>
<td>D358E691U01</td>
<td>BA-50-0838</td>
<td>SP-50-1615</td>
</tr>
<tr>
<td>Backplane Board*</td>
<td>Standard EEx</td>
<td>D685A986U03</td>
<td>Leiterplatte</td>
<td>Bauanweisung</td>
<td>D358E896U01</td>
<td>BA-50-0859</td>
<td>SP-50-1760</td>
</tr>
<tr>
<td>EMV Board*</td>
<td></td>
<td>D685A987U03</td>
<td>Leiterplatte</td>
<td>Bauanweisung</td>
<td>D358E895U01</td>
<td>BA-50-0860</td>
<td>SP-50-1759</td>
</tr>
<tr>
<td>Baugruppe: EMV+Backplane</td>
<td></td>
<td>D682A009U01</td>
<td>EMV Board</td>
<td>Backplane Board</td>
<td>D685A987...</td>
<td>BA-50-0861</td>
<td></td>
</tr>
<tr>
<td>FRAM Board</td>
<td></td>
<td>D685A999U01</td>
<td>Leiterplatte</td>
<td>Bauanweisung</td>
<td>D358E892U01</td>
<td>BA-50-0848</td>
<td>SP-50-1758</td>
</tr>
</tbody>
</table>
Agenda

1. Startup / Calibration
2. Technical Details
3. Where can I measure what?
4. Common problems
5. Service Connector
6. Contact
Contact

- Norbert Jeske (service specialist)
  - Norbert.jeske@de.abb.com
  - Phone: +49 551 905 493

- Frank Frenzel (productmanager)
  - Frank.w.frenzel@de.abb.com
  - Phone: +49 551 905 389