For Converter
Model S4 (BA D184B122U02)
Instrument Designation
FSM4000 Model SE21_/SE41F

Operating Instruction
Part No. D184B121U02
Issue: 07.05
Revision: 02

Manufacturer:
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1 Flowmeter Primary and Converter Coordination

Notice!
This flowmetering system uses AC magnetic field excitation technology. The system consists of a flowmeter primary which is installed in the pipeline and a remotely mounted converter. In order to assure trouble free operation it is essential that a Model S4 converter be used with this flowmeter primary type and vice versa. The complete model number may be found on the Name Plate.

Flowmetering System with AC Magnetic Field Excitation

1.1 Application Range
The electromagnetic flowmeter provides an economical and precise method for metering the flowrate of liquids, slurries, pastes and sludges with an electrical conductivity $\geq 20 \mu\text{S/cm}$ (option $\geq 0.5 \mu\text{S/cm}$). The metering system is especially well suited for fast changing processes, two phase liquids, and continuous or pulsating flows (piston pump operation).

1.2 Model Number Coordination

<table>
<thead>
<tr>
<th>Flowmeter Primary</th>
<th>Converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Str. stl housing Series 2000 SE21_/SE21F (Flanged)</td>
<td>SM4000</td>
</tr>
<tr>
<td>Previous Series 2000 versions DS21_/DS21F, 10DS2111</td>
<td>MAG-SM</td>
</tr>
<tr>
<td>Aluminum housing Series 4000 SE41F (Flanged)</td>
<td>SM4000</td>
</tr>
<tr>
<td>Previous Series 3000/4000 versions DS41F/DS44F, 10DS3111/2, 10DS3121, 10DI1425, 10DI1422</td>
<td>MAG-SM</td>
</tr>
</tbody>
</table>

1.3 Operating Instruction

<table>
<thead>
<tr>
<th>Flowmeter Primary</th>
<th>Converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABB Part No.: D184B121U02</td>
<td>SM4000</td>
</tr>
</tbody>
</table>

1.4 Condensed Instructions
Assembly and installation
ABB Part No.: D184B121U12

1.5 Metering System Specifications

<table>
<thead>
<tr>
<th>Flowmeter Primary</th>
<th>Converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM4000</td>
<td>ABB Part No.: D184S073U02</td>
</tr>
</tbody>
</table>

Design
A electromagnetic flowmetering system consists of a flowmeter primary and a converter. The flowmeter primary is installed in the pipeline and the converter for processing the flowrate information is mounted separately either directly at the site or in a central location.
### Overview, Flowmeter Primary Designs

#### Flowmeter Primary

<table>
<thead>
<tr>
<th>Model Number</th>
<th>SE21*</th>
<th>SE21F</th>
<th>SE21W</th>
<th>SE41F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process Connections</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN</td>
<td>Inch</td>
<td>PN</td>
<td>*</td>
<td>DN</td>
</tr>
<tr>
<td>Wafer Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3–100</td>
<td>1/10-4</td>
<td>W</td>
<td>–</td>
<td>3–50</td>
</tr>
<tr>
<td>Flanges DIN 2501</td>
<td>–</td>
<td>3–100</td>
<td>10–40</td>
<td>–</td>
</tr>
<tr>
<td>Flanges ANSI B16.5</td>
<td>–</td>
<td>1/10”–4”</td>
<td>150–300</td>
<td>CL/JIS</td>
</tr>
<tr>
<td>Food Industry Fitting DIN 11851</td>
<td>25–100</td>
<td>1–4</td>
<td>10</td>
<td>S</td>
</tr>
<tr>
<td>Weld stubs DIN 11850</td>
<td>3–100</td>
<td>1/10–4</td>
<td>10</td>
<td>R</td>
</tr>
<tr>
<td>Weld stubs DIN 2463</td>
<td>3–100</td>
<td>1/10–4</td>
<td>10</td>
<td>Q</td>
</tr>
<tr>
<td>Weld stubs ISO 2037</td>
<td>25–100</td>
<td>1–4</td>
<td>10</td>
<td>P</td>
</tr>
<tr>
<td>Tri-Clamp DIN 32676</td>
<td>25–100</td>
<td>1–4</td>
<td>10</td>
<td>T</td>
</tr>
<tr>
<td>External threads ISO 228</td>
<td>10–40</td>
<td>3/8–1-1/2</td>
<td>10</td>
<td>C</td>
</tr>
<tr>
<td>1/8” Sanitary connectors</td>
<td>3–25</td>
<td>1/10–1</td>
<td>10</td>
<td>E</td>
</tr>
<tr>
<td>Liner</td>
<td>1–2</td>
<td>1/25–3/32</td>
<td>10</td>
<td>B</td>
</tr>
<tr>
<td>Food Industry Fitting DIN 11851</td>
<td>PEEK, Tetron (&lt;DN3 [1/10”])</td>
<td>PFA</td>
<td>PFA</td>
<td>Hard/soft rubber, PTFE, PFA, others</td>
</tr>
<tr>
<td>Conductivity</td>
<td>≥ 20 µS/cm</td>
<td>Option ≥ 0.3 µS/cm in preparation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrodes</td>
<td>SS No. 1.4571 [316Ti], SS No. 1.4539, Hastelloy B-2/C-4, Platinum-Iridium, Tantalum, Titanium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process connection material</td>
<td>SS No. 1.4404 [316L]</td>
<td>SS No. 1.4571 [316Ti]</td>
<td>–</td>
<td>Steel, SS No. 1.4571 [316Ti]</td>
</tr>
<tr>
<td>Protection Class per EN 60529</td>
<td>IP 67/IP 65</td>
<td>IP 67/IP 68</td>
<td>IP 67/IP 68</td>
<td>IP 67/IP 68</td>
</tr>
<tr>
<td>Fluid temperature</td>
<td>-25 to 130 °C</td>
<td>-25 to 130 °C</td>
<td>-25 to 130 °C</td>
<td>≥ 20 S/cm</td>
</tr>
<tr>
<td>Approvals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hygienic &amp; sterile requirements</td>
<td>CIP/SIP-capable FML, 3A, EHEDG</td>
<td>CIP-capable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Converter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model Number</td>
<td>S4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply power</td>
<td>85 – 253 V AC, 24 V AC/DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current output standard</td>
<td>0/2–10 mA, 0/4–20 mA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse output, 1-channel std.</td>
<td>active, 24 V, optocoupler (220 mA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ext. Zero return</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ext. Totalizer reset</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward/reverse metering</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>HART-Protocol® (PROFIBUS PA, FF in preparation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empty pipe detector std.</td>
<td>yes, from DN 10 [3/8”] and ≥ 20 µS/cm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self monitoring, diagnostics</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local display/totalizer</td>
<td>yes, manual entry (totalize and display in weight units)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection Class / EN 60529 09/00</td>
<td>IP 67, NEMA 4X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>Field mount housing</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3 Functional Description

ABB Automation Products Electromagnetic Flowmeters "EMF" are the ideal flow metering instruments for all liquids, slurries, pastes or sludges with a conductivity above a specific minimum value. The instruments meter accurately, produce no additional pressure drop, contain no moving or protruding parts and are wear free and corrosion resistant. Installations can be made in any existing pipeline.

ABB Automation Products EMFs have been field proven over many years and are the flowmeter of choice in the Chemical industry, Municipal Water and Waste Water treatment facilities, Food industry and the Paper industry.

Principle of Operation

Faraday’s Laws of Induction form the basis for the electromagnetic flowmeters. It states that a voltage is induced in a conductor as it moves through a magnetic field.

This principle is applied to a conductive fluid which flows through a magnetic field generated perpendicular to the flow direction, see Schematic.

\[ U_E = B \cdot D \cdot v \]

The voltage induced in the fluid is measured at two electrodes, installed diametrically opposite to each other. This signal voltage \(U_E\) is proportional to the magnetic induction \(B\), the electrode spacing \(D\) and the average flow velocity \(v\).

Noting that the magnetic induction \(B\) and the electrode spacing \(D\) are constants indicates that a proportionality exists between the signal voltage \(U_E\) and the average flow velocity \(v\). Further, the equation for volume flowrate* shows that the signal voltage \(U_E\) is linear and proportional to the volume flowrate.

\[ U_E = q_v \]

* \( q_v = \frac{D^2 \pi}{4} \cdot v \)

Fig. 1: Electromagnetic Flowmeter Schematic
3.1 External Data Storage Module FRAM (Ferroelectric Nonvolatile Random Access Memory)

When a flowmeter primary and converter are shipped, the data storage module (external FRAM) is installed in the flowmeter primary. Prior to installation, the ext. FRAM is to be removed from the flowmeter primary and plugged into the socket on the connection board in the converter. The ext. FRAM is already installed in the converter only when a converter is ordered separately. It includes a label listing its value settings, Cs = 100 % and Cz = 0 %. These values are only required for flowmeter primaries from the previous series.

---

**Fig. 2:**

![External data storage module (FRAM)](image1)

*Information!*

Please plug the data storage module into the socket on the converter connection board!

The data storage module stores the flowmeter primary data, e.g. the meter size, Cs, Cz, Type, etc.

---

**Fig. 3:**

![External data storage module (FRAM)](image2)

*Information!*

The data storage module from the associated flowmeter primary is plugged into the socket and secured with the screw (please compare the information on the tag on the FRAM with the Order No. and TAG-No. if applicable).
4 Safety Information

4.1 Basic Safety Requirements

4.1.1 Instrument Safety Standards

• This equipment corresponds to the fundamental safety requirements of the Pressure Equipment Directive and is designed using the latest state-of-the-art technology. It was tested at the factory, based on the safety requirements, and was shipped in proper working order. In order to maintain this condition over the life of the instrument the requirements described in this Operating Instruction must be observed and followed.

• The instruments satisfy the EMC-Requirements in EN 61326 /NAMUR NE 21.

• All instrument parameters (including the totalizer values) are permanently stored in an FRAM during a power outage or when the power is turned off. The instrument is immediately operational once the power is turned on again.

4.1.2 Correct Usage

This instrument is used

• to meter during transport of electrically conductive liquids, slurries, pastes and sludges

• the actual volume flowrate or

• the mass flowrate (at constant pressure / temperature) when the mass units parameter is selected

Correct usage includes the following:

• installations compatible with the specification limits

• observing and following the information relative to allowable fluids

• observing and following the statements in the Operating Instruction

• observing and following the information in the accompanying documents (Data Sheet)

The following equipment uses are not permitted:

• installation as a flexible adapter in piping, e.g. to compensate for pipe offsets, pipe vibrations, pipe expansions etc.

• use as a climbing aid, e.g. for assembly purposes,

• use as a support for external loads, e.g. as a bracket for pipelines etc.

• addition of materials or parts by painting (covering the Name Plate), welding or soldering

• removal of materials, e.g. by drilling into the housing

• repairs, modifications and additions and the installation of replacement parts. These are only permitted using the procedures described in this Operating Instruction. Additional tasks must be approved by ABB. We accept no liability for unauthorized tasks.

The operation, service and maintenance requirements in this Operating Instruction must be observed. The manufacturer assumes no responsibility for damages resulting from improper or prohibited use.

4.1.3 Specification Limits

The instrument is designed exclusively for use within the specifications listed on the Name Plate and in the Operating Instruction. The following limits must be observed:

• the allowable pressure (PS) and the allowable fluid temperature (TS) must be ≤ than the pressure-temperature values (p/T-Ratings) listed in the Operating Instruction.
- the maximum operating temperature defined in the Instrument Data Sheet may not be exceeded.
- the allowable ambient temperature range defined in the Instrument Data Sheet may not be exceeded
- housing Protection Class IP 67 or IP 68 per EN60529
- graphite must not applied to the seals because, under certain circumstances, it may cause an electrically conductive coating to form on the inside of the flowmeter.
- the flowmeter primary may not be operated in the vicinity of strong electromagnetic fields, e.g., motors, pumps, transformers, etc. A minimum spacing of approx. ca. 100 cm should be maintained. For installation on or to steel parts (e.g. steel brackets) a minimum spacing of approx. ca. 100 mm should be maintained. (These values were established using IEC801-2 or IEC TC 77B (SEC 101) as a guide).

4.1.4 Allowable Fluids (Liquids)

- Only fluids (liquids) may be metered for which assurance is available, from either published technical information or operational experience of the user, that the chemical and physical properties of the fluid wetted parts in the flowmeter (signal and or grounding electrodes, liner materials, connection fittings and grounding plates if used) will not be adversely affected during the life of the flowmeter.
- Fluids (liquids) with unknown or abrasive properties may only be metered if the user performs periodic inspections to assure that the safety parameters of the flowmeter have not been compromised.
- The specifications on the Name Plate are to be observed.

4.1.5 Safety Signs and Symbols, Name Plate and CE-Mark

All safety signs, symbols and the Name Plate are to be maintained in a readable condition and replaced if damaged or lost. Observe the following general information:

| Warning! | Warning indicates possible hazards to personnel, which may result in serious injury or even death. Follow these instructions to protect yourself and others. |
| Caution! | Attention indicates possible damage to components resulting in incorrect operation. Follow these instructions to prevent damage to the instrument. |
| Important! | Information indicates an important task or procedure, which must be followed correctly to prevent operating interruptions or improper functioning of the instrument. |
| CE-Mark | The CE-Mark confirms compliance of the instrument with the following guidelines and the fulfillment of their basic safety requirements: |
| | - CE-Mark on the Name Plate (on the converter) |
| | - Compliance with EMC-Directive 89/336/EWG |
| | - CE-Mark on the Name Plate (on the flowmeter primary) |
| | - Compliance with Pressure Equipment Directive (PED) 97/23/EU |
| | A CE-Mark is not present on the Name Plate of instruments when: |
| | - the max. allowable pressure (PS) is less than 0.5 bar. |
| | - due to minimum pressure risks (meter sizes ≤ DN 25 [1*]) a compliance certification is not required. |
| | - instruments installed as water meters in Water / Waste Water treatment facilities. Applies to meter sizes >DN 600 [24*]. |
4.1.6 Name Plate Specifications

The Name Plate is mounted on the housing of the flowmeter primary. Depending on the diameter of the instrument (pressure equipment) a different Name Plate is used: (see also Art. 3 Sect. 3 PED 97/23/EG)

a) Instruments with a diameter >DN 25 (2”)

The Name Plate includes the following specifications:

- CE-Mark (with the Number of the issuing Agency) to certify the compliance of the instrument (pressure equipment) with the requirements in PED.
- Manufacturer’s Serial number for identification of the instrument.
- Meter size and pressure rating of the instrument
- Flange material, liner material and electrode material (fluid wetted parts).
- Manufacture year and specification of the applicable fluid group per PED (=PressureEquipment Directive) Fluid Group 1 = hazardous fluids, gases
- Instrument manufacturer’s name

b) Instruments with a diameter ≤ DN 25 (2”)

The Name Plate contains most of the specifications included on the tag described above a) with the following differences:

- There is no CE-Mark (see Art. 3 Sect. 3 PED).
- Under PED the exception reason defined in Art. 3 Sect. 3 PED is specified. The instrument (pressure vessel) is categorized as SEP (=Sound Engineering Practice).

4.1.7 Personnel Qualifications

- Electrical installation, start-up and maintenance of the instrument should only be carried out by trained technicians who have been authorized to perform these tasks by the system operator. The trained personnel should be familiar with the operating requirements contained in this Operating Instruction.

4.1.8 User Responsibilities

- Prior to use for metering corrosive or aggressive fluids the user must consider the resistance of the fluid wetted parts. ABB will gladly provide assistance in their selection, however cannot not accept any liability for their selection.
- Observe the National Codes in your country relative to the installation, functional tests, repair and maintenance of electrical equipment.
4.1.9 Possible Dangers During Transport
Note when transporting the instrument to the installation site that:

- the center of gravity may be off-center
- the protection plates or caps mounted on the process connections for PTFE/PFA lined flowmeters should only be removed immediately prior to installation.
- care must be exercised to assure that the liner on the flanges is not cut or damaged in order to prevent possible leaks.

4.1.10 Possible Dangers During Installation
Before installing assure that:

- the flow direction agrees with the direction arrow - if present.
- all flange bolts are tightened to the maximum specified torque value.
- the instrument is installed in a stress free manner (twist, bending) and that flanged and Wafer Design flowmeters are installed with parallel, concentric mating flanges and that suitable gaskets are used.
- the pipeline cannot exert any unallowed stresses and moments on the instrument.

4.1.11 Possible Dangers During Electrical Installation
The electrical installation is to be completed by trained personnel in accordance with the Interconnection Diagrams.

- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- Ground the flowmeter system.

Warning!
When the housing cover is removed the EMC- and personnel are no longer provided.

4.1.12 Possible Dangers During Operation

- When metering hot fluids, touching the flowmeter primary surface could cause burns
- Aggressive fluids can cause corrosion on liner or electrodes, when fluids are under a vacuum, due to premature vaporization.
- Fatigue of the flange or process connection gaskets may result in fluid leakage when the system is pressurized.
- Flat gaskets in the Series 2000 can become brittle when exposed to CIP/SIP procedures.
### 4.1.13 Possible Dangers During Inspection and Maintenance

- Prior to removing the instrument from the pipeline assure that the instrument and the pipeline or reservoirs are depressurized.

- Before opening the instrument ascertain whether hazardous material had been present in the flowmeter. Hazardous residues may still be present in the flowmeter and exit when it is opened.

- The flange bolts and nuts are to be secured to prevent loosening due to pipeline vibrations.

- During the periodic inspection specified in the Pressure Equipment Directive check the following elements of the instrument (pressure equipment):
  - the walls / liners of the pressure equipment subjected to the fluid pressure
  - its operation
  - its seals
  - for wear (corrosion, abrasion)

### Warning!

The inspection plug (for draining condensate) in flowmeters ≥ DN 350 [14"] may be under pressure - liquid squirting out may cause injury.

After an instrument failure, dangerous fluids may exit when the housing cover is removed. Be sure to depressurize the pipeline prior to opening. This also applies when cleaning removable electrodes.

### 4.1.14 Returns

- If it is necessary to return the instrument for repair or recalibration to the ABB factory in Göttingen, Germany, use the original packaging material or a suitably protective packing material. Please indicate the reason for the return.

- All flowmeter primaries and/or flowmeter converters which are returned to ABB for repair are to be free of any hazardous materials (acids, bases, solvents, etc.). The flowmeter primaries must be flushed so that the hazardous materials are decontaminated. This includes the hazardous materials which may be present in the cavities in the primaries between the meter tube and the housing. For flowmeter primaries ≥ DN 350 [14"] the inspection plug (for draining condensate) at the bottom of the housing is to be opened in order to drain any hazardous materials and to decontaminate the coil and electrode areas. Written confirmation that these measures have been carried out should accompany the flowmeter.

- If the user cannot completely remove the hazardous materials, then appropriate documents should accompany the shipment acknowledging this condition. Any costs incurred by ABB to remove and decontaminate the hazardous materials during the repair will be billed to the owner of the instrument.

Important! EU Hazardous Material Directives

The owner of special wastes is responsible for its decontamination and must satisfy the following requirements before shipping the materials:

- All flowmeter primaries and/or flowmeter converters which are returned to ABB for repair are to be free of any hazardous materials (acids, bases, solvents, etc.). The flowmeter primaries must be flushed so that the hazardous materials are decontaminated. This includes the hazardous materials which may be present in the cavities in the primaries between the meter tube and the housing. For flowmeter primaries ≥ DN 350 [14"] the inspection plug (for draining condensate) at the bottom of the housing is to be opened in order to drain any hazardous materials and to decontaminate the coil and electrode areas. Written confirmation that these measures have been carried out should accompany the flowmeter.

- If the user cannot completely remove the hazardous materials, then appropriate documents should accompany the shipment acknowledging this condition. Any costs incurred by ABB to remove and decontaminate the hazardous materials during the repair will be billed to the owner of the instrument.
5 Assembly and Installation

5.1 Inspection

Before installing the electromagnetic flowmeter system check for mechanical damage due to possible mishandling during shipment. All claims for damage are to be made promptly to the shipper before installing the flowmeter.

5.2 Flowmeter Primary Installation Requirements

The flowmeter primary should not be installed in the vicinity of strong electromagnetic fields. A minimum distance of 100 cm should be maintained.

The electromagnetic flowmeter primary must be installed so that the metering tube is always filled with fluid. A slight pipeline slope of approx. 3 % is desirable for preventing gas build up in the meter (Fig. 4).

Vertical installations are ideal when the fluid flows in an upward direction. Installations in drop lines, i.e. the fluid flows from the top to the bottom are to be avoided because experience has shown that it is not possible to guarantee that the pipeline will remain full and that an equilibrium condition between the upward flowing gas and the downward flowing liquid will not occur. (Fig. 5)

The flowmeter primary should generally be installed so that the cable connectors point downward. If the flow direction in this situation does not agree with the flow direction arrow in the flowmeter primary, use measures a) and b) described in Sect. 5.2.1 on Pg. 18.

Important!

The EMF flanged examples shown in Section 5.2 also apply for the other process connection types, e.g., Wafer Design, Food Industry fittings, 1/8" sanitary connections, Tri-Clamp, hygienic fittings and others.
In horizontal installations the imaginary line connecting the electrodes should be horizontal so that air or gas bubbles cannot affect the signal voltage. The electrode orientation is shown in Fig. 6.

For a free flow in- or outlet an invert should be provided to assure that the flowmeter primary is always filled with fluid (Fig. 7).
In a free flow outlet (drop line) the flowmeter primary should be not be installed at the highest point or in the discharge of the pipeline (metering spool could drain, air bubbles, Fig. 8).

Fig. 8:

The measurement principle is independent of flow profile as long as standing eddies do not extend into the measurement region (e.g. after double elbows, tangential inflows or partially open valves upstream of the flowmeter primary). In such situations measures to condition the flow are required. Experience indicates that in most cases a straight upstream section with a length of 3 x D and a downstream section of 2 x D are sufficient (D = flowmeter primary size) Fig. 9. In calibration stands the reference conditions of EN 19200 require straight lengths of 10 x D upstream and 5 x D downstream.

Fig. 9:

Wafer valves are to be installed in such a manner that the wafer, when open, does not extend into the flowmeter. Valves or other shut off devices should be installed downstream.

The converter includes an automatic empty pipe detector utilizing the existing electrodes as a standard option. The detector should be adjusted for the process conditions at start-up.

For highly contaminated fluids, a bypass line Fig. 10, arrangement A, is recommended so that the during mechanical cleaning the system operation need not be interrupted.

Fig. 10:
When insulation or coating of the electrodes is to be expected, a bypass line as shown in Fig. 10, arrangement B, should be utilized to simplify the cleaning operation.

For flowmeter primaries which are to be installed in the vicinity of pumps or other vibration generating equipment, the utilization of mechanical snubbers is advantageous (Fig. 11). Additional supports should be provided for longer pipelines as shown in Fig. 11.

![Fig. 11: Mechanical Snubbers](image)

### 5.2.1 Flowmeter Primary Installation

The electromagnetic flowmeter can be installed at any arbitrary location in the pipeline as long as the installation requirements are satisfied (Page 14). Installation dimensions may be found in the Specification Sheet for the particular flowmeter. When selecting the installation site consideration should be given to assure that moisture cannot enter into the electrical connection or converter areas. Make certain to carefully seat the gaskets and secure the covers after installation and start-up have been completed.

#### Electrode Axis

Assure that neither electrode is located at the highest point when installing the flowmeter in horizontal pipelines. Otherwise any entrained gas in the fluid could interrupt the connection between the electrodes and the fluid. The ideal installation for an EMF is in a vertical pipeline. Fig. 12 shows the preferred installation orientation.

#### Gaskets

It is important to use the gaskets included in the shipment. Only when these gaskets are correctly installed will leaks be avoided. Observe the information in Table 1.

Wafer Design flowmeters are shipped without gaskets. These flowmeters are to be installed (concentrically with parallel flange mating surfaces) directly in the pipeline without gaskets. A gasket is only required if a grounding ring is also installed (between the grounding ring and the mating flange). For torque specifications see Table 3.

For all other flanged instrument designs, commercial gaskets made of materials compatible with the fluid and temperature (rubber, It, PTFE, etc.) should be installed. Observe the torque specifications in Tables 2 and 3.

#### Important!

Graphite should not be used for the flange or process connection gaskets, because in some instances, an electrically conductive coating may form on the inside of the metering spool.

Vacuum shocks in the pipeline should be avoided to prevent damage to the liners.

#### Note:

A vacuum tight liner is included in the product program.
Installation of the Flowmeter Primary in a Fill Machine Station

The flowmeter primary should generally be installed so the cable connectors point downward. If the flow direction in this situation does not agree with the flow direction arrow in the flowmeter primary, the following procedure should be followed. This is necessary to prevent activation of the contact outputs during a reverse flow condition.

Procedures:

a) For standard flowmeter primaries the signal leads with their shields (at the flowmeter primary only) should be interchanged.
   Switch the lead at terminal 1 to terminal 2.
   Switch the shield at terminal 1S to terminal 2S.

b) For flowmeter primaries with preamplifiers only the leads to terminals 1 and 2 are to be interchanged (at the flowmeter primary only), because the ±12 V DC voltage U+ and U- for the preamplifier is supplied over terminals 1S and 2S.

Control, Signal and Supply Power

Caution!

The flowmeter primary may not be operated in the vicinity of strong electromagnetic fields. We recommend that the control, signal and supply power leads be shielded and separated from one another. It is advantageous to install the cables in grounded, metal conduits in which multiple similar cables can be run.

In the process system region appropriate noise reduction measures, such as protection diodes, varistors or R-C combinations, should be installed (VDE 0580).
Gasket Surfaces on the Mating Flanges

In every installation parallel mating flange surfaces should be provided and gaskets made from materials suitable for the fluid and the temperature should be installed. Only then can leaks be avoided. The flange gaskets for the flowmeter primary must be installed concentrically to achieve optimum measurement results. The dimensions for the gaskets for the parallel mating surfaces are:

<table>
<thead>
<tr>
<th>Flowmeter Primary DN mm</th>
<th>Required Parallel Gasket Surface</th>
<th>∅ Inside mm</th>
<th>∅ Outside mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-6 1/10-1/4</td>
<td></td>
<td>8</td>
<td>21.5</td>
</tr>
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<td>10 3/8</td>
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<td>14</td>
<td>35</td>
</tr>
<tr>
<td>15 1/2</td>
<td></td>
<td>18</td>
<td>35</td>
</tr>
<tr>
<td>20 3/4</td>
<td></td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>25 1</td>
<td></td>
<td>29</td>
<td>52</td>
</tr>
<tr>
<td>32 1-1/4</td>
<td></td>
<td>37</td>
<td>61</td>
</tr>
<tr>
<td>40 1-1/2</td>
<td></td>
<td>43</td>
<td>71</td>
</tr>
<tr>
<td>50 2</td>
<td></td>
<td>52</td>
<td>91</td>
</tr>
<tr>
<td>65 2-1/2</td>
<td></td>
<td>71</td>
<td>107</td>
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<tr>
<td>80 3</td>
<td></td>
<td>81</td>
<td>124</td>
</tr>
<tr>
<td>100 4</td>
<td></td>
<td>100</td>
<td>149</td>
</tr>
</tbody>
</table>

Table 1

Protection Plates

Protection plates are installed on the PTFE/PFA lined flowmeters to prevent damage to the liners during transport. Remove the protection plates only when ready to install the meter in the pipe line. Be careful not to cut or otherwise damage the liner in order to prevent leakage. The dimensions for your specific flowmeter design may be found in the Specification Sheet.

Torque Specifications for Flanges

The mounting bolts are to be tightened equally in the usual manner without excessive one-sided tightening. We recommend that the bolts be greased prior to tightening and that they be tightened in a crisscross pattern as shown in Fig. 13. Tighten the bolts during the first pass to approx. 50 %, during the second pass to approx. 80 % and only during the third pass to 100 % of the max. torque value. The max. torque values should not be exceeded, see the tables on Page 20.
## Torque Specifications

<table>
<thead>
<tr>
<th>Liner</th>
<th>Meter Size DN mm/Inch</th>
<th>Process Connections</th>
<th>DIN</th>
<th>ANSI (ASME)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Torque max. NM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CL150</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>max. NM</td>
</tr>
<tr>
<td>PFA/ PTFE/ Hard rubber ≤ DN 15 [1/2&quot;]</td>
<td>3 - 101/10 - 3/8</td>
<td>Flanged, Wafer Design</td>
<td>4 x M12</td>
<td>8</td>
</tr>
<tr>
<td>PFA/ PTFE/ Hard rubber ≤ DN 25 [1&quot;]</td>
<td>151/2</td>
<td>4 x M12</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>203/4</td>
<td>4 x M12</td>
<td>16</td>
<td>40</td>
</tr>
<tr>
<td>PFA/ PTFE/ Hard rubber ≤ DN 300</td>
<td>251</td>
<td>4 x M12</td>
<td>21</td>
<td>40</td>
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<td>321-1/4</td>
<td>4 x M16</td>
<td>34</td>
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<td>401-1/2</td>
<td>4 x M16</td>
<td>43</td>
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<td>502</td>
<td>4 x M16</td>
<td>56</td>
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<td></td>
<td>652-1/2</td>
<td>8 x M16</td>
<td>39</td>
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<td></td>
<td>803</td>
<td>8 x M16</td>
<td>49</td>
<td>40</td>
</tr>
<tr>
<td>PFA/ PTFE/ Hard rubber ≤ DN 100 [4&quot;]</td>
<td>1004</td>
<td>8 x M16</td>
<td>47</td>
<td>16</td>
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<td></td>
<td>1255</td>
<td>8 x M16</td>
<td>62</td>
<td>16</td>
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<td>81</td>
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<td>25010</td>
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<td>16</td>
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<td></td>
<td>30012</td>
<td>12 x M24</td>
<td>160</td>
<td>16</td>
</tr>
<tr>
<td>PFA/ PTFE/ Hard rubber ≤ DN 600 [24&quot;]</td>
<td>35014</td>
<td>16 x M24</td>
<td>195</td>
<td>16</td>
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<td></td>
<td>40016</td>
<td>16 x M27</td>
<td>250</td>
<td>16</td>
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</tbody>
</table>

### Table 2

**Max. Torque Specifications for PTFE-Envelope Gaskets**

<table>
<thead>
<tr>
<th>Liner</th>
<th>Meter Size DN mm/Inch</th>
<th>Process Connections</th>
<th>Bolts</th>
<th>Torque max. NM</th>
<th>PN bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFA</td>
<td>3 - 8 1/10-5/16</td>
<td>Wafer Design Variable Connections</td>
<td>4 x M12</td>
<td>2.3</td>
<td>40</td>
</tr>
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<td>PFA</td>
<td>10 3/8</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 1/2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 3/4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>25 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>32 1-1/4</td>
<td>Variable Connections Wafer Design</td>
<td>4 x M12</td>
<td>15.0</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>40 1-1/2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>65 2-1/2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>80 3</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>100 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 3
5.2.2 Assembly and Installation for Protection Class IP 68

For Protection Class IP 68 the continuous submergence level can be 5 m. Protection Class IP 68 can be added after the meter has been installed, possible only for horizontal installations with remote mounted converters, (or can be ordered shipped from the factory with the cable potted) - because the connection box can be potted for IP 68 after start-up has completed.

The potting material (2-component PU) included with the shipment is packaged in a protection sleeve with appropriate safety information. This information should be noted before starting the potting procedure.

**Warning!**

The potting material is hazardous - take appropriate safety precautions!

Safety information: R20, R36/37/38, R42/43

Vapors are harmful, avoid inhaling, avoid direct skin contact, eye irritant!

Safety suggestions: P4, S23-A, S24/25, S26, S37, S38

Wear suitable gloves, provide good ventilation, observe manufacturer’s instructions before handling the potting material.

**Preparation:**

- Only apply the potting material after the installation has been completed successfully, avoid introducing moisture and check all connections for proper seating and tightness.
- Do not overfill the connection box - keep potting material away from O-ring and seal/groove.
- Avoid putting potting material into the protection pipe for ½” NPT installations (if used).

**Procedure:**

- Cut open the potting material protection sleeve - see packaging
- Open the clamp between the potting and hardener materials
- Knead both materials until they are thoroughly mixed
- Cut open one corner of the package (working time is 30 minutes)
- Carefully fill the connection box with mixed potting material until the connection cables are covered
- Allow a few hours to elapse for the potting material to harden before carefully reinstalling the cover
- Dispose of the packing and desiccant materials and in an environmentally safe manner

![Potting Material Diagram](image_url)
5.2.3 Installation of High Temperature Design Flowmeter Primaries

Please note the installation information in 5.2 and in 5.2.1.

A pipe section is used to separate the flowmeter primary from the connection in the high temperature design which is suitable for fluid temperatures to max. 180 °C. This thermally insulates the connection box from the flowmeter primary. The pipeline and flowmeter primary insulation should be installed as shown in Fig. 16.
5.2.4 Installations in Larger Size Pipelines

The flowmeter can readily be installed in larger size pipe lines through the use of flanged transition sections (e.g. Flanged Reducers per DIN 28545). The pressure drop resulting from the reduction can be determined using the Nomograph Fig. 17. The pressure drop can be determined using the following procedure:

1. Calculate the diameter ratio d/D.
2. Calculate the flow velocity as a function of the meter size and the flowrate:
   \[ v = \frac{Q}{\text{primary constant}} \]
   The flow velocity can also be determined from the Flow Rate Nomograph in the Specification Sheet.
3. The pressure drop can be read on the -Y- axis at the intersection of the flow velocity and the “Diameter Ratio d/D” value on -X- axis in Fig. 17.

---

**Fig. 17: Pressure Drop Nomograph**

- d = EMF-Inside diameter
- D = Pipeline inside diameter
- v = Flow velocity in m/s
- \( \Delta p \) = Pressure drop in mbar
5.3 Material Loads

5.3.1 General

Important!
The actual liner and flange materials used determine the allowable fluid temperature (TS) and the allowable pressure (PS) of the instrument. See the Name Plate on the instrument.

5.3.2 Process Connections

5.3.2.1 DIN-Flanges SS No. 1.4571 [316Ti] to DN 600
Liner: PTFE, Hard/soft rubber (limited to 90 °C)

Fig. 18:

5.3.2.2 ANSI-Flanges SS No. 1.4571 [316Ti] to DN 300 [12"] (CL150/300) to 1000 [40"] (CL150)
Liner: PTFE, Hard/soft rubber (limited to 90 °C)

Fig. 19:
5.3.2.3 DIN-Flanges Steel to DN 600
Liner: PTFE, Hard/soft rubber (limited to 90 °C)

Fig. 20:

5.3.2.4 ANSI-Flanges Steel to DN 300 [12"] (CL150/300) to 1000 [40"] (CL150)
Liner: PTFE, Hard/soft rubber (limited to 90 °C)

Fig. 21:

5.3.2.5 JIS 10K-B2210 Flanges SS No. 1.4571 [316Ti] or Steel
Liner: PTFE, Hard/soft rubber (limited to 90 °C)
5.3.2.6  DIN Flanges SS No. 1.4571 [316Ti] ≤ DN 1000
Liner: Hard/soft rubber ≤ 90 °C

Fig. 22:

5.3.2.7  DIN Flanges Steel ≤ DN 1000
Liner: Hard/soft rubber ≤ 90 °C

Fig. 23:
5.3.2.8 Wafer Design Series 2000

Liner: PFA Wafer Design

![Diagram of Meter Size Material and Pressure Temperature Relationship](image)

**JIS 10K-B2210 Wafer Design**

<table>
<thead>
<tr>
<th>Meter Size</th>
<th>Material</th>
<th>PN</th>
<th>TS [°C]</th>
<th>PS [bar]</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 - 100 [1-1/4&quot; - 4&quot;]</td>
<td>SS No. 1.4404</td>
<td>10</td>
<td>-40 °C to +130 °C</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>SS No. 1.4435</td>
<td></td>
<td>-40 °C to +266 °F</td>
<td>145 PSI</td>
</tr>
<tr>
<td></td>
<td>SS No. 1.4301</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
6 Electrical Connections

6.1 Grounding

The connections described here must be maintained. They are used to shunt ground and stray currents in the pipeline. In accordance with VDE 0100, Part 540 a connection using at least a 4 mm² Cu-cable must be made between the grounding screw on the flowmeter primary and the protection ground potential. For measurement reason this should be identical to the pipeline potential if possible. An additional ground connection at the connection terminals is not necessary.

For pipelines made of plastic or with insulating liners a grounding plate or grounding electrode is used for grounding. When the pipeline section contains stray currents we recommend that a grounding plate be installed at both ends of the flowmeter.

Three grounding possibilities are described below. In cases a) and b) the fluid is in electrical contact with the pipeline. In case c) it is isolated from the pipeline.

Important!

In flowmeter primary Model SE21 the grounding screws are located in the lower section of the connection box. In instrument designs with Food Industry fittings, Tri-Clamps and weld stubs the meter tube is already in electrical contact with the fluid. It is only necessary to connect the protection ground to the ground connection on the flowmeter primary, see Fig. 35 and Fig. 36.

a) Metal pipe with fixed flanges

1) Drill blind holes in the flanges on the pipeline (18 mm deep)

2) Thread holes, (M6, 12 mm deep).

3) Attach the ground strap to the flange using a screw (M6), spring washer and flat washer and connect to the ground connection on the flowmeter primary.

4) Connect a 4 mm² CU wire between the ground connection on the flowmeter primary and a good earth connection.

Fig. 25: Flowmeter Primary, Flanged

*) Is shipped from the factory. Other connections are to be provided by the user.

Fig. 26: Flowmeter Primary, Wafer Design

*) Is shipped from the factory. Other connections are to be provided by the user.
b) Metal Pipe with Loose Flanges

1) In order to assure a trouble free ground connection between the fluid and the flowmeter primary in a pipeline with loose flanges, a 6 mm threaded stud should be welded directly to the pipeline (included with shipment).

2) Attach the ground strap to the flange using a nut, spring washer and flat washer and connect to the ground connection on the flowmeter primary.

3) Connect a 4 mm² CU wire between the ground connection on the flowmeter primary and a good earth connection.

Important!

Instruments DN 125 [5"] and larger with hard/soft rubber liners, include as standard, a conductive grounding surface integrated in the meter tube. This conductive surface grounds the fluid.
6 Electrical Connections

c) Plastic, Concrete or Pipe lines with Insulating Liners

1) Install EMF in pipeline with a grounding plate.

2) Connect the connection tab on the grounding plate to the ground connection on the flowmeter primary with a ground strap.

3) Connect a 4 mm² CU wire between the ground connection on the flowmeter primary and a good ground connection.

Important!

Flowmeters with grounding electrodes and flowmeter sizes from DN 125 [5"] with hard/soft rubber liners do not required a grounding plate. When pipelines with insulated liners are used, a ground cable must also be connected between the flowmeter and pipeline flanges.

*) Is shipped from the factory. Other connections are to be provided by the user.
Electrical Connections

*) Is shipped from the factory. Other connections are to be provided by the user.

Fig. 33: Flowmeter Primary Wafer Design

Fig. 34: Flowmeter Primary Two Piece Housing and Flanged

Fig. 35: Flowmeter Primary DN 3 to 100 [1/10" - 4"], Aseptic Connections

Fig. 36: Flowmeter Primary DN 3 to 100 [1/10" - 4"], Tri-Clamp Connections
6.1.1 Supply Power Connections

The supply power connections are made in accordance with the specifications on the Name Plate. High voltage at terminals L (Phase) and N (Neutral), and  or low voltage and terminals 1+, 2- and  at the converter over a main fuse and switch.

The electromagnetic flowmeter primary is connected to the converter by a signal/reference voltage cable and a magnet coil supply cable. For detailed wiring information see the Operating Instruction for the converter.

6.1.2 Magnet Coil Supply Connections

The magnet coils are supplied directly from the converter over terminals M1, M3 using a shielded cable 2 x 1.0 mm². A 10 m long cable is included with the shipment unless a different length was ordered.

6.1.3 Power

The connection voltage and current specifications are listed on the Name Plate. The lead cross-section for the supply power and the installed fuse size must be compatible (VDE 0100). The power consumption is S ≤ 50 VA (flowmeter primary including the converter).

6.1.4 Signal Cable Connections

Caution!

The signal cable connections vary dependent on the function. Observe the appropriate Interconnection Diagram!

The signal cable conducts an AC signal of only a few millivolts and therefore should be routed along the shortest path. The cables should not be routed in the vicinity of large electrical machinery and switch gear equipment which could induce stray fields, pulses and voltages. The signal cable should not be fed through branch fittings or terminals strips.

The max. allowable signal cable length for designs without a preamplifier in 50 m. When a preamplifier is installed in the flowmeter primary for low conductivity applications the max. signal cable length is 200 m. In the cable, a shielded reference voltage cable runs parallel the signal leads so that only two cables are required between the flowmeter primary and the converter. The construction of the signal cable includes a aluminium-polyester-foil which surrounds the individually shielded signal cables and the shielded reference voltage cable. The signal lead shields are “Driven Shields” for transmitting the signal voltage.

To shield against magnetic pickup an outer woven steel shield surrounds the entire cable which is connected to terminal SE.

Important!

If plant conditions make it impossible to avoid proximity to electrical machinery or switch gear equipment, it is advisable to route the signal cable through a grounded metal conduit.

When a preamplifier is installed in a flowmeter primaries it is supplied by a DC voltage connected to terminals U- and U+.

The signal/reference voltage cable is connected to the flowmeter primary and the converter in accordance with the Interconnection Diagrams. If the actual flow direction does not agree with the flow direction arrow in the flowmeter primary, interchange the connections at 1 and 1S with those at 2 and 2S at the flowmeter primary. For flowmeter primaries with preamplifiers, only interchange the connections at terminals 1 and 2.

The common potential 3 is the same as the common potential of the flowmeter primary, which is connected to earth per VDE 0100.
6.1.5 Interconnection Diagram

**Important!**

The signal cable shields may not contact each other or the outer shield (signal short circuit).

**Warning!**

The instrument should be voltage free before opening the cover or making any connections!

Energy storing components, such as capacitors, may contain dangerous voltages even after the power is turned off.
6.1.6 Connection Area

The signal cable leads are to be routed to the connection terminals in the most direct way possible. Loops should be avoided, (see Fig. 40).

Important!

A water trap should be provided for the cable connected to the flowmeter primary, (Fig. 39).

When reinstalling and tightening the housing cover care should be exercised to assure that the gasket is seated properly. Only then can Protection Class IP 67 be assured.

Connection Box with Screw Terminals

The cables are to be connected in accordance with the Interconnection Diagrams, see Fig. 40, using a screwdriver of the correct size and width.
7 Replaceable Parts, Flowmeter Primary

If the liner, electrodes or magnet coils require repair the flowmeter primary must be returned to ABB Automation Products Göttingen, Germany. Please see the information contained in the paragraph entitled “EU Hazardous Material Directives” in Section Fig. 4.1.14 “Returns”.

7.1 Replaceable Parts, Connection Box, Stainless Steel ≤ DN 100 [4”]

![Connection Box IP 67/IP 68](image)

**Replaceable Parts, Connection Box, Stainless Steel ≤ DN 100 [4”]**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
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<tr>
<td>1.1</td>
<td>Connection board, with preamplifier</td>
<td>D685A1028U01</td>
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<tr>
<td>2</td>
<td>Lower section SS No. 1.4301 [304] Model SE21</td>
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<tr>
<td>3</td>
<td>Gasket</td>
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<td>4</td>
<td>Phillister hd. screw M3 x 6 DIN 7985</td>
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<td>5</td>
<td>Serrated washer A3.2 DIN 6798</td>
<td>D085G017AU32</td>
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<tr>
<td>6</td>
<td>Cable connector, plastic gray</td>
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</tr>
<tr>
<td>7</td>
<td>Spacer</td>
<td>D375A018U01</td>
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<td>8</td>
<td>Hex hd. screw M4 x 14 DIN 7964 SS</td>
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<td>9</td>
<td>Washer “Nylitite-Siegel” F.M4</td>
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<td>Cover SS No. 1.4301 [304]</td>
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<td>11</td>
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<td>12</td>
<td>Interconnection Diagram with preamplifier</td>
<td>D338D310U01</td>
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</table>
## Replaceable Parts, Connection Box, Aluminum ≤ DN1000 [40”]

<table>
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<th>Item No</th>
<th>Description</th>
<th>Part No.</th>
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<tr>
<td>1</td>
<td>Connection board, standard</td>
<td>D685A1025U01</td>
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<tr>
<td>1.1</td>
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<td>Lower section with cable connector M 20x1.5 ≤ DN 100 [4”]</td>
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<td>Lower section with NPT-Adapter ≤ DN 100 [4”]</td>
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<td>2.3</td>
<td>Lower section with NPT-Adapter &gt; DN 100 [4”]</td>
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<td>3</td>
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<td>Clamp bracket</td>
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<td>4</td>
<td>Sheet metal screw 2.9x6.5 DIN 7981</td>
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<td>Cable connector M 20x1.5 Standard</td>
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<td>Cable connector Pg 13.5 Option</td>
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<td>Cover gasket</td>
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<td>6.3</td>
<td>Interconnection Diagram with preamplifier</td>
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<td>7</td>
<td>Cap screw, hex hd. M 4x18 DIN 912</td>
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<td>7.1</td>
<td>Flat washer B 4.3 DIN 125</td>
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<td>7.2</td>
<td>Securing ring</td>
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<td>8</td>
<td>Ground accessories</td>
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</tr>
<tr>
<td>9</td>
<td>Short circuit jumper (RM 2.54)</td>
<td>D172A001U01</td>
</tr>
</tbody>
</table>

Fig. 42: Connection Box, Aluminum
The start-up procedure for the EMF-System is initiated after the assembly and installation of the flowmeter primary and the converter have been completed. A preliminary check of the flowmeter primary should be carried out. A test of the flowmeter primary using the converter see Operating Instruction Converter. “Tests and Error Search of the flowmeter Primary Using the Connected Converter”.

8.1 Preliminary Checks

First check if

- the flow direction of the fluid agrees with the direction indicators in the display.
- the installation requirements in 5.2 were considered.
- the wiring is in accordance with the Interconnection Diagrams.
- the ambient conditions are within the specified range.
- the flowmeter grounds are in accordance with 6.1.
- the parameters corresponding to the operating conditions have been entered.
- the system zero was adjusted using the software, (see Sect. 8.2 Zero Adjustment).
- the flowmeter primary model number parameters were entered in the converter (for previous versions also enter the excitation frequency) in the submenu Primary and the correct Operating Mode has been selected.

General Important!

If the actual flow direction does not agree with the flow direction indicators in the display, interchange the connections at 1 and 1S with those at 2 and 2S at the flowmeter primary. For flowmeter primaries with preamplifiers, only interchange the connections at terminals 1 and 2.

The assignment of the flow direction can also be changed using the parameter “Flow direction, normal or inverse” in the converter.

8.2 Zero Adjustment

During start-up the zero for a previous model or the system zero can be set at the converter after the warm up phase has been completed. The fluid in the flowmeter primary must be at an absolute standstill. The meter tube must be completely filled with fluid. Then the adjustment can be automatically started or made manually using the parameter “System Zero” in the converter. Select the parameter with ENTER, use the arrow keys to select “manual” or “automatic” and activate with ENTER. The automatic adjustment takes approx. 10 seconds and the zero value should be in a range of ± 1000 Hz.

8.3 Detector „Empty pipe“

At start-up the module „Detector empty pipe“ must be adjusted for the operating conditions of the system. See converter Operating Instruction.

8.4 Gaskets

Some of the design options are shipped with gaskets. Only when these gaskets are correctly installed will leaks be avoided.

For all other design options, commercially available gaskets made of materials compatible with the fluid and the operating temperature (rubber, PTFE, It, EPDM, Silicone, Viton etc.) should be used.

Important!

The Wafer Design flowmeter primaries are installed directly in the pipeline without gaskets.
8.5 Maintenance

The flowmeter primary is essentially maintenance free. Annually a check should be conducted of the ambient conditions (air circulation, humidity), seal integrity of the process connections, cable connectors and cover screws, functional reliability of the supply voltage, the lightning protection and the grounds.

The electrodes in the flowmeter primary must be cleaned when the flow indication display in the converter changes even though the flow has not. For higher flowrate readings an insulating coating is the cause, for lower readings a conductive short circuiting coating is the cause.

General Important!

All repairs or maintenance tasks should be performed by qualified service personnel.

If the flowmeter primary is to be returned to ABB Automation Products Göttingen, Germany for repair, please see the information contained in the paragraph entitled “EU Hazardous Material Directives” in Section 4.1.14 “Returns”!
9.1 EU-Declaration of Conformity PED for Flanged Instruments

EG-Konformitätserklärung
EC-Declaration of Conformity


Hereby we confirm that the listed instrument is in compliance with the council directives of the European Community and are marked with the CE marking. The safety and installation requirements of the product documentation must be observed.

---

Hersteller: ABB Automation Products GmbH,
manufacturer: 37070 Göttingen - Germany

Modell: SE2_F, D_2_F, SE4_F, D_4_F
model: SE2_F, D_2_F, SE4_F, D_4_F

Richtlinie: Druckgeräterichtlinie 97/23/EG
directive: pressure equipment directive 97/23/EC

Einstufung: Ausrüstungsteile von Rohrleitungen
classification: piping accessories

Normengrundlage: AD 2000 Merkblätter
technical standard:

Konformitätsbewertungsverfahren: B1 (EG-Entwurfsprüfung) + D (Qualitätssicherung Produktion)
conformity assessment procedure: B1 (EC design-examination) + D (production quality assurance)

EG-Entwurfsprüfungsbeschreibung: Nr. 07 202 0124 Z 052/2/0002
EC design-examination certificate:

benannte Stelle: TÜV Nord e.V.
notified body: Rudolf-Diesel-Str. 5

Kennnummer: 0045
identification no.

Göttingen, den 21.05.2002

ppa ................................
(K.Wiskow, Personalleiter APR Göttingen)
9.2 EU-Declaration of Conformity PED for Wafer Design Instruments and Instruments with Variable Process Connections

EG-Konformitätserklärung
EC-Declaration of Conformity


Herewith we confirm that the listed instrument is in compliance with the council directives of the European Community and are marked with the CE marking. The safety and installation requirements of the product documentation must be observed.

Hersteller: ABB Automation Products GmbH, 37070 Göttingen - Germany

Modell: D_2_, D_2_W, D_4_W, SE2_, SE2_W

Richtlinie: Druckgeräterichtlinie 97/23/EG

Einführung: Ausrüstungsteile von Rohrleitungen

Normen: AD 2000 Merkblätter

Konformitätss bewertungsverfahren: B1 (EG-Entwurfsprüfung) + D (Qualitätssicherung Produktion)

EG-Entwurfsprüfung: Nr. 07 202 0124 Z 052/2/0006

benannte Stelle: TÜV Nord e.V.

EG design-examination certificate: Rudolf-Diesel-Str. 5

Kennnummer: 0045

Göttingen, den 21.05.2002

ppa (K. Wiskow, Personalleiter APR Göttingen)

EG-Konformitätserklärung
EC-Certificate of Compliance


Herewith we confirm that the listed instruments are in compliance with the council directives of the European Community. The safety and installation requirements of the product documentation must be observed.

Modell: S4...
Model: SE21 / SE21F
SE41F

Richtlinie: EMV Richtlinie 89/336/EWG
Directive: EMC directive 89/336/EEC

Europäische Norm: EN 50081-1, 3/93
European Standard: EN 50081-1, 3/93
EN 50081-2, 3/94
EN 61000-6-2, 3/00

Richtlinie: Niederspannungsrichtlinie 73/23/EWG
Directive: Low voltage directive 73/23/EEC

Europäische Norm: EN 61010-1, 8/02

* einschließlich Nachträge including alterations

Göttingen, 06.09.2002

Unterschrift / Signature

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Bundesanzeiger-Nr.: DE 115 300 097

Vorsitz des Aufsichtsrats: Bang/Peh
Geschäftsführung: Hans-Peter Plath/Manfred Huggen

Konto: 339 025 250
BLZ: 502 400 03

ABB Automation Products GmbH

RZ-13-6111, Rev. 1, 6120