MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Amikon cover with selected official ABB reference pages

PFEA112 / 3BSE050091R20

PFEA112-20

IP20 TENSION MEASUREMENT ELECTRONICS

OFFICIAL SOURCES

ABB 3BSE029380R0201 Rev E. Selected original reference pages; not the complete installation manual.

Use of **DANGER**, **WARNING**, **CAUTION**, and **NOTE**

This publication includes, **DANGER**, **WARNING**, **CAUTION** and **NOTE** information where appropriate to point out safety related or other important information.

DANGER Hazards which could result in severe personal injury or death

WARNING Hazards which could result in personal injury

CAUTION Hazards which could result in equipment or property damage

NOTE Alerts user to pertinent facts and conditions

Although **DANGER** and **WARNING** hazards are related to personal injury, and **CAUTION** hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all **DANGER**, **WARNING**, and **CAUTION** notices.

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CE and UK regulations marking

Provided that the installation is carried out in accordance with the installation instructions given in this manual this product meets the requirements for CE-marking specified in: the RoHS directive 2011/65/EU + AD 2015/863/EU, EMC directive 2014/30/EU and the Low Voltage Directive 2014/35/EU and Conformity to UK regulations: The Electrical Equipment (Safety) Regulations 2016, S.I.2016:1101, The Electromagnetic Compatibility Regulations 2016, S.I.2016:1091 and The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012, S.I. 2012:3032.

The Tension Electronics PFEA111-20, PFEA111-65 and PFEA112-20 fulfill the requirements of safety approval for USA and Canada according to the standard UL61010C-1 for Process Control Equipment and CSA C22.2 No. 1010-1 Safety Requirements for Measurement, Control and Laboratory Use, Part 1: General Requirements Certificate No. 170304-E240621 and No. 240504-E240621, provided that the installation is carried out in accordance with the installation instructions given in Chapter 2 Installation, included in this User Manual.

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3BSE001264/B

Template: 3BSE001286/D

3BSE029380R0201 Rev E

1.6 About this System

Your system for tension measurement consists of:

- Tension Electronics PFEA111, PFEA112 or PFEA122
  - **PFEA111** is a cost effective compact and user friendly tension electronics providing an accurate and reliable fast analog SUM signal from two load cells for control and/or monitoring. The display can show the SUM, individual A & B and difference signal. The small size and DIN-rail mount make this unit very easy to integrate into many types of electrical cabinets
  - **PFEA112** provides the same functionality and user friendliness as the PFEA111 with the addition of fieldbus communication via PROFIBUS-DP.
  - **PFEA122** provides the same functionality and user friendliness as the PFEA111 with the addition of PROFINET and EtherNet/IP communication, as well as individual A and B signals via these fieldbuses.
- Tension Electronics PFEA113
  - **PFEA113** can supply up to four load cells and has six configurable analog outputs for control and/or monitoring of web tension. The output signals are also available on PROFIBUS-DP. Another useful feature is the possibility to, via the digital input or PROFIBUS, switch the gain for two different web paths (gain scheduling) and zero set. (The PFEA113 is described in a separate manual)

  Covering a wide range of applications the Tension Electronics comes in four versions, with different levels of performance and functionality. All four versions have multi-language digital display and configuration keys. The configuration keys being used for setting different parameters and to check the status of the tension system. The 2 x 16 character display can present sum, difference or individual load cell signals. All four versions are available in both DIN-rail version (IP 20-version, unsealed) and enclosed IP 65-version (NEMA 4) for mounting in more severe environments.
- Load cells of type PFCL 201, PFCL 301E, PFTL 101, PFTL 201, PFTL 301E and PFRL 101

The equipment is intended for use in a wide range of manufacturing processes where a web of any kind of material, for example paper, plastic or textile, is transported in a machine. The only requirement is that the web is wrapped over a roll. The force on the roll is proportional to the web tension. The resulting force is transferred through the bearing housings into the load cells. The load cells create a signal that is proportional to the force acting in the measuring direction of the load cells. This signal is processed and amplified in the tension electronics and can be used as an input signal for process control, presentation on a display or for registration.

1.7 Safety Instructions

Read and follow the safety instructions given in this section before starting any work. However, local statutory regulations, if stricter, are to take precedence.

The tension measurement system contains no moving parts. However, the load cells are mounted close to a rotating roll over which a web is running.

1.7.1 Personnel Safety



WARNING

Never work with the load cells, or nearby, when the production line is in service. Before starting any work, switch off and lock the operating switch of the drive section for the measuring roll.



DANGER

Switch off and lock the mains operating switch to the tension electronics before performing any work on the tension electronics. When the work is completed, check that there are no loose wires, and that all units are properly secured.

NOTE

All personnel working with the installation must know the location of the main power supply switch to the measurement system and how it is operated.

1.7.2 Equipment Safety

CAUTION

Always switch off the mains supply voltage to the measurement system before replacing a unit.



CAUTION

Handle the electronic unit carefully to reduce the risk of damage from Electric Static Discharge (ESD). Note the warning label on the circuit boards.

Chapter 2 Installation

2.1 About this Chapter

The way you install your system has more influence on its functionality, accuracy and reliability than you might think. The more accurate the installation, the better the measurement system. By following the instructions in this chapter, you will fulfill the most important requirements for proper mechanical and electrical installation.

The equipment is a precision instrument which, although intended for severe operating conditions, must be handled with care.

2.2 Safety Instructions

Read and follow the safety instructions given in Chapter 1 , before starting any installation work. However, local statutory regulations, if stricter, are to take precedence.

2.3 Mounting the Load Cells

Installation requirements and mounting instructions are given in:

- Appendix B PFCL 301E - Designing the Load Cell Installation
- Appendix C PFTL 301E - Designing the Load Cell Installation
- Appendix D PFRL 101 - Designing the Load Cell Installation
- Appendix E PFTL 101 - Designing the Load Cell Installation
- Appendix F PFCL 201 - Designing the Load Cell Installation
- Appendix G PFTL 201 - Designing the Load Cell Installation

2.4.2.2 IP 20-version (Unsealed)

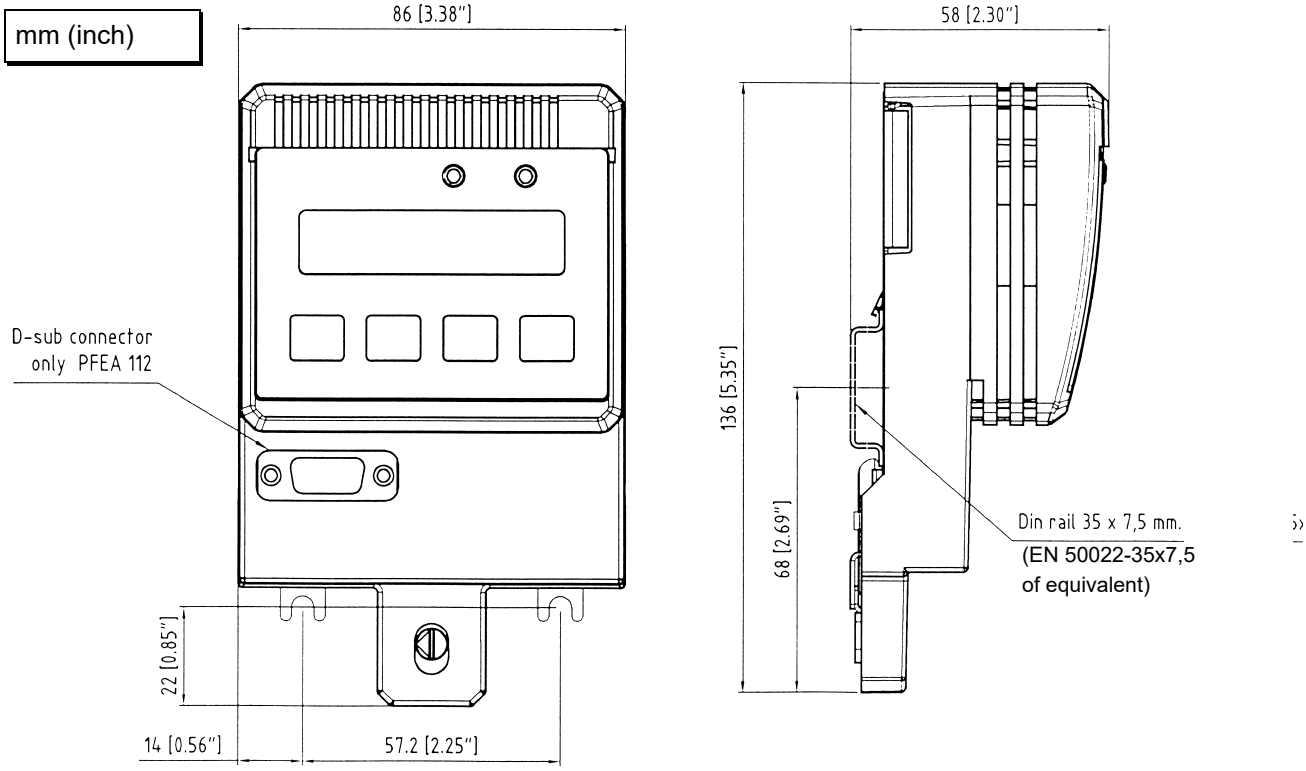


Figure 2-6. Installation Dimensions PFEA112

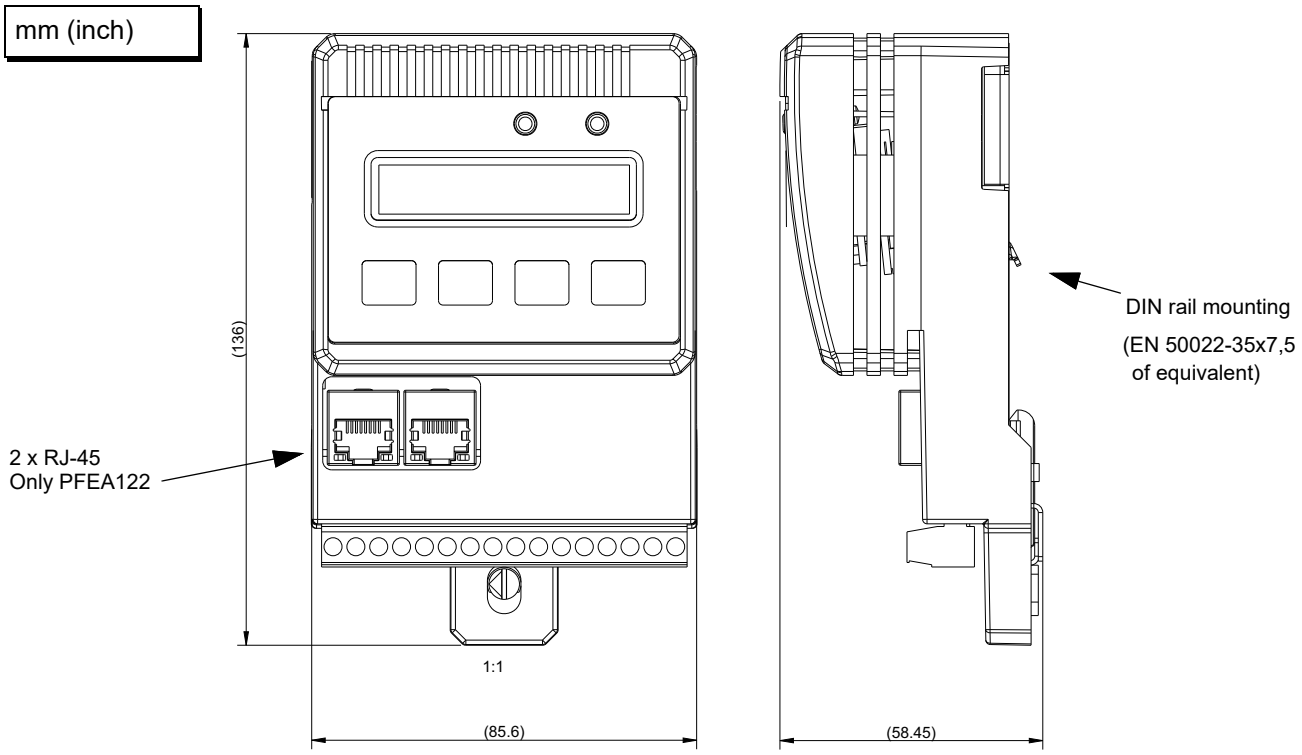


Figure 2-7. Installation Dimensions PFEA122

Connect the cables to terminals according cable diagrams in Appendix (B, C, D, E, F or G) depending on installed load cell type.

NOTE

Do not connect solid conductors to terminals. Do not crimp pins to stranded cores.

Earthing

The metal bottom of PFEA111-20, PFEA112-20 and PFEA122-20 connects to the metallic DIN-rail which serves as the Tension Electronics earth connector.
This is to ensure a good earth connection both for internal logic and for the EMI immunity and RF emission of the electronics.
The DIN-rail must have a good connection to the PE (Protective Earth) of the cabinet.

To achieve the best possible corrosion resistance, DIN-rails should be chromium plated, for instance, yellow chromium treated. Use star washers with each screw used to fasten the DIN-rail to the mounting plate.
To fasten the DIN-rail onto the mounting plate, the minimum screw diameter is 5 mm and the maximum distance between screws is 100 mm.

3.13 PROFIBUS DP Communication with PFEA112

3.13.1 General Data about PROFIBUS DP

The purpose of the PROFIBUS DP communication in PFEA112 is to provide a high speed communication link between superior systems and the PFEA112.

PROFIBUS DP is a multidrop communication protocol intended to connect PLCs to sensors (DP means “Distributed Peripherals”).

The physical interface is RS 485 (two wire cable).

The maximum transfer rate is 12 Mbit/s.

The protocol is based on a master-slave principle. The PFEA112 is a slave. A PROFIBUS master polls the slaves all the time, that means the polling is going on with a fixed time interval even when no new data is available from the PFEA112.

Each slave has an address in the range 0 to 125.

PROFIBUS requires that the message format, communication parameters and error codes of slaves are made available in a so called type file, also known as GSD file (See Appendix A.7 PROFIBUS DP - GSD File for PFEA112). This file is then stored in the PROFIBUS Master.

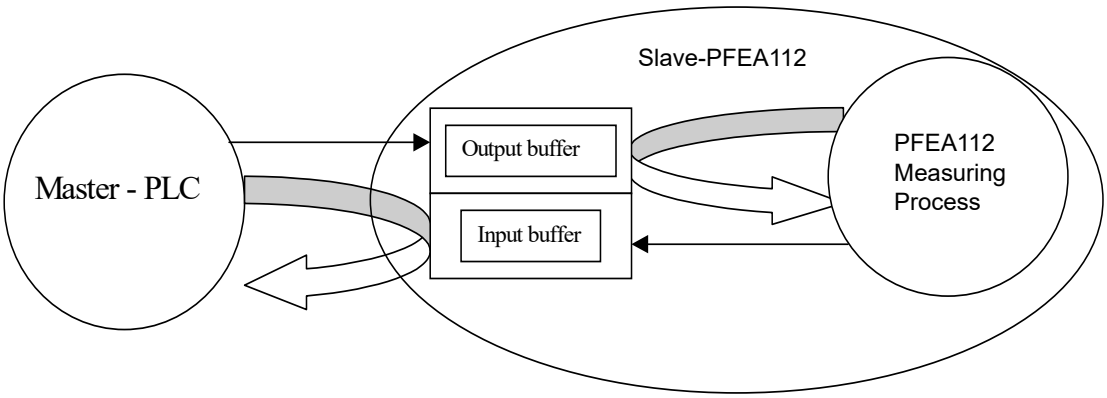
At start-up the PROFIBUS Master verifies that the Slave with the given type file is indeed available on the bus.

3.13.2 Master-slave Communication

The Master and the slave communicate via an output buffer and an input buffer.

The master reads the input buffer and writes to the output buffer once every scan cycle for PROFIBUS.

The slave polls the output buffer and updates values in the input buffer.



3.13.3 PROFIBUS Physical Media

The bus line is specified in EN 50170 as line type A. Line type B should be avoided.
The physical properties of the media are shown in Table 3-5 and Table 3-6.

Table 3-5. Line Parameters

Parameter	**Line type A**	**Line type B** (Avoid if possible)
Impedance in Ω	135 to 165	100 to 130
Capacitance per unit length (pF/m)	<30	<60
Loop resistance (Ω /km)	110	---
Core diameter (mm)	0.64	> 0.53
Core cross section (mm^2)	> 0.34	> 0.22

The specified line parameters result in the following lengths of a bus segment.

Table 3-6. Maximum Cable Lengths per Segment

Maximum bus segment length (m)	**Transmission rate in kbit/s**						
	9.6	**19.2**	**93.75**	**187.5**	**500**	**1500**	**12000**
Wire A	1200	1200	1200	1000	400	200	100
Wire B	1200	1200	1200	600	200	-	-

Stub lines up to 1500 kbit/s < 6.6 m.
If you are using 12 Mbits/s you should avoid stub lines.

If you are using line A as specified by EN 50 170, the bus terminating resistance combination is as shown in Figure 3-17, so that a defined idle state potential is ensured on the line.

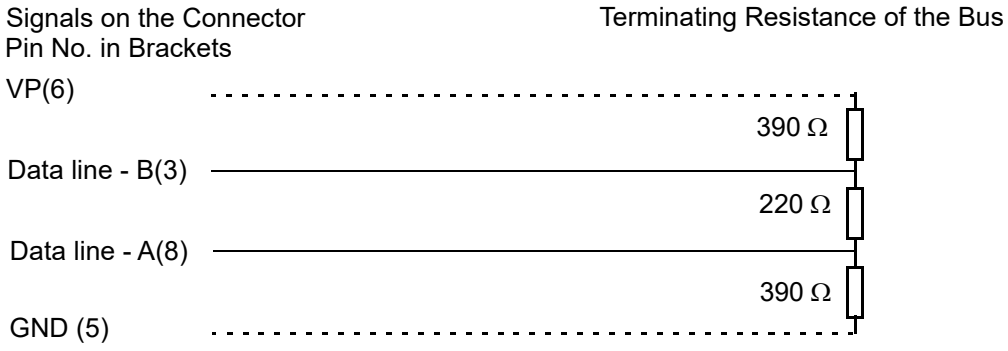


Figure 3-17. Line Termination of Wire A in Accordance with EN 50170

To bridge longer distances and bypass EMC interference, transmission with optical fiber conductors (glass or plastic) is also specified.
Standard bus plug connectors are available for transmission with optical fiber conductors. These connectors convert RS 485 signals to optical fiber conductor signals and vice versa. (OLP = optical link plug).
In addition, repeaters are available to handle this signal conversion.
This gives you the option of switching between the two transmission techniques within one system if necessary.

You can connect up to 126 stations to one PROFIBUS system.
To be able to handle this number of participants on the bus, the bus system must be divided into individual segments, containing maximum 32 stations each.
These segments are linked by repeaters.

x

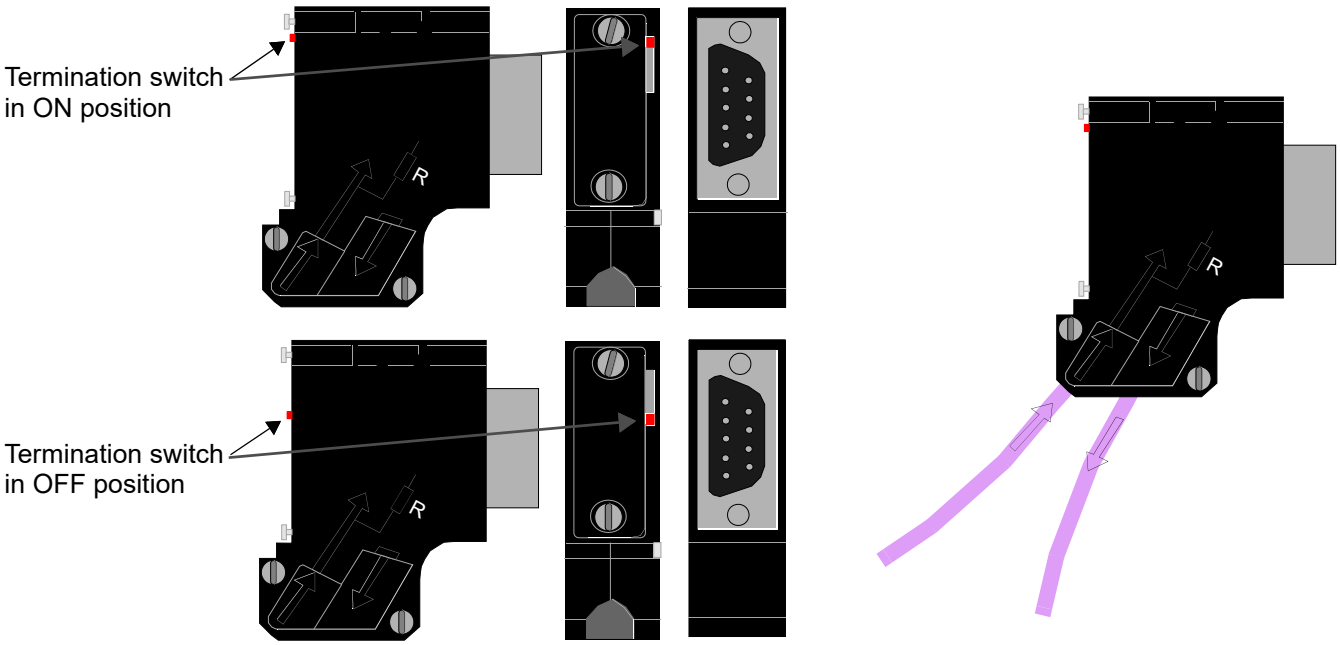


Figure 3-18. PROFIBUS Cable Connector

3.13.4 Commands through PROFIBUS

PROFIBUS DP is available in PFEA112 (not in PFEA111).

“Zero set” is the only command that can be performed through PROFIBUS in PFEA112.

3.13.5 Handling of Measurement Data through PROFIBUS

Two web tension measurement values are transferred through PROFIBUS:

- Value 1 has the same step response time as "voltage output"
- Value 2 has the same step response time as "current output".

The scaling of "voltage output" and "current output" does not affect the measurement values transferred through PROFIBUS.

If zero set has been performed, the zero set values are transferred through PROFIBUS.

For scaling of PROFIBUS measurement values, see Section 3.13.5.2.

Each measurement value has 16 bit, 2-complement representation (Integer 16).

3.13.5.1 Miscellaneous Menu PFEA112

Use this menu for scaling PROFIBUS measuring values

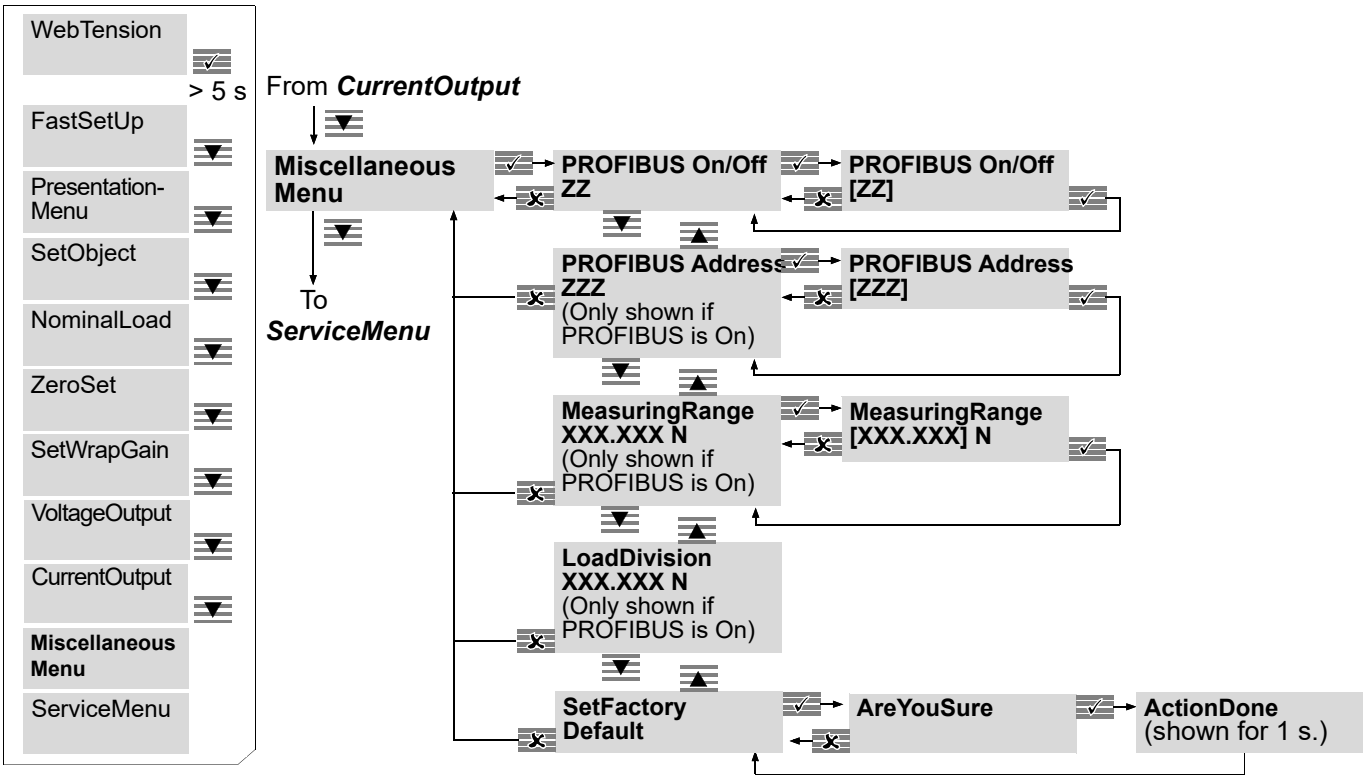


Figure 3-19. PROFIBUS Scaling

A.3 Technical Data

Table A-2. Data for Supply Voltage

	Data	Comments
Supply voltage		
IP 20-unit (unsealed)	24 V DC *	18 - 36 V DC
IP 65-unit (NEMA 4)	24 V DC *	18 - 36 V DC
	85 - 264 V AC	100 V -15% to 240 V +10%
Mains frequency	47 - 63 Hz	100 - 240 V AC, 0.2 - 0.1 A
Power consumption	8 W (24 V)	
Fuse		
IP 20-unit (unsealed)	Automatic reset	
IP 65-unit (NEMA 4)	Slow blow, 2 A, 250 V	

Table A-3. Data for Load Cell Excitation

	Data	Comments
Current	0.5 A rms, 330 Hz	Regulated
Max. load	Two load cells + max. 5 Ω cable resistance (1 μF cable capacitance).	Load cells of type: PFCL 301E, PFTL 301E, PFRL 101 and PFTL 101. PFCL 201, PFTL 201.

Table A-4. Data for Load Cell Inputs

	Data	Comments
Number of inputs	2	
Input impedance	10 kΩ	

***** The +24V power supply must be isolated from the AC mains supply and designed not to be subjected to transient voltage (that means reliable grounded capacitively-filtered DC secondary circuits). ABB SD83X or similar power supply units inside cubicle fulfills these requirements.

Table A-5. Data for Signal Outputs

	Data	Comments
Voltage output	0 - 10 V	Range -5 to +11 V
Max. load	5 mA	
Ripple	<10 mV_{p-p}	Wrap gain = 1
Step response time	15 ms	
Band width	35 Hz	
Current output	4 - 20 mA	Range 0 to 21 mA
Max. load	550 Ω	
Step response time	15 ms	
Band width	35 Hz	
Extra filtering for voltage and current output		
Filter setting	30 ms 75 ms 250 ms 750 ms 1500 ms	
Cut-off frequency	15 Hz 5 Hz 1.5 Hz 0.5 Hz 0.25 Hz	
Wrap gain adjustment	0.5 - 20	

Table A-6. Measurement Ranges for the Tension Electronics

Type	Range (1)
Zero Setting Range	±2.0 × F_{nom}
Dynamic Measurement Range (including zero set)	–2.5 × F_{nom} to + 3.5 × F_{nom}

(1) F_{nom} = Load cell nominal load

Table A-7. Communication PFEA112

	Data	Comments
PROFIBUS	1	12 Mbit
Communication protocol	PROFIBUS DP slave	According to EN 50 170
Transfer speed	Max. 12 Mbits / s	
Address range	0 - 125	