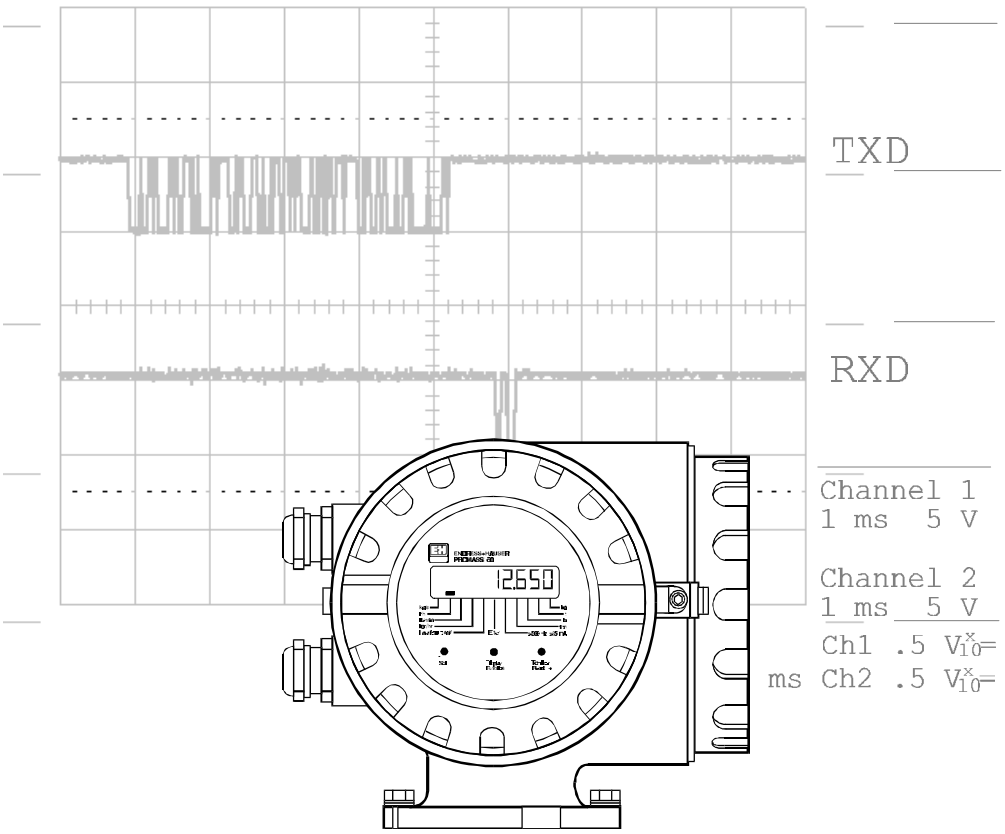
SH 006D/06/e/07.96
No. 50071188

promass 60
promass 63

Flow measurement

Service manual



Endress+Hauser

Nothing beats know-how


Note!

General Information

This manual is written for service technicians. The Promass measuring system should only be repaired by qualified personnel.

This service manual describes the Promass 60 and Promass 63 measuring systems. It is valid for software versions V1.00.XX (amplifier) and V1.00.XX (communications module) and above. Further information on updating and supplements is available from your local Endress+Hauser Sales Office.

The operating manuals for the Promass 60 (BA 013D/06/e) and Promass 63 (BA 014D/06/en) measuring systems are also part of this service manual.

Safety

The instruments are built and checked according to EN 61010, “Protection Measures for Electronic Equipment for measurement, Control, regulation and Laboratory Procedures“ and have left the factory in a safe condition.


Warning!

Warning!

When removing the housing cover under power, the protection status is no longer valid. Therefore, always switch off the power supply before opening the instrument.

All local regulations concerning the operation and repair of electrical instruments must be strictly observed.

Do not carry out repairs or soldering in hazardous areas.
Under no circumstances should soldering of the boards be carried out by service engineers. Do not unsolder any SMD components. All existing regulations covering Ex boards must be strictly adhered to!

Ex devices should only be opened after the mains voltage is switched off and after a minimum cooling time of 10 minutes.

Regulations governing repair

All instruments sent to Endress + Hauser for repair must be free of all dangerous or poisonous chemicals (acids, lyes, solvents, etc.). Please do not return instruments unless every possible step has been taken to completely remove dangerous material. If you do send instruments back to the factory for repair please send them with the completed form “Recognition of safety“ signed by the user. Remote versions: return also DAT

The Promass measuring system fulfils all IP 67 and NEMA 4X protection requirements (sensor optional in IP 68). All transmitter and sensor housing screws should be undone by qualified and trained personnel only otherwise the protection guarantee is no longer in force. All gaskets and screws are to be replaced and tightened.

Please protect your electronic boards against electrostatic discharges. Ground yourself and your work area. Always use special conducting plastic bags for transportation of the electronic boards.

Release of programming levels for Promass 63

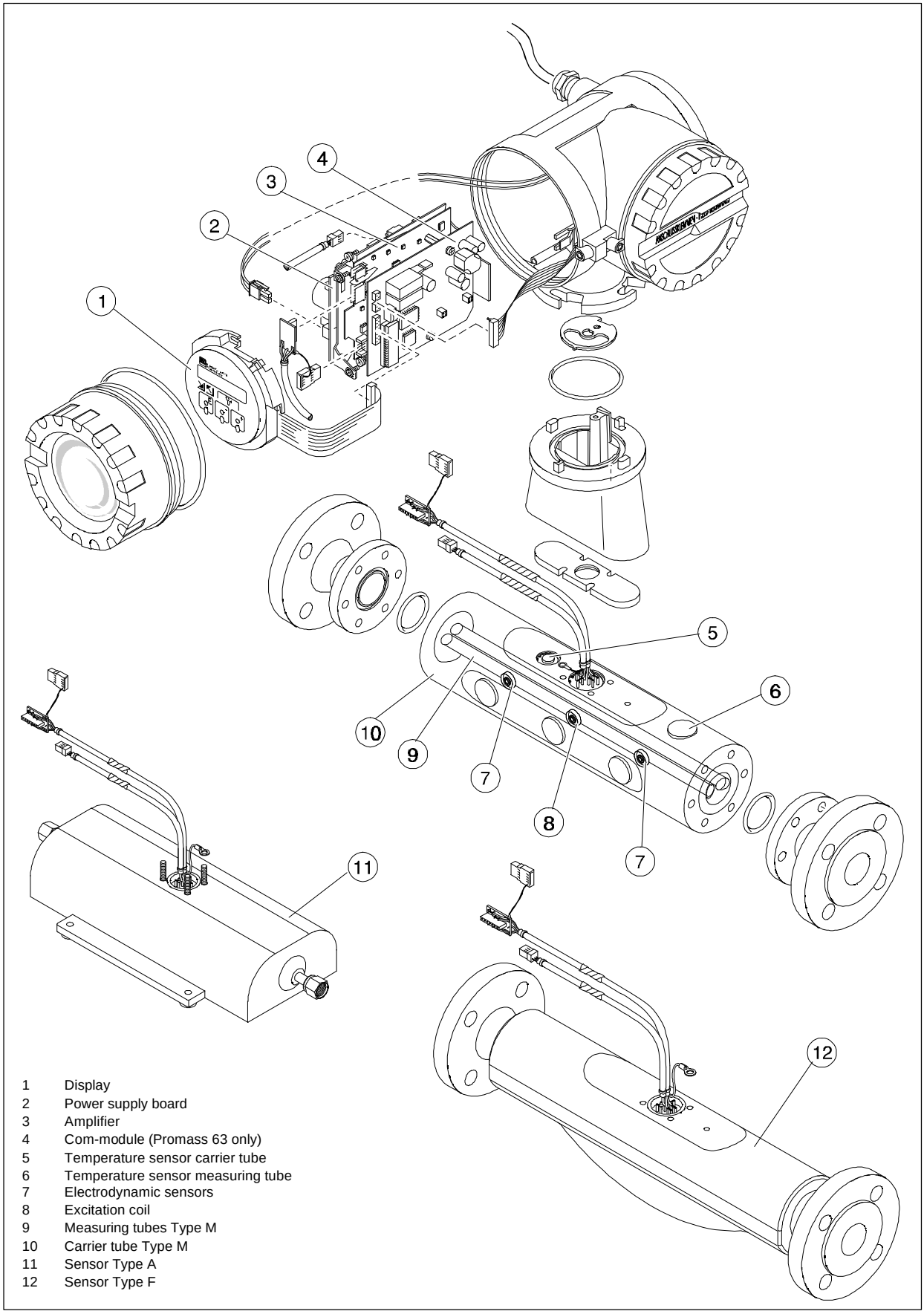
- Release of programming level: 63 (factory setting)
- Release of service programming level: 4685

Checklist of service items

- Multimeter with continuity tester
- Two-channel oscilloscope
- Flowjack with Promass adapter or simulation board, test point plug
- Replacement electronics modules
- Service software Prospy, Interface box, Laptop or PC

Summary of Contents

1. Construction of the Promass*



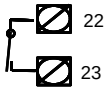
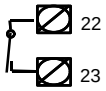
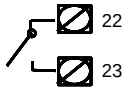
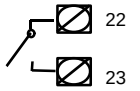
1 Display
2 Power supply board
3 Amplifier
4 Com-module (Promass 63 only)
5 Temperature sensor carrier tube
6 Temperature sensor measuring tube
7 Electrodynamic sensors
8 Excitation coil
9 Measuring tubes Type M
10 Carrier tube Type M
11 Sensor Type A
12 Sensor Type F

* Display and amplifier of the Promass 63, communication module for the Promass 63 only

Fig. 1: Construction of the Promass

2. Instructions on troubleshooting

2.1 Response of the measuring system to fault or alarm

Condition of measuring system	Transmitter	Response of measuring system
System operating correctly	Promass 60	Status output closed, i.e. open collector = conducting 
	Promass 63	Relay contact Relay 1* = closed 
Fault, system error (Error due to instrument failure)	Promass 60	Status output open, i.e. open collector = non-conducting  Pulse output not operating Current output set to 0 or 2 mA according to programmed current output (0 or 4 mA) Display: Two error segments visible, display flashing Green LED on amplifier board flashing Warning! Do not open Ex devices in hazardous area
	Promass 63	Error message shown on display Relay contact Relay 1* = open  Signal outputs respond according to the programmed response on error
Alarm, process error (Error due to process conditions)	Promass 60	Status output active on system error only Pulse and/or current output out of range (>500 Hz, > 25 mA segment on display)
	Promass 63	Alarm message shown on display Response of Relay 2 according to programming Error output (Relay 1) not affected

* Factory set Relay 1 = make contact set. The break contact can also be set as required by using a jumper on the communications board (see Fig. 17 on Page 35).

Warning!

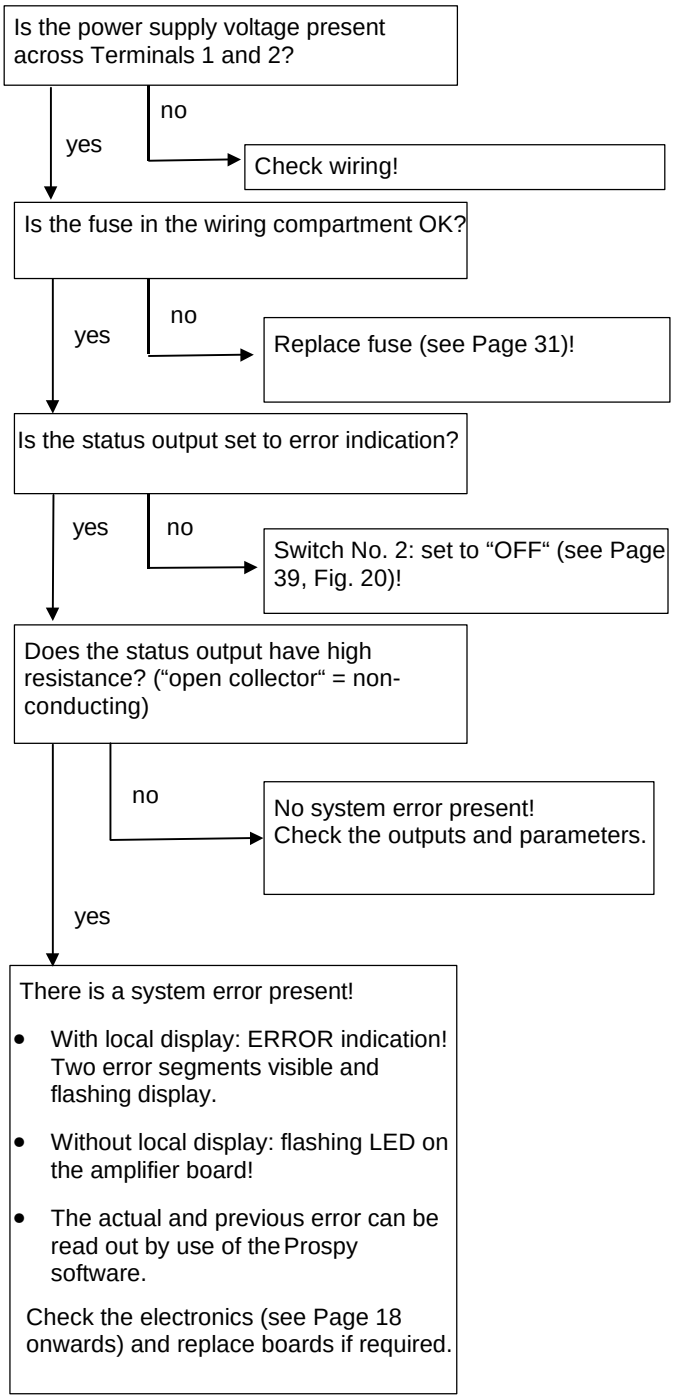
Caution!

Caution!

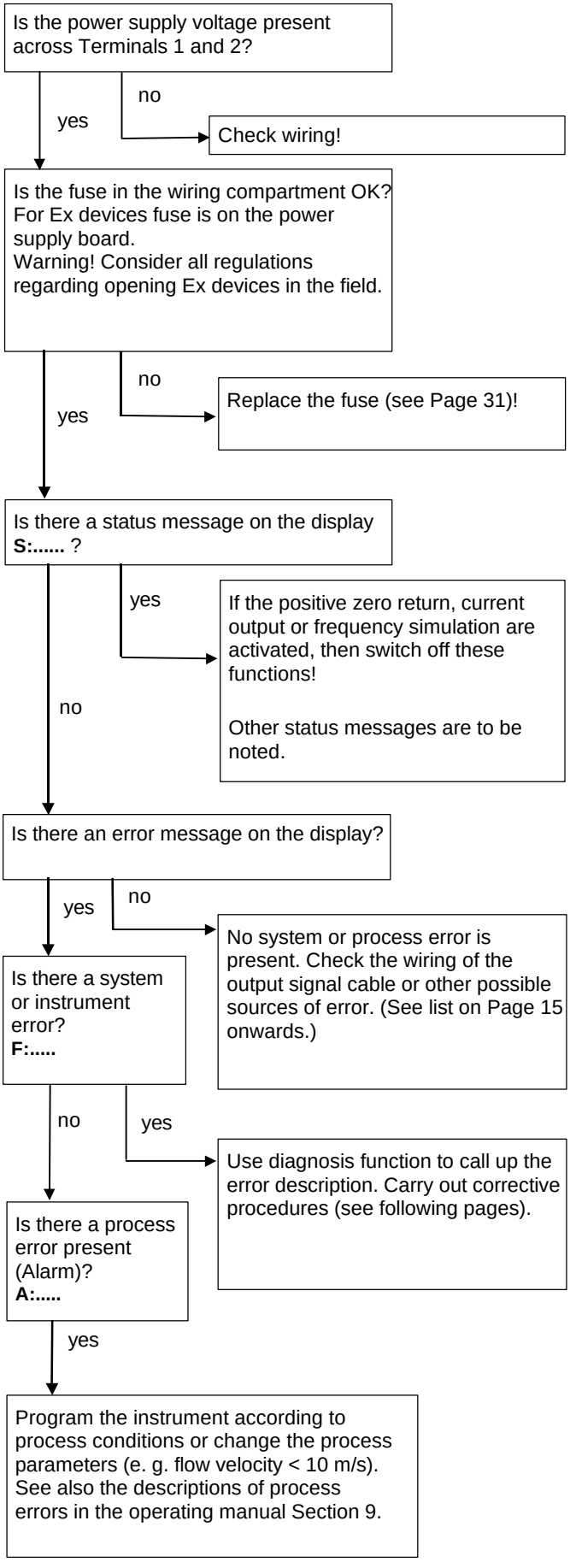
Positive zero return and simulation:
The response of the measuring system is changed if these functions are activated. They should be deactivated during diagnosis (troubleshooting).

Please refer to section 7 in the installation and operating manual for the response of the outputs with active positive zero return and simulation.

2.2 System check for Promass 60



2.3 System check for Promass 63



2.4 Possible errors, causes and remedial action

Promass 63: Error description by calling up diagnosis function or check error output.
Promass 60: ERROR indication (with local display,Prospy) or check status output.

Application errors are indicated according to the following priority:
1: Tubes are not oscillating
2: Amplifier fault
3: Sensor out of tolerance
4: Max. excitation current
5: Medium inconsistent
6: Too high flow velocity
7: Empty pipe detection
Using Prospy in conjunction with Promass 60 only the error with the highest priority is indicated.

System error (fault) F:..	Cause Promass 63: diagnosis function Promass 60: Prospy	Remedial action
F: SYSTEM ERROR AMPLIFIER	**LOW VOLTAGE DETECTED** The amplifier detects a power voltage which is too low. • Mains voltage too low. • Power supply defective. • Amplifier defective.	Ceck mains voltage Check power unit and replace electronic module or power supply board if necessary. Replace electronic module or amplifier board.
	DAT FAILURE Error on access to DAT data. DAT on the amplifier is missing or defective.	Use new DAT. Note! The sensor data must then be reprogrammed!Use Prospy with Promass 60.
	EEPROM FAILURE Error on access to EEPROM data. EEPROM (or DAT) on amplifier is defective.	Check DAT or replace electronics module or amplifier board.
	RAM FAILURE Error on access to working memory (RAM) of the amplifier. RAM defective.	Replace electronic module or amplifier board.
	NO DIAGNOSIS	1. Check the amplifier with the simulation board or Flowjack (see Page 22). 2. If this is OK, then check the sensor (see Page 23).


Note!

System error (fault) F:..	Cause Promass 63: diagnosis function Promass 60: Prospy	Remedial action
F: SYSTEM ERROR AMPLIFIER (continued)	**TEMP. CIRCUIT FAILURE** Temperature circuit on the amplifier is defective.	Replace electronics module or amplifier board.
	ASIC FAILURE The ASIC on the amplifier is defective.	Replace electronics module or amplifier board.
	TEMP. SENSOR CARRIER TUBE	Check the temperature sensor of the containment tube (sensor) using the connecting plug (see Page 23). If the temperature sensor is defective, then the flowmeter must be replaced.
	TEMP. SENSOR MEAS. TUBES	Check the temperature sensor of the carrier tube (sensor) using the connecting plug (see Page 23). If the temperature sensor is defective, then the flowmeter must be replaced.
F: SYSTEM ERROR POWER SUPPLY	**LOW VOLTAGE DETECTED** The power supply is supplying a power voltage which is too low. • The power supply voltage to the instrument is too low. • Power supply filter defective. • Power supply defective.	Check the power supply voltage to the instrument. Replace power supply filter. Replace electronics module or power supply.
F: NO DATA RECEPTION	**NO DIAGNOSIS** Data transfer between amplifier and Com module not possible. • Amplifier defective • Optocouplers on the Com module are defective.	Check the amplifier with the simulation board or Flowjack at TP9 and TP14 (see Page 22) and replace electronics module or amplifier if necessary. Check Com module (see Page 20) and replace electronics module or Com module if necessary.

System error (fault) F:..	Cause Promass 63: diagnosis function Promass 60: Prospy	Remedial action
F: VALUE NOT ACCEPTED	**NO DIAGNOSIS** Communications problem between amplifier and Com module.	If the message remains, then the system is not able to measure. Switch off the power supply and restart. If the message still remains then replace the electronics module.
F: TUBES NOT OSCILLATING	**NO DIAGNOSIS** • Application problem	Check application (gas, solids, density, etc. see Page 24).
	• Excitation coil of the sensor is defective	Check the excitation coil of the sensor (see Page 24). Replace flowmeter if necessary.
	• Amplifier is defective	Check the amplifier with the simulation board (see Page 22) and replace electronics module or amplifier if necessary.
	• Power supply is defective	Replace electronics module or power supply.
F: ELECTRODYN. SENSOR (PICKUP FAILURE)	**NO DIAGNOSIS** • The sensor coil is defective.	Check the sensor coils of the sensor (see Page 23). Replace the flowmeter if necessary.
	• The amplifier is defective.	Check the amplifier with the simulation board (see Page 22) and replace the electronics module or amplifier if necessary.
F: SYSTEM ERROR COM MODULE	**LOW VOLTAGE DETECTED** • Com module defective	Replace the electronics or Com module.
	• Power supply is defective (power supply does not supply the required 24 V to the Com module)	Replace electronics module or power supply.
	VOLTAGE REFERENCE The reference voltage of the Com module is outside tolerance. The correct functioning of the current output is no longer guaranteed.	Replace the electronics or Com module.

System error (fault) F:..	Cause Promass 63: diagnosis function Promass 60: Prospy	Remedial action
F: SYSTEM ERROR COM-MODULE (continued)	**EEPROM ERROR** Error on access to EEPROM data. Com module is defective.	Replace the electronics or Com module.
	RAM ERROR Error on access to the RAM of the Com module. RAM is defective	Replace the electronics or Com module.
	ROM ERROR Error on access to the program memory of the Com module. • Program memory (EPROM) is defective. • Com module is defective	Use new EPROM with software. Ensure that the correct software version is also used. Replace the electronics or Com module.
	EEPROM HW DATA ERROR The EEPROM of the Com module (hard and software identification) is damaged or a part of the data is overwritten. Default values from the ROM are loaded. The measuring system can still operate on a makeshift basis using these values.	1. With the service code (4685) in the function group SYSTEM PARAMETER open function SYSTEM RESET and select RST HW DATA ERR. 2. Reprogram the matrix. 3. Calibrate the current outputs. Note! The totaliser is automatically reset to "0". Note the further error messages: • **SYSTEM ERROR COM MODULE** HW-TYPE INCOMPATIBLE • **SYSTEM ERROR COM MODULE** HW-VERSION INCOMPATIBLE (see error messages below) These error messages cannot be switched off. Replace the electronics or Com module.

System error (fault) F:..	Cause Promass 63: diagnosis function Promass 60: Prospy	Remedial action
F: SYSTEM ERROR COM-MODULE (continued)	**EEPROM PARA.DATA ERR** A part of the EEPROM data of the Com module (parameter block: matrix entries, process data) is damaged or has been overwritten. Default values stored in the ROM are loaded. The measuring system can still operate using these values.	1. With the service code (4685) in the function group SYSTEM PARAMETER open function SYSTEM RESET and select RST PARA. DATA ERR. 2. Reprogram the matrix. Note! The totaliser is automatically reset to "0".
	EEPROM TOT. DATA ERROR A part of the EEPROM data of the Com module (totaliser block) is damaged or has been overwritten. The default value "0" in the totaliser is loaded.	With the service code (4685) in the function group SYSTEM PARAMETER open the function SYSTEM RESET and select RST TOT. DATA ERR. Note! The totaliser is automatically reset to "0".
	EEPROM DEFAULT VALUES The EEPROM of the Com module is empty. The default values stored in the ROM are (software identification, matrix entries, current calibration data) loaded.	Check the default values loaded and reprogram if necessary. This error message should not be indicated when the system is restarted. If this is so, then the Com module is defective and must be replaced. Note the further error messages: • **SYSTEM ERROR COM MODULE** HW-TYPE INCOMPATIBLE • **SYSTEM ERROR COM MODULE** HW-VERSION INCOMPATIBLE (see error messages below) These error messages can only be switched off if the hardware type and the hardware revision no. of the Com module are entered using the service software PROSPY. Otherwise replace the electronics or Com module.


Note!

System error (fault) F:..	Cause Promass 63: diagnosis function Promass 60: Prospy	Remedial action
F: SYSTEM ERROR COM-MODULE (continued)	**HW-TYPE INCOMPATIBLE** An incorrect Com module has been fitted; e.g. RS485 instead of HART®.	Check the Com module version and replace it with the correct one if necessary.
	HW-VERSION INCOMPATIBLE An incorrect hardware version of the Com module has been fitted.	Check the hardware version of the Com module and fit a Com module with the correct hardware version if required.
	SW-TYPE REPLACED The Promass software has been replaced with other software (Promag).	Check the type of software and replace it with the correct type if necessary.
	SW DOWNGRADE NOT POSSIBLE A previous software version has been installed. This is not allowed. The software is not downwards compatible!	Check the software version and replace it with the latest version if necessary.
F: SYSTEM ERROR AMPLIFIER	**SW-TYPE INCOMPATIBLE** The software of the amplifier and the Com module are not compatible.	Replace the electronics only as electronics module.
	HW-VERSION INCOMPATIBILE The hardware of the amplifier is not compatible with the Com module.	Replace the electronics only as electronics module.
	SW-VERSION INCOMPATIBLE The software versions of the amplifier and the Com module are not compatible.	Replace the electronics only as electronics module.
	HW-TYP INCOMPATIBILE The sensor and the transmitter are incompatible.	Combine the correct sensor and transmitter.

Error status of the measuring system	Cause	Remedial action
Instrument does not operate or there is no reading on the display	• No power supply. • Fuse defective.	Check power supply and connect. Check fuse in the wiring compartment and replace if necessary (see fuses Page 31).
No reading on the display but measuring pipes oscillate	• Power supply to the Promass is too low. • Connection to display is faulty. • Display is defective. • Com module is defective.	Connect the correct power supply. Check connection to the display. Replace display unit. Check the Com module (see Page 20) and replace electronics or Com module if necessary.
Faulty display and deviations in current output: unexplained response	Fault or noise in the power cable or I/O cables.	Protect cabling from electromagnetic interference, e.g. ground the sensor.
Unstable measurements or measurement error	• Gas bubbles in the system. Identified by deviating excitation current and varying amplitude. • Fluid with high viscosity, especially with large nominal diameters. Damping too large. • Zero point poorly adjusted, or zero point error. Indication: The error increases as flow velocity is reduced.	Check application. Increase system pressure. Application unsuitable under these conditions. Carry out the zero point adjustment correctly. The zero point should remain stable when adjustment is carried out a number of times.

Error status of the measuring system	Cause	Remedial action
Zero point is unstable, drifts and cannot be adjusted	• The measuring path is not properly sealed or is leaking creating variations in fluid flow velocity.	Ensure that the measuring path is sealed correctly and that the fluid is absolutely still.
	• Gas pockets in fluid (unstable excitation current).	Increase system pressure. The gas pockets will thus become smaller and therefore will not affect measurement.
	• Solids which have built up or have been released.	Increase flow velocity if possible. Caution! Note abrasive effects!
Incorrect density measurement	• Two-phase fluid with large density difference between carrier fluid and solids.	Problem cannot be remedied as application limits have been reached. Important: Contact E+H Flowtec concerning information on nominal diameter, measuring range, carrier fluid and solids.
	• Abrasion or corrosion of the measuring pipes: Check oscillation frequency of the measuring pipes (pipes must be clean). The frequency can be read off in the function group SERVICE & ANALYSIS (see Page 27). The original frequency can be obtained from E+H Flowtec by giving the serial number of the instrument.	Replace sensor. Check whether the fluid flow velocity is too high (for abrasion) and, if necessary, increase the nominal diameter with a replacement instrument. Check whether the material of the measuring pipes is suitable for the application.
	• Build-up/caked-on material in the measuring pipes. Check the oscillation frequency with pipes filled with air or water. Compare with the original frequency (±2Hz) for information. The original frequency can be obtained from E+H Flowtec by giving the serial number of the Promass.	Clean measuring pipes or replace sensor.

Alarm messages A:...	Cause	Remedial action
A: DAT CONTAINS DEFAULT DATA	Empty DAT in amplifier. The instrument is operating with default data.	Program sensor data (nominal diameter, calibration factor and zero point).
A: EXCIT. CURRENT LIMIT	The maximum excitation current for the excitation coil has been reached. The instrument is continuing to operate correctly.	If the excitation current is no longer sufficient to oscillate the measuring system, then the application conditions are to be changed (air, solids, multiphase fluid, etc.). Increase the system pressure or decrease the amplitude of the mechanical oscillation (see advanced functions on Page 29).
A: SLUG FLOW CONDITIONS	The excitation current varies significantly: Application problem!	Check application (see Page 24).
A: EMPTY PIPE	Application problem: • air in the measuring pipes • density too low (see Page 24).	 Check application and ensure that the measuring pipes are always filled with liquid. Check the density limit in the function group PROCESS PARAMETER
A: FLOW TOO HIGH	Velocity of liquid in measuring pipes > 12.5 m/s. Measuring range of transmitter electronics is exceeded.	Lower the flowrate.
A: ZERO ADJUST NOT POSSIBLE	The static zero point adjustment cannot be carried out or has been interrupted.	Check whether the flowrate velocity = 0 m/s.
A: CURRENT OUTP. OVERFLOW	The actual flowrate is out of range (limited by the scaled lrv and urv).	Adjust the initial and full scale values or the current output assigned for the variable.
A: FREQ. OUTPUT OVERFLOW	The actual flowrate is too large for the full scale value (f_{max} = 163%).	Adjust the initial and full scale values or the frequency output assigned for the variable.

2.5 Checking the amplifier at test points TP5, TP14, TP10 and TP13

Connect the Flowjack or simulation board (see Page 22) to the pin strips V1 and V8 of the amplifier and take measurements using an oscilloscope at the points described below. For the Promass 63, the measured values of the test points can also be shown directly on the display or given at any output. The test points can be selected in the function group SERVICE&ANALYSIS on access with service code 4685 (see Page 27).

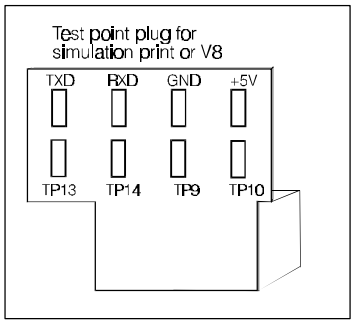


Fig. 2:
Assignment of the test point plug

The test points are set on the connection board of the Flowjack and on the simulation board. A special test point plug is available which can be connected to the appropriate pin strip. This can be plugged directly onto pin strip V8 of the amplifier board. In this case, all test points can be checked while the instrument is operating.

2.5.1 Resonant frequency at TP14 against TP12 (ground)

(resonance frequency on display of TP 5)

Medium	Resonance frequency in Hz ±10 Hz									
	Sensor type M						Sensor type A, Stainless Steel		Sensor type A, Hastelloy C	
	DN 8	DN 15	DN 25	DN 40	DN 50	DN 80	DN 2	DN 4	DN 2	DN 4
Air	770	900	950	850	870	960	267	308	267	300
Water	630	680	740	630	630	690	251	270	250	262

	Sensor type F, SS 1.4539					Sensor type F, Hastelloy C22				
	DN 8	DN 15	DN 25	DN 40	DN 50	DN 8	DN 15	DN 25	DN 40	DN 50
Air	590	700	940	770	660	608	712	930	782	665
Water	540	600	800	650	520	555	621	797	670	557

With frequency deviations: Material layers or corrosion on the measuring pipes possibly. Clean sensor or replace. The original frequency of the sensor can be obtained from E+H Flowtec by giving the serial number.

Check for the chemical resistance of the measuring pipes in this application for corrosion. If possible, increase the flow velocity when material build-up is to be expected (see also Section 2.10 Application).

2.5.2 Measuring pipe oscillation at TP14 against TP12 (ground)

Amplitude	With oscilloscope in Vpp	With voltmeter in Veff
100%	6.0 ±0.20	2.12 ±0.15


Note!

Note!
If the amplitude is increased or decreased using advanced functions then the values have to be recalculated as a proportion of the change.
The sensors DN 8F and DN 50F are permanently operated at 150% oscillating amplitude.

With deviations or fluctuations: The electronics are defective or the process conditions are unstable. Solid or gaseous components may be present in the fluid which may lead to irregular oscillation of the measuring pipes. Check also the excitation current (see Page 19). The excitation current fluctuates or is at its limit with heterogeneous distribution of solid or gaseous components.

2.5.3 Oscillation amplitude signal at TP10 against TP12 (ground)

Amplitude	Oscillation amplitude signal in Vp	
	Display value with software version 1.00.00	Value with oscilloscope or software version > 1.02.00
100%	1.6...2.0	1.8...4.0

Note!
If the amplitude is increased or decreased using advanced functions then the values have to be recalculated as a proportion of the change.
The sensors DN 8F and DN 50F are permanetly operated at 150% oscillating amplitude.

With deviations: The electronics are defective. Check also the electrodynamic sensors. If these are OK then replace the electronics.

2.5.4 Excitation current at TP13 against TP12 (ground)

Amplitude	Excitation current in mAeff (Values apply to air or water)			
	Sensor type A DN 2/4	Sensor type M/F DN 8/15/25	Sensor type M/F DN 40/50	Sensor type M DN 80
100%	<1	<3	<5	<10

Note!
If the amplitude is increased or decreased using advanced functions then the values have to be recalculated as a proportion of the change. The sensors DN 8F and DN 50F are permanently operated at 150% oscillating amplitude.
Multiply by a factor of 1.41 when calculating peak values.

The excitation current fluctuates strongly: Check the application. Solids or gaseous components may be in the fluid which may lead to irregular oscillation of the measuring pipes. The excitation current depends on application (gas or solid contents).

Max. excitation current:
Sensors type M/F: 100 mA_{eff} = 1 V_{eff} or 2,8 V_{pp} at TP13
Sensor type A: 25 mA_{eff} = 0,25 V_{eff} or 0,7 V_{pp} at TP13

Calculation of the excitation current: $I_{Err(mA_{eff})}$ = (TP13 x V_{pp}) / 10

2.6 Checking the Promass 63 Com module (HART, RS 485, current)

The function of the communication module and the amplifier board can be checked with a two-channel oscilloscope.
The terminals of the oscilloscope are connected to the V8 pin strip of the amplifier board (see Fig. 15 and 16 on Pages 34 and 35).
See Fig. 3, test point plug.
The test point plug can be pluged to the connection board of the Flowjack or to the simulation board.

Channel 1 of the oscilloscope is connected to TXD and Channel 2 to RXD (against ground TP 12).

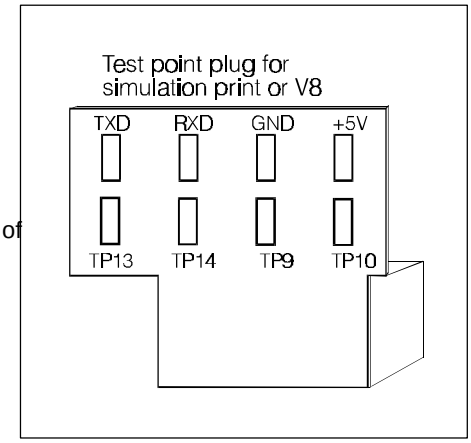


Fig. 3:
Test point plug

Normal operating mode

Figure 4 shows the signals of the amplifier and the communication module when operating normally. Channel TXD shows the transmission of the measured value from the amplifier to the communication module. Channel RXD shows acknowledgement of the communication module of the incoming value. This sequence is cyclical and repeats itself e.g. every 20 ms (independent of the frequency of the measuring pipe oscillation).

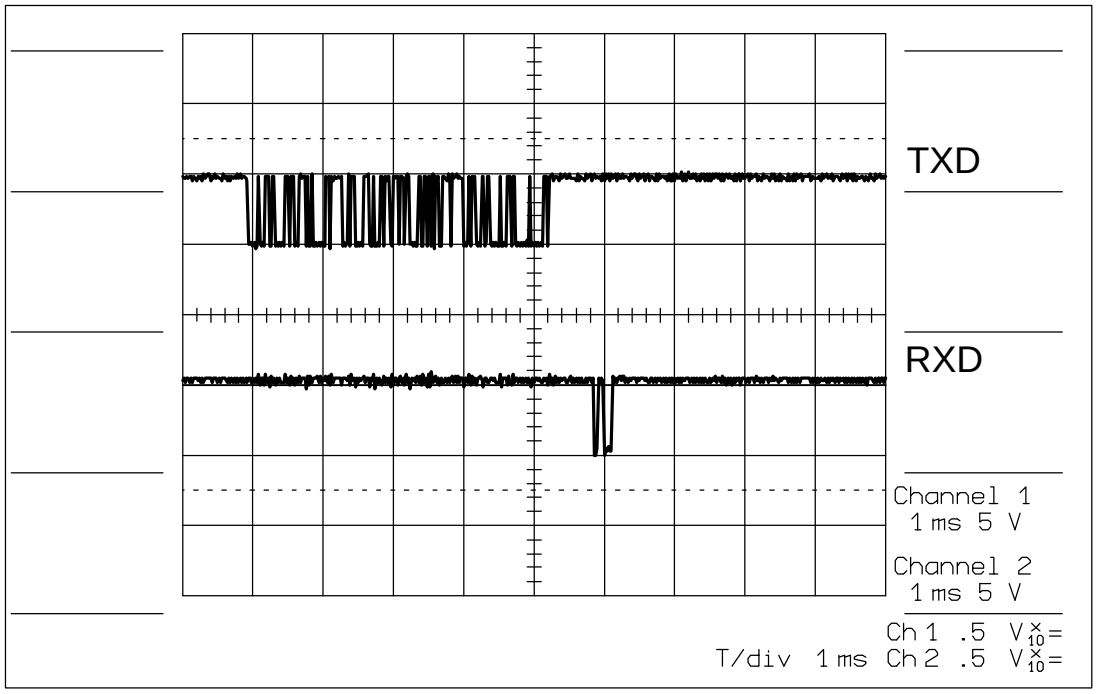


Fig. 4:
Amplifier and communication module signals in normal operation

Defective communication module

If the F: SYSTEM FAILURE AMPLIFIER error occurs with the diagnosis NO DATA RECEIVED, then there may be a fault in the communication module. In this case, no signal is available from the incoming channel RXD of the amplifier as shown in Fig. 5. The amplifier again attempts to create a connection with the communication module which results in a periodic signal of max. 100 Hz at TXD.

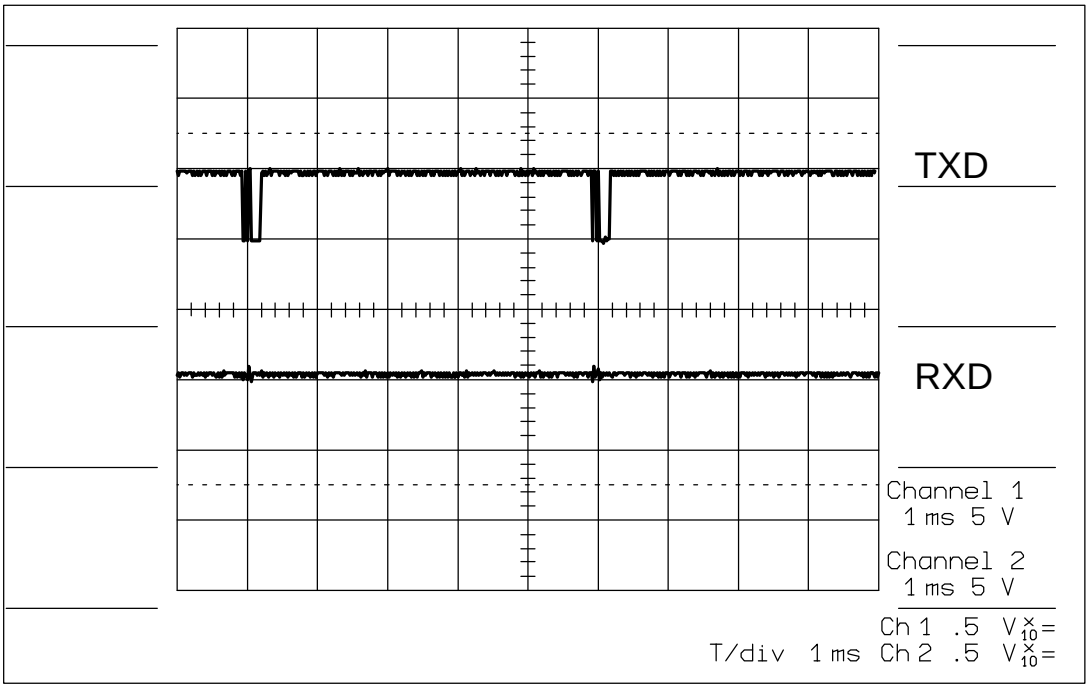


Fig. 5:
Signals with defective communications module

Defective amplifier board

If the F: SYSTEM FAILURE AMPLIFIER error message occurs with the diagnosis NO DATA RECEIVED, then the amplifier may be faulty. In this case there is no signal on the transmitting channel TXD (Fig. 6). The communication module again attempts to create a connection with the amplifier which results in a periodic signal of max. 100 Hz at RXD.

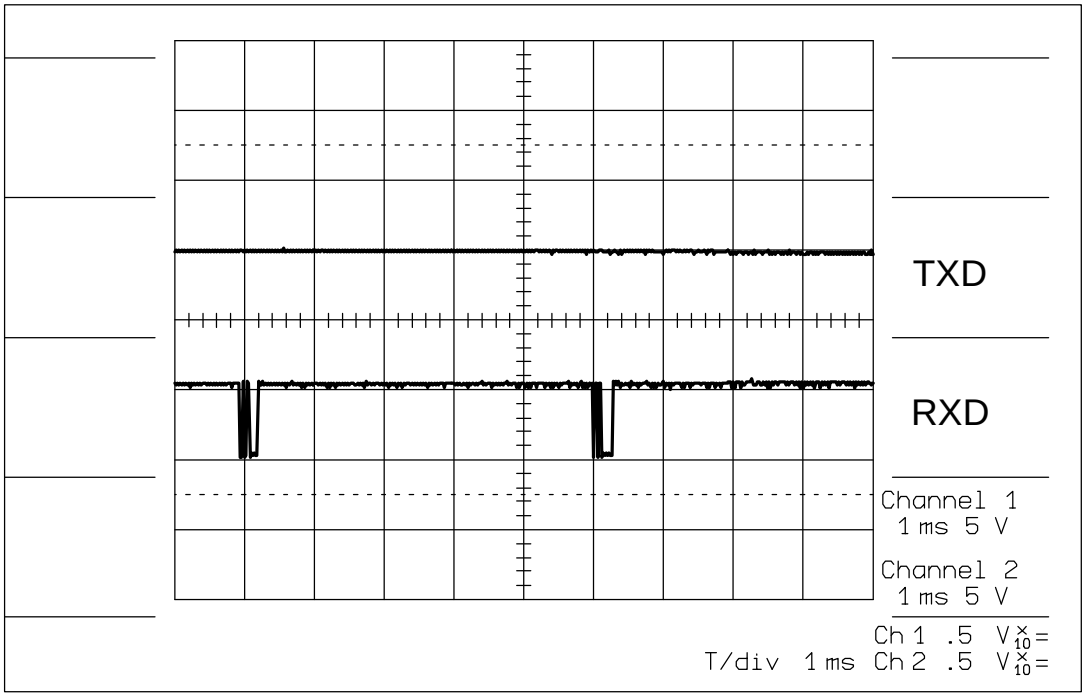


Fig. 6:
Signals with faulty amplifier

2.7 Checking other systems using simulation of current and frequency output of Promass 63

Checking the electronics of other systems connected can be carried out by simulating the signals of the current output or the signals of the frequency output. The functioning of the simulation mode does not mean full functionality of the Promass electronics.

The simulation function of the current and frequency output is activated in the function groups CURRENT OUTPUT or PULSE/FREQ. OUTPUT. The desired values are also set in these function groups.

2.8 Connections and functions of the Flowjack flow simulator and simulation board

Sensor signals are simulated using theFlowjack or the simulation board. TheFlowjack and simulation board are connected to the amplifier board of thePromass 60/63 over two pin strips, V8 and V1 (see Fig. 7). The sensor coil connection board must first be removed from the pin strip V1.

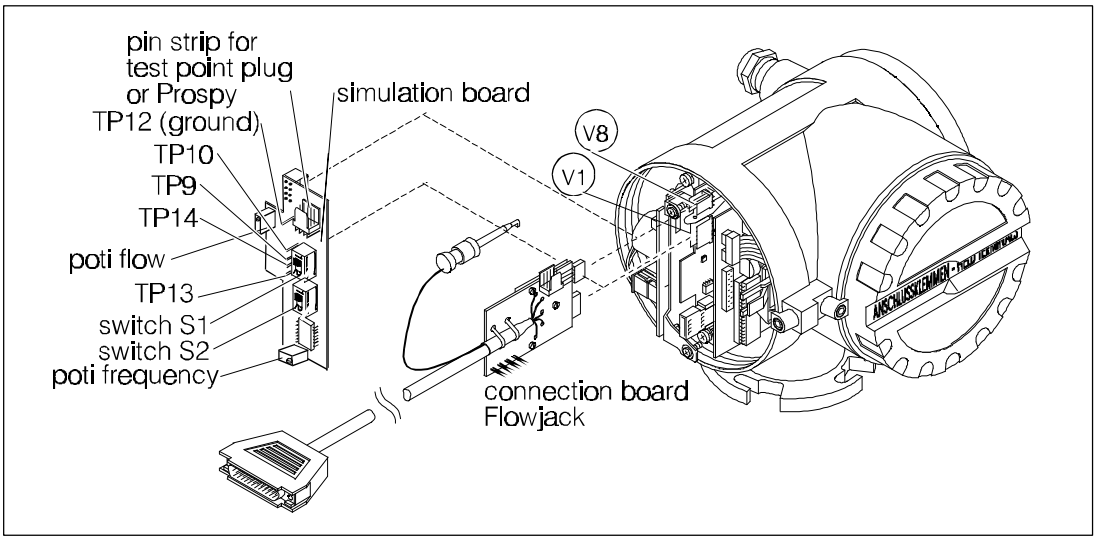


Fig. 7:
Connection of the Flowjack and simulation board

2.8.1 Simulation board for checking the amplifier

The simulation board allows the amplifier and communications board to be easily checked. The simulation board also provides access to all test points. The board is connected to pin strip V1 and V8 of the amplifier (see Fig. 7). The sensor coil connection board has already been removed from pin strip V1.

The sensor is simulated and the circuit on the amplifier is checked using the simulation board. This board supplies the following values to the measuring electronics:

Coriolis frequency: sensor M/F: appr. 600 Hz; sensor A: appr. 300 Hz
Temperature: 25.7 °C
Switch S1 position 2: flow according to adjustment
position 2: no flow
Switch S2 position 1: sensor type A
position 2: sensor type M/F

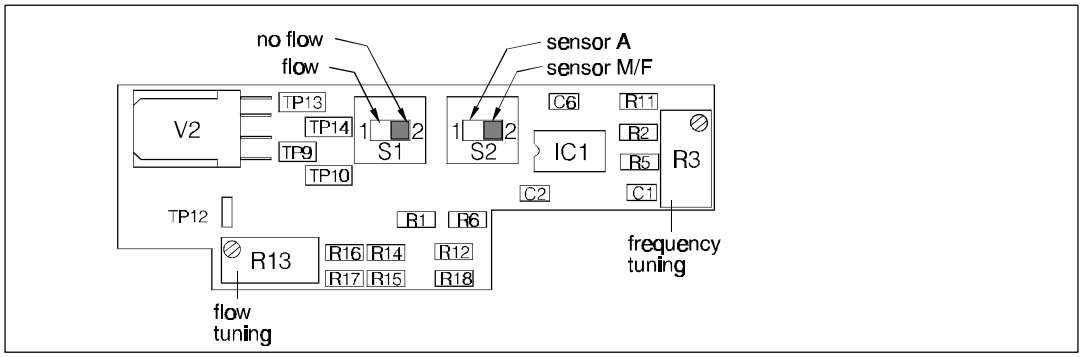


Fig. 8:
Layout of the simulation board

Check the frequency of the Promass 63 on the display in the function group SERVICE&ANALYSIS (see Page 27).
Check all test points of the Promass 60 with an oscilloscope or a voltmeter (see Sect. 2.5).
The transmitter electronics are OK if the electronics are operating correctly with the simulation board. Finally check the sensors (electrodynamic sensors, temperature sensors and excitation coil, see Sect. 2.9). If the Promass electronics are not operating correctly with the simulation board, then replace the electronics.

2.9 Checking the sensor

The following points can be checked on the sensor:

- electrodynamic sensors
- excitation coils
- temperature sensors.

When checking, resistances are measured with an ohmmeter. This is connected to the connection board of the electrodynamic sensors/temperature sensors or at the plug of the excitation coil (see Fig. 9).

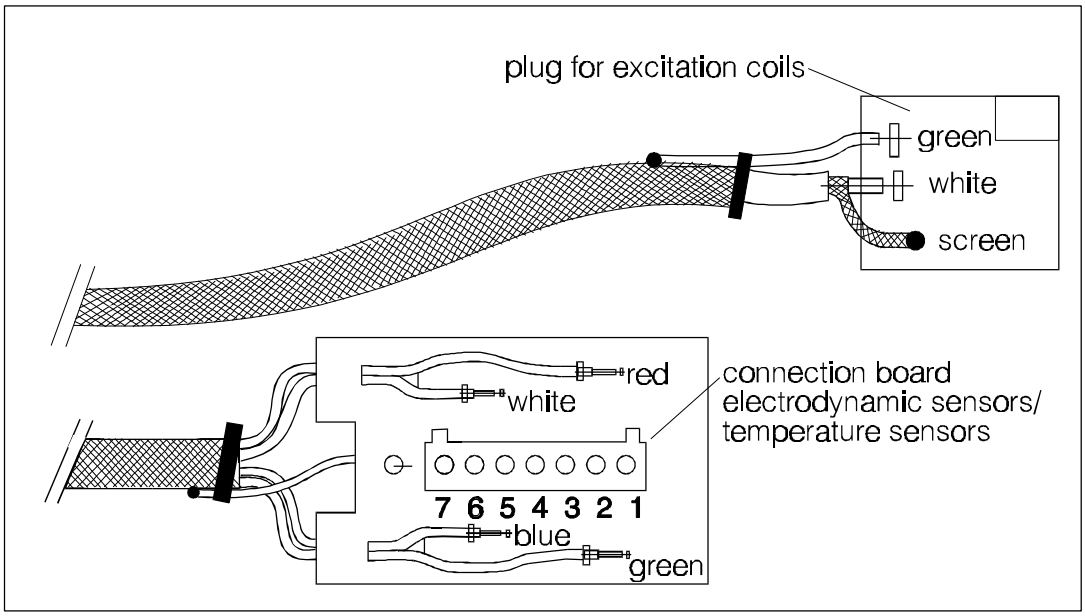


Fig. 9:
Plug of the excitation coils,
connection board for electrodynamic sensors and temperature sensors

2.9.1 Resistance of electrodynamic sensors

The resistance is measured at the plug or at the cables of the connection board. There are four induction coils in the sensor as electrodynamic sensors. One electrodynamic sensor consists of two induction coils connected in series.

Sensor 1 (inlet side): measure PIN 3 (green cable) against PIN 2 ground (screen).

Sensor 2 (outlet side): measure PIN 1 (blue cable) against PIN 2 ground (screen).

Sensor type, nominal diameter	Resistance of the electrodynamic sensors
type M, DN 8...50	104 Ω ±5 Ω at 20 °C (±2%/5 °C temperature change)
type M, DN 80	52 Ω ±5 Ω at 20 °C (±2%/5 °C temperature change)
type F, DN 8...50	76 Ω ±5 Ω at 20 °C (±2%/5 °C temperature change)
type A, DN 2/4	262 Ω ±5 Ω at 20 °C (±2%/5 °C temperature change)

The flowmeter must be replaced if one of the electrodynamic sensors is defective.

2.9.2 Resistance of the excitation coil

To check the excitation coil resistance, an ohmmeter is connected to the plug of the excitation coil (see Fig. 9). Connect between the white wire and the screen (ground).

Sensor type, nominal diameter	Resistance (±5 Ω at 20 °C)
type A, DN 2/4	240 Ω (±2%/5 °C temperature change)
type M, DN 8/15	172 Ω (104 + 68* Ω) (±2%/5 °C temperature change)
type M, DN 25/40	57 Ω (±2%/5 °C temperature change)
type M, DN 50/80	40 Ω (±2%/5 °C temperature change)
type F, DN 8/15	118 Ω (36 + 82* Ω) (±2%/5 °C temperature change)
type F, DN 25/40	20 Ω (±2%/5 °C temperature change)
type F, DN 50	27 Ω (±2%/5 °C temperature change)

* additional Ex resistance

If the excitation coils are defective (short or open circuit), then the flowmeter must be replaced.

2.9.3 Resistance of temperature sensors

The resistance of the temperature sensors (PT 1000) are measured using an ohmmeter connected to the plug of the connection board of the electrodynamic sensors/temperature sensors or the cables (see Fig. 9).

PT 1000 containment vessel:

PIN 7 (white cable) against PIN 5 ground (screen): 1077Ω at 20 °C (±3.85 Ω/°C temperature change)

PT 1000 measuring pipes:

PIN 6 (red cable) against PIN 5 ground (screen): 1077Ω at 20 °C (±3.85 Ω/°C temperature change)

The flowmeter must be replaced if one of the temperature sensors is defective.

Operation on a makeshift basis is still possible by soldering a reference resistor instead of the defective PT 1000. The reference resistor is calculated according to the temperature of the fluid (1077Ω at 20 °C ±3.85 Ω/°C temperature increase or decrease). The measuring error remains low if the fluid remains at constant temperature.

2.10 Checking the application

The following factors can cause problems in an application:

System pressure:

The minimum pressure for the measuring system is the vapour pressure of the liquid plus the atmospheric pressure. Measuring errors may occur below this pressure or the system may not operate. Note the position of the outlet.

Gaseous content in the fluid:

Gas in the fluid increases the measuring error drastically. This should therefore be avoided. Gas content is detected by irregular oscillation of the measuring pipes (TP14).
Remedial action: Increasing the pressure in the system can solve the problem. Gas separators are required if there is no stable oscillation of the measuring pipes.

Solids in the fluid:

Solids must be well mixed with the carrier fluid, i.e. the fluid must be homogeneous. If this is not the case, then measuring errors will occur.
Abrasion caused by solids may occur.

Multiphase fluid:

If a fluid consists of a number of phases, e.g. liquid/liquid/solid, correct measurement is only possible if the fluid is homogeneous. If this is not the case, measuring errors will occur. Those fluids in which gases are also present create special problems. Such applications are at the measuring limits of the system.

Viscosity:

High viscosity fluids often contain gases which may lead to problems. Highly viscous fluids strongly dampen the oscillation of the measuring pipes (sensor type A: consider pressure loss)

Remedial action: Carry out zero point adjustment under process conditions (pressure and temperature).
Non-Newtonian liquids have viscosities which change depending on the pressure and velocity of the fluid. In this case, a dynamic zero point adjustment must be carried out.
(Sensor type A: calculation of pressure loss see operating manual Sect.Techn. Data)

Temperature changes:

Zero point drift is possible if a highly viscous fluid is also present.

Corrosion of the measuring pipes:

Check for corrosion (TP 14) by frequency. Check the chemical compatibility of the measuring pipes in this application.
Remedial action: Change material of measuring pipes.

Build up on the measuring pipe walls:

Check for build-up on the measuring pipe walls by frequency (TP 14).
Remedial action: Increase the flow velocity (smaller nominal diameter).

Abrasion of the measuring pipes:

Check for abrasion by frequency (TP 14).
Remedial action: Lower the flow velocity (larger nominal diameter). Density can be measured in a bypass.

Filling applications

Reciprocating pumps and quick acting valves which are directly flanged to the sensor may significantly affect the repeatability of the measurement by the “hammer” blows they create.
Remedial action: Carry out mechanical decoupling by “silent-blocks“ or thick rubber gaskets.

Reciprocating and diaphragm pumps:

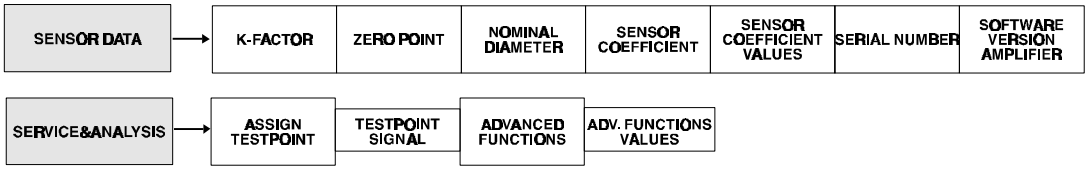
Reciprocating and diaphragm pumps cause rapid flow pulsation. The fluid must therefore be free of gas as the variation in pressure cannot be determined by the instrument.
Remedial action: Reprogram the full scale value and increase it by a factor “ “ of the average value of the mass flow. Use a gas separator if necessary .

Note!
In such applications do not measure with an automatic integration time but with a pre-programmed integration time which is fixed. Reprogram in the function group SERVICE&ANALYSIS.

2.11 Service-Tools Promass 63

The function groups SENSOR DATA and SERVICE&ANALYSIS are also available to assist troubleshooting for the Promass 63.

Data are found in these function groups via the operating matrix.



The data in the SENSOR DATA function group can always be read off and can also be edited once the service code “4685“ has been entered. Access to the SERVICE&ANALYSIS function group is only possible after the service code has been entered.

2.11.1 Function group SENSOR DATA

Function: K-FACTOR

The K-factor can be edited after the service code no. has been entered (no help function available).

DN	calibration factor sensor type M	calibration factor sensor type F SS 1.4539	calibration factor sensor type F Hastelloy C22	calibration factor sensor type A
2	-	-	-	0.64
4	-	-	-	0.49
8	1.9	3.1	3.17	-
15	1.3	2.1	2.21	-
25	1.2	2.4	2.65	-
40	0.9	2.0	2.20	-
50	1.5	2.2	2.29	-
80	1.5	-	-	-

Function: ZERO POINT (PIPE ZERO)

The zero point can always be edited. The help function indicates whether zero point 1 or zero point 2 is active.

Function: NOMINAL DIAMETER

Nominal diameter can be edited once the service code has been entered.

Function: SENSOR COEFF.

With this function a part of the DAT memory can be read and edited. Moving into the editing field SENSOR COEFFICIENT VALUES and back is by using the ENTER key. The following parameters can be edited:

- Density coefficients: $C_0...C_3$
- Temperature coefficients: K_M, K_T

DN	Sensor type M		Sensor type F SS 1.4539		Sensor type F Hastelloy C22		Sensor type A	
	KM	KT	KM	KT	KM	KT	KM	KT
2	-	-	-	-	-	-	400	0
4	-	-	-	-	-	-	400	0
8	1609	-1186	400	0	270	0	-	-
15	1331	-912	400	0	270	0	-	-
25	982	-460	400	0	270	0	-	-
40	968	-363	400	0	270	0	-	-
50	852	-276	400	0	270	0	-	-
80	852	-276	-	-	-	-	-	-

- The highest and lowest measured temperatures of the sensor (read only): T_{min}, T_{max}

Function: SERIAL NUMBER

The serial number can be read in this field.

Function: SW VERSION

The software version of the amplifier can be read in this field.

Function: DAT active/inactive

The DAT can be made active or inactive in this field (not available at present).

2.11.2 Function group SERVICE & ANALYSIS

Function: SEL. TESTPOINT

The test points of the amplifier can be selected in the field SELECTION TESTPOINT. The signal of the test point selected is given in the field VALUES TESTPOINT. The appropriate measured value can be displayed by using the help key (pressing the "+" and "–" keys simultaneously) or by using the ENTER KEY.

The values of the test points can be indicated on the display or via the current or frequency output as required. If a test point is selected, then an additional configuration is shown in the appropriate function field (e.g. the selection parameter TESTPOINT is also shown in the field ASSIGNMENT OUTPUT in the function group CURRENT OUTPUT in order to supply the particular test point signal to the current output (see example at end of this section).

The following test points are available:

- **OFF:** Test point selection is ended with this option.

  Note!
  If the test point signal is no longer required then always switch to OFF to maximise the computing capacity of the instrument.

- **TP5 OSC. FREQ.:** The oscillation frequency of the measuring tubes can be read at Test point 5.
- **TP10 AMPL. VALUE:** Test point 10 again provides the signal of the measurement amplitude. (see Sect. 2.5.3 for values).

- **TP13 EXC. CURRENT:** The effective excitation current can be read off at Test point 13. The maximum excitation current is 100mA_{eff} for the sensors type M/F (see Sect. 2.5.4 for excitation current values for air and water).
- **TP14 OSC. AMPL.:** The oscillating amplitude can be read off at Test point 14. With an amplitude of 100%, the value is 6.0 V_{pp} (other values given in Sect. 2.5.2).
- **CANCEL:** Leaving the cell.

Example 1: The oscillation frequency of the measuring tubes from TP5 is assigned to the current output.

Procedure:

1. The Coriolis signal OSCILL. FREQ. is selected in function SEL. TESTPOINT in the function group SERVICE&ANALYSIS.
2. The TESTPOINT is selected in function ASSIGNMENT OUTPUT in the function group CURRENT OUTPUT.
3. The frequency is then set in function INITIAL VALUE 1 which should correspond to 0 or 4mA. For example 0 Hz = 4 mA (or 600 Hz = 4 mA, if frequency variations in a small range are to be observed).
   The frequency is set in function FULL SCALE VALUE 1 which should correspond to 20 mA. For example, 1000 Hz.
4. The Coriolis signal is now available at the current output.
5. After tests, assign the original function to the current output.

Example 2: The oscillation frequency of the measuring tubes from TP5 is assigned to pulse/frequency output.

Procedure:

1. The Coriolis signal TP5 OSCILL. FREQ is selected in function SEL. TESTPOINT in function group SERVICE&ANALYSIS.
2. The TESTPOINT is selected in function ASSIGNMENT OUTPUT in the function group PULSE/FREQ. OUTPUT.
3. Values are set in functions FULL SCALE FREQUENCY and FULL SCALE VALUE in which the ratio of the signal is to be given. If FULL SCALE VALUE and FULL SCALE FREQUENCY are both set to 1000 Hz, then the Coriolis signal 1:1 will be given at the output.
4. The Coriolis signal is now available at the pulse/frequency output.
5. After tests, assign the original function to the pulse/frequency output.

Function: ADVANCED FUNCTIONS

This function offers a number of programming modes which may be useful to enable the system to operate in special applications.
The ENTER key can be used to toggle between the function selection and the programming.
Note!
The default values are marked in bold letters.


Note!

- **CANCEL:** This ends the function ADVANCED FUNCTIONS
- **INTEGRATION TIME:** Options: **AUTOMATIC**, 1, 2, 4, 8, 16 integration time periods (number of oscillations over which the measured value is integrated).
  The setting AUTOMATIC should not be selected with applications using reciprocal pumps or other strongly pulsating flows. In such cases, a fixed integration time period should be selected.
- **AMPLITUDE FILTER:** Options: OFF; WEAK, **AVERAGE**, STRONG.
  This function determines over how many measurements it is to be averaged.
  Application: strongly fluctuating output signals can be somewhat smoothed out.
- **SELF-ANALYSIS:** Options: OFF, **CYCLICAL**, SMART.
  This analysis mode measures the oscillation amplitude and determines a reference signal for calculating the mass flowrate.

  Note!
  OFF should never be selected, SMART only for short-time measurements.


Note!

- **OSC. AMPLITUDE:** Options: 50%, 75%, **100%,** 150%.
  The oscillation amplitude is the mechanical amplitude of the measuring pipe oscillation. This function enables the oscillation to be decreased with difficult applications if the excitation current is already at its limit. Measurement is still possible under certain circumstances with a decreased amplitude.
  Application: with very high fluid dampening.
- **FREQ. WINDOW:** Options: **ACTIVE**, INACTIVE.
  This function allows the frequency window of the PLL to be switched on or off. If the frequency window is switched on and the defined frequency window of the measuring pipe oscillation is left, then oscillation is restarted. If the resonance frequency cannot be found, then the measuring system will restart with an automatic reset.
- **TEMP. DISPLAY:** Options: CONTAINMENT TUBE, **MEASURING PIPE**.
  This function enables the temperature of the measuring pipes or the containment tube to be displayed at the outputs. The temperature indication only affects the display unit and the current output.
- **PICK-UP CHECK:** Options **ACTIVE**, INACTIVE.
  Sensor monitoring can be switched on or off by means of the error message ELECTRODYN. SENSOR.
- **MEDIUM MONITORING:** Options: **ACTIVE**, INACTIVE.
  If the fluid is highly heterogeneous, then the alarm message A: MEDIUM HETEROGENEOUS appears. This message can be switched off by selecting INACTIVE.
- **EXCIT. CURRENT OVERFLOW:** Options: **ACTIVE**, INACTIVE.
  If the excitation current is dampened to a maximum in an application, then the alarm message A: EXCITATION CURRENT AT LIMIT is given. This message can be switched off by selecting INACTIVE.
- **ERROR BEHAVIOUR:** Options: **OFF**; WEAK, AVERAGE, STRONG.
  This fuinction determines the response time of an alarm and of the alarm relay.
  OFF: Alarm and relay are inmediately active.
  WEAK: Response time of 4 seconds.
  AVERAGE: Response time of 8 seconds.
  STRONG: Response time of 16 seconds.

2.12 Using the service software Prospy

Using the service software Prospy is recommended when dealing with Promass 60 and the blind Promass versions.

The Prospy data cable should be connected at pin strip V8 (see Fig. 7 on Page 22). Via the Prospy interface box the Promass can communicate with the PC.

The following functions are available:

- Download: Downloading the complete program configuration of the Promass into the PC.
- Storing the configuration in the PC.
- Modifying the programming in the PC.
- Upload: Restore changed or modified data from PC to the Promass.

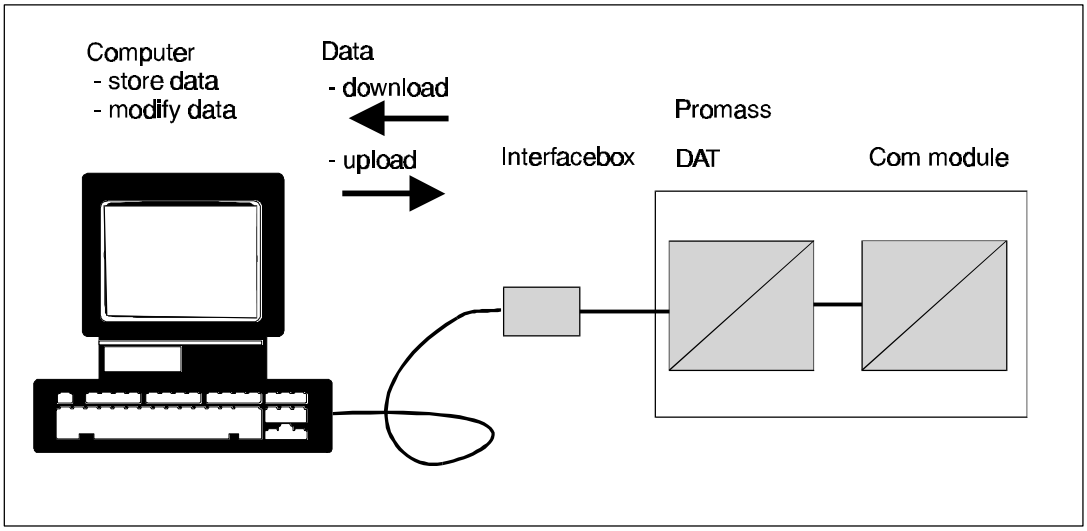


Fig. 10:
Using the service software Prospy

3. Electrical Data

3.1 Connection diagram for remote version

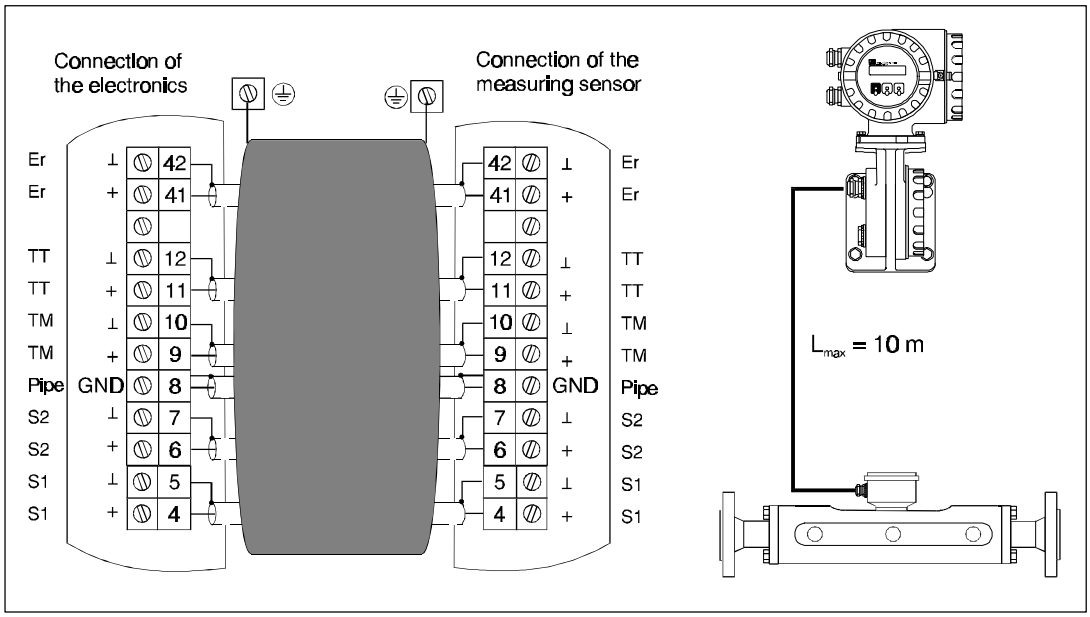


Fig. 11:
Electrical connection of remote version

3.2 Cable specifications

- 6 x 0,38 mm² PVC cable with common screen and each wire screened
- Resistance: ≤50 Ω/km
- Capacity wire/screen: ≤420 pF/m ±2%
- Permanent operating temperature: –25...+90 °C

Note !
The remote version will be delivered with a cable (10 m) installed at the sensor.

3.3 Fuse ratings of power supply

	Power supply 85...260 VAC	Power supply 20...55 VAC Power supply 16...62 VDC
Promass 60/63	1 A slow blow	2 A slow blow
Promass 60/63 Ex	1 A slow blow	2 A slow blow

4. Repair and service

4.1 Replacing the electronic boards of the Promass 60

Warning!

- Danger from electric shock! Switch off the power supply before unscrewing the cover to the electronic compartment of the transmitter housing. Befor opening Ex devices wait ten minutes after switching off the power supply.
- When replacing boards, ensure that the markings are identical (Part-No.). Exchange Ex modules only against Ex modules.
- Local power voltages and frequencies must agree with the technical specifications for the power supply board used.
- Electronic boards of Promass types M/F are different from type A boards.

Procedure:

1 Switch off the power supply.

2 Loosen the locking clamp (3 mm Allen screw).

3 Unscrew the cover to the electronic compartment.

4 Remove the local display/display unit (if present).
   a) Loosen the mounting screws.
   b) Remove the ribbon cable from the amplifier board.

5 Remove the two-pole plug of the connecting cable by simultaneously pressing the locking unit of the power supply board.

6 Also remove the cable board of the shielded electrode signal cable from the amplifier board, including the DAT module.

7 Loosen the two Phillips screws of the board support. Carefully remove the support approx. 4 - 5 cm out of the transmitter housing.

8 Remove the excitation current cable plug from the power supply board.

9 Also remove the plug of the ribbon cable (connecting the terminal compartment) from the amplifier board.

10 The complete transmitter electronic unit can now be removed from the housing together with the board support.

11 Replace the old electronic module with a new one.

12 Reassemble in reverse sequence.

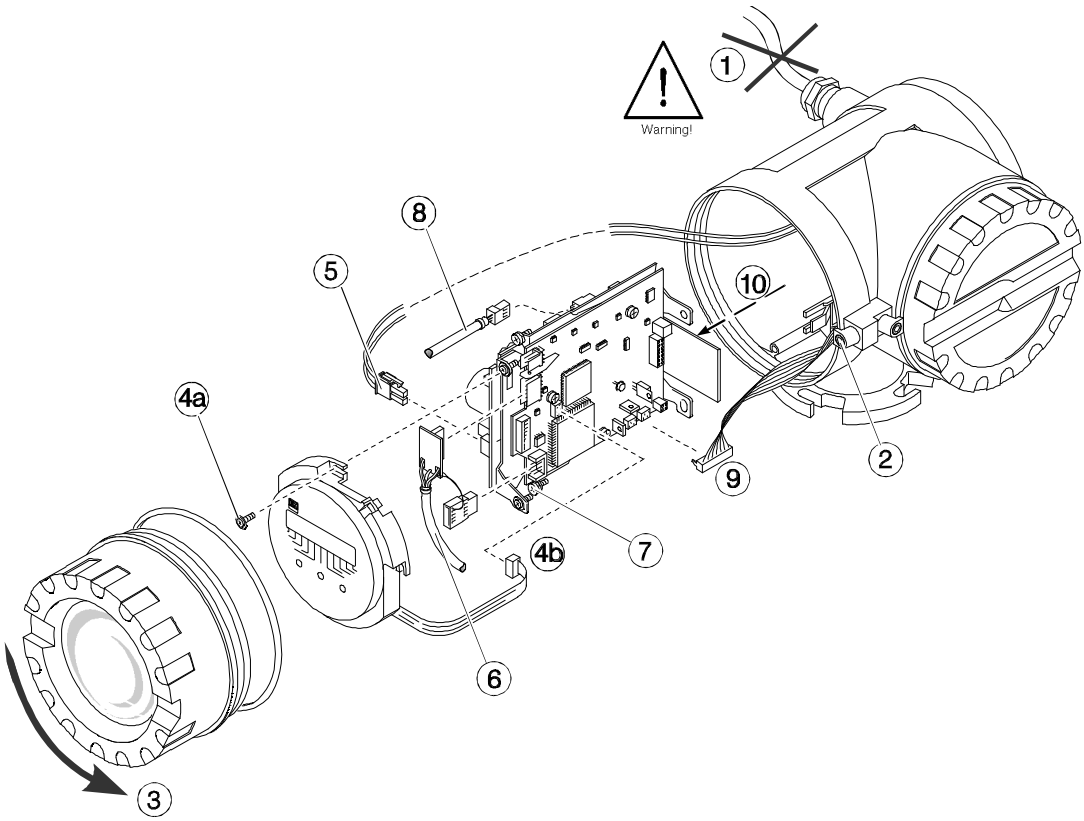


Fig. 12:
Replacing the electronic module
of the Promass 60

4.2 Replacing the electronic boards of the Promass 63

Warning!

- Danger from electric shock! Switch off the power supply before unscrewing the cover to the electronic compartment of the transmitter housing. Befor opening Ex devices wait ten minutes after switching off the power supply.
- When replacing boards, ensure that the markings are identical (Part-No.). Exchange Ex modules only against Ex modules.
- Local power voltages and frequencies must agree with the technical specifications for the power supply board.
- Electronic boards of Promass types M/F are different from type A boards.

Procedure:

1 Switch off the power supply.

2 Loosen the locking clamp (3 mm Allen screw).

3 Unscrew the cover to the electronics compartment.

4 Remove the local keypad/display (if present).
   a) Loosen the mounting screws.
   b) Remove the ribbon cable from the communication board.

5 Remove the two-pole plug of the connecting cable by simultaneously pressing the locking unit of the power supply board.

6 Also remove the cable board of the shielded electrode signal cable from the amplifier board, including the DAT module.

7 Loosen the two Phillips screws of the board support. Carefully remove the support approx. 4 - 5 cm out of the transmitter housing.

8 Remove the excitation current cable plug from the power supply board.

9 Also remove the plug of the ribbon cable (connecting the terminal compartment) from the communication board.

10 The complete transmitter electronic unit can now be removed from the housing together with the board support.

11 Replace the old electronic module with a new one.

12 Reassemble in reverse order.

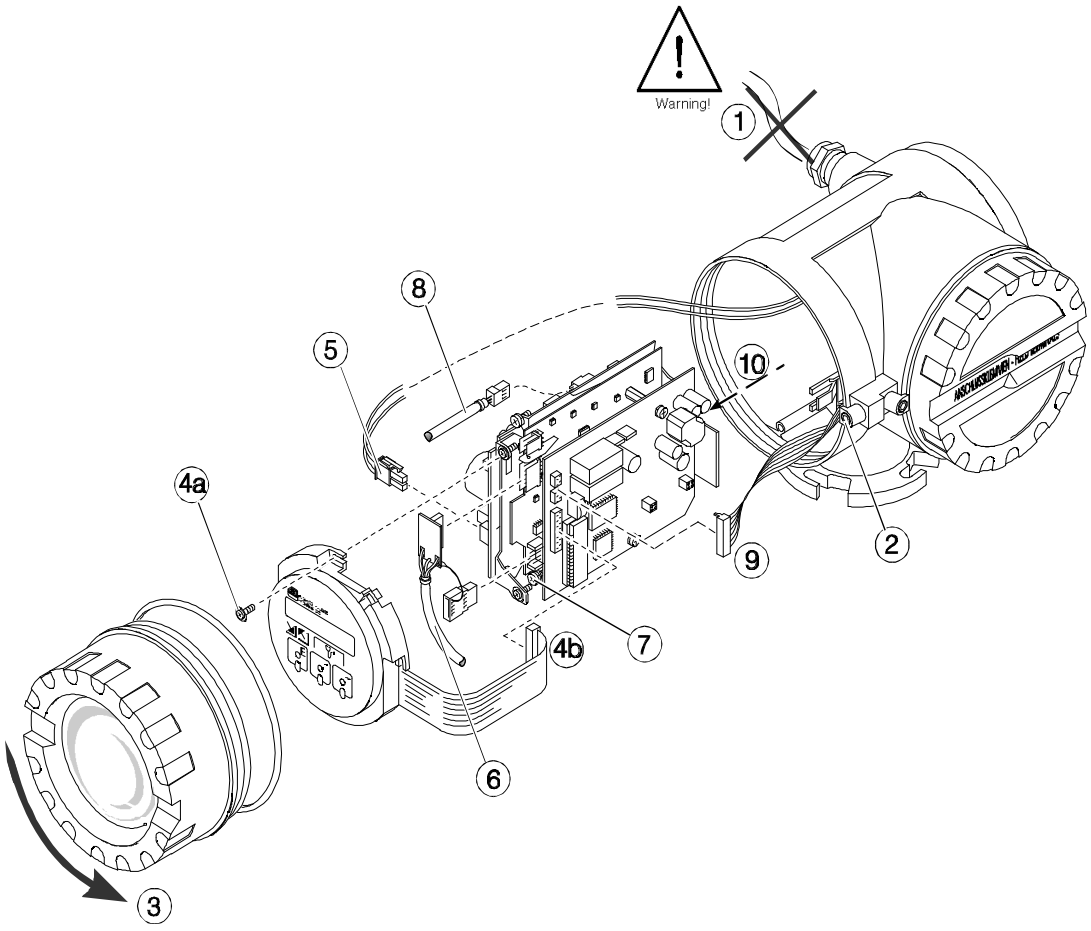


Fig. 13:
Replacing the electronic module
of the Promass 63

4.3 Design of the electronic boards

Power supply board Promass 60 and Promass 63

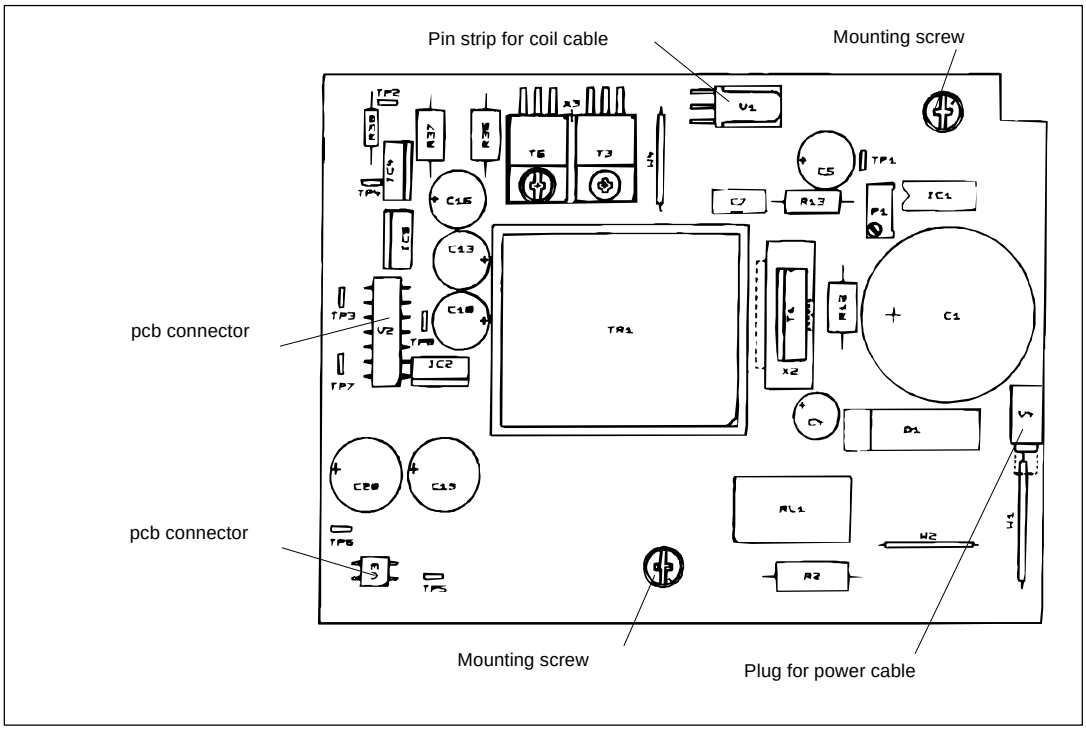


Fig. 14

Amplifier board Promass 60

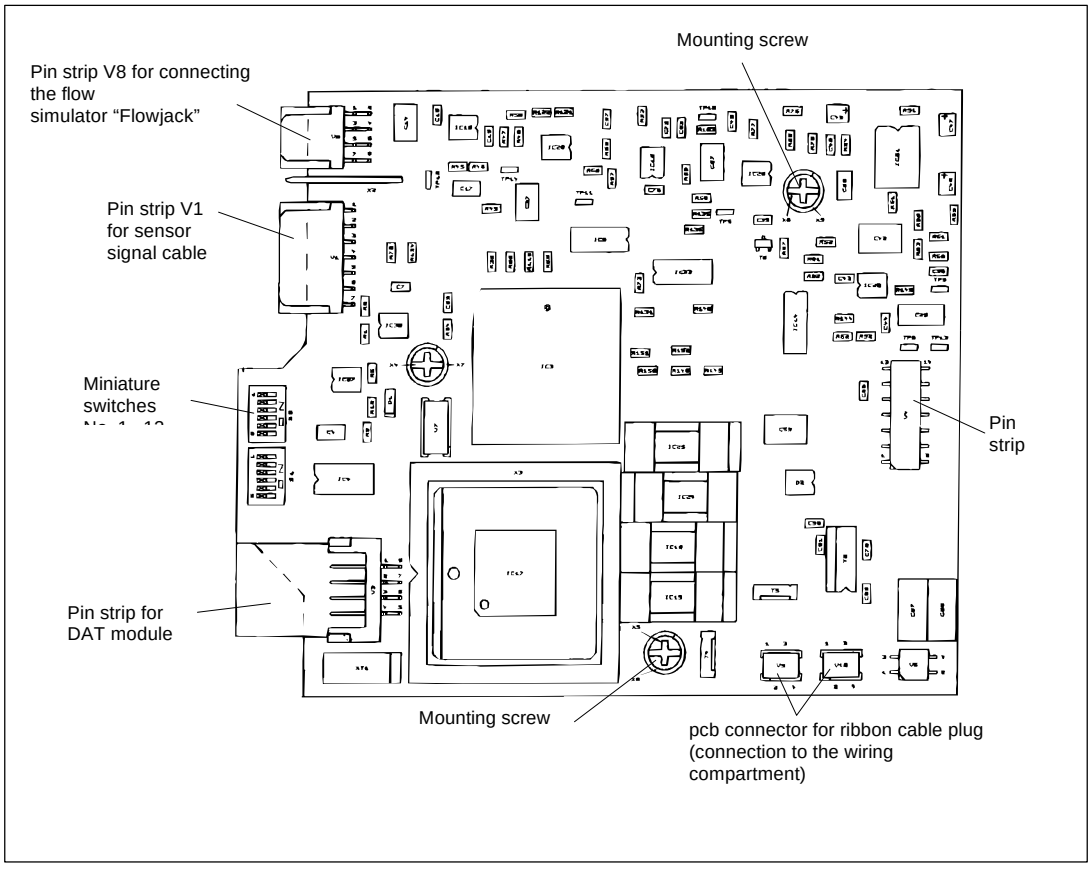


Fig. 15

Amplifier board Promass 63

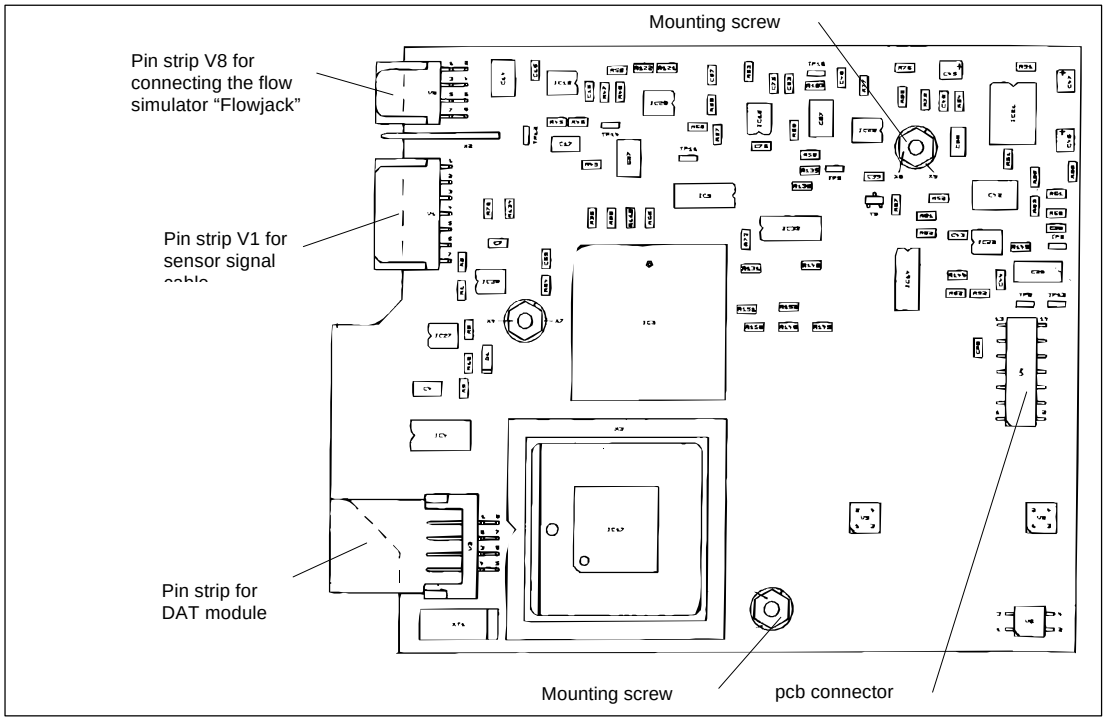
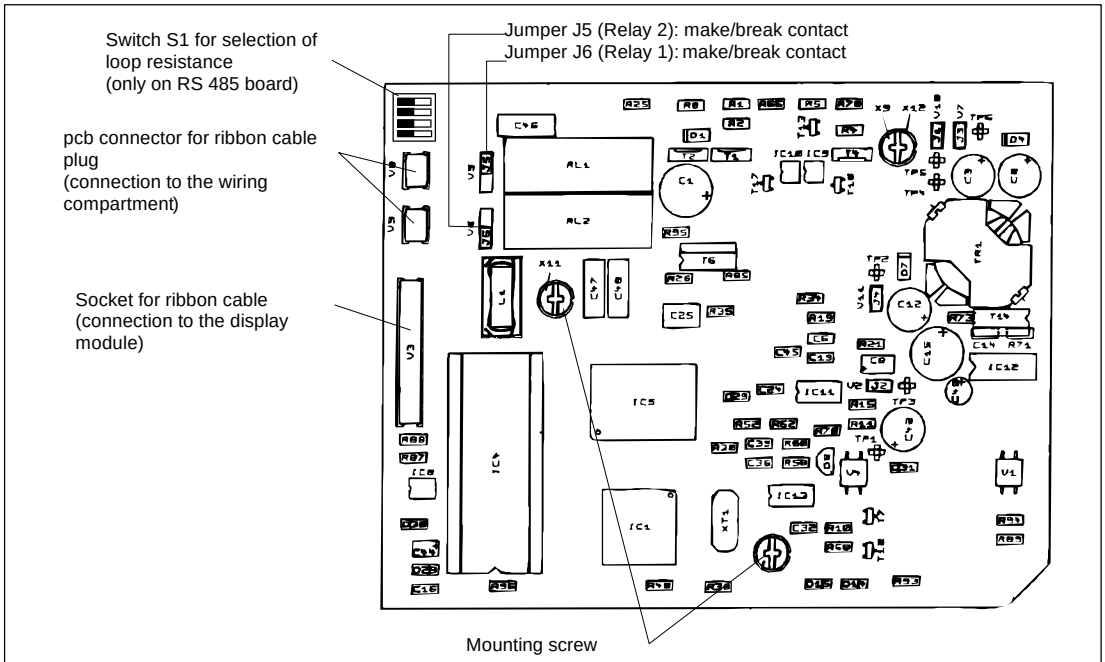


Fig. 16

Communication module HART® Promass 63 (RS 485 and current boards similar)



Relay contacts: NC and NO contact settings

NO contact set	NC contact set
Jumper J5, J6	Jumper J5, J6
Factory setting Relay 1	Factory setting Relay 2

Relay 1: e.g. fault output
can be freely configured

Relay 2: e.g. status output,
can be freely configured

Fig. 17

4.4 Block diagram of the Promass electronics

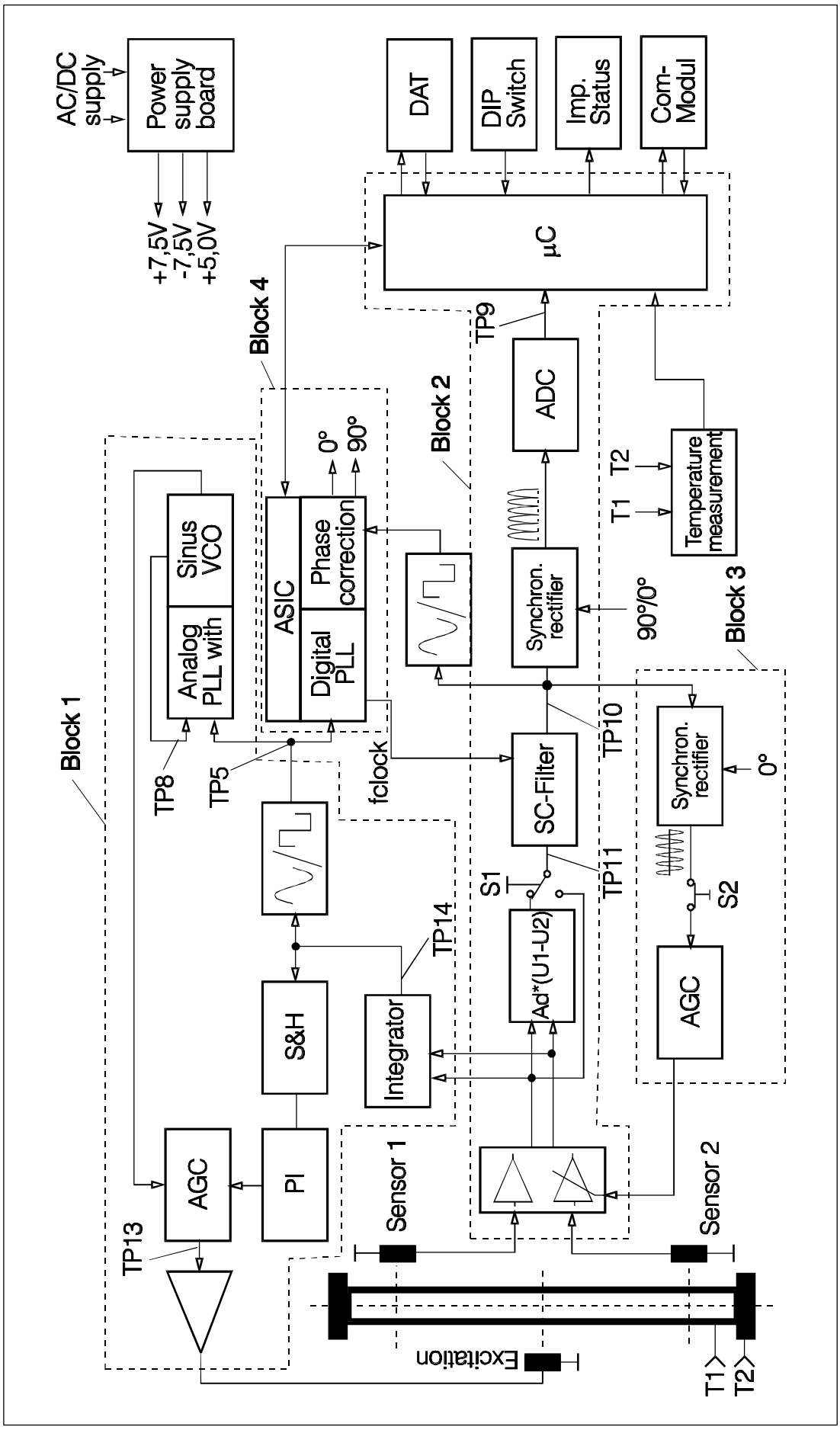


Fig. 18
Block diagram of Promass electronics

Description of the block diagram

Block 1:

Block 1 is responsible for creating the oscillation. In the Promass a sine wave signal which is produced by a VCO is used to create the oscillation. A total sum of sensor amplitudes is produced using an integrator and then used for controlling the sensor amplitudes and frequency.

Block 2:

Block 2 is the actual measuring path. The Coriolis signal is the result of subtracting the sensor amplitudes in the SC filter, the synchronous rectifier and analogue/digital converter. A reference signal (ϕ) is picked up by Sensor signal 1 at 2-second intervals (analysis). The time delay (t = /) is found using the oscillating frequency (ω).

Block 3:

Block 3 controls the amplitude of the oscillation. The amplitudes are controlled by the Auto Gain Control and a synchronous rectifier so that the amplitudes of the voltage are identical at the amplifier output.

Block 4:

Block 4 is the digital control of the entire system (timing). All cycles and signals required for measurement are created here (measurement, analysis, amplitude control and the production and maintenance of the oscillation).

Temperature measurement:

The block for temperature measurement measures the temperature of the measuring and containment pipes. The temperature is converted by a VFC into a frequency and then passed on to the microprocessor.

Power supply:

The power supply supplies power to the amplifier (and Com module) at the required voltage.

DAT:

The DAT contains all sensor data.

DIP switches:

The Promass 60 is programmed using DIP (miniature) switches (Promass 63 via display connected to the Com module).

Pulse/Status:

This is the pulse and status output of the Promass 60.

Com module:

This block is used as the interface to the Com module (Promass 63 only).

4.5 Updating the electronics from Promass 60 to Promass 63

The following components are required for upgrading:

Component	Order No.
• Electronics module (power supply/amplifier board and Com module) • Display module Promass 63 (if blind version not required) • Electronics compartment cover Promass 63 (if blind version not required) • Service labels (see Page 45)	see Page 46

Dismantle the entire Promass 60 electronics (see Page 32) and replace them with the appropriate components of the Promass 63. Ensure that the power supply board has the same voltage. Fill out the service lable and fix it to the housing.

Caution!
The original DAT module of the instrument must be used as it is part of the sensor!

4.6 Changing the power supply variants

The following components are required for changing the power supply:

Component	Order No.
• Electronics module (power supply and amplifier, also Com module for Promass 63, the correct power supply board variant) • Filter board Caution! Ensure that the power supply board and the filter board have the same voltage. • Service lable (see Page 45)	see Page 46

Dismantle the entire Promass electronics (see Page 32/33) and replace them with the appropriate new components. Ensure that the power supply board has the correct voltage. Fill out the service lable and fix it to the housing.

Caution!
The original DAT module of the instrument must be used as it is part of the sensor!

4.7 Electromagnetic compatibility EMC/RFI

The Promass measuring system is protected against electromagnetic interference fields and fulfils the EN 50081 part 1, EN 50082 part 1 standards and NAMUR recommendations. However, should problems arise in the direct vicinity of frequency converters, phase controllers or other sources of strong electromagnetic radiation (radio waves, microwaves, X-rays, etc.), then the following procedures should be carried out:

- In order to take full advantage of the electromagnetic compatibility of the Promass measuring system, it is recommended that the transmitter housing is connected to ground (see Fig. 19). A 6 mm^2 copper cable should be used. The connection can be via a flange or an existing potential equalisation system.
- Where the remote version is used, ensure that the connection cable does not lie in the same cable tray with other cables which are connected to or which supply power to the meter.

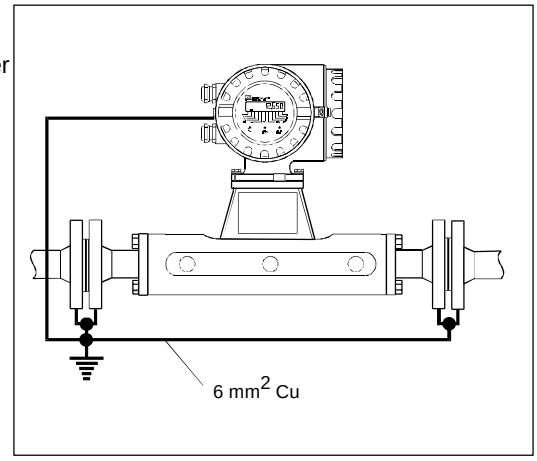


Fig. 19:
Potential equalisation in areas with strong electrical interference

4.8 Operating overview for Promass 60

The instrument parameters of the Promass 60 can be set using the miniature switches. These are found on the amplifier board (see Fig. 15). The cover to the electronics compartment must be removed to set the switches.

Warning!
Switch off the power supply before opening the cover to the electronics compartment.

Miniature switch No. 1...12 (factory settings)

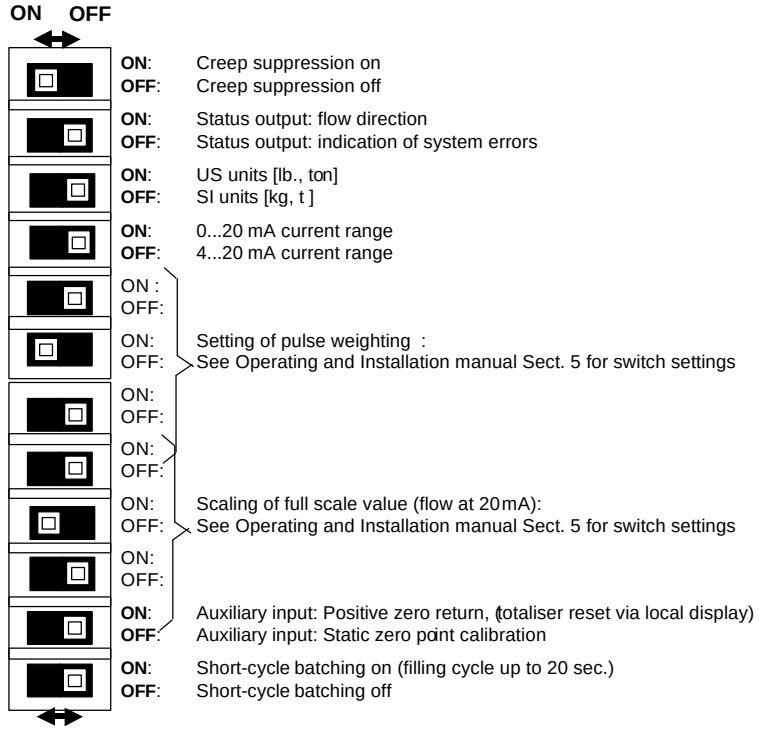


Fig. 20:
Setting the miniature switches for the various functions of the Promass 60

4.9 Local display for Promass 60

With the Promass 60 local display the following parameters can be read off directly at the measuring point:

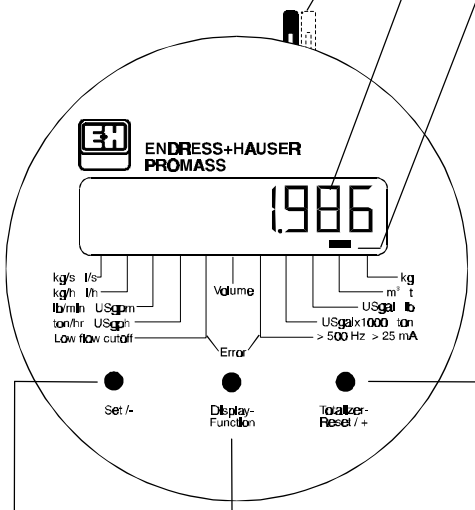
- Flow rate and/or totaliser value
- Technical units (SI/US units)
- Process conditions (creep rate, flow velocity)
- System errors

Selecting and activating various functions may be done using the three operating keys. These are accessible by unscrewing the cover of the electronics compartment. The keys are moved using a thin rod. Switching takes approx. 0.5...0.8 seconds.

Jumper

Left side: The auxiliary input is configured for “positive zero return “ or “static zero point”.

Right side: The auxiliary input is configured for “totaliser reset”.



LCD

All measured values, operating and status messages are shown here.

11 Display segments

The appropriate segments serve to identify the technical units, instrument and process condition:

- Actual technical units
- Creep understepped (low flow cutoff)
- Velocity of fluid too high for the set full scale value; > 500 Hz, > 25 mA.
- System fault (Error)
- Actual totalizer units
- Volume measurement activated/deactivated

Totaliser reset / ⊕

- The totaliser is reset to “0“ using this key (possible with “tot“ function only)
- Input of values (+)

Display function

The required function (= display mode) is selected using this key. Continuous depression of the key runs through the various functions:

- Actual flowrate
- Actual totaliser value
- Number of overflows of the totaliser display
- Alternating display: flow <=> totaliser
- Static zero point adjustment
- Enter zero point value for test function to check the display elements

Set / ⊖

The following operations are carried out within the function using this key:

- Selecting technical units
- Starting zero point calibration
- Input of values (-)

Fig. 21:
Local display Promass 60

4.10 Operating overview for Promass 63

Operation of the Promass 63 transmitter is carried out using three optical keypads.

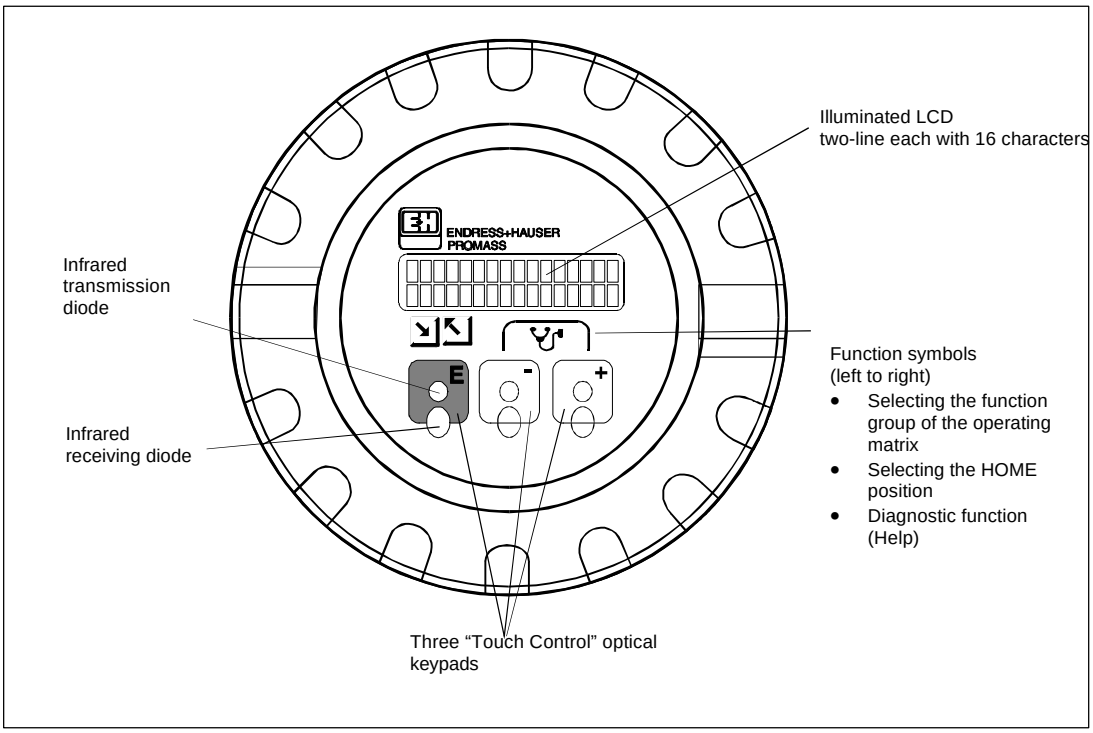


Fig. 22:
Display Promass 63
and operating elements

Selecting the individual function groups and functions within the E+H programming matrix is done by using the operating keys in sequence. The diagnostic function is activated by simultaneously pressing the +/- keys.

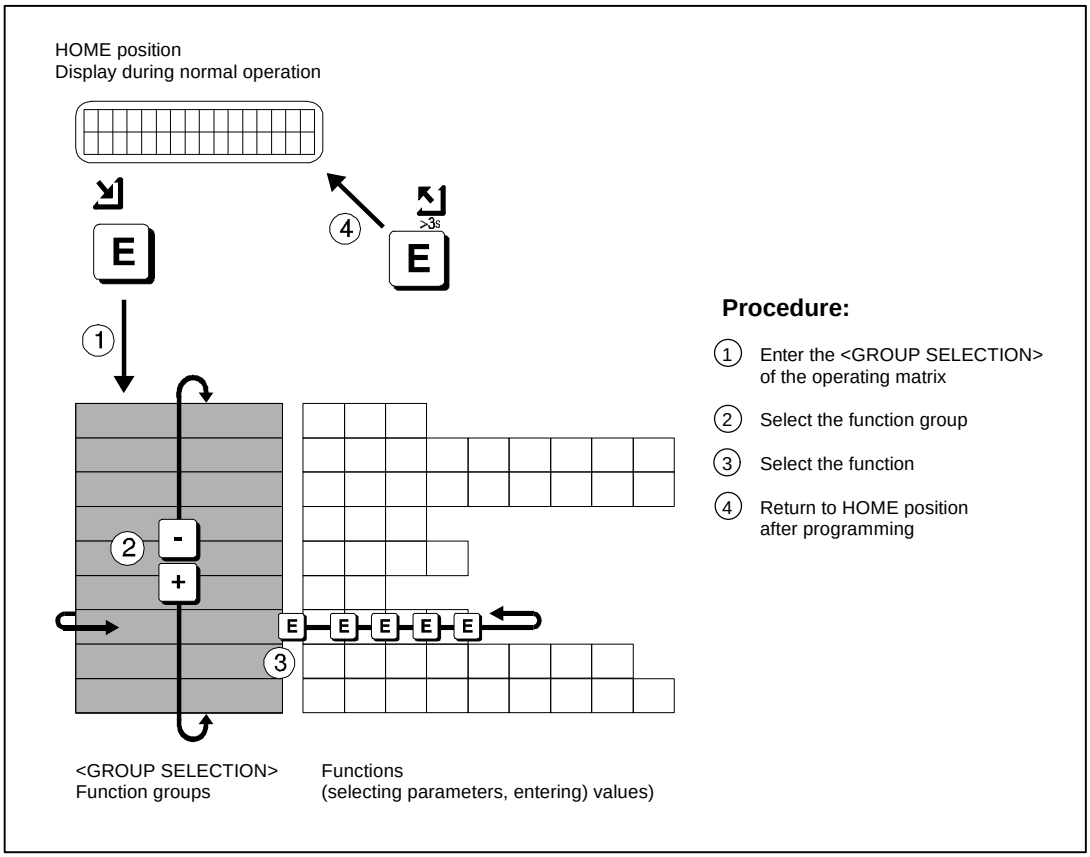


Fig. 23:
Selection of functions
within the operating
matrix

4.11 Programming matrix Promass 63

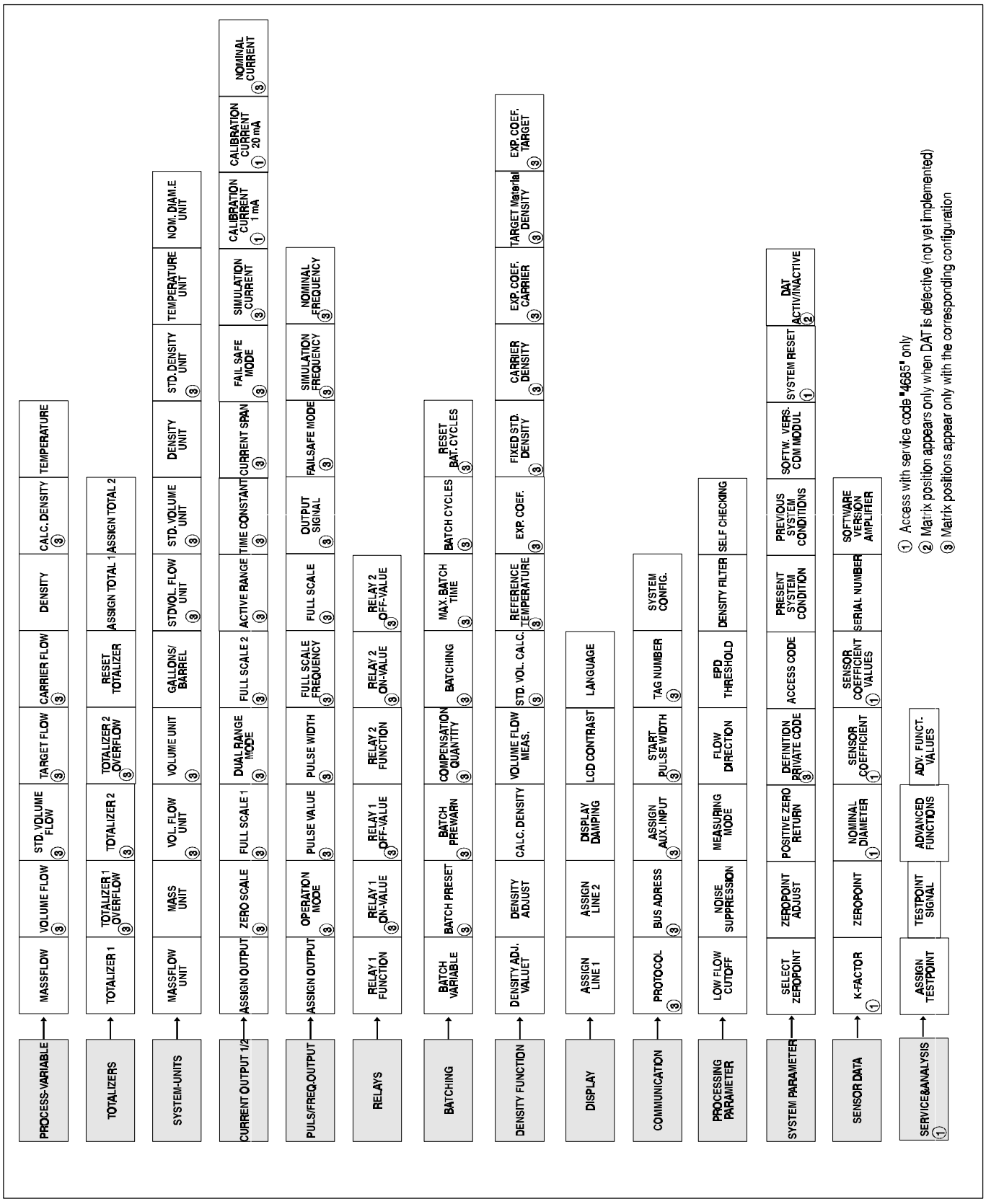


Fig. 24:
Programming matrix
Promass 63

4.12 Zero point adjustment

- A static zero point adjustment is carried out with single phase fluid without gas or solid content. The measuring pipes must be completely filled and the fluid must be completely still. The result is more accurate if the adjustment is done under operating conditions (pressure, temperature).
- A dynamic zero point adjustment is carried out with heterogeneous fluid.

4.12.1 Static zero point adjustment

Procedure:

1. Run the plant for as long as necessary until it is operating normally.
2. Stop the flow.
3. Check the shut off valves (for leaks, etc.). Also check the operating pressure.
4. Carry out zero point adjustment:

a) Promass 60:

Select the DISPLAY FUNCTION 0.-AdJUST on the display and confirm with the SET key.

Adjust using the auxiliary input (Switch No. 11 to OFF). The jumper on the local display must be plugged on the left side (see Page 39).

Apply a 3...30 V DC/AC voltage to the auxiliary input (Terminal 24/25). Zero point adjustment has now been carried out.

Note!
The **adjustment** can also be carried out by connecting amultimeter set to “Diode test“ to the auxiliary input.

b) Promass 63: via the display in the SYSTEM PARAMETER function group.

4.12.2 Dynamic zero point adjustment

Note!
Check that any measuring errors present do not originally come from the plant itself e.g. due to a slow acting valve.

Dynamic zero point adjustment can only be carried out with a local display (Promass 60) or display unit (Promass 63) or for blind versions by use of the service software Prospy.

Procedure:

1. Run the plant for as long as is necessary until it is operating normally.
2. Determine the new zero point value using weigh scales and calculate the measuring error.
3. Use the largest possible vessel available filled with the fluid.
4. Note the mass flowrate $\dot{m}_{act}$ during the filling procedure, e.g. in kg/h.
5. Note the mass shown by the Promass measuring system Δm_{act} (totalizer value).
6. Determine the mass Δm_{tgt} using weigh scales.

7. Calculate the measuring error as follows:

$$= \frac{\Delta m_{act} - \Delta m_{tgt}}{\Delta m_{tgt}} \bullet$$

8. Read off from the display the actual zero point value $PIPO_{old}$.
9. The new zero point is calculated as follows:

$$\mathbf{PIPO_{new} = PIPO_{old} + (F\% \bullet 100 \bullet m_{act}/\dot{m}_{ref})}$$

$\dot{m}_{ref}$ = Reference flow as function of the nominal diameter (DN); corresponding to v = 1 m/s at ρ = 1 kg/dm^3. Values are given in the table on the right.

DN	$\dot{m}_{ref}$
8	181 kg/h
15	636 kg/h
25	1767 kg/h
40	2895 kg/h
50	7069 kg/h

10. Enter the value for $PIPO_{new}$ using the local display or the display unit.

Example:

Nominal diameter: DN 25
Measuring error F: -1.3%
$\dot{m}_{act}$: 2300 kg/h (mass flowrate)
$PIPO_{old}$: +283

$PIPO_{new}$: +283 + (-1.3 • 100 • 2300/1767) = +283 + (-169) = +114

Note!
Take note of the arithmetical sign.

4.13 Service labels

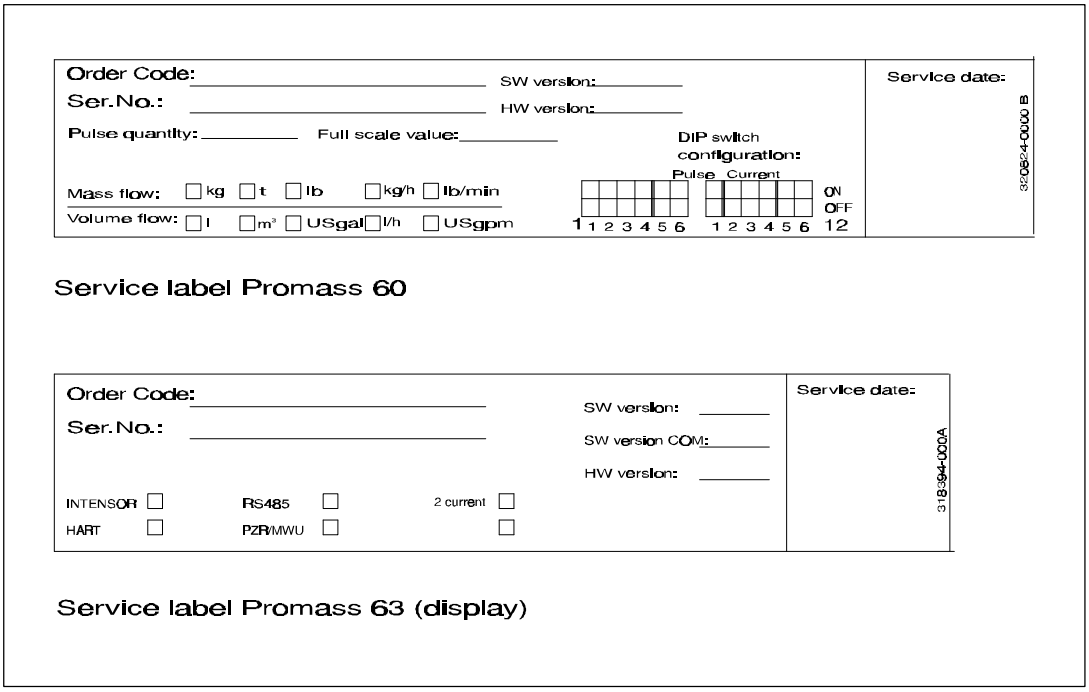


Fig. 25:
Service labels
for Promass 60/63

4.14 Exploded diagram and spare parts list for Promass 60/63

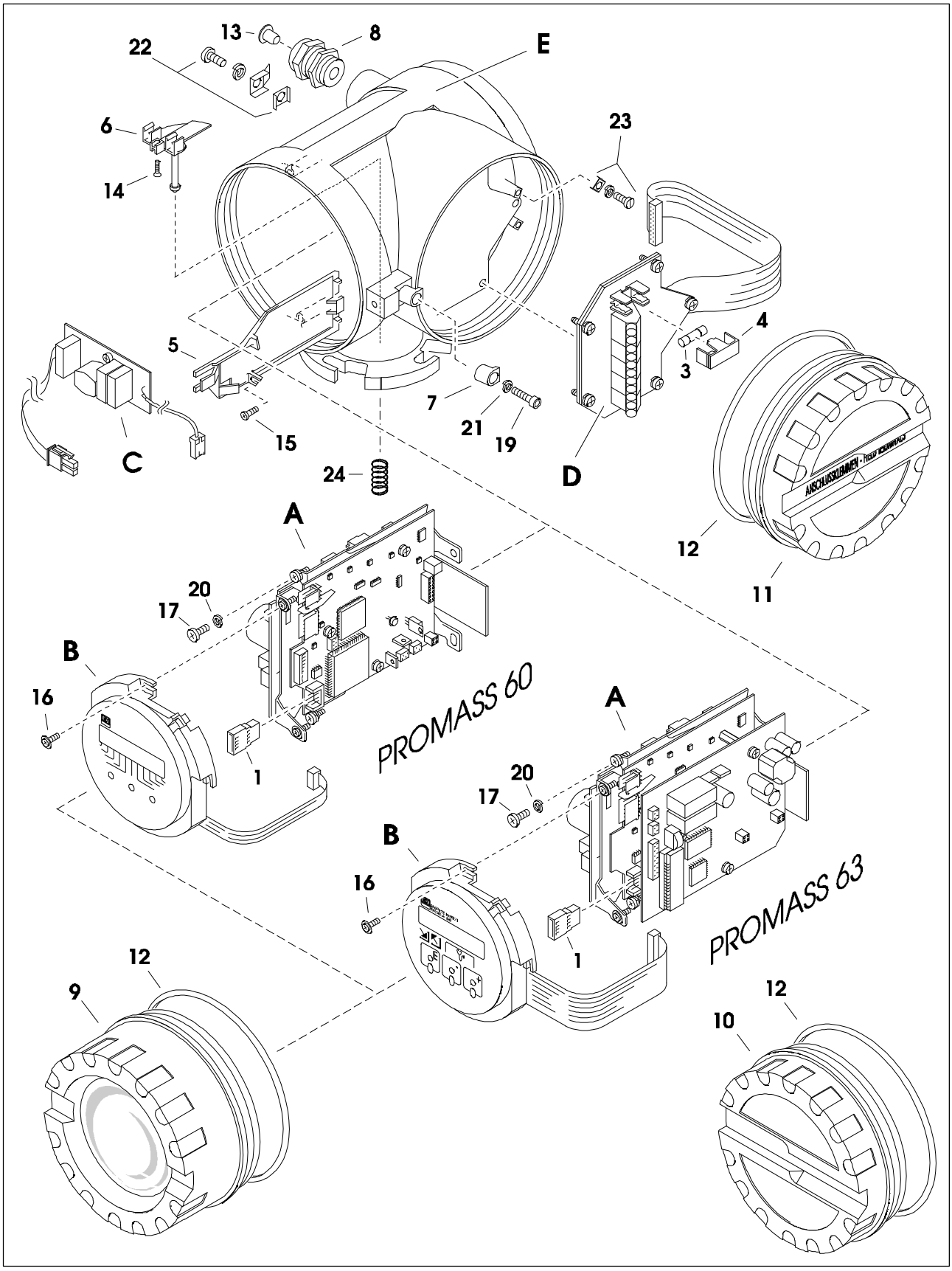
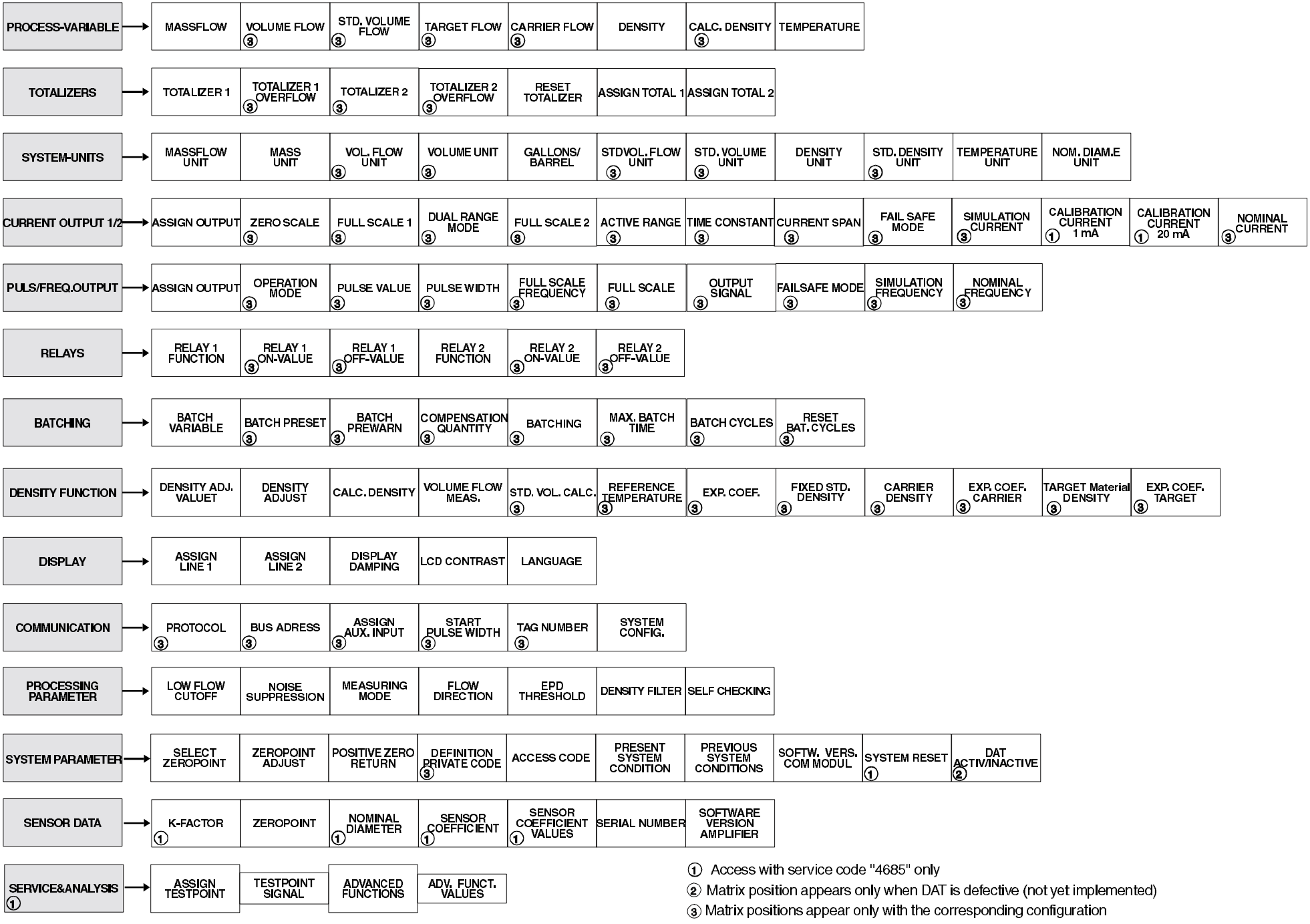


Fig. 26:
Exploded diagramm and spare part numbers of Promass 60/63

Spare parts list Promass 60/33

	Electronic module		Order No.
A	Electronic modules Promass 60/63	see spare	part list
1	Data storage DAT Promass		50068148
	EPROM CMOS 27C010 not programmed		50040559
	Display module		
B	Display module Promass 60		50066323
B	Display module Promass 60 Volume		50079073
B	Display module Promass 63		50066324
	Filter board		
C	Filter board Promass 20...55V AC, 16...62 V DC		50073296
C	Filter board Promass 85...260V AC		50073295
C	Filter board Promass 20...55V AC, 16...62 V DC, Ex		50069615
C	Filter board Promass 85...260V AC, Ex		50069614
	Connection board		
D	Connection board Promass		50058490
	Housing		
E	Housing Promass 20.....55V AC, 16...62V DC		50059315
E	Housing Promass 85...260V AC		50059314
E	Housing Promass E+H blue		50057255
3	Fuse 250 V AC T 2A50	! 10 units	50049263
3	Fuse 250 V AC T 1A00	! 10 units	50017757
4	Fuse cover	! 50 units	50060722
5	Cable conduit plate Promass		50058488
6	Strain release unit Promass PMF		50056331
7	Locking clamp		50058913
8	Cable gland PG 13.5		50020709
8	Cable gland PG 13.5/M20 x 1,5		50049195
8	Cable gland PG 13.5/NPT 1/2“		50049194
8	Cable gland PG 13.5/G 1/2“		50064460
9	Cover Promass display module		50059361
10	Cover Promass for blind version		50056514
11	Cover Promass terminal compartment		50056517
12	O-Ring 113.90 x 3.53		50059096
13	Sealing plugs for PG 11/13.5	! 50 units	50049055
	Small components		
14	Flat-headed screw KA25 x 10	! 50 units	50020017
15	Fillister head screw M3 x 8	! 50 units	50043383
16	Fillister head screw M3 x 8	! 50 units	50058679
17	Fillister head screw M4 x 12	! 50 units	50041698
19	Cylindrical Allen screw M4 x 16	! 50 units	50017388
21	Spring washer M4	! 100 units	50017361
22	Ground wire terminal		50022738
23	Ground terminal		50017499
24	Spring washer 1.25 x 10 x 20		50069599
	Service parts		
	Serviceplate Promass 60		50069007
	Serviceplate Promass 63 display version		50062094
	Simulation board		50068805
	Test point plug		50068803
	Prospy		50077720

! Minimum quantity



① Access with service code "4685" only

② Matrix position appears only when DAT is defective (not yet implemented)

③ Matrix positions appear only with the corresponding configuration