OPERATING INSTRUCTIONS

Flow Computer System
ERZ 9000

ERZ 9004M Mass Flow Computer

Status: August 18, 1998
Subject to change

CONTENTS

1 Introduction to the ERZ 9004 M

The operating concept:

The operating concept has been chosen in such a way that the operator can easily use the device without wasting too much time reading a manual.

The function keys:

The most important data for the operator can be directly selected via function keys. There are function keys for

Pressure
Temperature
Analysis values
Flow rates
Index readings
Outputs (currents, dispatcher, interfaces)
Identification / device data
Storing measured values (freeze) / calibration during operation.

The system of coordinates:

A system of coordinates makes it easy for the operator to access all configuration data, measured values and operands by means of a table.
The system of coordinates is based on 24 columns and 46 lines. Columns are marked **A** to **Y**, while lines run from **1** to **46**. The operator can reach every value in this system of coordinates via cursor keys (arrows).

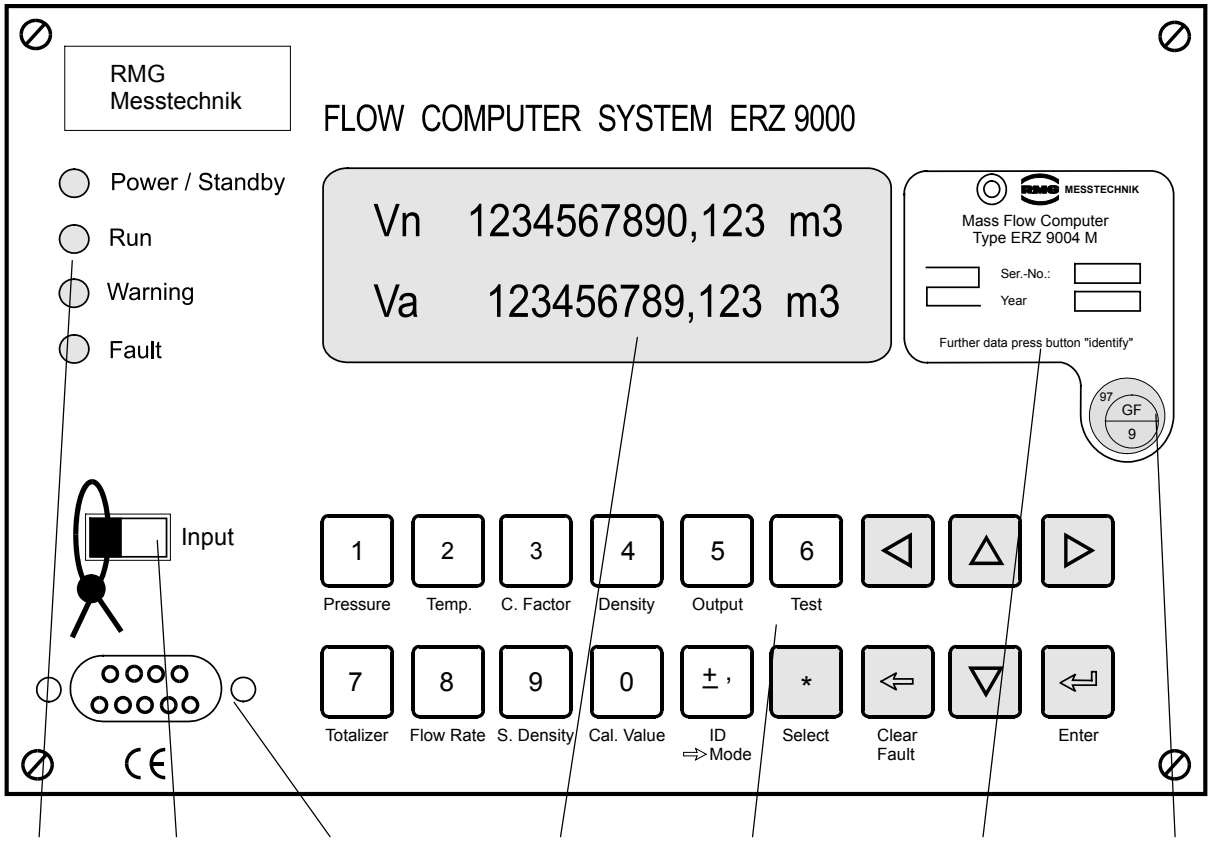
The display field:

An alphanumeric 2-line display with 20 characters per line enables data and measured values to be indicated together with their short designations and units. The display field consists of a fluorescent display in blue and is easily readable even from a distance.

The system:

A complete Flow Computer System has been developed taking the size of a Eurocard as a basis and using the most advanced SMD technology with large-scale integrated components. A fully assembled printed circuit board incorporates all inputs required for a complex corrector. The range extends from simple volume correctors through density correctors to calorific value correctors. The type of the individual device essentially depends on the software used. Therefore, all conceivable special versions, such as density computers or calorific value computers, are possible.
Thanks to large-scale integrated components, fewer parts are required and this also contributes to making the device reliable.

2 ERZ 9004 M Front Panel



LED's

Sealable slide switch

RS 232 C port

2-line display with 20characters per line

Keypad for directly accessing the various device functions

ID plate with basic data; all other data can be accessed via the **ID** function key

Main stamp

3 Operating the ERZ 9004 M

Description of function keys

Pressure	Indication of the PRESSURE and when pressing the ↑ ↓ keys all pressure-related values.
Temp.	Indication of the TEMPERATURE and when pressing the ↑ ↓ keys all temperature-related values.
C. Factor	Indication of the COMPRESSIBILITY FACTOR and the VOLUME CORRECTION FACTOR and when pressing the ↑↓ keys all the other gas-analysis values.
Density	This function is not available with the ERZ 9004 M mass flow computer
Output	Indication of all outputs of the device: ANALOG, DIGITAL or DATA INTERFACES.
Test	Activation of the FREEZE and CALIBRATION DURING OPERATION functions. This key initiates a dual function (see Chapter 6).
Totalizer	Indication of V_a and V_n totalizers.
Flow Rate	Indication of the VOLUME AT ACTUAL CONDITIONS and when pressing the ↑ ↓ keys all values related to the volume at actual conditions.
S. Density	This function is not available with the ERZ 9004 M mass flow computer.
Cal. Value	This function is not available with the ERZ 9004 M mass flow computer.
ID **⇒ Mode**	Indication of DEVICE DATA and OPERATING MODES.

Special function keys

↑ ↓ ← → **Clear** **Enter** **Select**

Arrow up / down

↑ ↓

To scroll up or down by lines within a column. If you press ↑ at the beginning of a line of a column, you jump to the freeze table, namely to the last value of this table. Now you can select the fourth, third or second value by pressing ↑. If you press ↓ at the end of the freeze table, the display returns to the standard indication of the function key.

Arrow to the right / left

→ ←

To scroll to the right or left by columns within a line. If you press ←, you can jump via the first column to the last column. If you press →, you can jump via the last column to the first column.

The following applies to cursor keys in general: Unoccupied line fields within a column and unoccupied columns within a line are automatically skipped. If the column jumped to is occupied but the line field is empty, the line number is automatically increased until an occupied field is found. When you jump to the next column, the initial line number is selected again.

Clear / Fault

⇐

a) To clear incorrect inputs in the programming mode. The state prior to inputting the first digit is restored.

b) To indicate and clear fault messages.

c) To close user inputs (locking by means of the code number).

Enter

To initiate and complete a data input. All data inputted are accepted.

Select

*

To switch over from short designations to coordinates and vice versa. Switching over is possible in almost all fields (also in the programming mode).

4 ID Display / Device Data

Press the **ID / Mode** key

	ID lines	**1-17**	
p	**0.9 .. 4.5**	**bar**	**1**

Press

	ID lines	**1-17**	
t	**-10 ... 50**	**°C**	**2**

← Line numbering

etc.

The ID display comprises a field with 17 data lines, a header line and a bottom line. When you press the **ID / MODE** key, the header line overlays the upper line of the display field. This header line will always remain in the upper part of the display field as long as the ID mode is active. The first data line of the ID data field is shown in the lower part of the display field. You can now scroll in the 17 data lines by pressing the ↑ or ↓ key. The bottom line appears at the end of the data field.

Depiction of the complete ID data field:

Header line →	ID	lines		1-17
	p	0.9 ... 4.5	bar	1
	t	-10 ... 50	°C	2
	Meter G	6500.0		3
	q	200 .. 10000	m3/h	4
	PV	600.315	pm3	5
	Fault corr	G7	yes	6
ID contents →	Meter type	TRZ		7
	PT type	G1151AP		9
	PT No.	634711		10
	TT type	AGG Ex		11
	TT No.	664711		12
	QminHP	0.0	m3/h	13
	Rho<HP	0	kg/m3	14
	Rho>HP	0	kg/m3	15
	Gas type:	Natural gas		16
	Comp. No.	604711		17
Bottom line →	***End of ID ***			

Programming the ID display

Set the switch to "Input" and make your changes after the bottom line "**End of ID**" has been displayed. The values are transferred to the electronic ID display after the device has been disconnected from the power supply.

5 Display Fault / Clear Fault Function

Display fault

The occurrence of a fault is indicated by the **Fault** LED on the front panel of the device or by an isolated contact at the terminal block. The LED flashes if faults are pending. If faults are no longer pending, the LED turns to steady light.

To display fault texts, you must press the **CLEAR / FAULT** key. After you have pressed this key, the display field shows ***Fault indication*** and the bottom line shows the fault texts at 3-second intervals. All messages are consecutively shown in the display field. As long as the Fault LED flashes, there is still at least one fault pending. If the Fault LED shows steady light, all indicated fault messages are no longer valid and the device has returned to fault-free operation.

Clear fault

There are two operating modes for clearing fault messages: ***DIRECT CLEARING*** and ***INDIRECT CLEARING***. You can select the desired operating mode under **CLEAR / FAULT** in the field Y 17.

a) Direct clearing
In the fault indication mode you can clear fault messages directly via the **CLEAR / FAULT** key.

b) Indirect clearing
You cannot clear fault messages unless you have selected the **CLEAR FAULT ?** field (Y 5) using the **ENTER** key.

The time and date of the fault occurred are shown in the fields Y3 and Y4. If there is more than one fault pending, the time and date of the first fault occurred are shown.

The time and date of the last fault acknowledgment are shown in the field Y6.

6 "TEST" Key Special Function: Freeze / Calibration During Operation

The **TEST** key comprises two functions:

1. Freeze function (storage of measured values and operands)
2. Calibration during operation (start / stop function of indexes)

Freeze

Manual freezing

If the freeze mode is set to manual, a freeze operation is performed every time you press the **TEST** key. The frozen values can be read in the columns A ... V, lines 43 ... 46.

Example:

Press the **TEST** key. The display will show the indexes for calibration during operation. At the same time, all freeze coordinates are written with the current values at this moment. Press the **FLOW RATE** key and the display will show the frozen value for the volume at actual conditions. The following is displayed for example:

current value	**qa**	**1622.70**	**m3h**
current value	**fm**	**450.75**	**Hz**

Press ↑ four times

current value	**qa**	**1622.70**	**m3h**
frozen value	**Fqa**	**1621.97**	**m3h**

If you press the **TEST** key again, this will result in a repeated freezing of current values.

Automatic freezing

In the automatic freeze mode the desired parameters are preselected in the "Mode" column.

Example:
You want to freeze current values daily at 06:00:00 a.m. First input the code number to enable the change option for the appropriate fields.

Press the **MODE** key.

Press →

current time	**Mode**	
	Time:	**13-28-56**

Press ↓ four times

Manual freezing

Mode
F mod: Manual

Set the "F mode:" to daily freezing Day(s).

Press the **ENTER** key
Press the **MODE** key three times

Daily freezing

Mode
F mod: Day(s)

Press ↓

Start time

Mode
F time: hh:mm:ss

Input the desired time for the first freeze operation.

Press ↓
Start date

Mode
F date: dd-mm-yy

Input the desired date (no days of the past) for the first freeze operation.

Press ↓
Repetition rate

Mode
F rep.: xx

Input the desired repetition rate. For daily repetition, input "1".

Calibration during operation

Parallel to the indexes for official calibration, separate indexes for standard volume and corrected and uncorrected volumes at actual conditions can be started or stopped via the **TEST** key. At the same time the indexes are started, they are set to "0".

Attention! Each time the indexes are started or stopped, a freeze operation of the appropriate fields is performed in the "Manual" freeze mode. If the freeze mode is not set to "Manual", pressing the **TEST** key will not have any effect on freezing.

7 Summary of Coordinates for the ERZ 9004 M

7.1 Coordinates from A to L

		Pressure				Temp.					Flow rate 1	Flow rate 2
		A / 01	B / 02	C / 03	D / 04	E / 05	F / 06	G / 07	H / 08	I / 09	J / 10	K / 11
1	Meas. value 1	bar				° C					qa	qn
2	Meas. value 2										qa corr	
3	On / Off 1	mA				ohm					f1 Hz	
4	On / Off 2										f2 Hz	
5	Min. range	*p min*				*t min*					*qa min*	
6	Max. range	*p max*				*t max*					*qa max*	
7	Min. limit											
8	Max. limit											
9	Default value	*p DF value*				*t DF value*					*Difference (%)*	
10	Jump	*delta (%)*				*delta (%)*					*delta (%)*	
11	Reference	p stand.d				*t stand.*						
12	Corr. factor	Input				*Input*						
13	Averaging										*Input*	
14	Min. contact	*p min*				*t min*					*qa min*	*qn min*
15	Max. contact	*p max*				*t max*					*qa max*	*qn max*
16												
17	Mode 1	*Off / 0- / 4-*				*Off / on*					*Off / on*	
18	Mode 2	*Meas./DF value*				*Meas./DF value*					*1/ 1:1 / x:y*	
19	Mode 3	*pa / pe*									*Off / G7 corr*	
20	Last meas.val.											
21	Specif. value											
22	Delta limit										*delta Kvc (%)*	
23	Delta act. val.										Kvc (%)	
24	Measured val.											
25	Corr.meas.val.										Kvc	
26	Corr. factor										*Kv*	
27	Constants										*Meas. wheel*	
28	Constants										*Ref. wheel*	
29	Constants										*Disturb.pulses*	
30	Constants										*Ref. pulses*	
31	Constants										*Startup pulses*	
32	Constants										*f<L*	
33	Constants										*t qa min*	
34	Constants										*A -2*	
35	Constants										*A -1*	
36	Constants										*A 0*	
37	Special										*A 1*	
38	Special										*A 2*	
39	Special											
40	Special										qa peak	qn peak
41	Special										Date / time	Date / time
42	Special											
43	Freeze / CDO	1st value				1st value					1st value	1st value
44	Freeze / CDO	3rd value				3rd value					2nd value	
45	Freeze / CDO										3rd value	
46	Freeze / CDO										4th value	

Locked via calibration switch (E) ***Italic*** Locked via code number (B) ***Italic*** No locking (A)

7.2 Coordinates from M to T

		C. factor	Analog 1	Analog 2	Analog 3	Analog 4	Digital 1	Digital 2
		L / 12	M / 13	N / 14	O / 15	P / 16	Q / 17	R / 18
1	Meas. value 1	VCF	Phys. value	Phys. value	Phys. value	Phys. value	Designation	Designation
2	Meas. value 2	K						
3	On / Off 1		I 1 (mA)	I 2 (mA)	I 3 (mA)	I 4 (mA)		
4	On / Off 2							
5	Min. range		*Phys. value*	*Phys. value*	*Phys. value*	*Phys. value*		
6	Max. range		*Phys. value*	*Phys. value*	*Phys. value*	*Phys. value*		
7	Min. limit							
8	Max. limit							
9	Default value	*K DF value*	*Cal. curr.*	*Cal. curr.*	*Cal. curr.*	*Cal. curr.*	*Pulse width*	*Pulse width*
10	Jump							
11	Reference		*Selection*	*Selection*	*Selection*	*Selection*	*Selection*	*Selection*
12	Corr. factor		*Input*	*Input*	*Input*	*Input*		
13	Averaging	*Input*	*Input*	*Input*	*Input*	*Input*		
14	Min. contact							
15	Max. contact							
16								
17	Mode 1	*B&B / K=c*	*Off / 0- /4-/CC*	*Off / 0- /4-/CC*	*Off / 0- /4-/CC*	*Off / 0- /4-/CC*	*Off / on*	*Off / on*
18	Mode 2	*Type of gas*						
19	Mode 3							
20	Last meas.val.							
21	Specif. value							
22	Delta limit	Density calc.						
23	Delta act. val.	Stand. dens.						
24	Measured val.	Z						
25	Corr.meas.val.	Zn						
26	Corr. factor							
27	Constants						*Pulse value 1*	*Pulse value 2*
28	Constants							
29	Constants							
30	Constants							
31	Constants							
32	Constants							
33	Constants							
34	Constants							
35	Constants							
36	Constants							
37	Special							
38	Special							
39	Special							
40	Special	Zn						
41	Special	Z						
42	Special							
43	Freeze / CDO	1st value						
44	Freeze / CDO	2nd value						
45	Freeze / CDO							
46	Freeze / CDO							

Locked via calibration switch (E) ***Italic*** Locked via code number (B) ***Italic*** No locking (A)

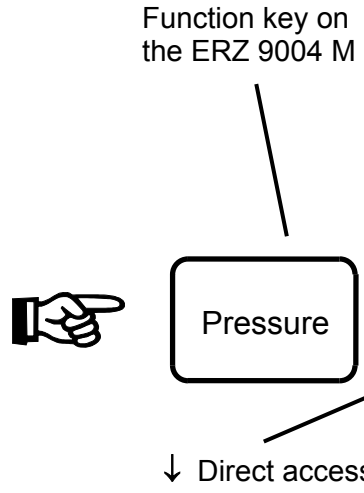
7.3 Coordinates from U to Y

		Data 1	Data 2	Totalizer	Test	ID	Mode	Fault
		S / 19	T / 20	U / 21	V / 22	W / 23	X / 24	Y / 25
1	Special	Designation	Designation	Vn	Vn	Designation	Designation	Designation
2	Special			Vac	Va corr	ID	*Time*	Indication
3	Special			Va	Va	ID	*Date*	Fault time
4	Special			M		ID	*Code No.*	Fault date
5	Special			LVa		ID	*Operat. hrs*	Clear fault
6	Special			HVa		ID	*Freeze mode*	Last clearing
7	Special			tp setpoint		ID	*Freeze time*	
8	Special					ID	*Freeze rep.*	
9	Special					ID	*Freeze date*	
10	Special					ID	*Last freeze*	
11	Special					ID	*Clock/external*	
12	Special					ID	*Auto / revision*	
13	Special					ID	*Manu./channel*	
14	Special					ID	*Print time start*	
15	Special					ID	*Print interval*	
16	Special					ID	*Revis. interval*	
17	Special	*Off / on*	*Off / on*	*Oper./malfunct.*		ID	*Last print*	*Fault mode*
18	Special		Mode			ID	*Limit. contacts*	
19	Special					Designation	*Display mode*	
20	Special			*If Va*			Comp. type	
21	Special			*If Vn*			Version	
22	Special						*Comp. No.*	
23	Special						*AD corr.*	
24	Special						*RTC corr.*	
25	Special			*Setting Vac*			*System fr. fV*	
26	Special			*Setting Vn*			*System fr. fD*	
27	Special	*Baud*	*Baud*	*Setting M*			Lamp test b.	
28	Special			*Setting Va*			Lamp test t.	
29	Special			*Setting VacD*				
30	Special			*Setting VnD*				
31	Special			*Setting MD*				
32	Special			*Setting VaD*				
33	Special			*Setting LVn*				
34	Special			*Setting HVn*				
35	Special							
36	Special							
37	Special			VacD dist.quan				
38	Special			VnD dist.quan.				
39	Special			VaD dist.quan.				
40	Special							
41	Special							
42	Special							
43	Freeze / CDO			Va corr	VacD dist.quan			
44	Freeze / CDO			Vn	VnD dist.quan.			
45	Freeze / CDO			Va	VaD dist.quan.			
46	Freeze / CDO							

Locked via calibration switch (E) ***Italic*** Locked via code number (B) ***Italic*** No locking (A)

8. Summary of Device Functions to Be Called up with Function Keys

8.1 Description of the matrix structure



Sequence of key operations to reach the desired column

Designation of the column
A .... 1st column of the matrix
(01) .. Programming value for this column

		A (01)	Description of coordinates	Unit	Comment(s)
1	A	P	Measured value for pressure (absolute pressure)	bar a	
3	A	I	Measured value for input current	mA	
5	E	P min	Lower adjusting value and fault limiting value	bar a/g	2)
6	E	P max	Upper adjusting value and fault limiting value	bar a/g	3)
9	B	PV	Default value (replacement value if a fault occurs)	bar a	

Short description of the coordinate

Abbreviation of the coordinate
(Display of the ERZ 9004 M)

Unit of the value displayed or programmed

Data protection level:
A ... Display value
B ... Data which the user can be modify using a code number
E ... Data which can be modified via the slide switch (sealable)

Designation of the line
9 ... 9th line column A

Explanatory notes on the coordinate

8.2 Device-specific functions

8.2.1 Pressure at measuring conditions

Pressure

↓ Direct access

		A / 01	Description of coordinates	Unit	Comment(s)
1	**A**	p	Measured value for pressure	bar a	
3	**A**	I	Measured value for input current	mA	
5	**E**	p<	Lower pressure transmitter adjusting value and fault limiting value	bar a/g	2)
6	**E**	p>	Upper pressure transmitter adjusting value and fault limiting value	bar a/g	3)
9	**B**	p DF	Default value (replacement value if a fault occurs)	bar a/g	
10	**B**	p JP	Max. permissible jump from measured value to measured value	%	
11	**E**	pn	Standard pressure	bar a	4)
12	**E**	pc	Correction factor: balancing A/D converter offset		
14	**B**	pmin	Min. limiting value contact	bar a/g	
15	**B**	pmax	Max. limiting value contact	bar a/g	
17	**E**	p mod1	Mode 1: current input = off (default value) / 0-20mA / 4-20mA		1)
18	**E**	p mod2	Mode 2: if a fault occurs = default value / measured value		1)
19	**E**	p mod3	Mode 3: pressure transmitter = pabs / pe		1) 5)
43	**A**	Fp	Freeze: pressure	bar a	
44	**A**	FI	Freeze: input current	mA	

1) Rolling texts! Press the **MODE** key to make your changes.
2) Assigning 0 mA or 4 mA to the lower adjusting value.
3) Assigning 20 mA to the upper adjusting value.
4) Reference quantity for standard conditions of the country concerned.

8.2.2 Temperature at measuring conditions (PT 100)

Temp.

↓ Direct access

		E / 05	Description of coordinates	Unit	Comment(s)
1	**A**	t	Measured value for temperature	°C	
3	**A**	R	Measured value for input resistance	ohm	
5	**E**	t<	Lower fault limiting value	°C	
6	**B**	t>	Upper fault limiting value	°C	
9	**B**	t DF	Default value (replacement value if a fault occurs)	°C	
10	**B**	t JP	Max. permissible jump from measured value to measured value	%	
11	**E**	tn	Standard temperature	°C	2)
12	**E**	tc	Correction factor: balancing A/D converter offset		
14	**B**	tmin	Min. limiting value contact	°C	
15	**B**	tmax	Max. limiting value contact	°C	
17	**E**	t mod1	Mode 1: resistance input = off (default value) / on (PT 100)		1)
18	**E**	t mod2	Mode 2: if a fault occurs = default value / measured value		1)
43	**A**	Ft	Freeze: temperature	°C	
44	**A**	FR	Freeze: input resistance	ohm	

1) Rolling texts! Press the **MODE** key to make your changes.
2) Assigning 0 mA or 4 mA to the lower adjusting value.
3) Assigning 20 mA to the upper adjusting value.
4) Reference quantity for standard conditions of the country concerned.

8.2.3 Volume flow rate at actual conditions

Flow Rate

↓ Direct access

		J / 10	Description of coordinates	Unit	Comment(s)
1	**A**	qa	Calculated volume flow rate at actual conditions	m3/h	
2	**A**	qac	Calculated corrected volume flow rate at actual conditions	m3/h	5)
3	**A**	fm	Measuring channel input value	Hz	
4	**A**	fr	Reference channel input value	Hz	
5	**E**	qa<L	Lower fault limiting value of volume meter	m3/h	
6	**E**	qa>L	Upper fault limiting value of volume meter	m3/h	
9	**B**	q D%	Max. permissible difference between qam and qar	%	2)
10	**B**	q JP	Max. permissible jump from measured value to measured value	%	
13	**B**	q A	Averaging factor for flow rate calculation and display		
14	**B**	qamin	Min. limiting value contact	m3/h	
15	**B**	qamax	Max. limiting value contact	m3/h	
17	**E**	Va mod1	Mode 1: volume measurement = on / off		1) 3)
18	**E**	Va mod2	Mode 2: operating mode = 1-channel / 2-chan. 1:1 / 2- chan. x:y		1) 4)
19	**E**	Fault corr. G7	Mode: characteristic correction acc. to G7 = no / yes		1)
22	**E**	d Kvc>L	Limiting value for max. deviation due to characteristic correction	%	5)
23	**A**	d Kvc	Deviation of corrected pulse value (Kvc) from pulse value (Kv)	%	5)
25	**A**	Kvc	Corrected pulse value of the volume meter	pulses/m3	5)
26	**E**	Kv	Volume meter pulse value	pulses/m3	
27	**E**	MWP	Number of blades of the measuring wheel * 10		
28	**E**	RWP	Number of blades of the reference wheel * 10		
29	**E**	DP	Limiting value for the number of disturbing pulses (official value 10)	pulses	6)
30	**E**	RP	Limiting value for the number of reference pulses (off. val. 10000)	pulses	6)
31	**E**	P start	Suppression of fault messages during startup of volume meter	pulses	
32	**E**	f<L	Min. volume meter frequency	Hz	7)
33	**E**	t qmin	Max. operating time for qa < qa min	sec	8)
34	**E**	A-2	Polynominal coefficient for characteristic correction		5)
35	**E**	A-1	Polynominal coefficient for characteristic correction		5)
36	**E**	A 0	Polynominal coefficient for characteristic correction		5)
37	**E**	A 1	Polynominal coefficient for characteristic correction		5)
38	**E**	A 2	Polynominal coefficient for characteristic correction		5)
40	**A**	>qa	Max. qa value (peak value)	m3/h	
41	**A**	>	Time of max. value (date / time)		
43	**A**	Fqa	Freeze: volume flow rate at actual conditions	m3/h	
44	**A**	Fqac	Freeze: corrected volume flow rate at actual conditions	m3/h	5)
45	**A**	Ffm	Freeze: measuring channel frequency	Hz	
46	**A**	Ffr	Freeze: reference channel frequency	Hz	

Comments: See next page.

8.2.4 Standard volume flow rate

Flow Rate

Indirect access by pressing the [→] key

		K / 11	Description of coordinates	Unit	Comment(s)
1	**A**	qn	Calculated standard volume flow rate	m3/h	
14	**B**	qnmin	Min. limiting value contact	m3/h	
15	**B**	qnmax	Max. limiting value contact	m3/h	
40	**A**	>qn	Max. qn value (peak value)	m3/h	
41	**A**	>	Time of max. value (date / time)		
43	**A**	Fqn	Freeze: standard volume flow rate	m3/h	

Comments on the column for the volume flow rate at actual conditions

1) Rolling texts! Press the **MODE** key to make your changes.
2) If the percentage deviation between the qa measuring channel (qam) and the qa reference channel (qar) is smaller than the preset value, the arithmetic mean is used to display the qa flow rate and the qa current output. If the deviation is greater, the greater one of the two flow rates is used.
   Attention! The calculation or display of flow rates does not have any effect on the calculation and monitoring of totalizers.
3) Va-mod1 = off The Flow Computer operates in the pulse counting mode without monitoring volume limits including f<L.
4) Va-mod2 = 1-chan. J/9, J/27 - J/31 not active
   Va-mod2 = 1:1 J/27, J/28 not active
   Va-mod2 = x:y J/29, J/30, J/31 not active
5) ECL = none The field is not displayed.
6) Number of permissible missing pulses for a quantity of reference pulses before an alarm is tripped.
7) Lower limiting frequency of the volume meter. When the frequency drops below the lower limiting frequency, correction is no longer carried out.
8) Time in seconds during which the volume meter can be operated below qa-min before an alarm is tripped.

8.2.5 Analysis

C. Factor

↓ Direct access

		L / 12	Description of coordinates	Unit	Comment(s)
1	**A**	VCF	Volume correction factor		
2	**A**	K	Compressibility factor calc. to Beatie & Bridgeman or default value		
9	**B**	K DF	Compressibility factor default value		
13	**B**	VCF A	Averaging factor		
17	**B**	BB mod1	Mode: B&B / K=const(ant)		1)
18	**B**	G sel	Select type of gas		1)
22	**A**	Racalc	Calculated density at actual conditions	kg/m3	
23	**A**	Rn-TAB	Standard density of the gas	kg/m3	
24	**A**	Z	Real gas factor at actual conditions		
25	**A**	Zn	Real gas factor at standard conditions		
43	**A**	FVCF	Freeze: volume correction factor		
44	**A**	FK	Freeze: compressibility factor		

1) Rolling texts! Press the **MODE** key to make your changes.

8.3 Outputs

8.3.1 Current Outputs

Output

↓ Direct access

→ → →

		M / 13	N / 14	O / 15	P / 16	Description of coordinates	Unit	Comment(s)
1	**A**	I1O	I2O	I3O	I4O	Physical value for output n	variable	
3	**A**	I	I	I	I	Indication of current for output n	mA	
5	**B**	O1<	O2<	O3<	O4<	Lower limiting value for output n	variable	2)
6	**B**	O1>	O2>	O3>	O4>	Upper limiting value for output n	variable	2)
9	**B**	I1CC	I2CC	I3CC	I4CC	Calibrating current default value	mA	3)
11	**B**	O1 CS	O2 CS	O3 CS	O4 CS	Selection of coordinate for output n		4)
12	**B**	I1 c	I2 c	I3 c	I4 c	Correction factor (D/A converter)		
13	**B**	I1 A	I2 A	I3 A	I4 A	Averaging factor (damping)		
17	**B**	I1 mod	I2 mod	I3 mod	I4 mod	Mode: operating mode = off / 0-20 mA / 4-20 mA / calibrating current		1)

1) Rolling texts! Press the **MODE** key to make your changes.
2) Assigning physical limits to 0/4 mA or 20 mA.
3) If the "calibration current" mode is selected under I(n)-mod, the corresponding output (n) operates as current transmitter. The current value preselected in this field will be outputted.
4) Selection of measured value to be outputted as current. Preselected the value via ist coordinate. Example: See Annex D.

8.3.2 Dispatcher outputs

Output

Indirect access by pressing the → key 4 times →

		Q / 17	R / 18	Description of coordinates	Unit	Comment(s)
1	**A**	Dispatcher 1	Dispatcher 2	Designation of the selected dispatcher		
9	**B**	PW	PW	Setting the dispatcher pulse width (50 - 300)	ms	
11	**B**	D1 CS	D2 CS	Assignment of the dispatcher = Va / Vn / Vac		1)
17	**B**	D1 mod	D2 mod	Mode: dispatcher = off / on		1)
27	**B**	Df1	Df2	Pulse value (0.001 to 10000)		

1) Rolling texts! Press the **MODE** key to make your changes.

8.3.3 Data interface

Output

Indirect access by pressing the
→ key 6 times →

		S / 19	T / 20	Description of coordinates	Unit	Comment(s)
1	**A**	Data 1:	Data 2:	Designation of the RS 232 C data interface		2)
17	**B**	D mod1	D mod1	Mode1: Interface off / on		1)
18	**B**		D mod2	Mode 2: Data / HP DeskJet / EPSON		1)
27	**B**	Baud rate	Baud rate	Data 1: bit rate = (1200 / 2400 / 4800 / 9600) Data 2: bit rate = (2400 / 4800 / 9600 / 19200)		1)
30	**B**		Baud rate 3	Data 3: bit rate = DSfG standard (9600)		1)
31	**B**		D mod3	Data 3: Interface off / on		1)
32	**B**		DSfG addr.:	User address on the DSfG bus (1 to 31)		
35	**B**		Master:	Bus master = off / on		1)

1) Rolling texts! Press the **MODE** key to make your changes.
2) Data 1: Interface on the front panel.
By means of this interface it is possible to read all fields from the corrector or rewrite all programmable fields.
Data 2: C1 interface on the rear panel.
You can adjust this interface to different printer protocols via the "D mod2" field or handle it like the "Data 1" interface. Make your selection via the fields T17, T 18 and T27.

C2 interface on the rear panel.
This interface can (optionally) be fitted as a standard data communication interface (DSfG). Make your selection via the fields T30, T31, T32 and T35.

8.4 Totalizer

Totalizer

↓ Direct access

		U / 21	Description of coordinates	Unit	Comment(s)
1	**A**	Vn	Main totalizer for standard volume	m3	
2	**A**	Vac	Main totalizer for corrected volume at actual conditions	m3	2)
3	**A**	Va	Main totalizer for uncorrected volume at actual conditions	m3	
4	**A**	M	Main totalizer for mass	kg	
5	**A**	LVn	Low tariff totalizer for standard volume	m3	
6	**A**	HVn	High tariff totalizer for standard volume	m3	
7	**A**	tb setp.	tariff band setpoint (standard volume flow rate qn)	m3/h	
17	**E**	TOT. mod:	Mode: Main totalizers = alarm run(ning) / alarm stop		1) 3)
20	**B**	If Va:	Va totalizer factor output contacts (1, 10, 100, 1000)		1)
21	**B**	If Vn:	Vn totalizer factor output contacts (1, 10, 100, 1000)		1)
25	**E**	Vac set	Setting: Main totalizer for corrected volume at operating conditions	m3	2) 4)
26	**E**	Vn set	Setting: Main totalizer for standard volume	m3	4)
27	**E**	M-set	Setting: Main totalizer for mass	kg	4)
28	**E**	Va set	Setting: Main totalizer for uncorrected volume at operat. cond.	m3	4)
29	**E**	VacD set	Setting: Disturbing quantity totalizer for corr. volume at operat. cond.	m3	2) 4)
30	**E**	VnD set	Setting: Disturbing quantity totalizer for standard volume	m3	4)
31	**E**	MD-set	Setting: Disturbing quantity totalizer for mass	kg	4)
32	**E**	VaD set	Setting: Disturbing quantity totalizer for uncorr. vol. at operat. cond.	m3	4)
33	**E**	LVn set	Setting: Low tariff totalizer for standard volume	m3	4)
34	**E**	HVn set	Setting: High tariff totalizer for standard voume	m3	4)
37	**A**	VacD	Disturbing quantity totalizer for corrected volume at actual cond.	m3	2)
38	**A**	VnD	Disturbing quantity totalizer for standard volume	m3	
39	**A**	VaD	Disturbing quantity totalizer for uncorrected volume at actual cond.	m3	
43	**A**	FVac	Freeze: Main totalizer for corrected volume at actual conditions	m3	2)
44	**A**	FVn	Freeze: Main totalizer for standard volume	m3	
45	**A**	FVa	Freeze: Main totalizer for uncorrected volume at actual cond.	m3	

The number of digit positions preceding or following a decimal point depends on the size of the flow meter preset in the ID data field.

	Size <= G 2500		**Size > G 2500**	
	Digit positions preceding / following a decimal point		Digit positions preceding / following a decimal point	
Vn	10	3	11	2
Va	9	3	10	2
Vac	9	3	10	2

1) Rolling texts! Press the **MODE** key to make your changes.
2) Fault corr. G7 = no: The field is not displayed.
3) Tot-mod = alarm stop: In the event of an alarm (Annex D) the main totalizers stop and the disturbing quantity totalizers start to run.
   Tot-mod = alarm run: In the event of an alarm (Annex D) the main totalizers continue to run and in addition to this, the disturbing quantity totalizers start to run.
4) To set the totalizer, you must first input the code number and then set the calibrations witch to "Input". Example: see Annex D.
   Attention! Observe the sequence of operations.

8.5 Test

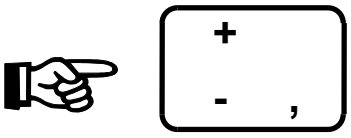
Test

↓ Direct access

		V / 22	Description of coordinates	Unit	Comment(s)
1	**A**	CVn	Calibration during operation: Index for standard volume	m3	2)
2	**A**	CVac	Calibration during operation: Index for corr. volume at operat. cond.	m3	1) 2)
3	**A**	CVa	Calibration during operation: Index for uncorr. vol. at operat. cond.	m3	2)
43	**A**	FVacD	Freeze: Disturbing quantity index for corr. volume at operat. cond.	m3	1)
44	**A**	FVnD	Freeze: Disturbing quantity index for standard volume	m3	
45	**A**	FVaD	Freeze: Disturbing quantity index for uncorr. vol. at operat. cond.	m3	

1) Fault corr. G7 = “none“: The field ist not displayed.
2) The totalizer can be started and stopped independetly of the main totalizer via the **TEST** key. See also Chapter “**TEST**“ Key Special Function.

8.6 ID display



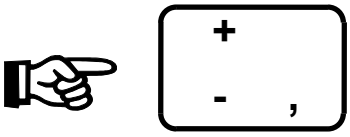
↓ Direct access

		W / 23	Description of coordinates	Unit	Comment(s)
1	**A**	Designation	ID header line		
2	**A**	ID	1st line of ID data: pressure range	bar	
3	**A**	ID	2nd line of ID data: temperature range	°C	
4	**A**	ID	3rd line of ID data: volume meter G size		
5	**A**	ID	4th line of ID data: flow rate range	m3/h	
6	**A**	ID	5th line of ID data: volume meter pulse value	pulses/m3	
7	**A**	ID	6th line of ID data: fault correction (characteristic correction G7)		
8	**A**	ID	7th line of ID data: type of volume meter		
9	**A**	ID	8th line of ID data: serial No. of volume meter		
10	**A**	ID	9th line of ID data: type of pressure transmitter		
11	**A**	ID	10th line of ID data: serial No. of pressure transmitter		
12	**A**	ID	11th line of ID data: type of temperature transmitter		
13	**A**	ID	12th line of ID data: serial No. of temperature transmitter		
14	**A**	ID	13th line of ID data: QminHP	m3/h	
15	**A**	ID	14th line of ID data: Rho<HP	kg/m3	
16	**A**	ID	15th line of ID data: Rho>HP	kg/m3	
17	**A**	ID	16th line of ID data: gas type		
18	**A**	ID	17th line of ID data: serial No. of corrector		
19	**A**	Designation	ID bottom line		
25	**E**	PT type	Input field: G1151AP / G1151GP / 2088A / 3051CA		1)
26	**E**	PT No.	Input field: serial No. of pressure transmitter		
27	**E**	PT min	Input field: lower adjusting value of pressure transmitter	bar a/g	
28	**E**	PT max	Input field: upper adjusting value of pressure transmitter	bar a/g	
29	**E**	TT type	Input field: AGG Ex / Q/4407 / PT100		1)
30	**E**	TT No.	Input field: serial No. of temperature transmitter		
31	**E**	TT min	Input field: lower limiting value of temperature transmitter	°C	
32	**E**	TT max	Input field: upper limiting value of temperature transmitter	°C	
33	**E**	Meter type	Input field: TRZ / DKZ / WBZ08		1)
34	**E**	Meter No.	Input field: serial No. of volume meter		
35	**E**	Q min	Input field: lower limiting value of volume meter	m3/h	
36	**E**	Q max	Input field: upper limiting value of volume meter	m3/h	
37	**E**	Meter size	Input field: volume meter G size		
38	**E**	QminHP	Input field: lower limiting value of volume meter above high pressure	m3/h	
39	**E**	RhominHP	Input field: min. density at actual conditions above high press.	kg/m3	
40	**E**	RhomaxHP	Input field: max. density at actual conditions above high press.	kg/m3	
41	**E**	Gas type	Input field: natural gas / ethylene / oxygen / hydrogen / nitrogen		1)
42	**E**	PV	Input field: volume meter pulse value	pulses/m3	

1) Rolling texts! Press the **MODE** key to make your changes.

For more information, please refer to Chapter 4.

8.7 Mode

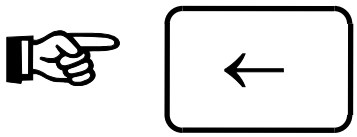


Indirect access by
pressing the [→] key

		X / 24	Description of coordinates	Unit	Comment(s)
1	**A**	Mode	Heading		
2	**B**	Time:	Current time		
3	**B**	Date:	Current date		
4	**E**	Code No.	User code (can only be defined if slide switch is set to "Input")		
5	**A**	Oph	Indication of operating hours	hours	
6	**B**	F mod:	Mode: Freeze = manual / minute / hour / day / week / month		1) 2)
7	**B**	F time:	Time: Freeze start		
8	**B**	F date:	Date: Freeze start		
9	**B**	F rep.:	Repetition rate for automatic freezing		2)
10	**A**	F	Indication of time / date of the last freeze operation		
11	**B**	Pr mod1:	Mode: Print initiation = clock / external		1) 3)
12	**B**	Pr mod2:	Mode: Switching over = automatic / revision		1) 4)
13	**B**	Pr mod3:	Mode: Printout = ---- / manual / channel		1) 5)
14	**B**	Pr start:	Start time for automatic printout		
15	**B**	Auto rep:	Repetition time for automatic printout (1, 2, 3, 4, 6, 12, 24 hours)	hours	
16	**B**	Rev.rep:	Repetition time for revision printout (1 to 99 minutes)	minutes	
17	**A**	LPr	Last print time		
18	**B**	><Cont.:	Limiting contacts: Definition of coordinate		6)
19	**B**	Display mod:	Mode: Active display = 30 min. / 6h - 18h / continuous duty		1)
20	**A**	Comp. type:	Corrector version, e.g.: ERZ 9004 M		
21	**A**	V	Software version: Version date		
22	**B**	Comp. No.:	Serial number		
23	**E**	AD corr.:	Correction factor for AD measurement		
24	**E**	RTC corr.:	Correction factor for real-time clock		
25	**E**	f Vol	Internal clock frequency for volume frequencies	Hz	
26	**E**	f Den	Internal clock frequency for density frequencies	Hz	
27	**A**	Lamp test b.	Lamp test of bottom line of display		
28	**A**	Lamp test t.	Lamp test of top line of display		

1) Rolling texts! Press the **MODE** key to make your changes.
2) If F-mod = "manual" is selected, the F-rep mode is not active.
   If F-mod = "minute, hour, day, week, or month" is selected, the freeze operation is carried out periodically in connection with the field X9. See also Chapter '"Test" Key Special Function'.
3) Printing is initiated via the internal clock or an external contact.
4) Automatic printing in connection with the field X15 or revision printing in connection with the field X16.
5) Initiate printing manually, print a channel protocol.
6) Selection of the measured value whose min. and max. limiting value contacts should be available as output contacts. The measured value is to be preselected via its coordinate.

8.8 Clear / Fault



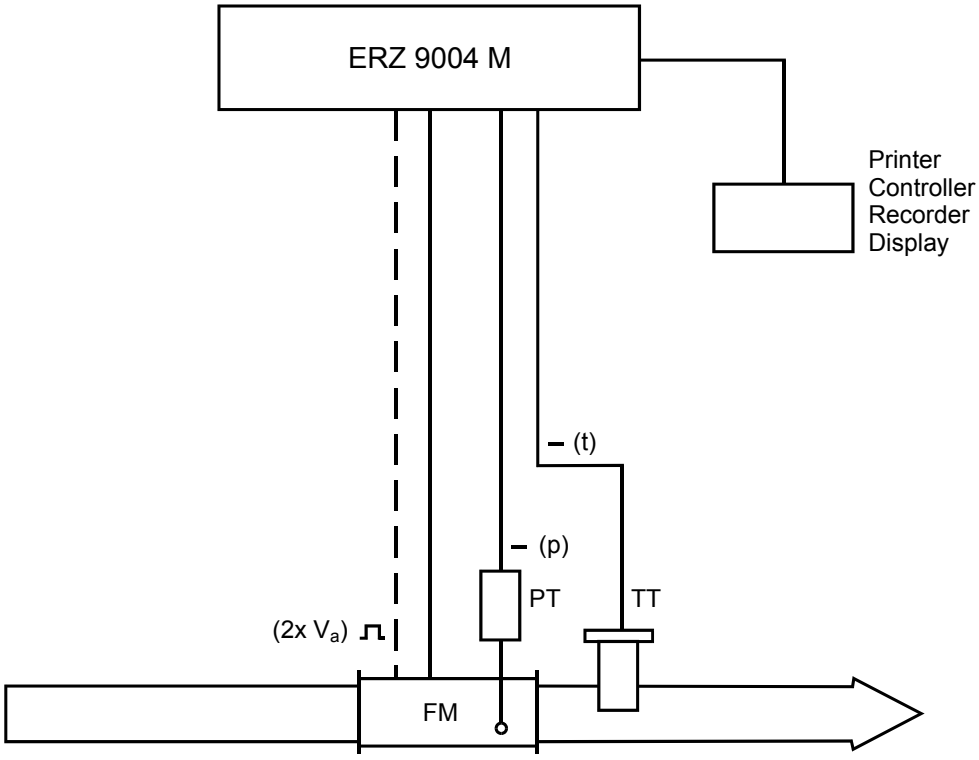
↓ Direct access

		Y / 25	Description of coordinates	Unit	Comment(s)
1	**A**	Fault indication	Heading		
2	**A**		Indication of fault number and type or "Operation"		
3	**A**	Time:	Time of the first fault message		
4	**A**	Date:	Date of the first fault message		
5	**A**	Clear fault?	Indirect clearing function		
6	**A**	CF	Indication of the time of clearing the last faults		
17	**B**	Fault mode:	Mode: Fault clearing = direct / indirect		1)

1) Rolling texts! Press the **MODE** key to make your changes.

For more information, please refer to Chapter 5.

Annex A Function Chart for the ERZ 9004 M Mass Flow Computer



Transmission

⎍ Pulses / current
– Current

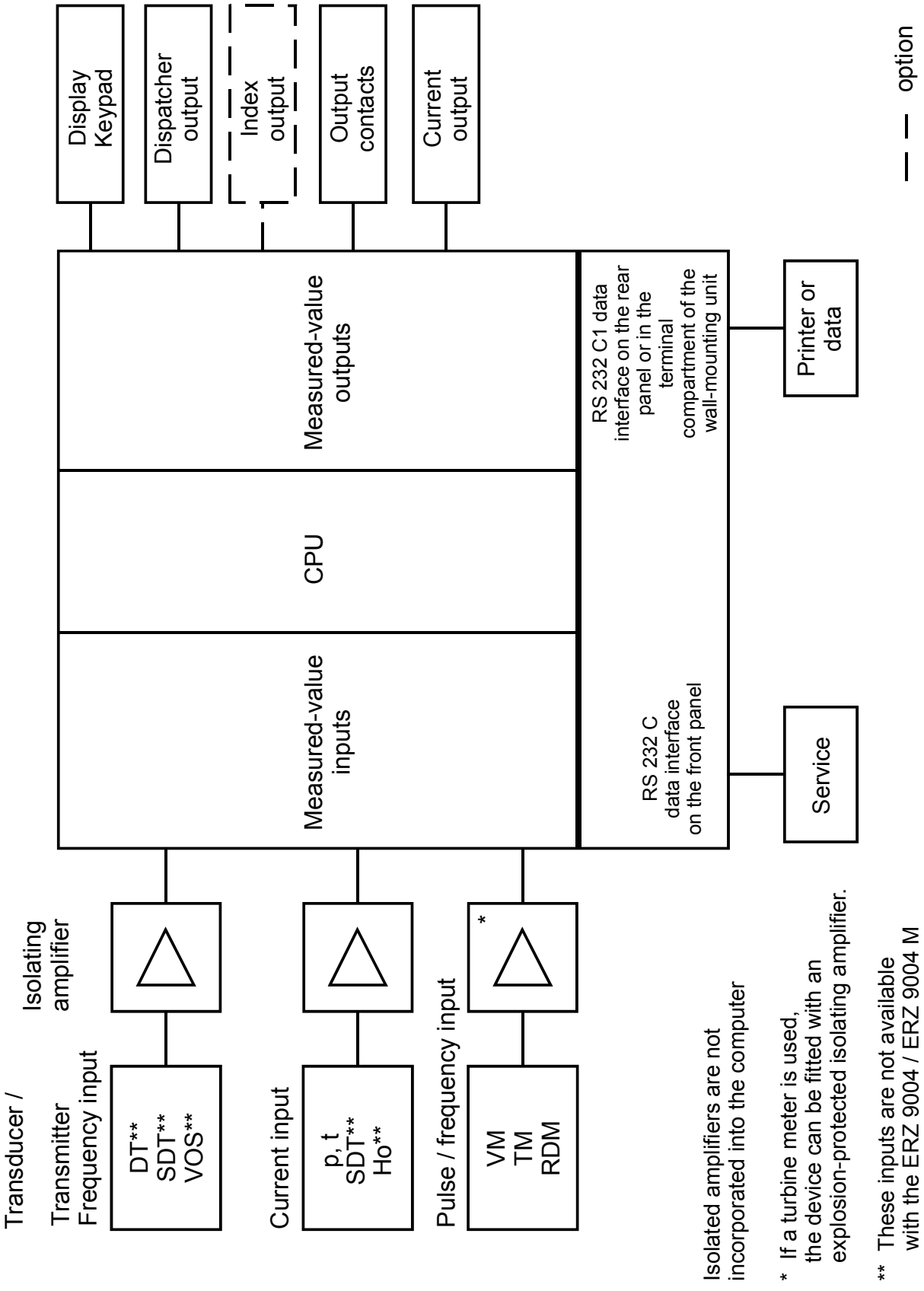
Devices:

FM = Vortex meter, turbine meter or
PT = Pressure transmitter
TT = Temperature transmitter
ERZ = Computer

Indications / outputs

V_a = Volume at actual conditions (m^3)
V_n = Standard volume (m^3)
p = Pressure (bar)
t = Temperature (°C)
T = 273.15 (K) +t
K = Compressibility factor
p_n = Standard pressure (bar)
T_n = Standard temperature (K)

Annex B Block Diagram for the ERZ 9004 M



* If a turbine meter is used, the device can be fitted with an explosion-protected isolating amplifier.

** These inputs are not available with the ERZ 9004 / ERZ 9004 M

Annex C Survey of Equations Used

Volume at actual conditions

V_a = Volume at actual conditions (m^3)
p_V = Volume pulse
K_V = Meter factor (pulses/m^3)
K_{Z1} = V_a totalizer factor (output contact only)

$$V_a = \frac{p_V}{K_V} \cdot \frac{1}{K_{Z1}}$$

Volume correction factor

VCF = Volume correction factor
V_n = Standard volume (m^3)
V_a = Volume at actual conditions (m^3)
p = Absolute pressure (bar)
T = Temperature (Kelvin)
T_n = Standard temperature (Kelvin)
p_n = Standard pressure (bar)
K = Compressibility factor

$$VCF = \frac{V_n}{V_a} \cdot \frac{p \cdot T_n}{p_n \cdot T \cdot K}$$

Compressibility factor

K = Compressibility factor
Z = Real gas factor
Z_n = Real gas factor at standard conditions

$$K = \frac{Z}{Z_n}$$

Calculation is made in accordance with GERG 88 pursuant to G 9.

Standard volume / Mass

$$V_n = V_a \cdot VCF_{(Rho)} \cdot \frac{1}{K_{Z2}}$$

M = Mass (kg)
Rho_b = Density (kg/m^3)
K_{Z2} = V_n / M index factor (output contact)

$$M = V_a \cdot Rho_b \cdot \frac{1}{K_{Z2}}$$

Volume flow rate at actual conditions

Q_{Va} = Volume flow rate at actual cond. (m^3/h)
f_V = Volume transmitter frequency (Hz)
K_V = Meter factor (pulses/m^3)

$$Q_{Va} = \frac{f_V}{K_V} \cdot 3600$$

Standard volume flow rate

Q_{Vn} = Standard volume flow rate (m^3/h)
f_V = Volume transmitter frequency (Hz)
K_V = Meter factor (pulses/m^3)
VCF = Volume correction factor

$$Q_{Vn} = \frac{f_V}{K_V} \cdot VCF \cdot 3600$$

Gas meter error curve linearization

Correction is made using a quartic polynominal which adequately simulates the fault curve of the gas meter.

Fault equation: $F = A_{-2} * Q_{Va}^{-2} + A_{-1} * Q_{Va}^{-1} + A_0 + A_1 * Q_{Va} + A_2 * Q_{Va}^{2}$

F = Deviation of the error curve (%)
Q_{Va} = Volume flow rate at actual cond. (m^3/h)
A_n = Constants

The following values are permanently programmed in the computer: A_1: 10^{-4} A_2: 10^{-8}

The constants A_n (n = -2 to n = 2) are calculated from the measured value pairs error F_i and flow rate Q_{Vai}. Instead of the constant meter factor K_V, the corrected meter factor K_{Vc} is used for subsequent calculation or correction.

$$K_{Vc} = K_V \cdot \left(1 + \frac{F}{100}\right)$$

Thus, the volume flow rate at actual conditions Q_{Va} is calculated from the following equation:

f_V = Volume transmitter frequency (Hz)
K_{Vc} = Corrected meter factor (pulses/m^3)

$$Q_{Va} = \frac{f_V}{K_{Vc}} \cdot 3600$$

Annex D Operating Examples

Displaying measured values and constants on the ERZ 9004 M mass flow computer

The colums B, C, D, F, G, H and I are not applicable to the ERZ 9004 M.

1. example

Press the **PRESSURE** key

P	**34,26**	**bar a**	
I	**13,50**	**mA**	

Press ↓ twice

P	**34,26**	**bar a**	
P<	**10,00**	**bar a**	p min

Press ↓

P	**34,26**	**bar a**	
P>	**50,00**	**bar a**	p max

Press →

t	**10,57**	**bar a**	
t>	**30,00**	**mA**	t max

Press →

qa	**734,26**	**m3/h**	
qa>	**3600,00**	**m3/h**	qa max

2. example

Press the **C FACTOR** key

VCF	**55,41**	
K	**0,988**	

Press ↓ three times

VCF	**55,41**	
K-mod	**GERG**	

Press ↓ twice

VCF	**55,41**	
CO2	**xx,xx**	**%**

Press ↓

VCF	**55,41**	
H2	**xx,xx**	**%**

Press ↓

VCF	**55,41**	
Rhon	**x,xxx**	**kg/m3**

Press ↓

VCF	**55,41**	
Hon	**xx,xx**	**kWh/m3**

Programming a new constant

You want to change the p-max value to 41,50 bar.

Press the **PRESSURE** key

P	**34,26**	**bar a**
I	**13,50**	**mA**

Press ↓ twice

p	**34,26**	**bar a**
p>	**50,00**	**bar a**

p max range

Set the **SWITCH** to "Input"

Press the **ENTER** key. The bottom line of the display turns darker and the POWER / STANDBY LED flashes at one-second intervals to indicate the programming mode.

Press the "4" key

p	**34,26**	**bar a**
p>	**4....**	

Press the "1", "± ", "5" and "0" keys consecutively.

p	**34,26**	**bar a**
p>	**41,50**	

Press the **ENTER** key

p	**34,26**	**bar a**
p>	**41,50**	**bar a**

The display turns bright and the unit indicated again.

Lock the data inputted by means of the **SWITCH**.

Programming is completed!

General information about inputting new values:
If a value is locked with the code number (user data), you must first input the correct code number into the appropriate field (X4) in the **MODE** function (see example on Page 33). You can input values either in the **short designation** or **coordinate** display mode. Switching over is possible at any time by pressing the **SELECT** key.

Programming current / dispatcher outputs

Current outputs
You can select the desired values in the columns M11, N11, O11, P11 via the **OUTPUT** function key and the cursor keys. To input coordinates, you must input the appropriate digits (A = 01, B = 02, etc.) instead of the letters of the columns concerned (A, B, etc.). **However, you can only connect the fields 1 and 2 of the columns A to L to one current output!**

Example: You want to output the standard volume flow rate (field 1, column J) to current output 1. (Column J corresponds to the number 10; see Page 11 Flow Rate 1 column)

1) Press the **OUTPUT** key.
2) Press ↓ four times ("I10 J-1" is indicated on the bottom line of the display).
3) Press the **ENTER** key. (The display switches over to "I10 10-1").
4) Input the key sequence "1" "0" "1" (for field J1). (The first two digits stand for the column and the third digit stands for the field.)
5) Press the **ENTER** key.

Dispatcher outputs
Programming dispatcher outputs is analogous to the procedure for programming current outputs.

Programming a new mode

Press the **PRESSURE** key

p	**34.26**	**bara**
I	**13.50**	**mA**

Press ↓ nine times.

p	**34.26**	**bara**
p-mod1	**0-20**	**mA**

Set the **SWITCH** to "Input".
The POWER / STANDBY LED flashes at one-second intervals to indicate the programming mode, and after you have pressed the **ENTER** key, the bottom line of the display turns darker.

Press the **MODE** key.

p	**34.26**	**bara**
p-mod1	**4-20**	**mA**

The setting changes from 0-20 mA to 4-20 mA.

Press the **ENTER** key and lock the data inputted by setting the of the **SWITCH** to „Input“.

The input field that you must change via the **MODE** key is seperately refered to under **Summary of Device Functions to Be Called up with Function Keys** (Chaper 8).

Setting main totalizers

You want to set the main totalizer V_a to 100000.

First input the code number and then set the **SWITCH** to "Input".
Press the **TOTALIZER** key.

Vn	**000004321.985**	**m3**
Va	**00000346.987**	**m3**

Press ↓ five times

Vn	**000004321.985**	**m3**
Va-set	**0**	**m3**

Press the **ENTER** key. The bottom line of the display turns darker and the POWER / STANDBY LED flashes at one-second intervals to indicate the programming mode.

Press the keys "1" "0" "0" "0" "0" "0" consecutively.
Press the **ENTER** key and lock the data inputted bei setting the **SWITCH** to „Input“.

Vn	**000004321.985**	**m3**
Va-set	**100000**	**m3**

Setting and resetting disturbing quantity totalizers is performed in the same way.

NOTE:
If you set the mode in the column J19 (Fault correction G7) to "yes", the sequence of the totalizers changes, since additional totalizers are inserted for the corrected volume at actual conditions (see also Chapter 8.3).

Enabling programming

Code number to enable user access

First press the **MODE** key and then the → key. The time is indicated.

	Mode
Time:	**12-48-10**

Press ↓ twice.

	Mode
Code	****** - ******

Press the **ENTER** key and input the appropriate digits.

	Mode
Code	*****

The digits inputted remain invisible. Each digit is marked with an asterisk.

Press the **ENTER** key to complete the data input.

	Mode
Code	****** - ******

If the code number is correct, the POWER / STANDBY LED on the front panel starts to flash at one- second intervals. If the code number is incorrect, the display returns to

	Mode
Code	****** - ******

Repeat the operation using the correct code number!

The computer enables you to access user data. To change data, you must select the desired coordinate on the bottom line of the display and press the **ENTER** key. The brightness of the bottom line is reduced to indicate that access to the coordinate field is enabled. If you want to lock the computer again after having completed your programming, press the **CLEAR / FAULT** key twice quickly. If you forget to do so, the computer itself disables access after approx. 30 minutes. It is possible to change the code number if the sealable slide switch is in its "Input" position.

Sealable switch for the Office of Weights and Measures

When the switch is operated, the POWER / STANDBY LED starts to flash at one-second intervals and access to the memories (incl. code number) is enabled. To change data, you must select the desired coordinate on the bottom line of the display and press the **ENTER** key. The brightness of the bottom line is reduced to indicate that access to the coordinate field is enabled.

Annex E Technical Data

Inputs

Analog inputs:	14½-bit resolution corresponding 20000 steps accuracy ± 1 bit, measuring period approx. 100 ms.
Volume frequency:	16-bit resolution, reciprocal measuring method range from 0.05 Hz to 20 kHz or metering from 0 Hz.
Frequency inputs:	23-bit resolution, reciprocal measuring method range from 0.05 Hz to 25 kHz.
Digital inputs:	Status signals, passive contact mechanism (relay or open collector), load 5 V, 20 mA.

Outputs

Analog outputs:	14-bit resolution, accuracy ± 1 bit, load 800 ohms, electrically isolated as plug-in module for each output. The CPU can optionally be fitted with 1 to 4 analog outputs.
Digital outputs:	Limiting value 24V 100mA Dispatcher Pulse width adjustable from 50 ms (10 Hz) to 300 ms (1.5 Hz). Output frequency from 0 to 10 Hz, electrically isolated open collector. Index pulses Pulse width of approx. 150 ms (3 Hz), not adjustable. Electrically isolated open collector. Limiting contacts Electrically isolated open collector. Fault / Warning Contact assemblies (principle of closed-circuit current).

Power supply

	Switched-mode power supply unit with 40 kHz clock frequency. All secondary voltages are electrically isolated from each other. Charging unit for standby battery.
Standard power supply unit:	24 V DC (21 V to 27 V), power input approx. 31 W
Special version:	230 V AC (-10% to +6%), power input approx. 31 W
Internal battery (option):	The standby battery sustains the power supply of the ERZ 9004 M including transmitters for approx. 30 minutes. After a discharge, the battery attains its full power after approx. 10 hours.

Ambient temperature

Temperature range:	-20°C to +60°C

Weight & dimensions

Rack-mounting unit:	Height 3 units, width 213 mm, depth 295 mm (without connectors) weight excl. battery approx. 3.2 kg, weight incl. battery approx. 4 kg
Wall-mounting unit:	Height 245 mm, width 340 mm, depth 260 mm weight excl. battery approx. 3.7 kg, weight incl. battery approx. 4.5 kg

Interfaces

Without handshake lines, communication is made via Xon / Xoff. Short-circuit-proof.

Rack-mounting unit

Front panel:

Front interface
RS 232 C as service interface
9-pin Cannon connector
transmission rates from 1200 to 9600 baud
1 start bit, 1 stop bit, 8-bit data, no parity

Rear panel:

C1 interface
RS 232 C as service or printer interface
9-pin Cannon connector
transmission rates from 2400 to 19200 baud
1 start bit, 1 stop bit, 8-bit data, no parity

C2 interface (option)
RS 485 as standard data communication (DSfG) interface
9-pin Cannon connector
transmission rates from 2400 to 19200 baud
1 start bit, 8-bit data
parity bit setting: off / even / odd
stop bit setting: 1 / 2

Wall-mounting unit

Front panel:

Front interface
RS 232 C as service interface
9-pin Cannon connector
transmission rates from 1200 to 9600 baud
1 start bit, 1 stop bit, 8-bit data, no parity

Rear panel:

Interface in the terminal compartment
Max. one interface. Screw terminals in the terminal compartment. There are the same interfaces available as with the rack-mounting unit.

CPU

CPU: 80C537 / 12 MHz

Memory areas:

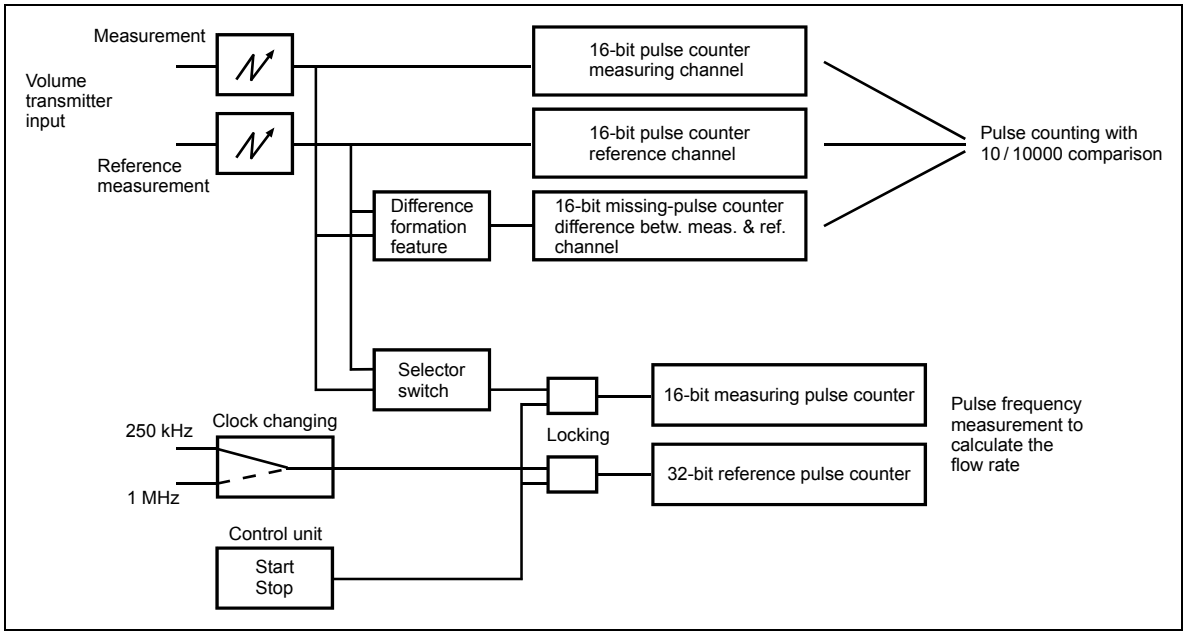
a)	Official calibration data:	non-volatile memory C-MOS RAM, 2 kilobytes
b)	User data:	non-volatile memory C-MOS RAM, 2 kilobytes
c)	Totalizer memory:	non-volatile memory C-MOS RAM, 512 bytes
d)	Program memory:	EPROM 64 / 128 kilobytes

Display field and keypad

2-line luminescent display in blue with 20 characters per line.
Digit height 5 mm, 7x5 dot matrix.
Luminosity 856 cd / m^2
Temperature range -10°C to +60°C

Front panel film with short-stroke keys

Pulse counting / pulse frequency measurement block diagram



Description of pulse counting

2-channel pulse counting arrangement with seperate measuring and reference channels

1:1 operating mode
There is the same number of pulses per time unit (or per rotation of the turbine wheel) on both channels. The input pulses must be out of phase (90° to 270°). The difference formation feature alternately compares the measuring and reference pulses. Every deviation is counted by the missing-pulse counter. If the preset limiting value (e. g. 10 pulses) is exceeded, an alarm is tripped. If the limiting value is not exceeded within a presettable period (e. g. 10000 pulses), the missing-pulse counter is set to zero.

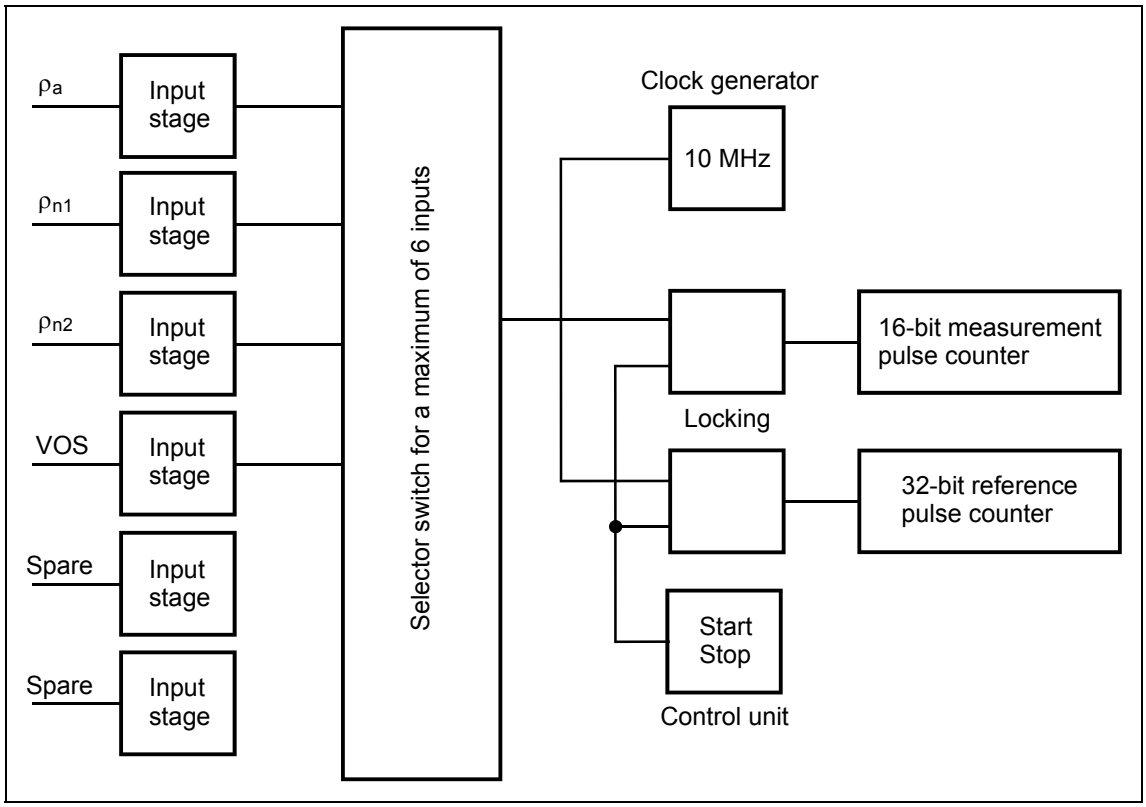
X:Y operating mode
The number of pulses per time unit (or per rotation of the turbine wheel) is not the same on both channels. The input pulses may have any phase angles. Differences are formed only via the software. The deviation results from the ratio of the measuring wheel and reference wheel parameters inputted. In the event of a deviation > 4%, an alarm is tripped.

Description of pulse frequency measurement

To calculate the flow rate, the frequency of volume pulses is determined by means of a period measurement. A selector switch samples the measuring and reference channels in such a way that a frequency and thus a volume flow rate can be determined from both pulse frequencies (irrespective of the mode 1:1 or X:Y). Clock frequency changing (250 kHz / 1 MHz) allows to change the measuring resolution or the measuring period in connection with the chosen volume transmitter (vortex meter = long gate time).

Measurable frequency, min.: 0.05 Hz
Measurable frequency, max.: 20 kHz

Frequency measurement block diagram

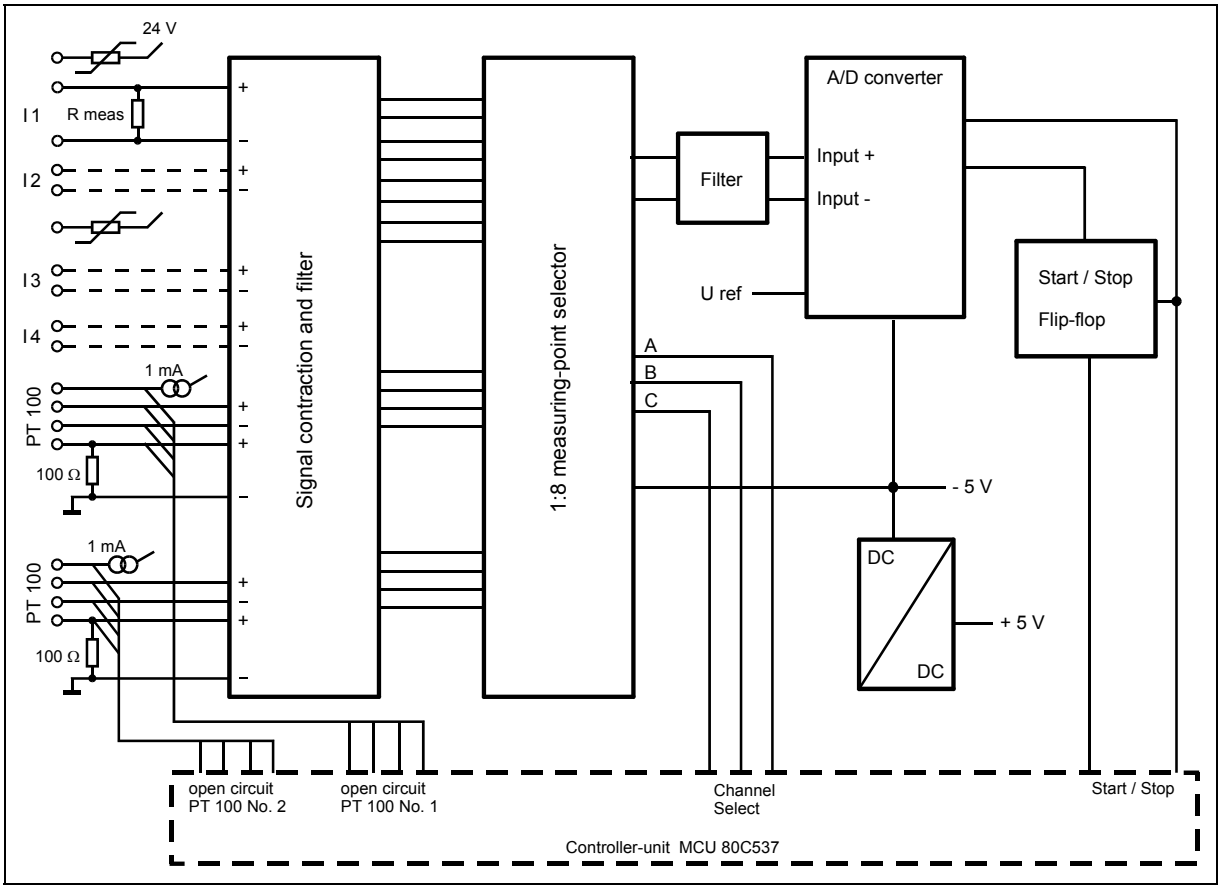


Description of frequency measurement

To carry out density or sound velocity calculations, it is necessary to measure the frequency of the transmitters connected. A selector switch samples the inputs connected. The measuring pulse counter has a resolution of 16 bits, whereas the reference pulse counter has a resolution of 32 bits.

Measurable frequency, min.: 0.05 Hz
Measurable frequency, max.: 20 kHz

Block diagram of analog inputs



Analog inputs

Dual-slope analog-digital converter with 14½-bit resolution corresponding to 20000 steps. A multiplexer which can sample a maximum of 6 analog inputs is located upstream of the A/D converter. Four inputs are designed for current measurement and two inputs for resistance measurement using four-wire technology with open-circuit monitoring.

Analog outputs

Digital-analog converters with 14-bit resolution. There is one electrically isolated converter for each current output.

Storing quantity pulses / electronic indexes

The counted and evaluated pulses are stored threefold in a non-volatile memory (C-MOS RAM). A cyclic 1-out-of-3 comparison checks the contents of the memory locations for equality. In the event of one value deviating from the other two values, an alarm is tripped and the wrong value is overwritten with the contents of the coinciding memory locations. This applies to all V_a and V_n indexes.

Digital outputs

Index pulses:	Transistor output open collector with protective network limiting values: 24 V 100 mA
Limiting contacts:	Transistor output open collector with protective network limiting values: 24 V 100 mA
Dispatcher:	Transistor output open collector with protective network limiting values: 24 V 100 mA
Fault / Warning:	Contact assemblies with protective network limiting values: 24 V 100 mA

Interfaces

There are two RS 232 C interfaces. One is located on the front panel and the other on the rear panel. Both interfaces are without handshake lines; communication is made via Xon / Xoff. The rack-mounting unit is fitted with two 9-pin subminiature Cannon connectors, whereas the wall-mounting unit has one 9-pin connector on the front panel and one screw terminal in the terminal compartment. Including back-up fuse, varistor and transient absorber (TAZ diode).

Power supply unit

Standard version	24 V DC	21 V to 27 V
Special version	230 V AC	-10% + 6%
Power input	approx.	26 W

Switched-mode power supply unit with 40 kHz clock frequency. All secondary voltages are electrically isolated from each other.
Charging unit for standby battery.

a) **Rack-mounting unit**

Size:		Height: 3 units	Width: 213 mm	Depth: 295 mm (without connectors)
Weight excl. battery:	approx. 3.2 kg			
Weight incl. battery:	approx. 4.0 kg			

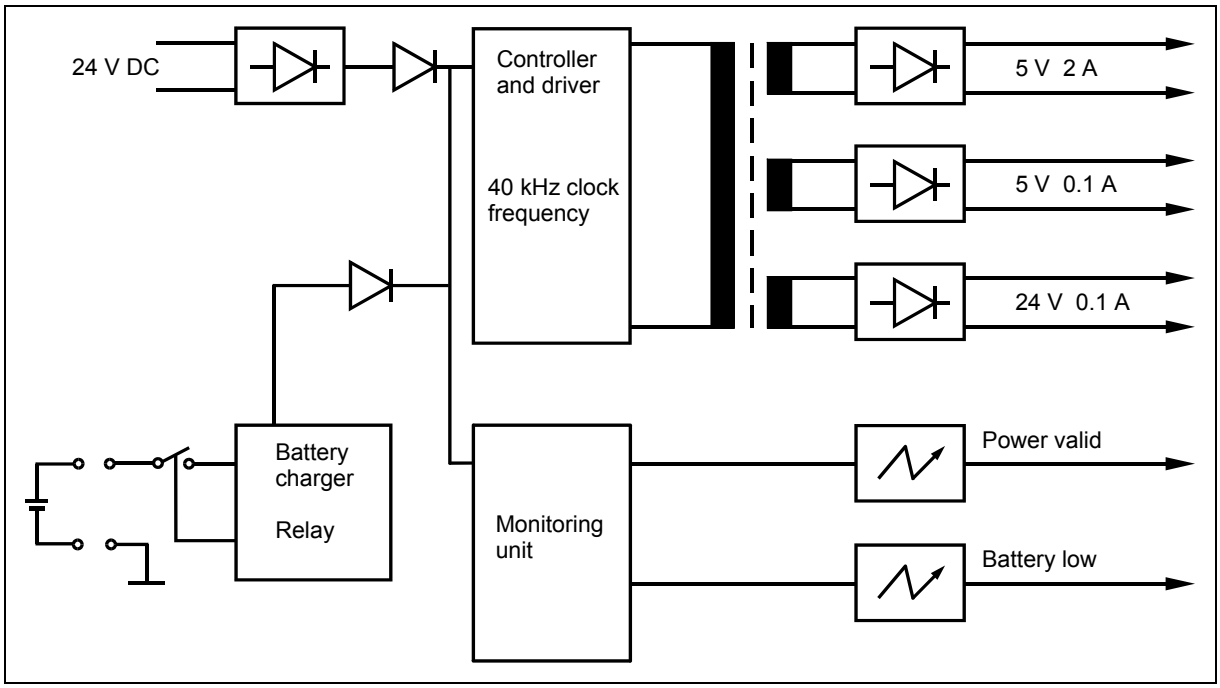
b) **Wall-mounting unit**

Size:		Height: 225 mm	Width: 340 mm	Depth: 260 mm
Weight excl. battery:	approx. 3.7 kg			
Weight incl. battery:	approx. 4.5 kg			

Original battery standby supply

The standby battery sustains the power supply of the entire device and the transmitters for approx. 30 minutes if it is fully charged. Recharging the battery after a discharge takes approx. 2 hours.

Block diagram of battery standby supply



Activation of the standby battery

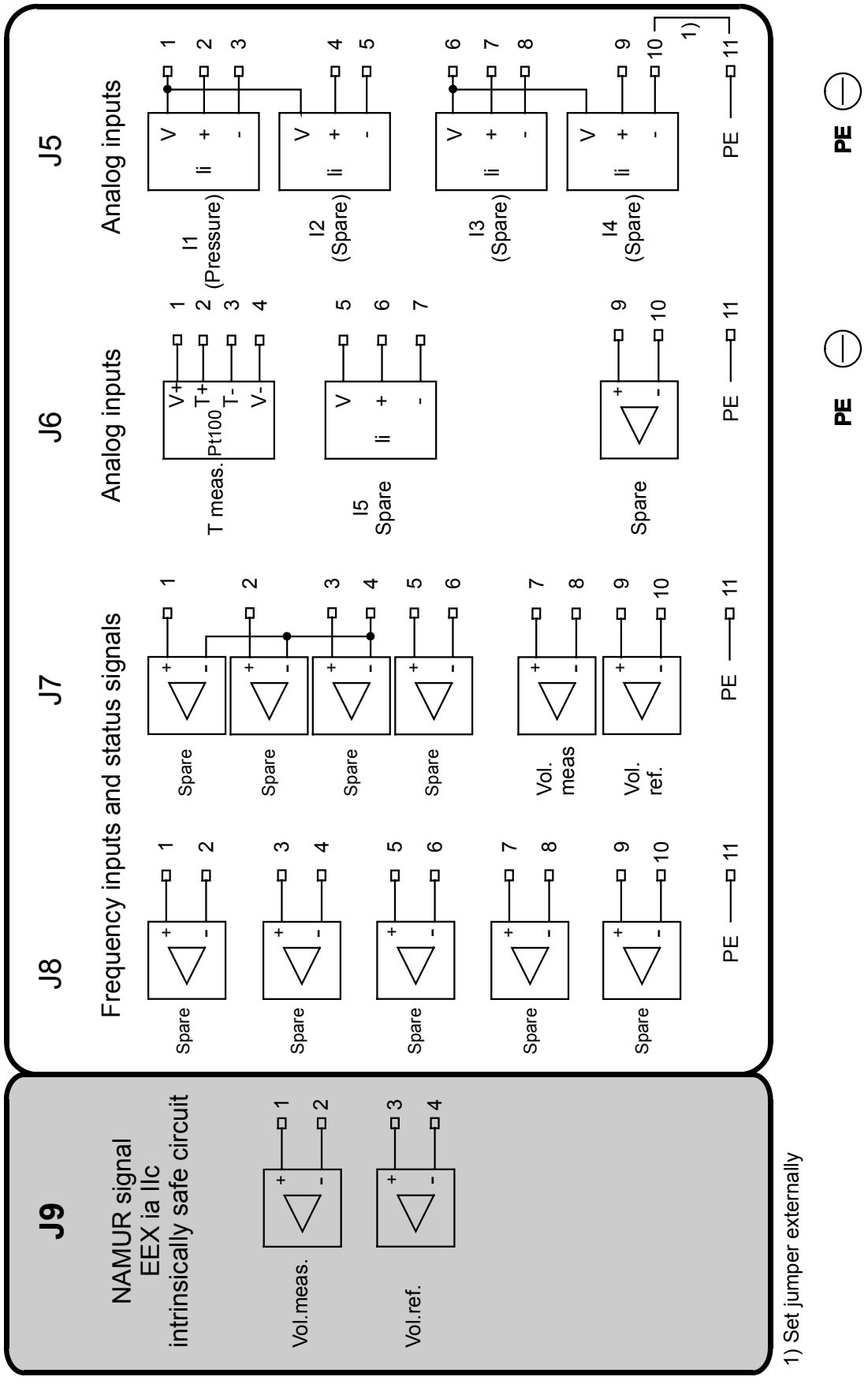
To activate the standby battery, set the following jumper:

Rack-mounting unit: Connector J4, jumper between 9 and 10.
Wall-mounting unit: Jumper between A2 and A6

Afterwards, the device must be supplied with 24 V or 230 V one time. Only then will the standby battery sustain the power supply of the device in the event of a power failure.

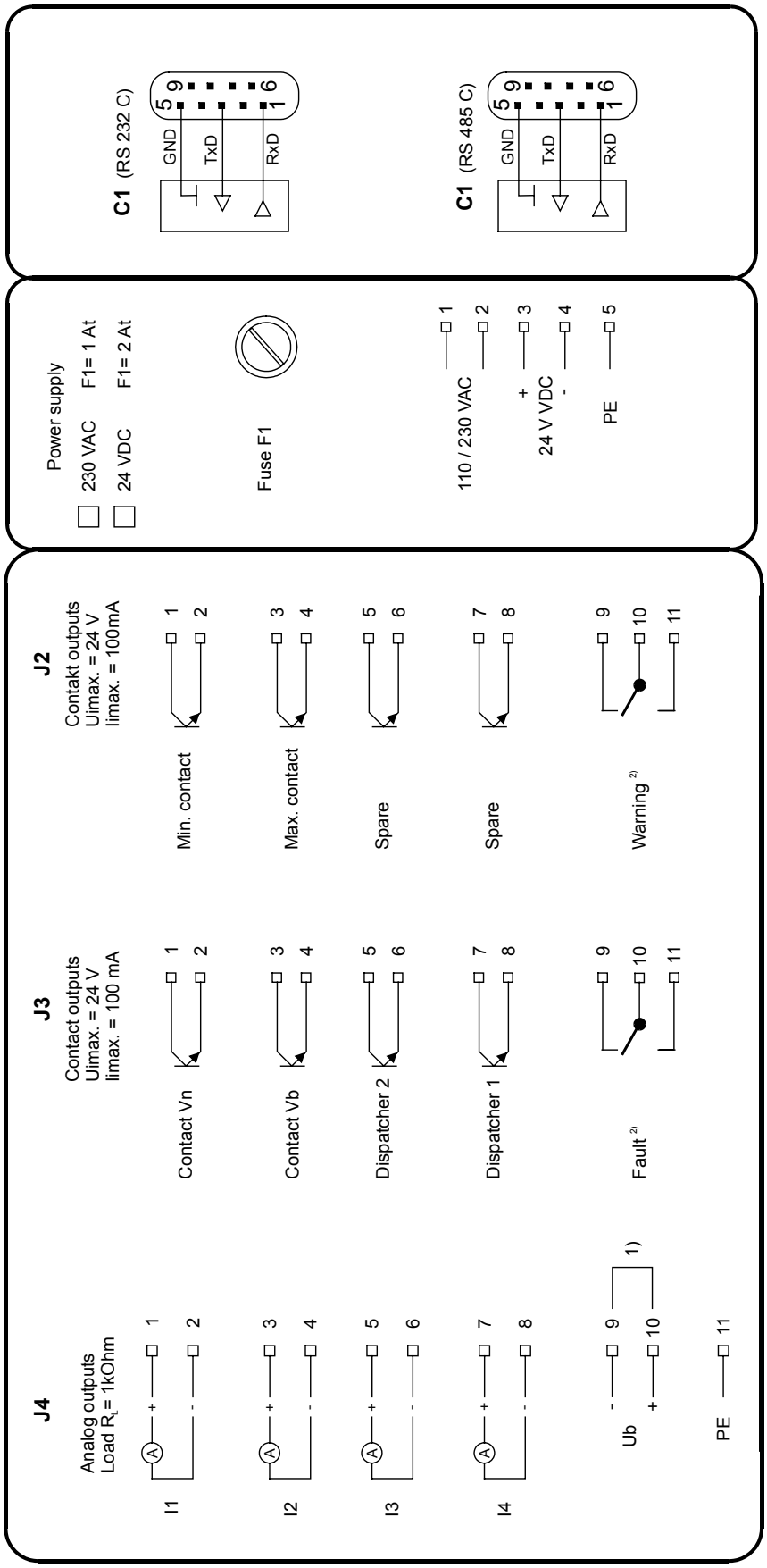
Annex F Pin Assignment Diagrams

Inputs of the rack-mounting unit



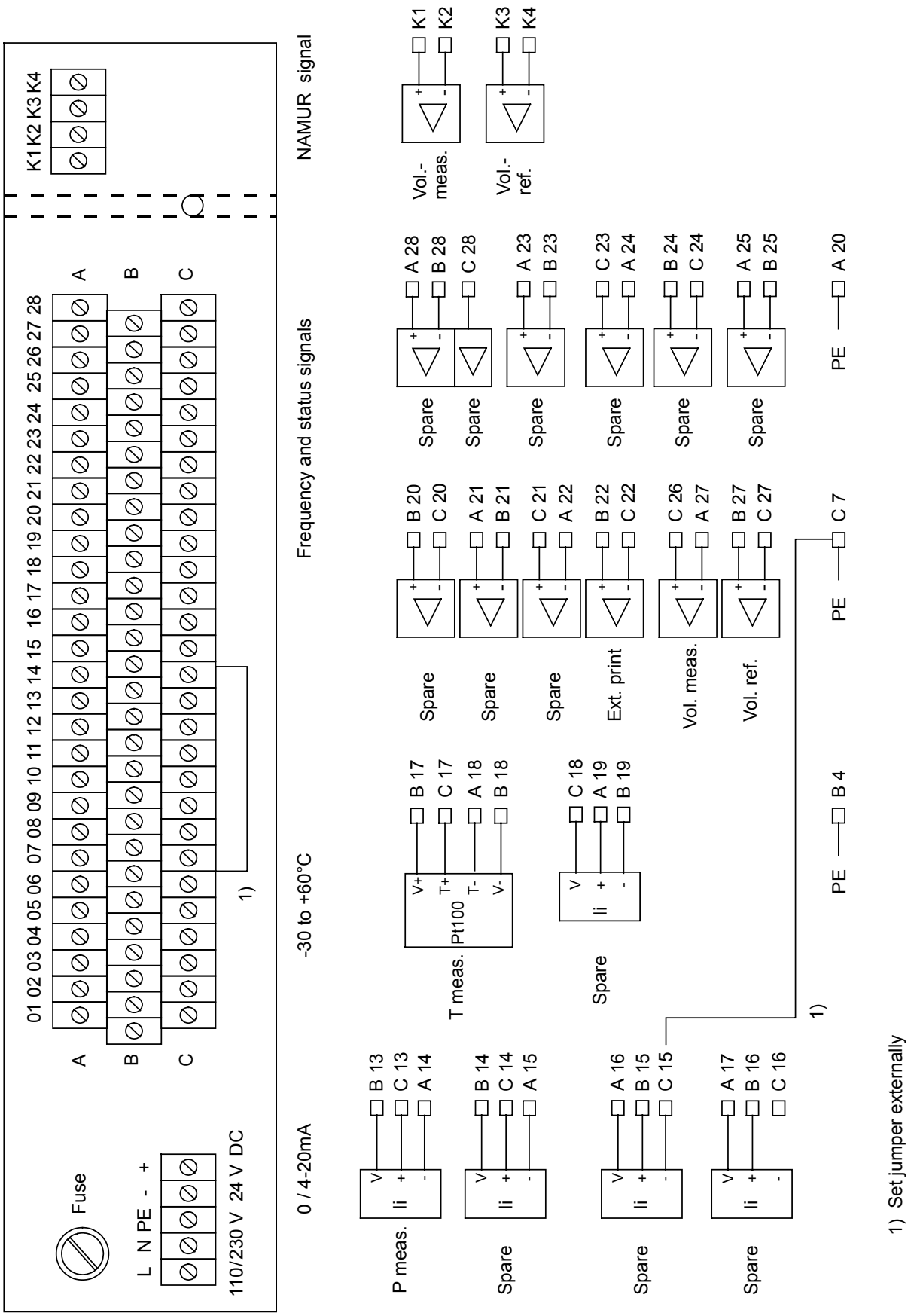
1) Set jumper externally

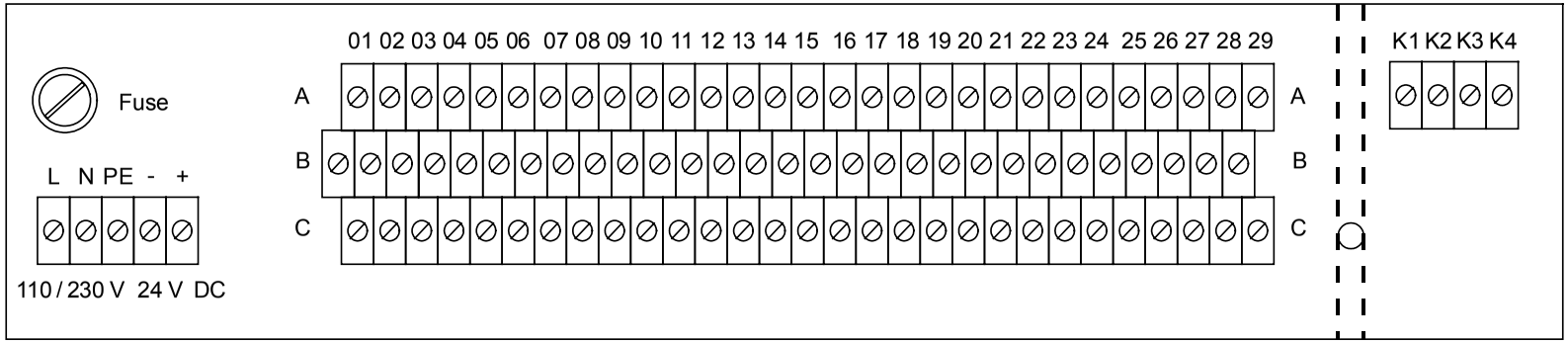
Outputs of the rack-mounting unit

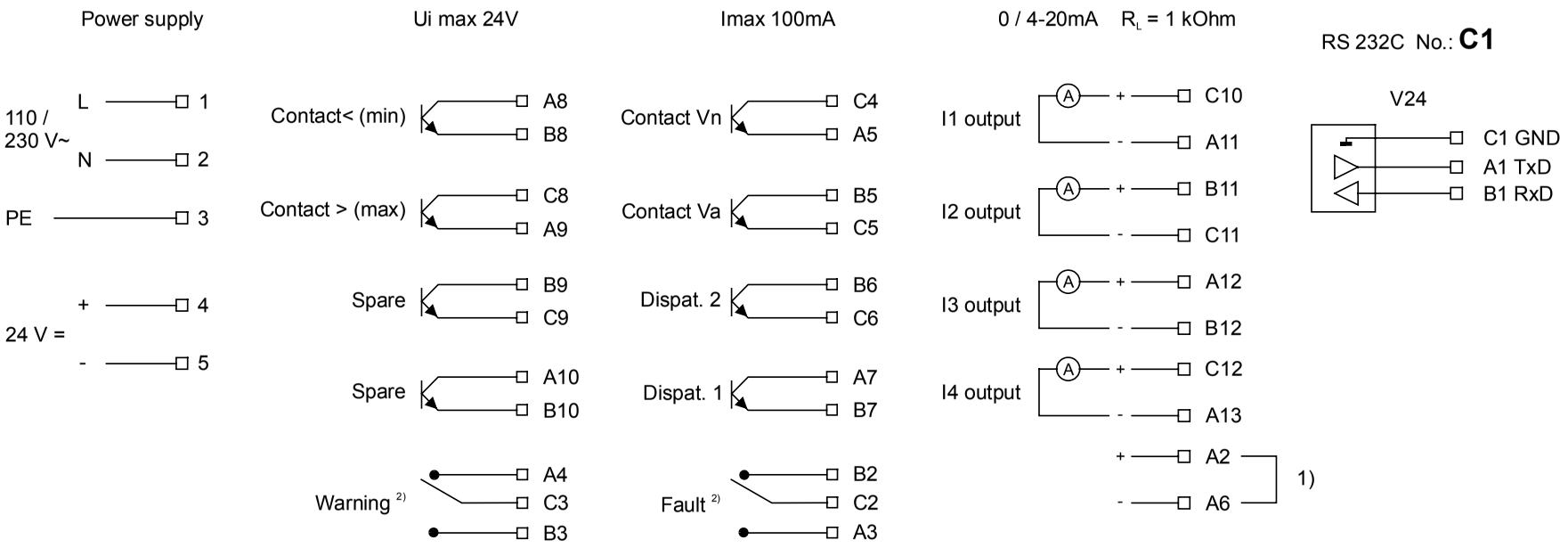


1) When using an internal battery, set a jumper between the contacts 9 and 10. When using an external battery, set the soldering jumper P14 in the ERZ 9004 / ERZ 9004 M.
2) In the event of fault-free operation, the fault / warning relays are picked up (contacts J3/(9-10) and J2/(9-10) are closed).
If a fault occurs and in the event of a power failure, the relays release (contacts J3/(10-11) and J2/(10-11) are closed).

Inputs of the wall-mounting unit







1) When using an internal battery, set a jumper between the contacts A2 and A6. When using an external battery, set the soldering jumper P14 in the ERZ 9000 (see "Technical data").
2) In the event of fault-free operation, the fault / warning relays are picked up (contacts B2-C2 and A4-C3 are closed).
If a fault occurs or if the device is disconnected from the power supply, the relays release (contacts C2-A3 and C3-B3 are closed).

Annex G Fault List

F A U L T M E S S A G E S

No.	Text displayed	Explanation
	General	
02	Power failure	Power failure
03	Defective clock	Clock component in the ERZ 9004 M is defective
04	EEPROM fault	Fault detected when checking the EEPROM
05	A/D hardw. 517	Hardware fault A/D measurement 517
06	A/D hardw. 7135	Hardware fault A/D measurement 7135
07	Watchdog	Program runtime exceeded
08	AGA iter. 1	AGA-NX 19 iteration 1
09	AGA iter. 2	AGA-NX 19 iteration 2
10	AGA limit.	AGA-NX 19 limiting values
11	8279 fault	8279 fault
12-15		Spare
	Volume measurement	
16	Pulse comp. 1:1	Pulse comparison 1:1
17	Pulse comp. x:y	Pulse comparison x:y
18	Miss.pulse meas.	Missing pulses of the measuring channel
19	Miss.pulse ref.	Missing pulses of the reference channel
20	qVa min range	Min. range of volume flow rate at actual conditions violated
21	qVa max range	Max. range of volume flow rate at actual conditions exceeded
22	Delta qVa	Delta fault of volume flow rate at actual conditions
23	Delta Kvc max	Kvc delta fault
24 & 25		Spare
	Analog inputs	
26	p hardware	Pressure hardware
27	p min range	Min. pressure range violated
28	p max range	Max. pressure range exceeded
29	p delta	Pressure delta fault
30 – 41		Spare
42	T hardware	Temperature hardware
43	T min range	Min. temperature range violated
44	T max range	Max. temperature range exceeded
45	T delta	Temperature delta fault
46 – 49		Spare
	Totalizers	
50	1 out of 3 Va	1-out-of-3 comparison volume at actual conditions
51	1 out of 3 Vn	1-out-of-3 comparison standard volume
52	1 out of 3 Vac	1-out-of-3 comparison corrected volume at actual conditions
53		Spare
54	1 out of 3 VaD	1-out-of-3 comparison disturbance of volume at actual conditions
55	1 out of 3 VnD	1-out-of-3 comparison disturbance of standard volume
56	1 out of 3 VacD	1-out-of-3 comparison disturbance of corrected volume at actual conditions
57 - 69		Spare

W A R N I N G S

No.	Text displayed	Explanation
	Totalizers and flow rate	
70	Dispatcher 1	Dispatcher output 1
71	Dispatcher 2	Dispatcher output 2
72	el.mech. TOT. 1	Output contacts of totalizer V_a
73	el.mech. TOT. 2	Output contacts of totalizer V_n
74	qVa min limit	Min. limit of volume flow rate at actual conditions violated
75	qVa max limit	Max. limit of volume flow rate at actual conditions exceeded
76	qVn min limit	Min. limit of standard volume flow rate violated
77	qVn max limit	Max. limit of standard volume flow rate exceeded
78 & 79		Spare
	Current outputs	
80	I1 out min	Current output 1 min. violated
81	I2 out min	Current output 2 min. violated
82	I3 out min	Current output 3 min. violated
83	I4 out min	Current output 4 min. violated
84	I1 out max	Current output 1 max. exceeded
85	I2 out max	Current output 2 max. exceeded
86	I3 out max	Current output 3 max. exceeded
87	I4 out max	Current output 4 max. exceeded
	Limiting contacts	
88	p min limit	Min. limit of pressure violated
89	p max limit	Max. limit of pressure exceeded
90 - 95		Spare
96	T min limit	Min. limit of temperature violated
97	T max limit	Max. limit of temperature exceeded
98 & 99		Spare