W&M Functional Description

Version/Rev. 3.20 (10/11)
MN F09 010 EN ◄► DOK-389

Electronic Register

MultiFlow

FMC Technologies

Further Dokumentation for this Product:

Description	**Order No.**
MultiFlow Operating Instruction	MNF09002US / DOK-383E
MultiFlow Driver's Short Instruction	MNF09012US / DOK-392E
MultiFlow Calibrating Information	MNF09010US / DOK-389E
MultiFlow Seal Receipt MID	MNF09005US / DOK-503E

Documentation on the Internet:

www.fmctechnologies.com/seningttp

History

Revision	**Date**	**Editor**	**Status**	**Description**
Rev. 3.58	February 2011	RAL / jp	released	Version 3.58
Rev. 3.60	October 2011	RAL / JS / jp	released	Version 3.60 u. 5.11 (MID)

Table of Contents (English)

1 Approval

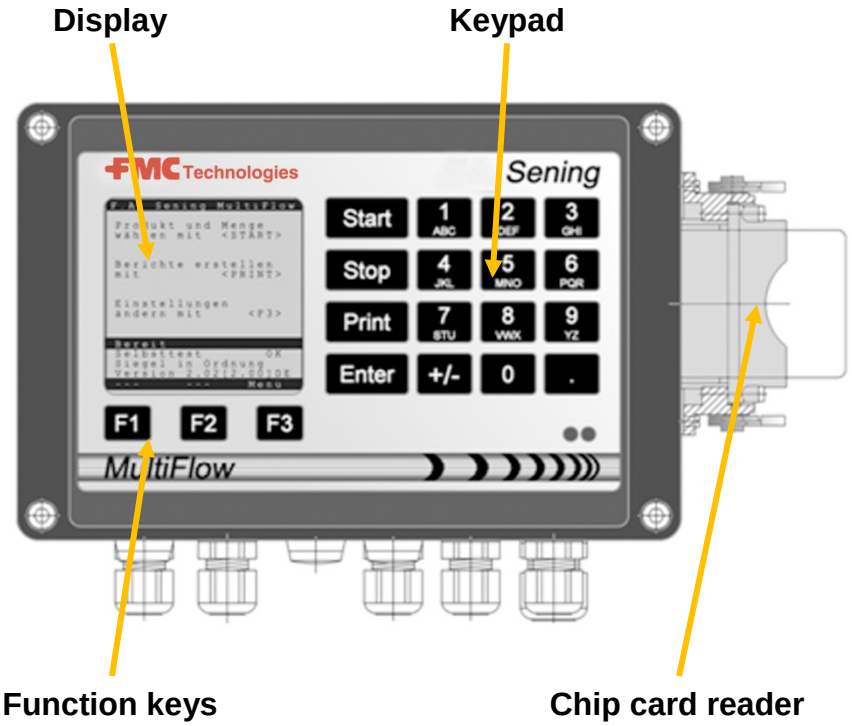
The national German pattern approval for the electronic register with ancillary devices as part of a measuring system is:

Approval mark:	**5.602** **97.10**
Type designation:	MultiFlow

Note:
A copy of the approval is attached in the appendix.

2 Basic principles

2.1 Overview of operating elements



2.2 Menu structure

2.2.1 Start screen

The start screen offers three menus for selection:

- **Select product and quantity**
  This is the discharge menu. You start it with the **<Start>** key,
- **Create reports**
  Here you can print out the reports.
  You start it with the **<Print>** key.
- **Change settings**
  This is the main and configuration menu.
  You start it with the **<F3>** key.

Menus are presented as selection lists with a selection number in front of each item. These menu entries are often further sub-divided into submenus.

☞ You call up submenus by entering the number which is visible in front of the menu option.

☞ Alternatively you can browse through the lists with a selection bar using the <**F1**> and <**F2**> keys.

The selection bar presents one of the menu entries each time in inverted text.

☞ You can also call up the selected entry by pressing the <**Enter**> key.

☞ With <**Stop**> you leave a selected menu and go to the next higher level.

To designate a given menu in this structure the **menu** or also the **parameter number** will normally be used in the following sections.

The parameter number is made up of the chain of position numbers of the different menu entries. Thus for example the product definition has the parameter **3.5**.

☞ From the main menu you should thus first select here the <**3**> and then the <**5**> (without the dot)

2.2.2 Main menu (function key <F3>)

The main menu (which can be reached by the function key <**F3>** in the start screen) permits the configuration of the MultiFlow. It contains both the product parameters as well as the settings of the display, the printer and the sensors.

2.2.3 Reports menu (<Print> key)

Every discharge is saved by the MultiFlow and can be printed out as a report. In this way you can document the whole shift or tour combined with all events in a tour or trip report.

In the start screen of the MultiFlow open the reports menu with the <**Print**> key. In the now displayed reports menu select and print out all the required reports.

2.3 Parameters

The main menu (which can be reached by the <**F3**> key in the starting screen) permits the configuration of the MultiFlow. It contains both the product parameters as well as the settings for the display, printer and sensors.

All entries in the menu can be *viewed* with virtually no restrictions. A *change* is however only possible in a limited way, since entries, especially parameter lists (Menu 3), are provided with different access rights; 'Driver, 'Master' or 'Calibration'.

Driver's rights:
Access to the basic discharge and setting functions
(e.g. contrast setting).

Master's rights:
Access to higher-value settings (sequence control, options).
Password required.

Protected data:
Information which is relevant to the calibration work, which is electronically 'sealed' during calibration. Password required.

It is only the settings in the '**Driver**' group which you can change at any time. A safety query is provided for all others.

Parameters in the '**Master**' and '**CALIBRATION**' group require a master's or a calibration password. You must therefore enter such a password to obtain access.

As master you have access to *all* the settings of the MultiFlow. In the case of protected data you are however advised that the electronic W & M (Weights and Measures) seal must be broken. You can do this in menu 4.1.3.

Attention: When changing the parameters in the 'CALIBRATION' group (data requiring compulsory calibration) the non-resetable event counter is automatically incremented. See also see chapter 4.1 "Version numbers" / page 27.

NOTE:
- If the seal has already been broken a warning message will appear if you change calibration-relevant data.
- During discharge the display will advise of the non-permitted seal condition.
- If a false password is entered (master's key) an entry will be made in the logbook. If repeated false entries are made the waiting time is extended until a new entry is possible (1, 15, 60 min).
- You can circumvent the safety query by deactivating the W & M seal.
- To do this you must remove the lead W & M seal on the control unit and open the housing. Then place the jumper on the contacts inside the unit (see see chapter 5 "Setting of the plug-in jumper" / page 33).

APPENDIX: An example of a possible parameter list is contained in the appendix.

The parameter menu contains the following areas:

Meter no., control options, calibration restrictions→
Transfer rate, FDW protocol→
Pulse generator, temperature sensor, additive dosing pump→
Units, prices, meter factors→

2.4 Menu structure

2.4.1 Passwords

☞ Access rights and passwords are generated from the entries in the driver's table (Menu 3.6).

The factory settings define the following operators:

Personnel no.	Password	Access rights
000001	-	Driver
999999	654321	Master

*Passwords are always 6-digit numbers

☞ After switching on, Driver '000001' is automatically activated. As long as no other logon takes place (Menu 5) the operator will only have the driver's rights.

Attention: When the electronic W & M seal is set an ***additional*** **password** is requested, which is *not* identical to the master password. Definition of this password is done in Menu 3.1.3 (under calibration protection).

The factory setting of the **seal password** is: '**123456**'

NOTE: The protection of calibration-relevant parameters is only active as long as the electronic W & M seal is intact and the seal switch inside the device is not bridged over.

In the case of a 'broken' electronic W & M seal it is only the master's access rights which are required to edit these parameters.

If the seal switch is bridged (jumper set) **all** safety queries are deactivated. See also see chapter 5 "Setting of the plug-in jumper" / page 33.

3 Initial calibration

Upon delivery certain parameters, passwords and conversion factors are preset in our factory, but not adjusted to match the peripheral equipment. Before the MultiFlow can be used for trading products requiring compulsory calibration, it is necessary to arrange for acceptance by a weights and measures official or a person who possesses the same rights. During initial calibration all the settings must be checked and corrected as necessary.

3.1 Check list

The calibration procedure is summarised as a check list in the following. You must follow the sequence given here during calibration of the MultiFlow unit:

- Checking the date and time
- Checking the meter number and seal password
- Checking the calibration restrictions
- Checking the printer settings
- Checking the sensor settings
- Checking the entries in the preacceptance test certificate
- Checking of all product parameters, deactivate non-used registers
- Setting of meter factors (Calibrate)
- Seal
- Print out parameter list

3.2 Preparation

Before carrying out calibration you should again check the following parameters for consistency and plausibility:

3.2.1 Date

The date of the internal clock on the MultiFlow is used both for the documents as well as the logbook and during electronic sealing. It is therefore subject to statutory calibration. In order not to obtain any misleading data,

Always check the date and time before calibration.

The date is set under parameter **1.2** of the main menu.

3.2.2 Meter number

Serial number and meter designation are intended to identify the device and appear on delivery notes, parameter lists and the seal print-out.

Unlike the series number the meter designation can be freely defined. When making the factory settings it is only the serial number which is set, while the device number and meter designation remain blank.

☞ You can match the values to individual requirements under parameters **3.1.1** and **3.1.2**.

3.2.3 Seal password

The seal password protects the parameters, which are subject to calibration, from inadvertent changes. It is pre-set in the factory to '123456'.

To avoid misuse it is however recommended that this value is **not** retained.

☞ You can match the seal password to individual requirements under parameter **3.1.3**.

The seal password is a component of the parameter list, but is only shown there for security reasons by the placeholder "######" .

3.2.4 Calibration restrictions

The function specifications are grouped together by the calibration authority in Parameters menu 3,1,5. In Germany, these are parameters 3.1.5.1 thru 3.1.5.6.

3.2.4.1 Volume resolution

☞ Volume resolution (parameter 3.1.5.1) is by liter, i.e. the value is '0' because no decimal places are displayed.

NOTE: During calibration, the display resolution is *automatically* increased by one decimal place.

3.2.4.2 Number of delivery operations

Parameter 3.1.5.2 describes the number of delivery operations that can be grouped together on *one* voucher.

☞ Enter the currently authorized value '1'.

3.2.4.3 Minimum preselection

The minimum preselection quantity (parameter 3153) for a measuring system is visible from the details on the type plate. As a rule, this value is 200 liters.

3.2.4.4 Minimum layout

Parameter 3.1.5.4 (minimum layout) lists the printable elements that correspond to the minimum level required by the calibration authorities in respect of the elements to be printed on a receipt. Ex factory and/or Reset factory settings is the minimum layout defined in all currently valid program versions is specified as the following requirement: '2,3,(11:12),25'. The expression '(11:12)' here means that either form element no. 11 or no. 12 must be used here.

List of form elements as defined in minimum layout:

ID	Output	Name	Comments
2	`Meter No.: 123456`	Device No.	Device name
3	`Voucher No.: 123456`	Voucher No.:	
11	`Product name` Volume at nn Cel XXXXXXX L incl. sales tax: 12.34DM/100L = YYYYY.YY DM Product name At delivery temperature XXXXXXX L incl. sales tax: 12.34DM/100L = YYYYY.YY DM Product name XXXXXXX ea incl. sales tax: 12.34DM/100 ea. = YYYYY.YY DM	Product block #1	Includes product name / code, delivery volume / delivery type, gross/net price. Compensation details may vary!
12	`'Printout of Vt and V15'`	Product block #2	The volumes for Vt and V15 are both printed out
25	`(COPY)`	Text: Copy	Predefined text element (only appears on copies!)

✍ As well as these five elements, there are other modules, e.g. date, time, driver name etc. In the 'MultiFlow Control and Installation Instructions' (DOC-383); all available form elements are listed.

✍ Parameter 3.1.5.4 (minimum layout) is calibration-protected, i.e. no changes can be made to a sealed device.

✍ The editor used for designing the voucher layout is subject to Master protection, i.e. changes can be made provided that these take account of the minimum layout requirements, even on sealed devices.

The minimum layout only constitutes a **minimum** requirement. Naturally, **additional** elements can be printed on a voucher at any time.

To ensure that the voucher layout complies with current specifications (e.g. PTB-A5, Chap. 5.1.3), the following procedure is required:

- Set parameter 3.1.5.4 (minimum layout) to the new value '2,3,11,25'.
- Completely quit the menu by repeatedly pressing the <START> key. If the actual voucher layout does not comply with the minimum layout, a message appears advising of a parameter error. In this case, the corresponding form element should be corrected in the layout editor.

3.2.4.5 Price correction

This parameter 3.1.5.5 indicates if a correction to a product price is permitted *after* delivery. However, this needs to be clarified with the local calibration authorities.

3.2.4.6 Decimal separation

To enable the decimal separation commonly employed in Germany (in the USA, a decimal point),

set parameter 3.1.5.6 to '1'.

With '0' the decimal point is used to indicate the decimal point locations.

3.2.5 Printer

To be able to meet the requirements for secure data transmission to the printer, the FDW protocol must be activated on the MultiFlow. The settings for the printer interface can be found under parameter **3.2** in the main menu.

NOTE: Although the MultiFlow also supports other printers (e.g. DR-570-FDW, DR-298-FDW and EPSON-FX), the following description chiefly outlines the use with the printers DR-295-FDW and TM-U295.

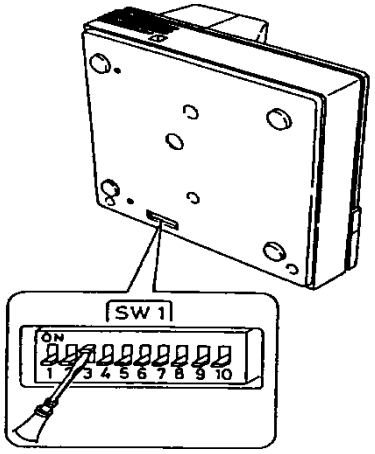
3.2.5.1 MultiFlow setting for DR-295-FDW

☞ The following values must be entered for operation of the DR-295-FDW:

Parameter	Name	Value	Meaning
3.2.1	Printer selection	1	DR-295 FDW
3.2.2	Interface type	0	RS232
3.2.3	Data rate	0	9600 Baud
3.2.4	Parity check	0	No check for transparent transmission
3.2.5	Lines per page	57	Corresponds with DIN-A4
3.2.6.1	Protocol	1	FDW protocol active
3.2.6.2	FDW timeout	5	Maximum waiting time for reply after protocol query
3.2.6.3	Repeat transmission	3	Repeated in the event of errors

☞ The following factory settings are to be checked on the printer in the event of a fault:

Switch	Position	Function
SW-1	ON	Ignore transmission errors
SW-2	OFF	512 Byte data buffer
SW-3	ON	Handshake XON/XOFF
SW-4	OFF	8 Bit
SW-5	OFF	No Parity
SW-6	ON	Even Parity
SW-7	OFF	9600 Baud
SW-8	OFF	
SW-9	OFF	
SW-10	ON	Transparent mode ON



DIL switch settings TM-U295

From MultiFlow version 3.45[3.45]DE and higher you can connect the TM-U295 to the MultiFlow.

The switches to set the operating mode of the TM-U295 are located on the bottom of the unit (see manual).

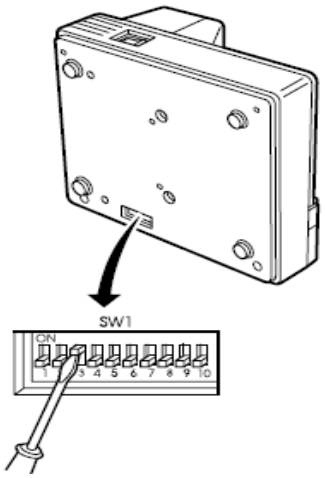
A special protocol is used to control the TM-U295 and this is required to monitor some basic functions of the printer. This is activated automatically as soon as the TM-U295 printer is selected in menu item 3.2.1 of the MultiFlow. If the printer is operated without this protocol or with a FDW converter, you must select the printer type "*DR-295*" instead of "*TM-U295*"!

☞ Settings of the MultiFlow.

No.	Name	Setting	Meaning
3.2.1	Printer Selection	7	7: TM-U295
3.2.2	Interface Type	0	RS232
3.2.3	Transfer Rate	0	9600 baud
3.2.4	Parity Check	1	1: Even Parity
3.2.5	Lines per Page	57	Number of lines on a page
3.2.6.1	Protocol	0	FDW protocol inactive
3.2.9	Data bits	1	1: 8bits

☞ The following factory settings are to be checked at the printer:

DSW1	Position	Function
1	OFF	Transfer error: "?" print
2	OFF	512 byte data buffer
3	ON	Handshake XON/XOFF
4	OFF	8 bits
5	ON	Parity used
6	ON	Even parity
7	OFF	9600 baud
8	OFF	
9	OFF	No pin 6: Reset signal
10	OFF	No pin 25: Reset signal



3.2.6 Sensors

The sensor settings are summarized in parameter menu **3.3**.

3.2.6.1 Encoder

In the summating register it is essentially the pulse value which is of interest. This determines the relationship between the number of pulses and one liter of flow.

Parameters	Name	Value	Meaning
3.3.1.1	Pulse value	See meter name plate	Pulses per liter
3.3.1.2	Max. backflow volume	8	In liters
3.3.1.3	Max. error pulses	Twice the parameter 3311	Corresponds with 2 liters
3.3.1.4	Sensor type	See meter name plate	Selection of encoder type
3.3.1.5	Min. flow	See meter name plate	Minimum permitted flow rate through measuring system

Using the following formula you can calculate the number of permitted spurious/error pulses from the nominal meter values:

$$I_{per} \leq 0{,}01 \times V_{min} \times I_{imp}$$

where:

I_{per} = max. permitted number of spurious/error pulses

I_{imp} = Number of pulses per unit volume (meter name plate)

V_{min} = Smallest measured / discharged quantity (meter name plate)

If this value is exceeded, the error message “Pulse error” is displayed.

NOTE: The smallest measured quantity must not be less than 200 litres.

There is no evaluation of error pulses below the **minimum flow quantity** (parameter **3.3.1.5**). Also in the event of this being permanently below the minimum, after 30 seconds an interruption to the discharge takes place with a corresponding error message.

If a minimum flow quantity of 0 litres/minute is entered the evaluation of error pulses takes place independently of the throughflow and no interruption to the discharge then takes place because of this min. flow parameter.

Parameter settings for a smallest possible measured quantity of V_{min} = 200 ℓ

Pulse values Parameter 3.3.1.1	**Error pulse limit Parameter 3.3.1.3**
23.715 pulses/ℓ	47
11.858 pulses/ℓ	23
10.000 pulses/ℓ	20
6.568 pulses/ℓ	13
5.714 pulses/ℓ	11
5.517 pulses/ℓ	11

Sensors in the following Sening measuring systems are supported (parameter **3.3.1.4**):

Measuring system	**Sensor type**
GMVT400 / 700 / 403 / 7003 GMVZ400 / 700 / 1000 / 1003	PNP
GMVT404 / 704 / 805 GMVZ1004 T11-J / T20-J / T40-J	THS

3.2.6.2 Temperature sensor

Parameter **3.3.2.1**, 'temp. shift' is provided for the fine adjustment to the temperature measurement. This is first adapted during factory preacceptance testing. The parameter is therefore normally set to '0'.[1]

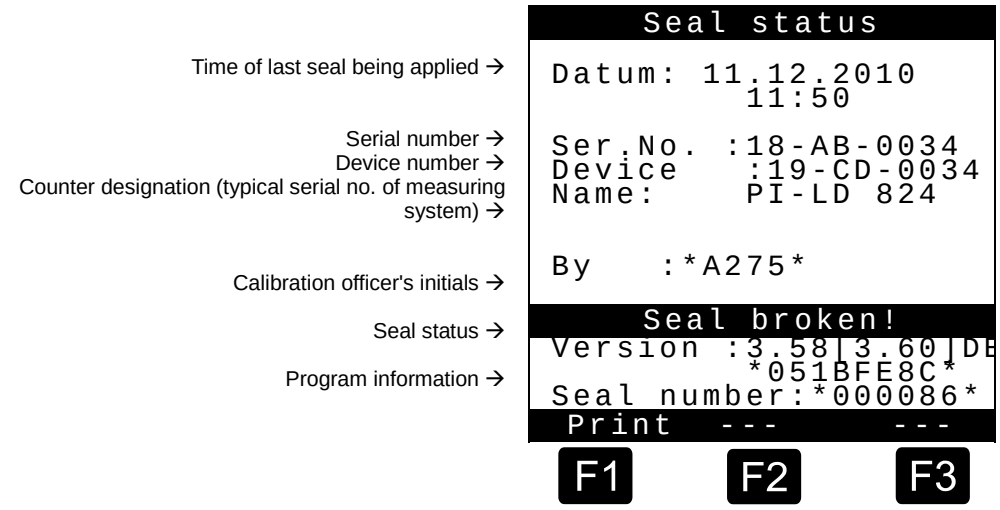
☞ You can find the correct value in the preacceptance test certificate.

Attention: In the case of older units, which have been updated to the latest software status by downloading the program, parameter **3.3.2.1** continues to be used since the new parameters could not be pre-set at the factory.

3.2.7 Comparison of the preliminary inspection certificate against the screen display

3.2.7.1 The checksum

The checksum is displayed in menu 4.1.1 (electr. calibration seal).



The checksum must match the details on the approval document for the relevant software version.

A distinction is always made between two checksums:

1. Checksum for the EPROM version
2. Checksum for the download version (Flash)

[1] During recalibration a deviation in this measured temperature value - caused by component ageing - can be corrected.

NOTE: The valid checksums can be found in the EU model type test certification.

NOTE: Using menu item 'Checksums' (menu 4.7), it is possible to display the version number as well as the checksums. These are used for unique identification of the software. In addition, the arithmetic checksum for the entire software and a note as to whether this is an EPROM or a Flash version are displayed.

3.2.7.2 The pulse input

The maximum permissible number of faulty pulses must be set to twice the level of the pulse value.

That corresponds to 1% of the minimum delivery volume (2 liters).

Pulse value levels Parameter 3.3.1.1	**Faulty pulse limit Parameter 3.3.1.3**
23,715 Pulses/ℓ	47
11,858 Pulses/ℓ	23
10,000 Pulses/ℓ	20
6,568 Pulses/ℓ	13
5,714 Pulses/ℓ	11
5,517 Pulses/ℓ	11

3.2.8 Product definition

An important component of the parameter lists are the product registers (directories). The MultiFlow has over 30 product registers (parameters **3.5.1.1** to **3.5.3.0**[2]), which can be freely defined. This can include products which are delivered via the measuring system (here also called liquid products), also bulk goods (drums) or also additives , which are delivered via a dosing pump. The use is only established by the parameter setting.

NOTE: In the following the last two characters of parameters **3.5.1.1** to **3.5.3.0** are product register numbers. They serve to identify the products.

The factory settings already include a number of predefined products. They are located in the product register under the position stated in the following table as (**No.**).

[2] Please note that Parameter 3530 has a higher value than Parameter 3539, since the submenus are consecutively numbered from 1 to 0.

No.	PTB-Code	Name	Unit	Density	Price	
					€	Factor
11	1	Heating Oil	ℓ	846	0,00	100
12	2	Diesel	ℓ	836	0,00	100
13	3	Super E5	ℓ	749	0,00	100
14	5	Super E10	ℓ	749	0,00	100
15	6	4-Star	ℓ	753	0,00	100
16	7	Kerosene	ℓ	807	0,00	100
17	8	Jet Fuel	ℓ	801	0,00	100
18	9	Bio Fuel Oil	ℓ	831	0,00	100
19	12	Heating Oil +	ℓ	846	0,00	100
21	-	Additive (1L)	pcs.	-	0,00	1
22	20	Additive (Pump)	mℓ	-	0,00	1000
31	-	Transport Duty	-	-	0,00	0
32	97	Propane	ℓ	509	0,00	100
33	98	Butane	ℓ	577	0,00	100
34	99	LPG	ℓ	537	0,00	100
35	0	E05	ℓ	739	0,00	100
36	0	E10	ℓ	741	0,00	100
38	0	E80	ℓ	781	0,00	100
39	0	E85	ℓ	785	0,00	100

Note: Programmed calculation for final cost: [€]

The simplest way to obtain an overview of the product parameter settings is to print out a parameter list. Here it is possible to restrict the list to those parameters which are subject to compulsory calibration.

☞ The following parameters must be checked for ***each*** product register nn:

Parameter	Name	Value	Meaning
3.5.nn.1	Product name	-	Valid product designation
3.5.nn.2	Product type	1...4	1 Register not active 2 Liquid product 3 Additive via dosing pump 4 Bulk goods
3.5.nn.3	PTB code	1...9	Product code definition through the PTB
3.5.nn.4	Unit	1...0	See parameter list
3.5.nn.7.1	Compensation	0,1	Activate temperature compensation 0 No 1 Yes
3.5.nn.7.2	Comp. temp.	0...99	Compensation temperature (°C)
3.5.nn.7.3	Product group	1...3	Determination of compensation algorithm depending on the product group. 1 Bulk goods 2 Crude oil (API table 54A) 3 Refined oils (API table 54B) 4 Special products (DIN table 54X) 5 Lube oil (API table 54D) 6 Direct-Linear (Mixed products)
3.5.nn.7.4	Average density	600...1200	See table in see chapter 3.2.8 "Product definition" / page 19
3.5.nn.7.5.m	Meter factors	-	Setting via calibration function, see see chapter 3.4 "Calibration" / page 22

Parameter	Name	Value	Meaning
3.5.nn.7.7.3	Change factor	- 1000… +1000	Density change factor for calculation according to „Method 1“ in [1/K]

** nn corresponds with the product register number (11 - 30)*

HINWEIS: Non-used product registers should be set to 'Register not active' (parameter **35.nn.1**) since otherwise the parameter list will be unnecessarily long.

3.3 Selecting the temperature volume re-evaluation

- Selecting the type of volume temperature re-evaluation takes place in the Index tab 'Product group' 3.5.nn.7.3. This re-evaluation can be performed based on the API-54 tables specifying the density or by using linear compensation with a relative density change factor K0E in accdance with the PTB definition dated April 11, 2011 for the 'Temperature volume re-evaluation of mineral oil-based, bio-components fuels/combustible fluids and their blends'.

- The selected temperature volume re-evaluation depends on which product is being measured. For purely mineral oil-based products, it is still possible to use the API54 table for conversion purposes. In such cases, please ensure that the correct density value is entered.

- If temperature volume re-evaluation is to be applied to a blended product made of a combination of mineral oil and bio-fuel: using linear compensation is preferable because no API54 tables have been defined for these products.

- The density change factors that are to be applied are published by the national meteorological institutes and are very robust in respect of density fluctuations.

- Linear compensation can also be applied to purely mineral oil-based products. The discontinuation of the density value is advantageous as this can fluctuate greatly in some cases, and can result in unnecessary inaccuracies in the temperature volume re-evaluation when employing the API54 table.

- If the density is measured online during loading, this figure can be entered in the MultiFlow system prior to the measurement and using the AP154 tables will provide excellent results. Inputting the density measured by the refinery is controlled by parameter 3.1.5.2.1. Access to the density parameter is permitted but password protected. If the MultiFlow unit is set in this manner, it is mandatory to print out the density employed on the printout.

3.4 Calibration

The MultiFlow supports the calibration of the measuring system by means of a special routine (service menu). Before calibration you first have to define the basic product parameters (see see chapter 3.2.8 "Product definition" / page 19):

- PTB code, parameter **3.5.n.n.3**
- Product name, parameter **3.5.n.n.1**
- Product type, parameter **3.5.n.n.2** (2 = Flüssigprodukt)
- Volume unit, parameter **3.5.n.n.5** (1 = Liter)
- Date and time, parameter **1.2** (für die Protokolle)

The placeholder n.n is the product or register number of the product which is to be calibrated.

After selecting the calibration function (in Service menu 4.2 “Calibrating”) the system automatically switches over to the calibration accuracy (tenfold resolution of standard discharge).

The normal discharge mask appears (see below), in which you select the product to be calibrated.

Volume preselection, if desired→

As a rule the entry of a preselected volume is not done.

In such a case you can terminate the discharge with the **Stop** key as soon as the can is full.

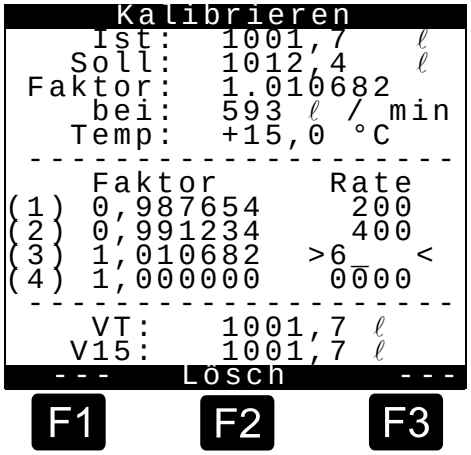
Attention: During discharge in calibration mode ***no form of volume correction*** takes place. Already-defined meter factors as well as temperature compensation are not active[3].

☞ After completing the discharge you can read the volume actually delivered to the calibration can.

☞ You then enter this volume into the MultiFlow as the setpoint volume.

☺ The MultiFlow then automatically calculates the meter factor and compares the two volumes ('Target' and 'Actual') in the mask shown below.

Volume determined by MultiFlow →
Volume determined acc. to the calibration can (manual entry) →
Calculated meter factor →
Correction table →
Volume based →
on ***old*** meter factor→



Attention: The actual volume determined by the MultiFlow is always a ***raw volume***. This means it is influenced by neither the meter factor nor temperature compensation.

NOTE: To check the meter factors being used check the volume details in the lower area of the display since these values are based on the meter factors ***defined before discharge***.

☞ If the meter has to be shifted slightly to the positive or negative side, just vary slightly the entered target value (the measured volume in the calibration can). The following example will clarify this.

Attention: The procedure described above must be carried out for all released products.

[3]) Only valid from program version 1.1. With older versions the uncompensated volume (VT) is shown during discharge, which is based on a correction factor which may have been predefined. However for the calculation of the meter factor it is ***always the raw volume*** which is used.

Example:

The MultiFlow display shows exactly 1000.0 ℓ and a volume of 1000.0 ℓ was also determined in the calibration can. On the basis of already-done measurements the value shown by the MultiFlow should be shifted slightly into the **positive**. For the target value (measured value of the calibration can) you should thus not enter the actually-measured volume, but instead base it on a somewhat higher volume.

For example enter 1010.0 ℓ (see table). This gives a meter factor of about 1,01 (positive shift), i.e. with this meter factor for the next discharge the same volume will be displayed with a volume greater by the factor 1.01.

In the reverse situation, i.e. the meter should be shifted slightly towards the **negative**, you must enter a corresponding target value of 990.0 ℓ. Now for the next discharge the actually-measured volume will be displayed reduced by the factor 0.99.

Examples of positive or negative shift:

MultiFlow (act.)	MultiFlow (target)	Meter factor
1000,0	1010,0	1,010000
1000,0	1000.0	1,000000
1000,0	990,0	0.990000

In general it is true that only the target value can be changed during entry. The actual value is always determined by the MultiFlow. The same is true for the other values, such as the average flow.

The meter factor is calculated in the MultiFlow according to the following formula:

$$Meterfactor = \frac{V_{t\,\mathrm{arg}\,et}}{V_{actual}}$$

Using the displayed average flow rate you can now place the correction value in the correction table.

the case of *flow rate-dependent* compensation you enter the different flow rates, at which the meter factor was determined, together with the established meter factor in the correction table.

If *only one meter factor* is to be used across the whole flow range (which is the normal case), you must enter the ***maximum*** flow rate of the meter as the flow rate. Correspondingly you must enter the established factor under ‘Factor’. You should set all other flow rates to ‘0’.

☞ After completing calibration (end it with the <**PRINT**> key) the original settings (compensation) are reactivated and the new correction table is saved in the product register. Additionally the MultiFlow offers you a print-out of a calibration report, which consists of an expanded delivery note and an excerpt from the parameter list (namely the respective product register).

3.4.1 Copy meter factors

Since normally in practice the same meter factors are used for the product groups, the MultiFlow permits the copying of meter factors.

If a product is given the same meter factor as one which already exists,

☞ From the product register select Parameter 3.5n.n7.5.9 (‘n.n’ here stands for the product register number).

☺ The MultiFlow now offers the selection menu for the product pages.

☞ Select the register which already includes the desired value.

☍ It is inserted automatically after selecting the product register.

Attention: If the meter factors are corrected during a recalibration operation you must repeat this procedure for all products in the respective product groups.

3.5 Seal

After all the parameters have been checked and the meter factors have been determined the MultiFlow must be sealed.

☍ An explanation of the function of the electronic W & M seal can be found in see chapter 4.2 "Testing of the electronic W & M (Weights and Measures) seal (soft seal)" / page 27

☞ For this purpose call up the menu entry 4.1.4 (‘renew seal’).

☺ A warning message will then appear which says that this function should only be carried out by repair staff or under the supervision of a W & M official.

☞ You either accept this with the <**F1**> key or you terminate the function with the <**F3**> key.

☺ If you have selected <**F1**> the query concerning the seal password then takes place.

NOTE: The factory-set password is ‘123456’. We recommend however that you change it *before* sealing (see see chapter 2.4.1 "Passwords" / page 10).

Attention: In the sealed state the seal password is **not** displayed or printed out. If you change the seal password, you should keep it in a sealed envelope with the measuring system file.

If the seal password does get lost you can only break the seal by opening the unit and setting the seal switch (see see chapter 5 "Setting of the plug-in jumper" / page 33).

After electronically sealing the seal certificate is automatically printed out. It contains information on the calibration status of the unit (see dg_ref_source_inline>Verweis--->Parameter</dg_ref_source_inline>).

APPENDIX: An example of a seal certificate can be found in the appendix to this document.

see chapter 2.3 "Parameters" / page 8

3.5.1 Sealing plan

To avoid manipulation of the unit the MultiFlow is fitted with a lead seal in addition to the electronic seal.

Attention: A complete sealing plan can be found in the appendix to this document.

3.6 Parameter list

☞ After this you should print out the current parameter list. This is done via the function ‘5’ in the print menu. You have a choice of printing out either just the data relevant to calibration or all the parameters.

You should also keep the parameter list in the measuring system file.

APPENDIX: An example of a parameter list can be found in the appendix to this document.

4 Recalibration

Recalibration of the MultiFlow is always necessary if the W & M seal has been broken or during the regular technical calibration tests.

In such cases the system has already been subject to at least one technical calibration test and it merely requires the adjustment of certain parameters, which are shown in the following.

4.1 Version numbers

The version number, which is printed out on parameter lists and calibration certificates, is used to identify the current software version. These numbers can be called up onto the screen from Menu 3.4.1 (W & M seal displays).

The version number has the following format:

Calibration version	Service version	Country code
3.04	[3.10]	DE

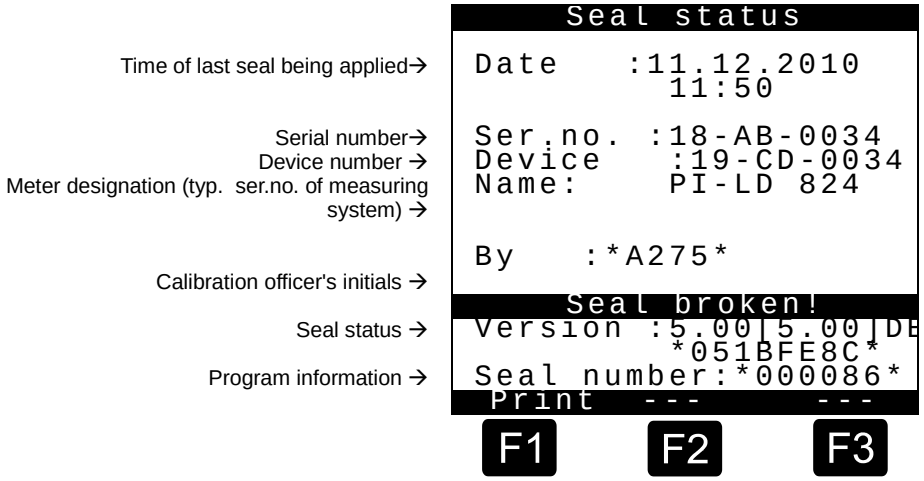
The calibration version shows which calibratable version is used in the MultiFlow. This is the decisive version number for the approval.

The service version shows the version of the program section which is not relevant to calibration. This program section is not subject to compulsory calibration and can be exchanged without recalibration.

The version numbers can occur in different combinations, since for example the calibration version 1.00 can also work together with service version 1.05 or possibly even 2.0 (downward compatibility).

4.2 Testing of the electronic W & M (Weights and Measures) seal (soft seal)

- The Electronic Seal is used to monitor the integrity of high-security MultiFlow parameters.
- When calling up the seal status (menu 4.1.1), the device forms the checksum by means of the technical metrology software version and checks the status of the *non-resettable* process counter (code).
- The found values and the version number as well as the date of the last calibration are displayed ('Display seal') or are printed out ('Print seal').
- The value of the event counter is displayed as the 'Seal number'.



If the data do not comply with the most recent test results in the measuring device documentation, the seal has been damaged. It is then necessary for an authorized party to check the parameters and to apply a new seal.

Small changes in the technical metrology-tested section of the program can be performed by means of downloads without breaking the electronic seal. This results in a changed checksum and can be traced back using the Update Report (menu item 4.6.3). The information as to whether the seal will be broken can be obtained from the supplement to the EC product type test certification. The decision about breaking the seal is provided in the newly loaded section of program ex-factory and cannot be influenced by any external party.

Changing a high-security parameter or the backed up sections of program, changes the checksum and the non-resettable process counter and the seal is then considered to have been 'damaged'.

Differences between the seal status and actual status also indicate electronic seal damage.

NOTE Any damage to the seal is pointed out to the user during data input by corresponding notices on the display.

High-security parameters can only be altered by damaging the electronic seal. To do this, run the 'Break seal' function (menu 4.1.3). Otherwise you will not obtain access to the data.

☞ For sealing, call up the 'Renew seal' function (menu 4.1.4).

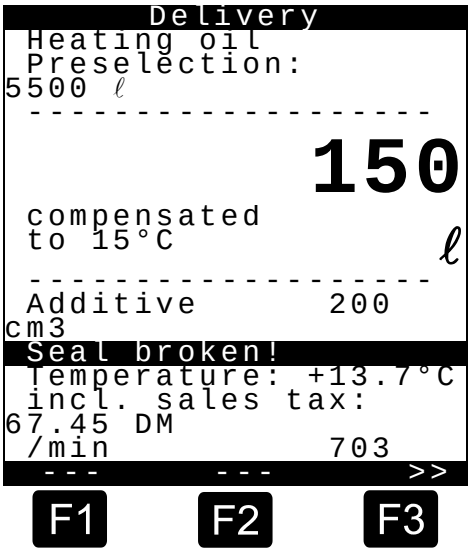
This involves increasing the event counter once again and defining the current date and version number. The new checksum is formed subsequently. All of this data is saved, displayed and/or printed out in the electronic seal.

To back up the electronic seal, the inputting of an additional password (parameter 3.1.5) is required.

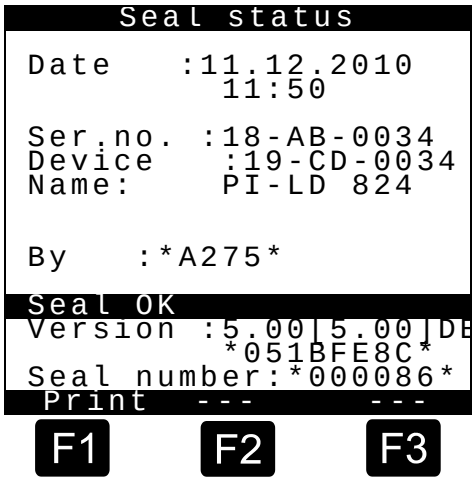
NOTE: Whenever the wrong password is keyed in, an entry is made in the logbook. Whenever an input error is made repeatedly, the wait time before new inputting can take place (1, 15, 60 mins) is extended.

NOTE The electronic seal may only be replaced by an authorized person!

Seal status →



Time of last seal being applied→
Serial number→
Device number →
Meter designation (typ. ser.no. of measuring system) →
Calibration officer's initials →
Seal status →
Program information →



The new data (printout) are added to the documents for the measuring system. The device is now considered to be 'sealed' again.

NOTE All changes to the system date are also subject to seal protection. The date must always be set before completion of the calibration process. This does not affect the time!

APPENDIX: The Appendix contains an example of a printout of the seal.

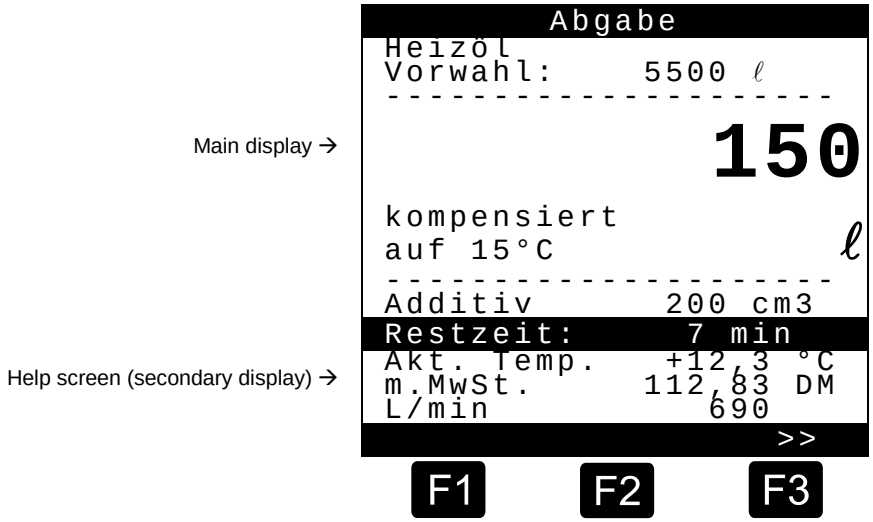
4.3 Parameter list check

The procedures for checking the parameter list have already been described in detail in see chapter 3.6 "Parameter list" / page 26.

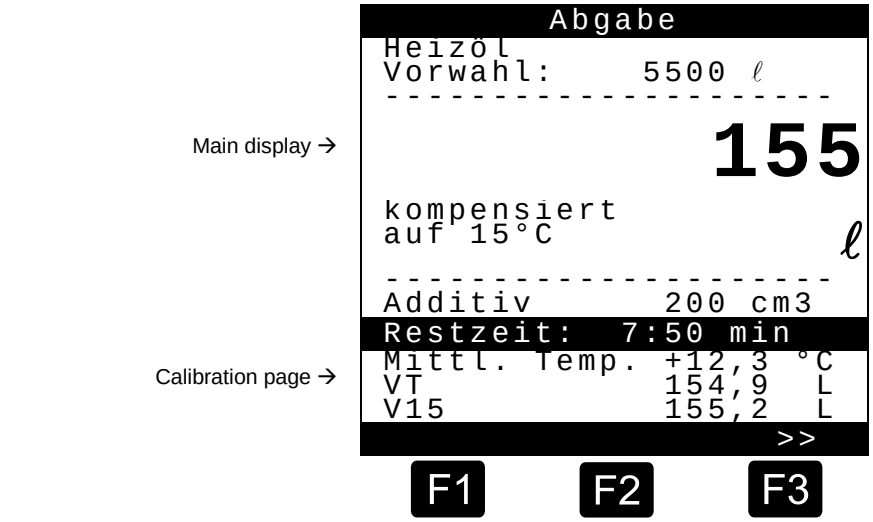
4.4 Check measurements

You can carry out check measurements to check the set meter factors. For this purpose you should use the normal discharge mode. Breaking of the W & M seal and changing to calibration mode is *not* necessary for this.

During discharge you can call up various help screens (secondary displays) by means of the <**F3**> key. These help screens are shown in the bottom third of the display. In the normal case these screens contain the current discharge temperature and flow rate.



☞ By pressing the <**F3**> key you can change the secondary display to the 'Calibrating page':



On the calibration page the volumes are shown in calibratable accuracy. This display can therefore be used for checking the measuring accuracy, without having to break the W & M seal.

see chapter 3.4 "Calibration" / page 22

4.5 Renewed calibration (optional)

If during check measurements deviations are still found (against expectations) between the target and actual values, then renewed calibration is necessary.

☞ In such a case you should carry out the adjustments described in (see chapter 3.4 "Calibration" / page 22.

5 Setting of the plug-in jumper

In some cases parameters that must be calibrated have to be changed. If the seal password has been forgotten you will have to break the W & M seal in this case.

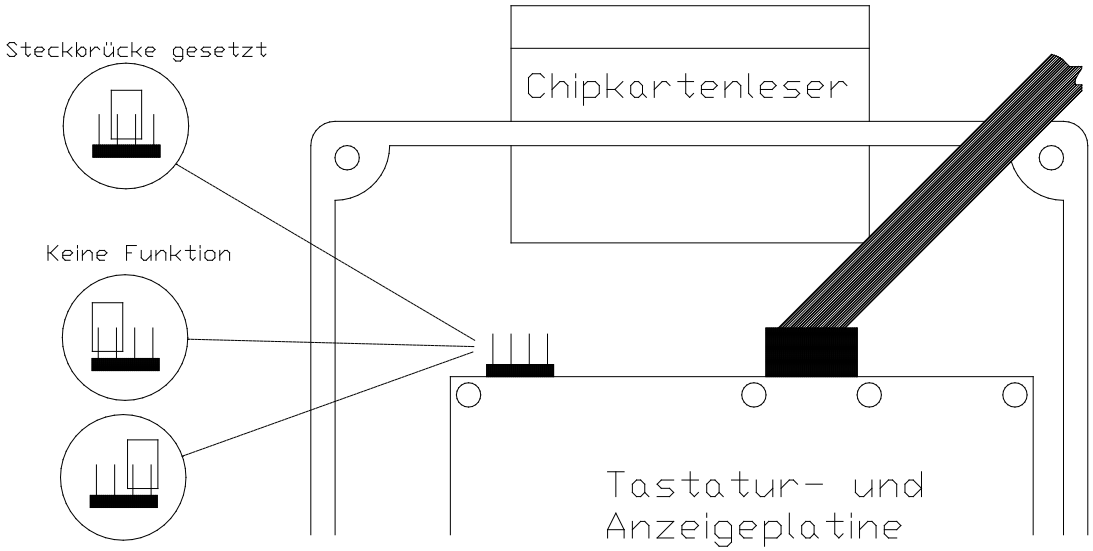
For this situation a plug-in jumper is installed in the MultiFlow. This jumper is located inside the operating unit on the back of the keyboard and display PCB.

You must remove the lead seal from the operating unit so as to open the housing and set the jumper. In the aluminium version for safety reasons the operating unit is a passive consumer in its own intrinsically-safe circuit. This means it is permissible to open the control section even during operation.

To obtain access to the sealed parameters you must plug the jumper into the middle position.

NOTE: If the jumper is plugged into an outer position the bridge is not functioning (parking position).

By setting the jumper the protective mechanisms of the MultiFlow are put out of action. You obtain access to all parameters. Damage to the electronic seal is thereby automatically detected (warning message).



Deutsch	**English**
Steckbrücke gesetzt	Jumper set

Parken des Jumpers	Parking the jumper
Keine Funktion	No function
Chipkartenleser	Chip card reader
Tastatur- und Anzeigeplatine	Keyboard and display PCB

Attention: The electronic seal stays permanently broken and will have to be reset.

NOTE: It is not possible to reset the electronic seal without first removing the jumper. In carrying out such a task you will be asked to remove the “Seal switch”.

6 Documents and lists

6.1 Calibration note

Kalibrier-Beleg

Zaehler-Nr.: PI-ME 97
Beleg-Nr.: 001275
Abgabe-Datum: 01.12.2010
Abgabe-Start: 10:45
Abgabe-Ende: 10.48
Kunden-Nr.: 000000

Heizoel EL
Meter-Faktor 0,967498
Durchflußrate 513
Mittlere Dichte 845,0
Bei +25.1 Cel (Rohvol.) 1033,6 L
Referenz-Menge 1005,4 L

Unterschrift

Es bediente Sie
heute: Karl Mustermann

Heizoel EL

.1	+ Produkt-Name	Heizoel EL
.2	+ Produktart	1
.3	+ PTB - Code	1
.4	+ Maßeinheit	1
.51	+ Add.pumpe nutzen	0
.52	+ Additiv-Nummer	0
.53	+ Mischungsverhaeltnis	1000
.61	Preisvorgabe	87.65
.62	Preisfaktor	100
.63	Steuersatz	15.00
.71	+ Kompensation	1
.72	+ Komp. Temperatur	15
.73	+ Produkt-Gruppe	B
.74	+ Mittlere Dichte	845.00
.741	+ Meter-Faktor 1	0.967498
.742	+ Meter-Faktor 2	1.000000
.743	+ Meter-Faktor 3	1.000000
.744	+ Meter-Faktor 4	1.000000
.745	+ Durchfluss-Rate 1	1000
.746	+ Durchfluss-Rate 2	0
.747	+ Durchfluss-Rate 3	0
.748	+ Durchfluss-Rate 4	0

6.2 Print-out of parameter list (example)

Parameter List

(Sample printout!
For further information, please see the annex)

```
Serial Number     :  16TK0001
                     # 00
Device Number     :  18UB0001
Meter Name        :  Z-4711
Personnel ID      :  000001

Version           :  3.54[3.54]GE
                     *ABCDEF00*
Report date       :  05.08.2011   11:50
Reference         : *000017*
-----------------------------------------
The seal is approved!
-----------------------------------------

Grand totals
-----------------------------------------
Uncompens. Volume       217169 L
Compensated Vol.        205973 L
Compens. Weight         32098 kg
Total Additives           0.00 L
Fail volume               0.00 L

Device Settings
-----------------------------------------
311   + Device Number       18UB0001
312   + Meter Name            Z-4711
313   + Seal Password         #######

3141    Operating Mode      Standard
3142    Save Display             15 min

31431   Valid Currency     Currency A
31432   Exchange Rate        1,955830
31433   Position Symbol         After
31434   Currency Symbol A           £
31435   Currency Resol. A           2
31436   Currency Symbol B         EUR
31437   Currency Resol. B           2

31451   Driver ID Query            No
31452   Language Query             No
31453   Customer ID Query          No
31454   Cust Type Query           Yes
31455   Add Products Query        Yes

3148    Add Surcharge              No
3149    Default Surcharge          31

- Page 1 –
```

```
                MultiFlow: Z-4711 (16TK0001)
                        Setup Count: 000017
                          05.08.2011, 15:51
=========================================
31401   Billing                 w. VAT

3151  + Volume Resolution            0
3152  + No. of Discharges            1
3153  + Minimum Preset           200 L
3154  + Minimum Form       2,3,(11:12),25
3155  + Price Correction           Yes
3156  + Decimal Separator            .
3157  + Show Additive               No
3158  + Flushing Volume             0 L
3159  + Force deliv. stop           0 min

3161    Global Node No.              0
3162    CAN-Termination              1
3163    OBC Node                     0

Remote Control
-----------------------------------------
31641   Enable Control               No
31642   Remote Ctrl Node             0

Level Probe
-----------------------------------------
31651   Probe Timeout               18
31652   Level Probe Node             0

Deadman Switch
-----------------------------------------
31661   Enable Switch                No
31662   Probe Timeout               18
31663   Deadman Sw. Node             0

3171    Internal Node No.            0
3172    Display No. 1                1
3173    Display No. 2                0

Valve Control
-----------------------------------------
3181  + Path Selection      Basic Control
3182    Turn-on Delay              10 sec
3183    Turn-off Delay             10 sec

Flow Control
-----------------------------------------
31841   High Flow Rate ON           5 L
31842   High Flow Rate OFF         20 L
31843   Wet Hose OFF              0,5 L
31844   Dry Hose (G) OFF          0,5 L
31845   Dry Hose (P) OFF          1,5 L

                                   etc.
```

6.3 Print-out of electronic W & M seal

See the original in the annex, page 40

W&M Seal

```
Serial Number   :  16TK0001
Device Number   :  18UB0001
Meter Name      :  Z-4711
Personnel ID    :  999999

Report Date     :  06.02.2009  11:45
Version         :  3.54[3.54]GB
                   *BA7BFA2A*
Setup Count     : *000981*
--------------------------------------

Seal Status

Seal Date       : *06.02.2009  11:45*
Version         : *3.54[3.54]GB*
                   *BA7BFA2A*
Setup Count     : *000981*
Sealed by       : *M-044-C*
--------------------------------------
* The seal is approved!**
--------------------------------------
17.10.2008/10:56  2 Change(s) [999999]
12.01.2009/11:06  3 Change(s) [999999]
12.01.2009/15:38  1 Change(s) [000001]
12.01.2009/13:01  3 Change(s) [999999]
03.02.2009/70:07  1 Change(s) [999999]
03.02.2009/14:43  2 Change(s) [999999]
03.02.2009/11:40  5 Change(s) [999999]
--------------------------------------
```

Electronic Weights & Measures Seal

as Appendix to
Measurement System Certificate

The seal was produced by:

Signature and identification of official:

It is essential to observe the following instructions when checking the seal status:

- The seal is not violated by the inspection.
- The opposite seal impression for the MultiFlow can be repeated with the following key combination:

  Switch on, <***F1***> *(Seal status)*
  <***F1***> *(Print)*

- The code number in the 'Seal status' area on the copy and on the original must match (double-sized printing).
- The text under the code number must read: **The seal is approved!**
- If the details do not match, the seal has been broken. Appropriate action must be initiated.

IMPORTANT:

Illegal modification of the W & M data or the W & M seal is a punishable offence!

Appendix A. Drawings and Approvals

No.	Title
DOK-386	W & M seal form (blank)
52.350952	Sealing plan for MultiFlow, version AI (pages 1 & 2)
52.350953	Sealing plan for MultiFlow, version AIII (pages 1 & 2)
	Internal national design approval for MultiFlow

Index

FMC Technologies

Seal Receipt
MultiFlow
Electronic Register

Issue/Rev. 2.21 (07/03) MN F09 003 US / DOK-386E

Electronic Weights & Measures Seal

as

appendix to measurement system certificate

Internal state type approval

5.602
97.10
MultiFlow

The seal was produced by:

Signature and identification of official:

It is essential to observe the following instructions when checking the seal status:

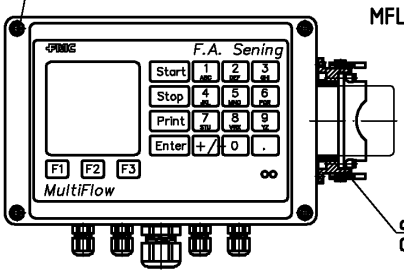
- The seal is not violated by the inspection.
- The seal impression opposite for the Multiflow can be repeated with the following key combination:
  Switch On **<F1>**, (*Seal Status*)
  <F1>, (*Print*)
- The code number in the 'Seal status' area on the copy and on the original must match (double-sized printing).
- The text under the code number must read:
  `*The seal is approved!*`
- If the details do not match, the seal has been broken. Appropriate action must be initiated.

IMPORTANT:
Illegal modification of the W & M data or the W & M seal is a punishable offence!

Measurement Solutions
F. A. Sening GmbH
Regentstrasse 1 • 25474 Ellerbek, Germany
Tel.: +49 4101 304-0 • Fax: +49 4101 304-133 • E-Mail: info.ellerbek@fmcti.com • www.fmctechnologies.com/seningttp

Sealing Arrangement

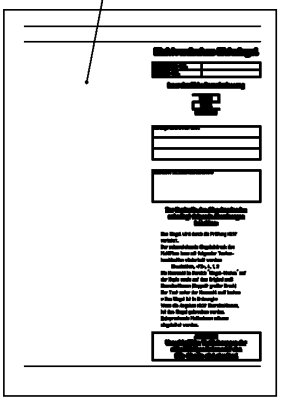
1



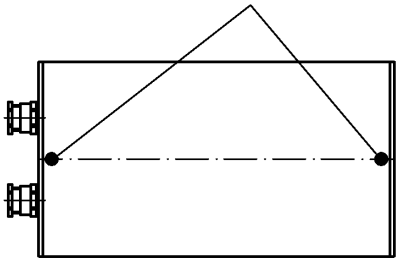
MFLOW-GD1

optional for Card Reader

2 Check electronic W&M-Seal in the measurement system certificate!

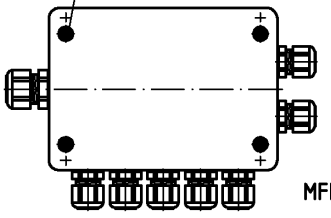


1



MFLOW-MB1

1



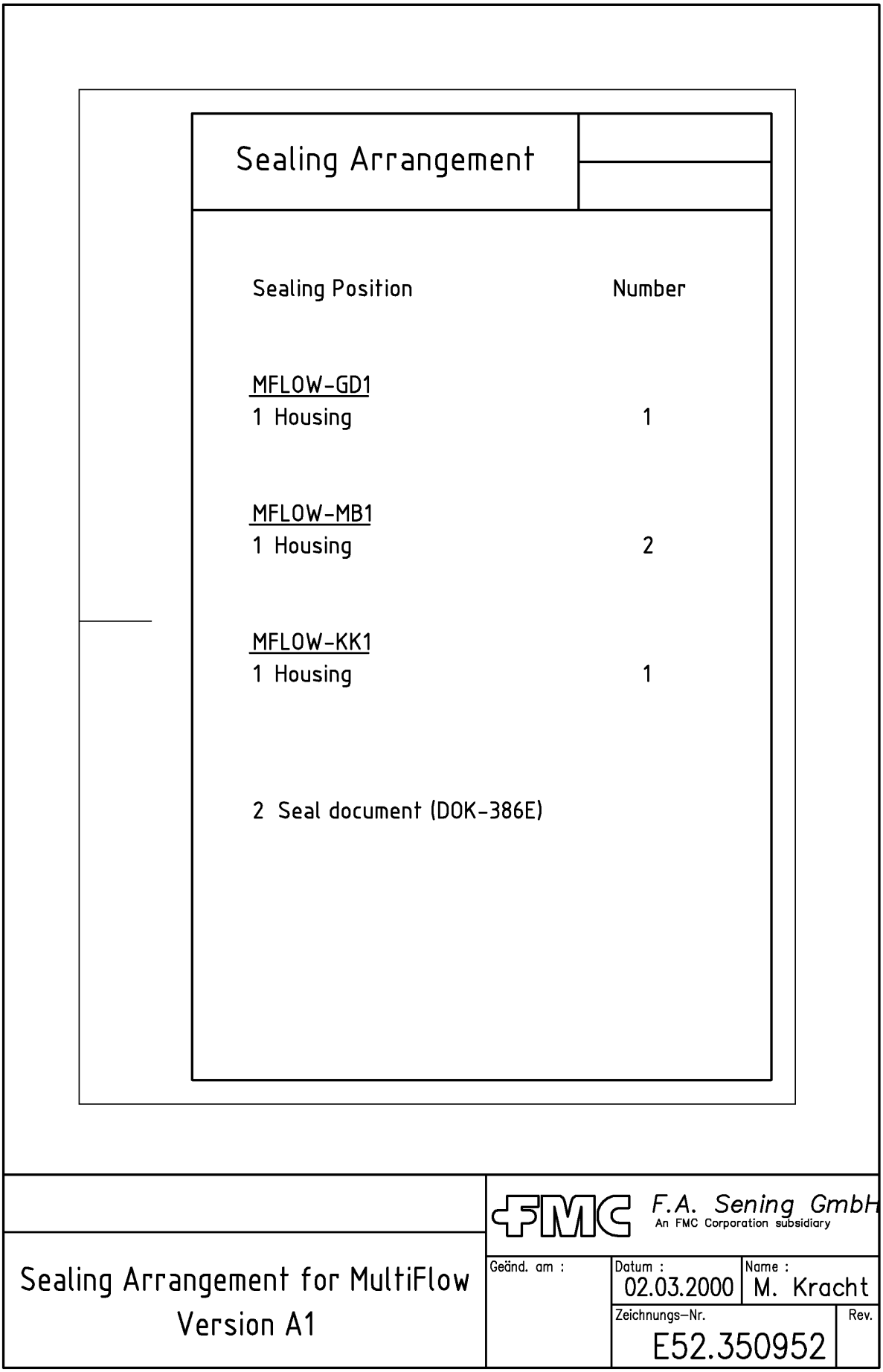
MFLOW-KK1

DOK-383E
"Schutzvermerk nach DIN 34 beachten"

Sealing Arrangement for MultiFlow
Version A1

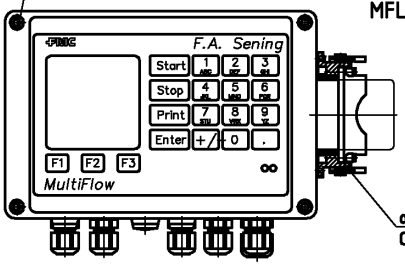
F.A. Sening GmbH
An FMC Corporation subsidiary

Geänd. am :	Datum : 02.03.2000	Name : M. Kracht
	Zeichnungs–Nr. E52.350952	Rev.



Sealing Arrangement

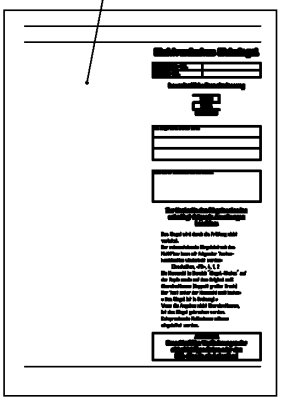
1



MFLOW-A3

optional for
Card Reader

2 Check electronic W&M-Seal in the measurement system certificate!

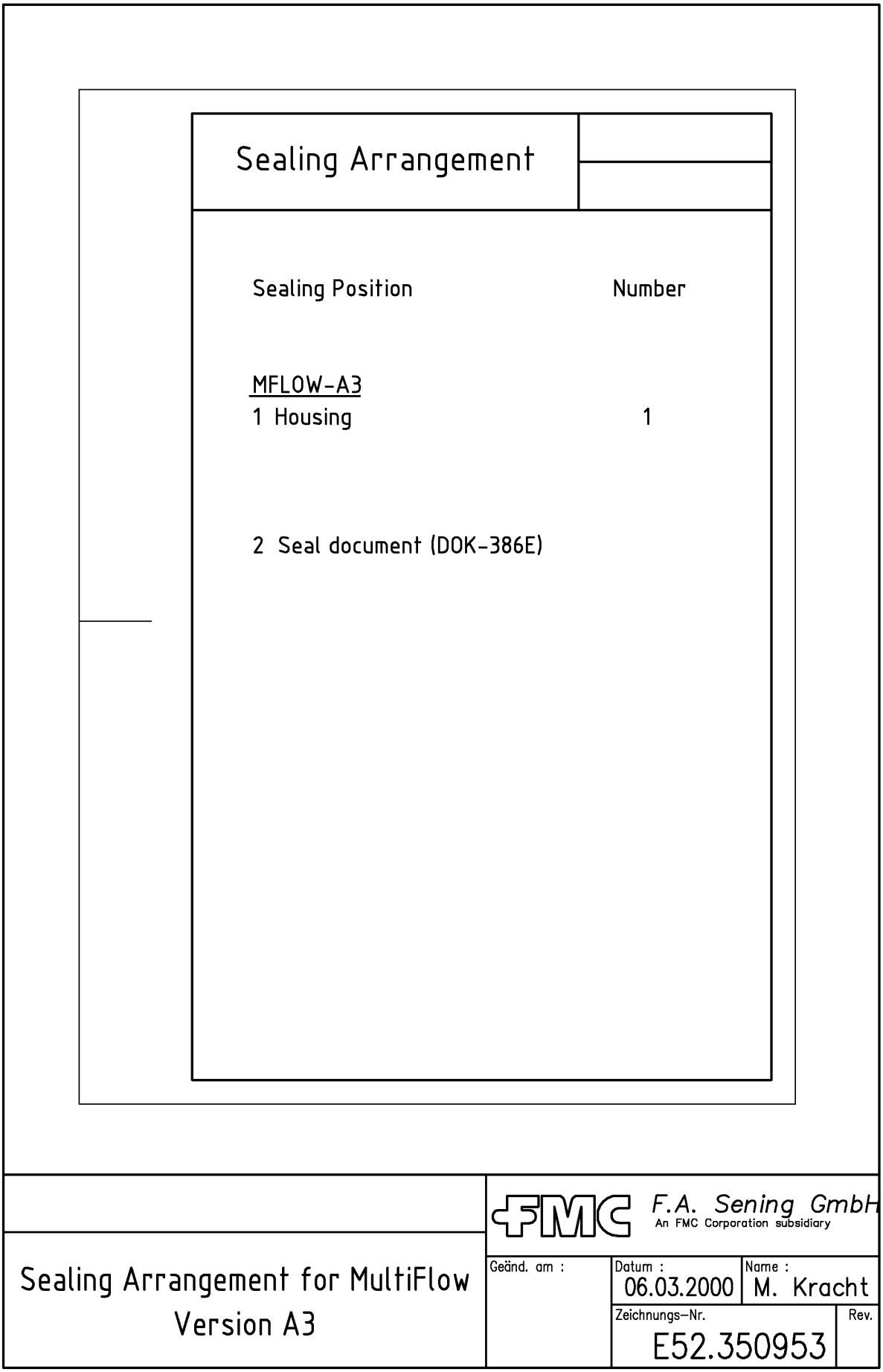


DOK-383E
"Schutzvermerk nach DIN 34 beachten"

Sealing Arrangement for MultiFlow Version A3

F.A. Sening GmbH
An FMC Corporation subsidiary

Geänd. am :	Datum :	Name :
	06.03.2000	M. Kracht
	Zeichnungs–Nr. E52.350953	Rev.



PTB

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

Innerstaatliche Bauartzulassung

Type-approval certificate under German law

Zulassungsinhaber: *Issued to:*	F.A. Sening GmbH Regentstraße 25474 Ellerbek Deutschland
Rechtsbezug: *In accordance with:*	§ 13 des Gesetzes über das Meß- und Eichwesen (Eichgesetz) vom 23. März 1992 (BGBl. I S. 711)
Bauart: *In respect of:*	Elektrisches Zählwerk mit Temperatur-Mengenumwerter
Zulassungszeichen: *Approval mark:*	5.602 97.10
Gültig bis: *Valid until:*	unbefristet
Anzahl der Seiten: *Number of pages:*	19
Geschäftszeichen: *Reference No.:*	1.32 - 97033641

Im Auftrag
By order

Rüdiger Jost

Braunschweig, 27.03.1998

Siegel
Seal

PHYSIKALISCH-TECHNISCHE BUNDESANSTALT 53

394 00 a

Hinweise und Rechtsbehelfsbelehrung siehe letzte Seite der Anlage, die Bestandteil der innerstaatlichen Bauartzulassung ist.
For notes and information on legal remedies, see last page of the Annex which forms an integral part of the type-approval certificate under German law.

Contact information is subject to change. For the most current contact information, visit our website at www.fmctechnologies.com/measurementsolutions and click on the "Contact Us" link in the left-hand column.

Headquarters:
500 North Sam Houston Parkway West, Suite 100 Houston, TX 77067 USA, Phone: +1 (281) 260 2190, Fax: +1 (281) 260 2191

Measurement Products and Equipment:
Erie, PA USA +1 (814) 898 5000
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