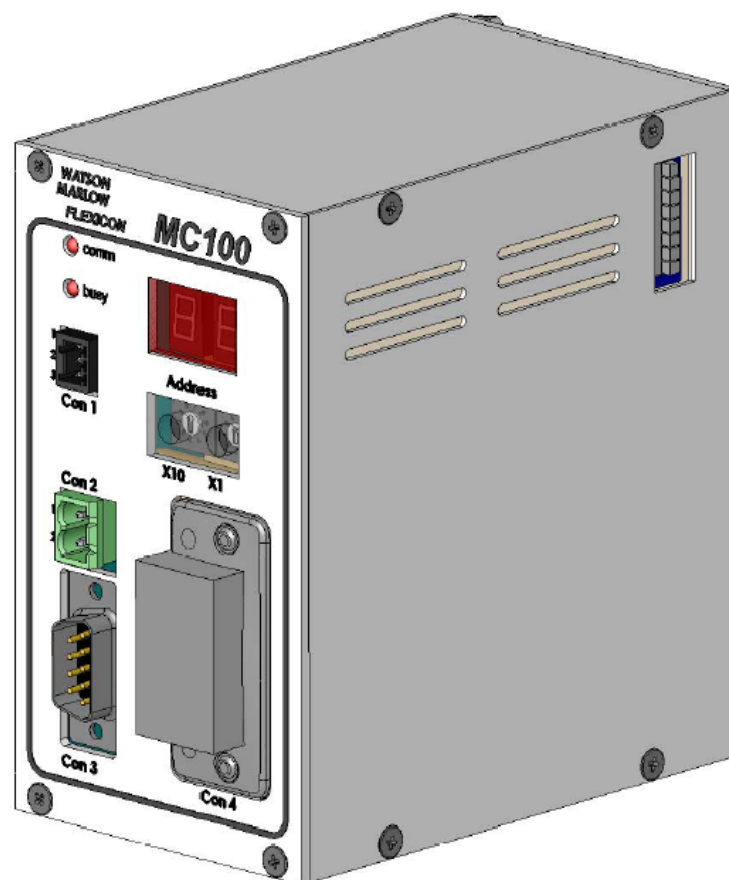


# MC100 Pump Control Module

## User's Manual (Profibus DP)



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## 1 Introduction

### 1.1 Abbreviations in this manual

Fieldbus	DeviceNet, Profibus, CANOpen etc.
Fieldbus interface module	Anybus Compact Com Module from HMS
Filling system	System consisting of an MC100 and from 1 to 16 pumps
Pumps	All Watson-Marlow Flexicon pumps types that communicates on Flexnet
WMF	Watson-Marlow Flexicon

### 1.2 Precautions

This manual should be read thoroughly before using the MC100.

It is strongly advised that

- No wiring is connect or disconnect on the MC100, while power supply is turned ON
- The MC100 must mounted in an environment, that adheres to EN 60204-1:2006 4.4.3-6
- The MC100 must not to be used in explosion hazardous environments.

### 1.3 References

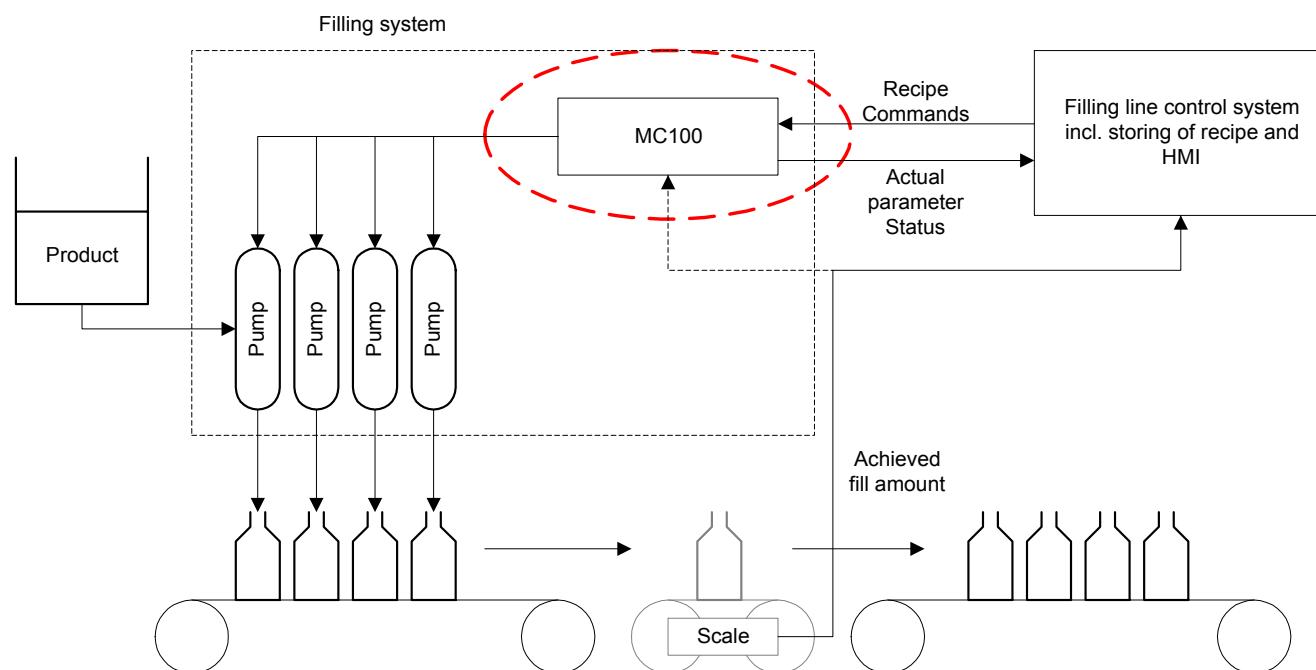
- EN 60204-1:2006

## 2 General description of MC100

### 2.1 Overview

MC100 is a Pump control module capable of controlling up to 16 WMF Pumps. The basic function is to receive filling data from the filling line control system through an industrial fieldbus and to calculate operating values for the pumps. Transmit/ Receive those values and status through the FlexNet protocol.

MC100 constitutes with WMF Pumps a filling system that is designed for incorporation into a larger facility as described below.



### 2.2 Introduction & design purpose

The MC100 is physically a small module intended for mounting inside the control cabinet of the filling line.

The MC100 is designed with the purpose of integrating Watson-Marlow Flexicon pumps into a filling line. The MC100 has no physical operator interface, all access to the module and hence the pumps is done through the fieldbus interface module

#### 2.2.1 How it works / Technical description of operation

Recipes, containing parameters, such as filling volume and filling speed for the requested filling, are sent to the MC100 via the fieldbus communication. The MC100 will, based on these specifications calculate operating parameters for all the pumps and transfer these parameters to the pumps

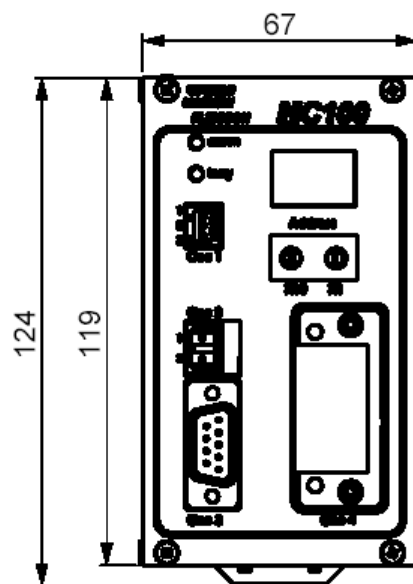
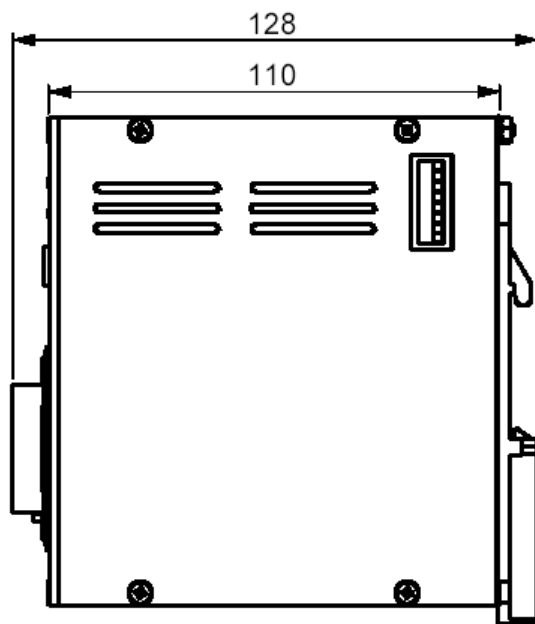
Parameters will be sent to and status retrieved from the pumps by the RS485 multidrop network using the proprietary FlexNet communication protocol.

All control signals and status signals from the pumps are available through the fieldbus interface, but start and status signals can be sent to / received directly from the individual pump by 24V signals.

MC100 holds no recipes, historical data or audit trail, only current runtime parameters for the filling system is stored internally.

### 3 Technical specifications

#### 3.1 Dimensions



## 3.2 Specifications

**Fieldbus:**

- Profibus DP-V1

**Pumps:**

Max 16 pumps can be connected and controlled.  
Pumps must be able communicate with MC100 via FlexNet protocol.

**Material and surface treatment:**

- Mounting box made from aluminium.
- All aluminium parts anodised (conductive).

**Environmental:**

- Ingress protection according to IP30.
- NEMA 1 enclosure.
- EN 60204-1:2006.

**Mounting:**

- MC100 is to be mounted on DIN rail size 35.

**Power supply:**

- Supply 24 VDC  $\pm$  10%.
- Power consumption less than 10 VA.
- Fuse max. 1A

**Weight:**

- 0.5 kg.

### 3.3 Unpacking and inspection of MC100

With the shipment of MC100 you should receive:

- The MC100
- Declaration of Conformity
- CD-rom with documentation:
  - Manual for installation, programming and service of MC100
  - Documentation and support-files for Anybus CompactCom fieldbus module

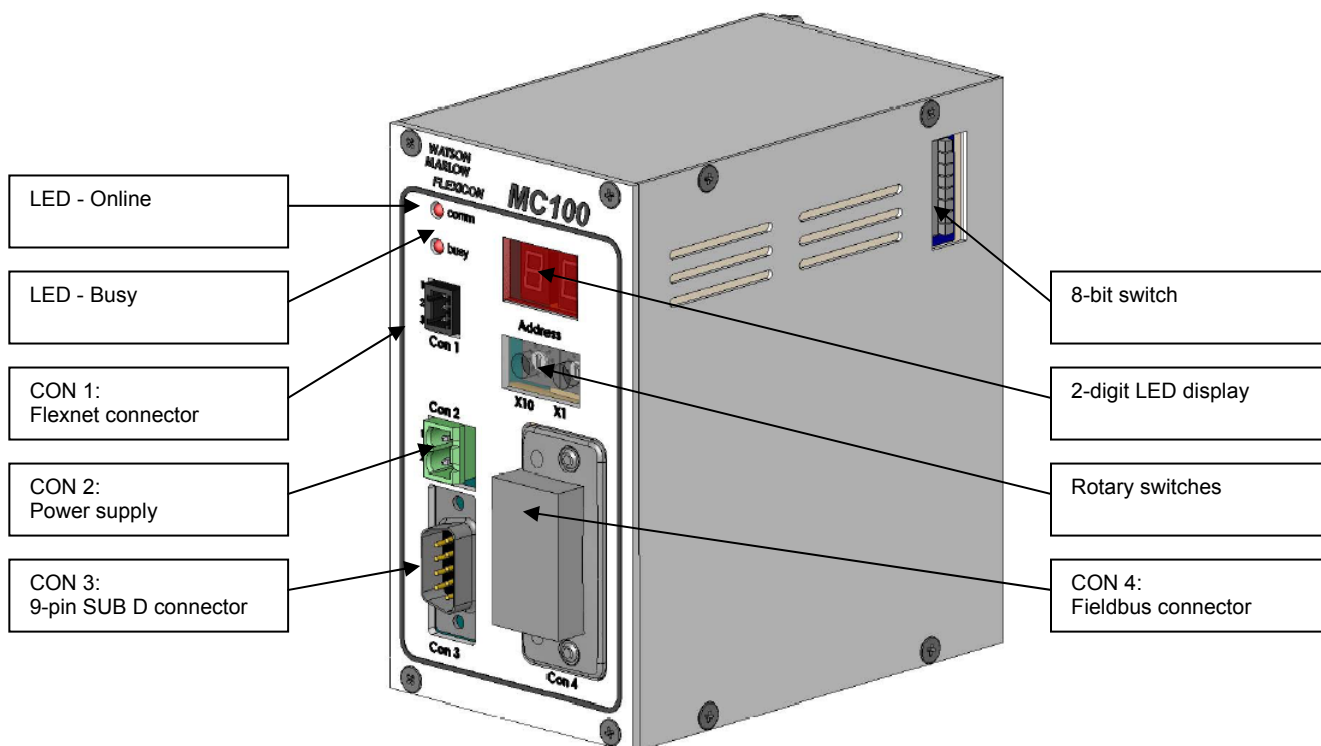
Please check that all ordered items have been received and that no items were damaged during transport. In case of any defects or omissions, please contact WMF or your supplier immediately.

Please verify that the model number stated on the nameplate and the installed fieldbus connector matches your purchase order.

Model number on nameplate	Fieldbus connector
MC100 61-120-000	Profibus DP-V1

#### 3.3.1 Identifying the module

MC100 module:



### **3.3.2 Identifying the parts**

- MC100 module.
- Connector for Flexnet.
- Connector for Power Supply.
- Connector for Fieldbus.

## **3.4 Mounting**

### **3.4.1 Choosing a place to mount the MC100**

The MC100 must be mounted in an environment that adheres to the specifications in 3.2.

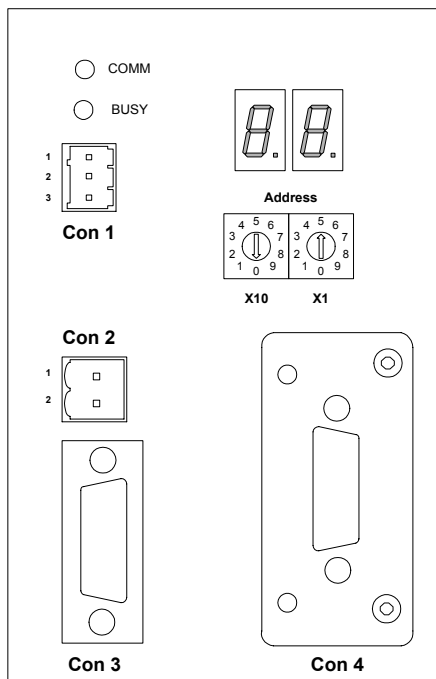
Be sure that the MC100 is also protected from the following conditions

- Rain and moistures
- Corrosive gasses
- Dust or metallic particles in the air
- Physical shock or vibration
- Magnetic noise (Examples welding machines, power devices, etc.)

On the left side of the module is located a dipswitch (se 3.1), which should be accessible.

## 4 Wiring

### MC100 Frontplate



#### Connectors / Indicators / Switches

Con1	Flexnet		Connector	Connect with
1	/DATA	I/O	PHOENIX MC 0,5/ 3 –G-2,5THT	PHOENIX FK MC 0,5/ 3 –ST 2,5
2	GND	-		
3	DATA	I/O		

The Flexnet connector should be connected to the corresponding terminals on all the pumps, establishing a multidrop network and the last pump should be terminated with a 120 ohm resistor between DATA and /DATA.

Use 0.25 – 0.35 mm<sup>2</sup> wires twisted or screened. Terminal tubes must be minimum 8 mm long.

Con2	Power Supply		Connector	Connect with
1	+24V	IN	PHOENIX MC 0,5/ 4 –G-2,5THT	PHOENIX FK MC 0,5/ 3 –ST 2,5
2	0V	IN		

Use 0.5 mm<sup>2</sup> wires, terminal tubes must be minimum 8 mm long.

Con3	Communication		Connector	Connect with
1	RS485 – A	I/O	9 pole SubD Male	Crossed cable to for example PC
2	TxD	OUT		
3	RxD	IN		
4	N.C.			
5	GND	-		
6	NC			
7	CTS	OUT		
8	RTS	IN		
9	RS485 – B	I/O		

Con4	Fieldbus Interface	Profibus DP	9-pole SubD Female
1	-		-
2	-		-
3	B Line		Positive RxD/TxD RS485 Level
4	RTS		
5	GND Bus		
6	+5V Bus output		Max. 10 mA
7	-		-
8	A Line		Negative RxD/TxD RS485 Level
9	-		-
Housing	Cable Shield		Internally connected to protective shield

## 5 Fieldbus network node address and front plate indicators

### 5.1 Network node address switches S1/S2:

The node address is setup on the 2 rotary switches S1 and S2.

Address-range                      1 to 99

The address is normally set before powering up and connecting to the network for the first time, but if the address is change after power up, the new address will flash on P4/P5 display for 5 seconds, where it is possible to change back to the old address.

After 5 seconds the MC100 will do a total factory reset and start up using the new address.

### 5.2 P1/P2 LED indicators:

<b>P1</b>	Green	Continuously ON or flashing indication communication with the pumps
	Red	Flashing indicates Lost connection to at least 1 pump or internal error
<b>P2</b>	Green	Currently not used
	Red	ON indicates at least 1 pump is active
		Flashing together with P1 indicate fatal internal error in the module.

### 5.3 Display P4/P5

This display is used for general indication of the start up states in the MC100 and for various other purposes.

#### 5.3.1 Start up states:

P4/P5	Description	Note
S U	Initial start up state	
S.U.	Internal communications started	
S.0.	Start initialisation of the fieldbus module	Short state if no errors
S.1.	Cyclic data now exchangeable with the network	Short state if no errors
S.2.	MC100 ready and waiting for connection	
S.3.	Intermediate state / special network state	Short state / idle state
S.4.	Connection to network established and working	Short state
S.5.	Internal error during initialization	Steady state (see trouble shooting)
S.7.	Internal error during initialization	Steady state (see trouble shooting)
S 8	Factory Reset to default	
S 9	Factory Reset to default	

#### 5.3.2 Network address

After initialization, the display is showing the network node address.

#### 5.3.3 Alarm- and warning display

The node address is replaced by a flashing:

**AL** and the alarm number **XX**, when an alarm is present (see 8.1.1 Alarms).

**Er** and the warning number **XX**, when a warning (recoverable alarm) is present (see 8.1.2 warnings).

#### 5.3.4 Dipswitch

The dipswitch on the right side of the MC100 module can be used to do a factory-reset function.

Reset state	Dipswitch	Action	Description
0	All OFF	None	Normal runtime state
1	All OFF	Remove power to MC100	
2	SW 8 ON	Apply power to MC100	MC100 starts up and reaches init state 2 And the restart again initializing to factory defaults and starts up.
3	SW 8 ON	Remove power to MC100	
4	SW 8 OFF	Apply power to MC100	MC100 starts up normally

The factory reset can be necessary to do before trying to connect to fieldbus network.

During the factory reset initialization, the MC100 determines how many and what pump types are connected on the Flexnet. (see 6.x.x).

## 6 Configuring the fieldbus network to the MC100

### 6.1 Connecting the MC100 and the pumps for the first time

Make sure all pumps have been giving a unique address and all the pumps have been powered up. The Flexnet is connected with MC100 and to the pumps in a multidrop network.

Connect SubD connector X3 to a PC using a NULL-modem cable.

Start a terminal program on the PC for example HyperTerminal.

Set the communication-parameters to: 9600 baud, 8 bits, even parity and 1 stop-bit.

When applying power to the MC100, it will identify itself by printing the line:

**“ MC100 MFSC Ver. x.yy.”** (x.yy will be the current version)

The MC100 will then try to identify all connected pumps on the Flexnet; the LED indicator X1 will flicker and finally be steady green.

If for example 4 pumps are detected, the following line will be:

**“Pumps: 1 2 3 4 1 4 4”**

Stating that pumps numbered 1-4 are detected, lowest number is 1 and highest number is 4 totalling 4 pumps.

If the 2<sup>nd</sup> line is not printed and the MC12 has an Alarm indication: AL01 or AL02 flashing, it must be investigated if the Flexnet is correct wired.

If all is OK, then continue to configure the Profibus master according to the guidelines from HMS, see below..

### 6.2 Configuring to the Profibus DP network

The description is on how to configure the MC100 for Profibus DP-V1 using Siemens Step7 PLC is described in the HMS document [PROFIBUS Slave Step7 2.1.pdf](#) the newest version can be downloaded from

<http://www.hms.se/products/products.asp?PID=321&ProductType=Anybus-CompactCom>

On the CDrom is also GDS files.

## 7 Operating the MC100

### 7.1 Process Data Exchange (Cyclic data)

The cyclic data consists of control bits and status bits.

There is a distinction between MC100 control/status bits and pumps control/status bits. When connected to the Fieldbus network the MC100 will always transmit and receive 1 word for the MC100 function and minimum 1 word for the pumps (even if only 1 pump is connected there will still be allocated 1 word, where the highest 8 bits will be empty).

#### 7.1.1 Process control bits for MC100

There is allocated one word (2 bytes) for MC100 control bits as shown below.

Word 0

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
B1.7	B1.6	B1.5	B1.4	B1.3	B1.2	B1.1	B1.0	B0.7	B0.6	B0.5	B0.4	B0.3	B0.2	B0.1	B0.0

- B0.0-4: Sets the active pump number
- B0.4-7 Reserved for future use
- B1.0: Mode bit 0
- B1.1: Mode bit 1

MC100 working modes: <sup>1</sup>	Mode bit 0	Mode bit 1
Individuel	"1"	"0"
Parallel	"0"	"1"
Seriei	"1"	"1"

- B1.2-4 Reserved for future use
- B1.5 Alarm reset: will reset lowest number alarm or warning
- B1.6 Rescan for pumps: resulting in new values for connected pumps.
- B1.7 Total reset of MC100 including loading the default values to connected pumps.

<sup>1</sup> See Appendix 1 for description of the working modes

### 7.1.2 Process status bits from MC100

Status bits cyclic process data

For MC100 status one word (2 bytes) is dedicated as scheduled below.

Word 0

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
B1.7	B1.6	B1.5	B1.4	B1.3	B1.2	B1.1	B1.0	B0.7	B0.6	B0.5	B0.4	B0.3	B0.2	B0.1	B0.0

B0.0-4 Active pump number

B0.4-7 Reserved for future use

B1.0 Mode status bit 0

B1.1 Mode status bit 1

MC100 mode status:	Mode status bit 0	Mode status bit 1
Individuel	"1"	"0"
Parallel	"0"	"1"
Seriél	"1"	"1"

B1.2-3 Reserved for future use

B1.4 Ready to receive acyclic ADI parameters (Used with DeviceNet explicit messages)

B1.5 Parameter error – is reset when new parameter is accepted.

B1.6 Ready

B1.7 Alarm

### 7.1.3 Process control bits for the pumps

To control each pump one byte (8 bits) is dedicated as described below.

Minimum one word is transmitted for pump control. The number of pumps connected is a parameter, which is part of the configuration of the number of cyclic bytes of the network.

Word 8		Word 7		Word 6		Word 5		Word 4		Word 3		Word 2		Word 1	
P16	P15	P14	P13	P12	P11	P10	P9	P8	P7	P6	P5	P4	P3	P2	P1

Bit mapping in each command byte:

7	6	5	4	3	2	1	0
	Direction	Disable in Par./Serial	RESET		PUMP	DISP	START

- Bit 0: START Start a single Dispense cycle, when the Pump is set in Dispense mode (Bit. 1)  
This bit must be cleared upon receiving the BUSY bit in the status byte for the pump, see below.
- Bit 1: DISP Sets the pump in dispense mode and thereby enables the START bit to start dispenses. If removed during a dispense, the pump stops immediately.
- Bit 2: PUMP<sup>2</sup> Starts pump running continuously with the set speed.
- Bit 3: Reserved for future use
- Bit 4: RESET To be used with future pumps
- Bit 5: Disable pump in parallel and serial mode.
- Bit 6: Direction<sup>3</sup> [1/0] [Backwards/Normal] pump and dispense direction.
- Bit 7 Reserved for future use

<sup>2</sup> The DISP bit has higher priority and must be cleared before setting the PUMP bit.

<sup>3</sup> Available for pumps able to handle this function (GD30).

### 7.1.4 Process status bits from the pumps

To retrieve status from each pump, one byte (8 bits) is dedicated as described below.

Minimum one word is received with status from the pumps. The number of pumps connected is a parameter, which is part of the configuration of the number of cyclic bytes of the network. The MC100 will always automatically send the number of bytes for the connected pumps, after a factory reset to defaults.

Word 8		Word 7		Word 6		Word 5		Word 4		Word 3		Word 2		Word 1	
P16	P15	P14	P13	P12	P11	P10	P9	P8	P7	P6	P5	P4	P3	P2	P1

Bit mapping in the status byte:

7	6	5	4	3	2	1	0
ALARM	Direction	DONE	Pump	Dispense	Tube Br.	BUSY	READY

- Bit 0:    READY       Pump is ready (self check is OK).
- Bit 1:    BUSY        "1" Indicate that the pump is active, either dispensing or pumping  
                  "0" pump is idle
- Bit 2:    Tube Br.    Tube bridge bit:     "1" = tube bridge on,     "0" = tube bridge off.
- Bit 3:    Dispense   Dispense bit:        "1" = dispense mode
- Bit 4:    Pump        Pump bit:            "1" = pump mode
- Bit 5:    DONE <sup>4</sup>     Set, when pump goes from dispensing to idle / reset by a new START bit.
- Bit 6:    Direction   Handshake for bit B5 from command byte (0=normal / 1=reverse direction.)
- Bit 7:    ALARM       See Chapter 7.2.4.1.3 for further information

<sup>4</sup> The DONE bit can be necessary to use if there is very short filling times, where the BUSY signal is not detected because of transmission times on the fieldbus network.

## 7.2 Operation Parameters / Parameter specifications

The section describes parameter exchange between MC100 and PLC<sup>5</sup>

### 7.2.1 List of basic parameters

Parameter	Description	Data type	Range	Default	DW
1	Volume	Double integer	1000-999990000	10000000	12-13
2	Tube	Integer	1-10	6	14
3	Speed	Integer	30-600	100	15
4	Acceleration	Integer	1-200	10	16
5	Reverse	Integer	0-5	0	17
6	Density	Double integer	50000 – 200000	100000	18-19
7	Calibration value	Double integer	50 –200 % of Volume	- - -	20-21
S	Text-string	Character	22 characters	- - -	20-22

The data types for parameter 1, 6 and 7 are special in that this data format has been chosen in stead of floating point, to be able to use the MC100 with PLC's without floating point capability.

The data type is a double word type where there is a hidden fixed decimal point position with 5 decimals.

Examples: Floating point value 123.45678 must be send to the MC100 as 12345678 or  
Floating point value 1.2 must be send to the MC100 as 120000

In the PLC or HMI there must be a conversion to this format (i.e. multiply with 100000), if the input is in floating point format. Likewise, if reading for example volume from the MC100, then divide the value with 100000 to display it as a floating point.

The tube size setting is a number from 1-10, as the maximum number of tubes in a pump is 10, the actual tubes sizes available for the pump can be found in appendix 1.

### 7.2.2 Description of parameter multiplexing in DW12-21

DW10 The header describing the contents of DW12-21

DW11 Reserved for future use

DW12 – 21 Holds pump parameters and other miscellaneous information, depending on DW10.

DW22 Holds Alarm/Warning numbers

<sup>5</sup> These parameters can also be exchanged using DPV1 Class 2 acyclic data exchange (MSAC2), contact Watson-Marlow Flexicon description if necessary

### 7.2.3 Control Data Words (PLC -> MC100)

DW 10

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
PS	P7	P6	P5	P4	P3	P2	P1	-	-	-	N4	N3	N2	N1	N0

N4-0	DW12-21	Comments
0	Not Used	
1	Request for MC100 FBM Version	
2	Application Name	
3	Pump version	For the active pump in DW0
4	Alarm text strings	Text strings for the pending alarm
5	Warning text strings	Text strings for the pending warning
6	Reserved	
7	Reserved	
8	Reserved	
9	Reserved	
10	Tube table for active pump	Tube table consisting of 10 bytes with tube diameters. <sup>6</sup>

N4-0 Selects the parameters type to be received in DW 12-21.

P7-1 is set if the corresponding parameter has a new value to be send to the active pump I DW0  
 PS is set to retrieve text strings or additional information

### 7.2.4 Status words from parameters transfer (MC100 -> PLC)

DW 10

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
PS	P7	P6	P5	P4	P3	P2	P1	-	-	-	0	0	0	0	0

P7-1 and PS are handshake for parameter bit(s) in Control DW 10.

Word 11 is reserved for future use

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

<sup>6</sup> Tube diameter is an integer value with a hidden decimal point for example 16 equals 1.6 mm ID

### 7.2.4.1 Examples:

#### 7.2.4.1.1 New Speed to pump 1:

Step 1: Set pump no. 1 in MC100 Control Word

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	1

Step 2: Set 0 in DW10

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0

Step 3:

Speed value 300 rpm to pump 1 in DW15

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	0	0	0	0	0	0	1	0	0	1	0	1	1	0	0

Step 4: Set P3 (Bit 10) in DW10 control

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Step 5: Check P3 (Bit 10) in DW10 Status

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Step 6: Clear P3 (Bit 10) in DW10 control

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Step 7: Check Clear P3 (Bit 10) in DW10 Status

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

The cyclic data can be read in DW10-25 and will always have the selected(active) pump in DW10 LSB, when NOT getting strings

### 7.2.4.1.2 New calibration value to pump 3:

Step 1: Set pump no. 3 in MC100 Control Word

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	-	-	-	-	-	0	0	1	1

Step 2: Set 0 in DW10

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0

Step 3:

Place calibration value in DW20-21.

Step 4: Set P7 (Bit 14) in DW10 control

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Step 5: Check P7 (Bit 14) in DW10 Status

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Step 6: Clear P7 (Bit 14) in DW10 control

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Step 7: Check Clear P7 (Bit 14) in DW10 Status

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

### 7.2.4.1.3 Reading strings:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0	0	0	0	0	0	0	-	-	-	N4	N3	N2	N1	N0

Setting the number in DW10 and the PS bit in DW11 will read the string i DW12-25 status:

Example

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0	0	0	0	0	0	0	-	-	-	0	0	0	0	1

“MC100 FBM Ver. x.yy.z”

## 8 Alarm and warnings

### 8.1 Alarms handling

When MC100 is in Alarm state, the only possible action is to reset the alarm. Only applies if the alarm causes are removed, otherwise the alarm will re-appear at the next attempt.

Alarms are cleared one-by-one, starting top down – meaning lowest number first.

#### 8.1.1 Alarms

Alarm no.	Alarm description	Action
0	No pending alarms	
1	No pumps connected during power up	Check connections /power to pumps
2	Connection to one or more pumps lost	Check connections /power to missing pump
3	Connected pumps not equal to last time	Configuration changed – Investigation or new initialization must be done
4	Attempt to access not connected pump	
5	Reverse direction not available	Pump command Bit 5: Direction set for one direction pump
6	Unstable FlexNet: Check pumps <sup>7</sup>	
7	FRAM storage failure: Restart or Reset	
8	Mode change not completed: check pumps	Changing mode was not possible, check pump versions, if change was to parallel or serial mode
9	Missing or defect Anybus CompactCom Module	No Alarm string available, because module not working
10	Disable/Enable fail	Attempt to Disable or Re-enable pumps has failed in the current mode.
11	Pump run length to long	Setting volume or calibration has resulted in to long fill length
12	Reserved	
13	Reserved	
14	Reserved	
15	Reserved	
16	Reserved	
17	Reserved	
NN	FB module not Ready <sup>8</sup>	Internal MC100 module check, possible replacement of module.

<sup>7</sup> Expected to be implemented in a later version

<sup>8</sup> Alarm is only displayed with the 2 LED's on MFSC module – both flashes RED.

## 8.2 Warnings handling

All warnings are cleared automatically, when data within limits are received via FB, or with clear-bit: MC100 command B1.4

In warning 08-13 by the phrase **individual** pumps, means “real” connected pumps and pump 0 means the pseudo pump, which holds common parameters in parallel and serial mode

### 8.2.1 Warnings

Warning no.	Warning description	Action
0	No pending warnings	
1	Fill volume out of range	Attempt to set parameter that is outside limits. Set new parameter.
2	Tube number is not in table	
3	Speed setting is out of range	
4	Acceleration setting is out of range	
5	Reverse setting is out of range	
6	Density setting is out of range	
7	Calibration is out of range	
8	Common calibration in parallel	Calibration attempt for individual pump, calibrate pump 0 only.
9	Individual calibration in serial	Calibration attempt for Pump 0, calibrate pumps individually

## 9 Trouble shooting

### 9.1 Trouble-shooting

Different kind of problems can cause machine stop, errors etc. Most trouble-shooting will be based on the information from the front plate indicators and display and the Alarm list information (see 8.1.1)

#### Examples:

**Problem:** Display is flashing AL / 01 when applying power to the module, indication that the MC100 cannot find any pumps connected.

**Solution:** First check if power is applied to the pump(s) and they are ON, then check cabling and connectors for faults.

To check if problem has been solved, it's necessary to turn power OFF and ON again

**Problem:** Display is flashing AL / 03 when applying power to the module.

**Solution:** First check if all the pump(s) has power applied and are indicating power ON.

If this is OK, then the MC100 has stored a different configuration and must be reconfigured using the factory default configuration.

Make a factory reset to default by following the steps below:

1. Locate the dipswitches on the right side of the cabinet, turn dipswitch 8 ON.
2. Turn power ON to the module, which now starts up with the Alarm, but shortly after starts the reset sequence and starts up again without the alarm 03.
3. Turn power OFF and turn dipswitch 8 back to OFF.
4. Turn power ON again and confirm that the alarm is still removed.

**Important:** The cyclic bytes exchanged with fieldbus master/scanner will now reflect the current configuration. If this configuration is different from setting in the Master/scanner it will not be possible to connect to the scanner.

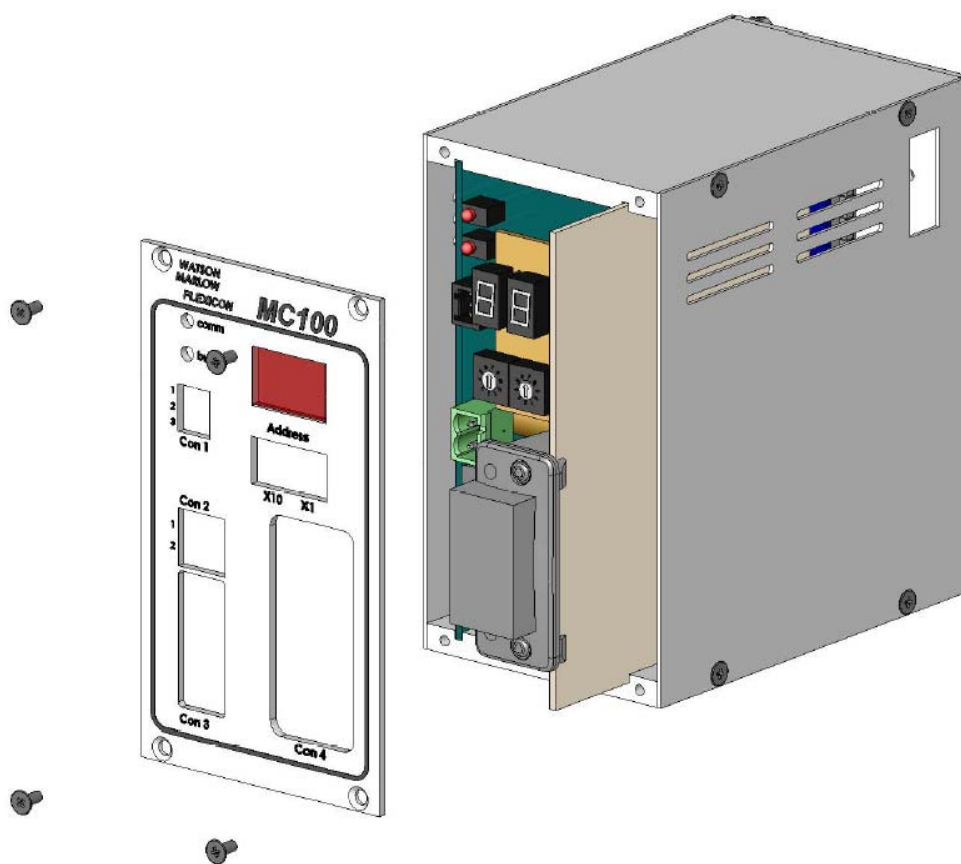
**Problem:** Display is showing "S.2.". As a follow up on the configuration problem above, this will be the display, when the master/scanner has a different configuration of the number of cyclic bytes.

**Solution:**

1. If this is the initial configuration, please use section **6. Configuring the fieldbus network to the MC100** and the supplied documentation and files on the CD-rom to setup the network.
2. If this situation occurs after the system has been running normally, but after a factory reset, focus must be moved to the pumps, where probably one or more pumps is not communicating on the Flexnet.  
Use the description in **6.1 Connecting the MC100 and the pumps for the first time**, to control the number of pumps that are detected on the Flexnet. When the problem is solved and the correct pumps corresponding to the correct configuration is verified, it will be necessary to do a factory reset again.

## 9.2 Opening the MC100 for service/replacement of PCB's

- 1 Power OFF for the 24V to the Module
- 2 Remove all cables attached the MC100.
- 3 To access the 2 circuit boards, remove the front cover by removing the 4 countersunk pozidrive screws and the front cover will come off. The 2 PCB's are connected with a ribbon cable and has to be pulled out together for service on either one.



## 10 Decommissioning

### 10.1 Advice about dismantling / removal / disposal

Disconnect all services prior to dismantling the MC100  
Disconnect all connections to other equipment.

### 10.2 Environmental conditions / -regulations

A MC100 is subject to the WEEE-system and may not be disposed using normal refuse collection.

The machine must be collected and disposed separately as it contains electrical components such as batteries, electrolytic capacitors and printed circuit boards. ?

Further information is available on our web-site [www.flexicon.dk](http://www.flexicon.dk).

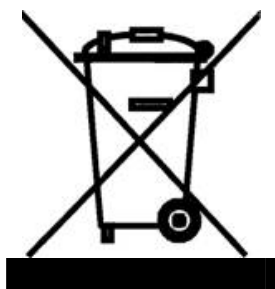
### 10.3 The WEEE system

WEEE stands for: "Waste Electrical and Electronic Equipment" and the term is used commonly throughout the EU for waste from electrical and electronic equipment (EEE).

The WEEE Directive stipulates common EU regulations on treatment of WEEE. The rules are based on consideration for the environment, and they aim at limiting the amount of WEEE we have to dispose of. The objective is, on the one hand, to encourage producers to manufacture environmentally friendly products, and, on the other, to increase reuse, recycling and other forms of recovery.

The WEEE rules provide for producer responsibility, which means that producers and importers of electrical products must organise and finance take-back and treatment of WEEE, and report information to a producer register.

WEEE pictogram:



## 11 Appendix 1

Operating modes for MC100

### (1) Individual

Individual filling means that each Pump has its own operating parameters and that fills, calibration and pumping will not be synchronized with any other connected Pump. In theory, this means that the MC12 can control up to 16 Pumps concurrently.

Calibration is carried out by first selecting the pump number via MC100 control bits as in Individual Mode and then sending the calibration value through the use of DW10 and DW20-21.

The parameters are sent to the individual Pump number after setting the pump number by the MC100 control bits.

### (2) Parallel

Parallel filling is used in a multi-head filling system in which a number of bottles are changed in each cycle and filled at the same time. This gives a very high capacity. The number of Pumps and the number of bottles changed at each cycle should be identical.

If more Pumps are connected to the MC100, they can, if they are of the same type, work synchronously with the same set of parameters. In parallel mode, only parameters in Pump 0 will be used i.e. all Pumps use same volume, tube size, speed, etc.

Calibration must be carried out for the individual Pumps, by first selecting the pump number via MC100 control bits as in Individual Mode and then sending the calibration value through the use of DW20-21

### (3) Serial

Serial filling is used to boost the overall capacity in a semi or fully automated system by using each Pump to fill part of the total volume.

Similar to parallel filling, Pump 0 is used for setting parameters for all connected pumps, with the exception of Function 2 for tube diameter.

For setting tube diameter, select the Pump number by the MC100 control bits as in Individual Mode and then send the tube number using DW10 and DW14. In this way, the last Pump may for instance fill a smaller part of the total volume than the other Pumps in the system. This is done by applying a smaller tube in the last Pump.

When all Pumps have been programmed, the MC100 will automatically calculate which part of the total volume the individual Pumps should fill, so that they are completed simultaneously. This gives the best capacity.

Calibration is also carried out in Pump 0, as the system perceives the whole system as one single Pump. I.e. selecting pump number 0 via MC100 control bits as in Individual Mode and then sending the calibration value through the use of DW10 and DW20-21 (see example in section).

## 12 Appendix 2

### 12.1 Tube tables

#### 12.1.1.1 PD12

Tube Number	Inner Diameter [mm]
1	0.8
2	1.6
3	3.2
4	4.8
5	6.0
6	8.0
7	1.2
8	0.5

#### 12.1.1.2 PD22

Tube Number	Inner Diameter [mm]
1	3.0
2	5.0
3	6.5
4	8.0
5	10.0
6	12.5

#### 12.1.1.3 GD30


Tube Number	Inner Diameter [mm]
1	1.0 (pseudo number)

### 13 Declaration of Conformity

We Watson-Marlow Flexicon  
Frejasvej 2-6  
DK-4100 Ringsted

Declare on our sole responsibility that the product:

Pump control module: **MC100**  
Model: **91-120-000 / 91-121-000**

	
Model	MC100
Serial No.	XXXX XXXX
Supply	24VDC
Year	2009
CE <span style="float: right;">Made in Denmark</span>	

To which this declaration relates is in conformity with the following standard(s):

- |             |   |
|-------------|---|
| EN55022     | Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement  |
| EN61000-6-2 | Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments  |
| EN61000-6-3 | Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments |

According to the provisions in the Directives:

- |             |   |
|-------------|---|
| 2004/108/EC | On the approximation of the laws of the Member States relating to electromagnetic compatibility |
|-------------|---|

Signature:



September 2009

Ringsted, Denmark

Jørn Jeppesen, Development Manager