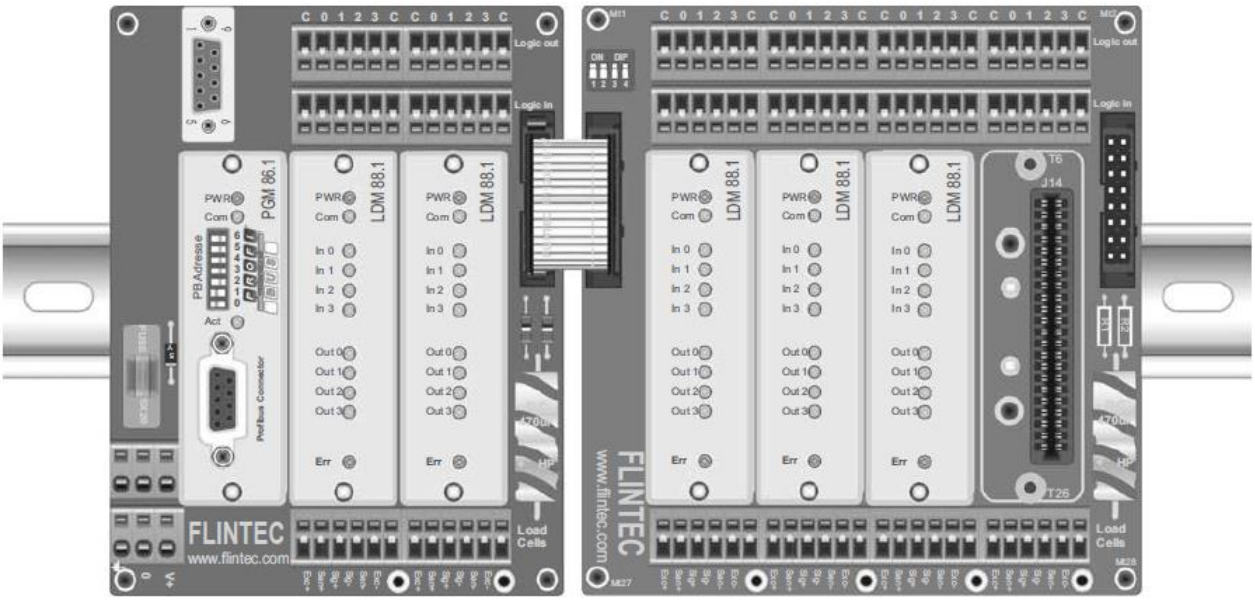
MCS-64

Multi-Channel-System for Process Industry

Technical Manual

Profibus



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1 INTRODUCTION

1.1 Identification and Scope

This document describes the system design for the Modbus on Ethernet (EGM 87.1) and up to 64 Load Cell Digitizing Modules (LDM88.x) using the Flintec backplane system. It describes the functionality of the backplane, the protocol used on the backplane and the Modbus mapping used to access the LDM88 modules via the EGM87 Gateway.

1.2 Purpose

The purpose of this document is to specify functionality and performance of the Gateway and the Load Cell Digitizing Modules (LDM88) with the available firmware versions (standard 88.183, filling 88.184, loss in weight 88.185).

2 SYSTEM DESIGN

2.1 General

This software connects a PROFIBUS network to the local backplane modules. The Gateway transports commands and responses to and from the PROFIBUS bus. It scans the LDM 88.x modules for their status and then transmits this status information continuously to the PROFIBUS controller.

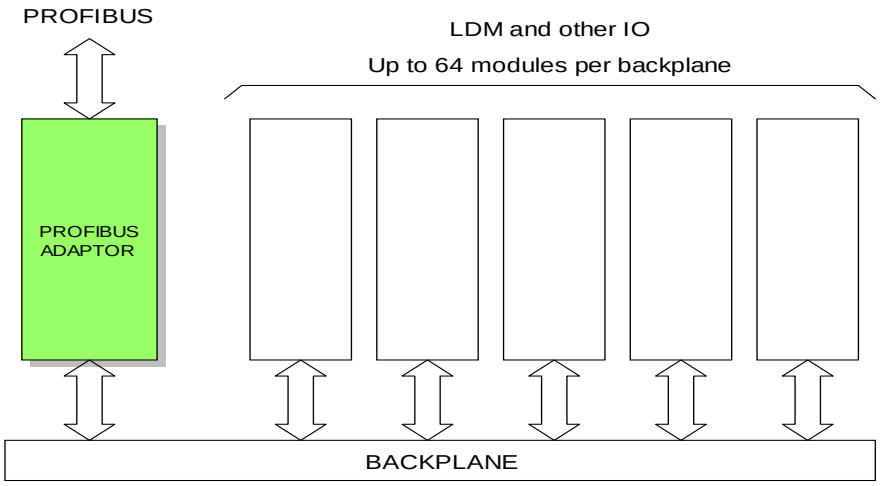


Figure 1- ETHERNET Gateway in context

2.2 Backplane handling

The Gateway must continuously scan the backplane modules. It keeps track of which modules are present and those that are not. The Gateway continuously transmits the gross weight, the net weight and status information on each module in cyclic mode as defined in
"Profile for Weighing and Dosage systems" (TC3-04-0001 and TC3-04-0002).
At a very low priority the Gateway looks for backplane modules that aren't recorded as active, in order to re-establish communication with modules that may have been restarted to recover from failure.
The Gateway always informs the PROFIBUS controller when a module fails or comes back on-line.

2.3 The backplane Load cell Digitizing Modules (LDM)

The LDM 88.x load cell digitizing units are a high-performance device that can form the "front end" of weighing systems intended for either "approved" or industrial applications. The device feature full multi-drop communications capability and can be programmed via a straightforward ASCII command set.

3 PROFIBUS

3.1 The Profile

The PROFIBUS Gateway follows the "Profile for Weighing and Dosage systems" (TC3-04-0001 and TC3-04-0002) recommendations for the cyclic data.
The Gateway incorporates two slots, or modules. The first module is a multiplexer used to select the source backplane, the second module provides the weight and status information.

	Master -> Slave	Slave -> Master	Description
GSD-Module #0	Selectors	Gateway data	Communication with the gateway and multiplexer only.
GSD-Module #1 (TC3-04-0001 and TC3-04-0002)	Control flags	Weight and status information	Communication with the selected unit on the backplane.

When started, the Gateway sends gross weight, net weight and current the status information. The backplane is scanned for status approx. 10 times per second. The cyclic communication holds the Gateway status, the unit status, net weight and gross weight. Direct commands to the backplane units can be sent using DP-V1 acyclic communication with slot number equal to backplane unit number and using index 220. The unit answer is sent back to the Gateway, and can be retrieved when the communication counters changes in status byte 13.

3.2 The Modules

The system uses two modules as described in the HABA09C5.GSD file.
The first module is the gateway. It must be configured first, and controls the communication with the LDM modules. This module now also supports direct backplane commands through DP-V0 access. The second module represents the selected gateway. This module is laid out in accordance with "Profile Weighing and Dosage Systems".

3.3 Communication Profile

Direct backplane communication is only possible using DP-V1 index 220. However, the gateway module offers a method of communication with the selected module. The basic principle is an 8 byte structure represented as an 8 byte in and 8 byte out DP-V0 module.

The structure is as follows:

Name	Function	Size
Module Nr	Select module to access	8 bit
ShortCmd	Short bit-wise command system	8 bit
Command	Command byte according the	8 bit

	command table (below)	
Index	Command parameter index	8 bit
Value	Command parameter value	32 bit

Remark: ShortCmd is not implemented yet.

The **Module_Nr** selects the module where commands and responses are sent to and received from. The valid range is 0 (zero) to 63. The selected module number is echoed back in the in/out 8 byte cyclic communication.

The **ShortCmd** contains single bit commands. Setting a bit causes the command to be sent to the module. These commands are: ClearZero, ClearTare, SetZero, SetTare. The ShortCmd byte is echoed back in the in/out 8 byte cyclic communication.

The **Command** byte is one of the valid commands listed in the command table. When the master changes the Command byte sent to the gateway, the gateway sends the command to the LDM along with the index and value parameter. The usage of the index and value are listed along with the commands below.
The Command byte position in the data sent to the controller is progress feedback with the following possible values;

Value (hex)	Meaning
0x00	The system is idle, no command in progress.
0x01,0x03	The command has been completed, if a value was requested is in the value field.
0x80	(MSB only is set) Command is in progress.
0xC0 – 0xFF	Command has been aborted or completed with an error. The bits 5..0 represents the error number.

The command status will remain at the final value until the master clears the Command byte, which will cause the gateway to return the Command status byte to zero as well. If the Profibus master zeroes the command byte before command is completed the gateway will complete the cycle on the backplane anyway, but zero the Command status byte immediately.

The **Index** is used by commands that can accesses more LDM values. The calibration command is an example, where more variables can be set, e.g. zero, gain and the number of decimals. Another example is the 19 filling parameters for the filling software.

The **value** is the actual value sent to or received from the LDM. When a value is set it is taken from this field. If a value is read, the value field reflects the result of the data sent to the master.

For possible error responses see next page.

Possible error responses are:

Error Name	Error no.	Profi. resp.
ERR_NOT_IMPLEMENTED,	1	0xC1
ERR_NOT_READY,	2	0xC2
ERR_BAUD,	3	0xC3
ERR_CAL_NOT_OPEN,	4	0xC4
ERR_CAL_ID,	5	0xC5
ERR_CAL_VALUE,	6	0xC6
ERR_TIMEOUT,	7	0xC7
ERR_NOT_STABLE,	8	0xC8
ERR_FILL_PARAM_ID,	9	0xC9
ERR_FILL_PARAM_VALUE,	10	0xCA
ERR_GEN_VALUE_ID,	11	0xCB
ERR_GEN_PARAM_VALUE,	12	0xCC
ERR_TRIG_PARAM_ID,	13	0xCD
ERR_TRIG_PARAM_VALUE,	14	0xCE
ERR_TARE_RANGE,	15	0xCF
ERR_FILL_SLOPE,	16	0xD0
ERR_MASS_PARAM_ID,	17	0xD1
ERR_MASS_PARAM_VALUE	18	0xD2

3.3.1 PGM86 Profibus Gateway Module and multiplexer

The PGM86 module MUST be configured as the first module, occupying the first 8 bytes of the output and input communication:

Module="PGM86":

Byte	OUTPUT (Gateway -> PLC)	INPUT (PLC -> Gateway)
00	Module selector; 8 bits indicates selected (LDM) slot number	Module selector; 8 bits indicates selected (LDM) slot number
01	Short command response; Currently not implemented.	Short command; Currently not implemented.
02	Status; 8 bits indicates the command status.	Command; 8 bits: a non-zero value indicates a command.
03	Index; reflects the index of the value below.	Index; selects the index of the value. If the command above is a set command the next field holds the value.
04 – 07	Returned value	Value to set.

3.3.2 LDM88 Loadcell Digitizing Module

The LDM88.x module must be configured as the second module, occupying the first 8 bytes of the output and 1 (one) byte of the input communication, according to "Profile Weighing and Dosage Systems, draft 0.96, june 2004". The LDM profile therefore starts at byte 8.

Module="LDM88":

OUTPUT / INPUT bytes see table next page.

3.3.3 GSD File

The GSD file supports all availabe commands of system MCS-64. The filename is “HABA09C5.GSD”; The GSD file is on www.flintec.com

Byte	OUTPUT (Gateway -> PLC)	INPUT (PLC -> Gateway)
08		Byte 8 only: Start command according to the profile. LDMs always start by themselves.
08 – 11	**Gross weight**; 32 bits IEEE754 floating point, high order byte first	
12 – 15	**Net weight**; 32 bits IEEE754 floating point, high order byte first	
16 – 17	Qualifier; 16 bits of weighing information. The bits are: 0 = Underrange 1 = Overrange 2 = Not within zero range 3 = Exactly zero 4 = No motion, stand-still, steady 5 = Tare set 6 = Preset Tare 7 = Invalid weighing 8-11 = Set-point 0-3 12 = Filling in progress 13 = Filling has completed 14 = Average ready 15 = Cold start see “Get long weight information”	
18	Limit status according to the profile; 8 bits (unused, zero on this system)	
19 – 20	Status word; 16 bits 0= Device warning (unused, zero) 1 = Device fault 2 = Device alert (unused, zero) 3- 6 = reserved, zero 7 = Init active 8-11 = reserved, zero 12,13 = command counter (increments on receiving a DP-V1 command) 14,15 = Acknowlegde counter (increments when a DP-V1 command has been finished)	
21	**Module No.**; 8 bits Reflects the LDM position in the backplane (0..63)	
22 – 23	Reserved, zero; 16 bits	

Remark:
Gross weight of channel 2 etc. you find in byte 24 – 27 etc. (just add every time 16)

3.3.4 Get long weight information

(Don't use this command)
The 'get long weight information' is used by the gateway during normal scan. It contains more data than can be retrieved through the current DP-V0 interface.

The response on the backplane has the following format:

8 bit	16 Bit	32 bit float	32 bit float	8 Bit
A	S	Gross	Net	FCS

- A is the address of the slave.
- S is a bitwise status byte; the values are:
  $0001 - Under range,
  $0002 - Over range,
  $0004 - Not within Zero range (not yet implemented, zero),
  $0008 - Exactly zero,
  $0010 - No motion, stand-still, steady state,
  $0020 - Tare set,
  $0040 - Preset tare (0=tare is measured, 1=tare is set by user),
  $0080 - Invalid weighing (wire-break, A/D ref. out of range),
  $0100 - Set-point 0 (source>limit),
  $0200 - Set-point 1,
  $0400 - Set-point 2,
  $0800 - Set-point 3,
  $1000 - Filling in progress,
  $2000 - Filling has completed,
  $4000 - Average ready,
  $8000 - Cold start.
- 'Gross' is the gross weight in 32 bit IEEE754 single float format.
- 'Net' is the net weight in 32 bit IEEE754 single float format.
- FCS is the backplane check summ.

3.4 Commands

The command contains the following main commands:

Identifier	Index	Value	Function	Applies to:
Abort Cycle			Abort cycle	F
Baudrate		x	Change baudrate setting on next SYNC	*
Calibration Get	x	x	Get calibration value	All
Calibration Set	x	x	Set calibration value	All
Dose Info		x	Determine the filling status	F
Dose Param	x	x	Read/modify dose parameters	F
EPrgrm			Enter programming state (firmware loader)	*
Default			Factory default (TAC protected)	All
Get Angle		x	Get angle value	
Get Average		x	Returns the current average weight value	C
Get Dose		x	Get the last dosed weight	F
Get Dose Tare		x	Get the last tare weight	F
Get Filter		x	Returns the post filtered net value	
Get Gross		x	Get gross value	All
Get Net		x	Get net value	All
Get Sample		x	Get A/D sample	All
Get Tare		x	Get tare value	All
Get Value		x	Get Generic value	All
Get Weight		x	Get long weight information	All
Hardware		x	Get Hardware revision	*
Ident		x	Information - device identification	All
Inp		x	Read input status	All
Out		x	Modify output status	All
Read Ref		x	Read the main A/D reference Voltage.	All
ReLoad		x	Reload parameters / settings from e^2prom	All
Reset Tare			Restores current zero point	All
Reset Zero			Restores the calibration zero point	All
Save		x	Save parameters / settings to e^2prom	All
Set-point	x	x	Set / Get Set-point	C
Set Tare		x	Set tare point	All
Set Value	x	x	Set generic value	All
Set Zero			Set system zero point	All
Soft Reset			Soft Reset	All
Start Cycle			Start cycle	F
Status		x	Information - motion	All
Trigger			Software trigger.	C,F
Trigger Param	x	x	Set / Get Trigger parameters	C
Version		x	Information - software version number	All
LIW control	x	x	The Mass Flow / Loss in weight control	L
LIW Parameters	x	x	The Mass Flow / Loss in weight Parameters	L

C= Checkweigher [LDM8813], F= Filling [LDM8814], L=Loss in weight / Mass flow [LDM8815],

*= functions used by the gateway or service port.

4 COMMANDS

These pages describe the ASCII commands as they must be used by the DOP software. For each command the equivalent Profibus command, index and value are shown in brackets [...] for reference. Further information regarding Profibus are also shown in brackets [...].

Conventions:
- "__" no index or value
- "xxx" means to get/set a value

For better clarity, all commands are divided into groups as described on the following pages.

4.1 System diagnosis Commands – ID, IV, IS

Use these commands to get type, firmware version or device status of System MCS-64. These commands are sent without parameters.

ID Request of device identity [get: cmd 21, index ___, value xxx]

Master (PC / PLC) sends	Devices responds
ID	D:8813

The response to this request gives the actual identity of the active device. This is particularly useful when trying to identify different device types on a bus.

IV Request of firmware version [get: cmd 37, index ___, value xxx]

Master (PC / PLC) sends	Device responds
IV	V:0124

The response to this request gives the firmware version of the active device.

IS Request device status [get: cmd 35, index ___, value xxx]

The 'Read Inputs' has the following format:
The value represents the inputs as a 4-bit binary value in the 32bit value field. The possible value range is therefore 0 (binary 0000) to 15 (binary 1111).

Master (PC / PLC) sends	Device responds
IS	S:240000 (example)

The response to this request comprises of two 3-digit decimal values, which can be decoded according to the table below:

Leftmost 3-digit value:	Rightmost 3-digit value:
1 Signal stable	1 (not used)
2 Zero action performed	2 (not used)
4 Tare active	4 (not used)
8 (not used)	4 (not used)
16 Setpoint 0 active	4 (not used)
32 Setpoint 1 active	4 (not used)
64 Setpoint 2 active	4 (not used)
128 Setpoint 3 active	4 (not used)

The example decodes the result S:067000 as follows:

Signal stable (no-motion): 1
Zero action: 2
Setpoint 2 active: 64

Total 67

Note: the bits that are not used are set to zero.

4.2 Calibration Commands – CE, CM, CI, DS, DP, CZ, CG AZ, AG, ZT, FD, CS

Note: TAC represents Traceable Access Code (calibration counter).

CE TAC counter reading [get: cmd 03, index 3, value xxx]
[set: cmd 04, index 3, value xxx]

With this command you get the TAC counter reading or you can enable a calibration sequence.

Master (PC / PLC) sends	Device responds	Result
CE	E+00017 (example)	Request: TAC-counter CE 17
CE_17	OK	Calibration sequence active

This command must be issued PRIOR to any attempt to set the calibration parameters CZ, CG etc. In legal for trade applications the TAC counter can be used to check if critical parameters have been changed without re-verification. After each calibration the TAC counter increases by 1.

CM Set maximum output value [get: cmd 03, index 7, value xxx]
[set: cmd 04, index 7, value xxx]

This command is used for setup the maximum output value. Permitted values are between 1...199999.

Master (PC / PLC) sends	Device responds	Result
CM	M+30000	Request : CM = 30000
CE	E+00017 (example)	Request: TAC-counter CE 17
CE_17	OK	Calibration sequence active
CM_50000	OK	Setting: CM = 50000

This value will determine the point at which the output will change to "oooooo", signifying over-range. **[It is reflected in the qualifier word, and actual Gross/Net are undefined]**

Note: The range, in which a scale can be set to zero (SZ) or automatic zero tracking (ZT) is active, is +/- 2% of CM value.

Factory default: CM = 199999.

CI Set minimum output value [get: cmd 03, index 8, value xxx]
[set: cmd 04, index 8, value xxx]

This command is used for setup minimum allowable output value. Permitted values are between -99999 ... 0.

Master (PC / PLC) sends	Device responds	Result
CI	I-300	Request : CI = -300
CE	E+00017 (example)	Request: TAC-counter CE 17
CE_17	OK	Calibration sequence active
CI_-10000	OK	Setting: CI = -10000

This value will determine the point at which the output will change to "uuuuuu", signifying under-range. **[It is reflected in the qualifier word, and actual Gross/Net are undefined]**
Factory default setting: -9000.

DS Display step size

[get: cmd 03, index 12, value xxx]
[set: cmd 04, index 12, value xxx]

This command allows the output to step up or down by a unit other than 1. Permitted values are 1, 2, 5, 10, 20, 50, 100 and 200.

Master (PC / PLC) sends	Device responds	Result
DS	S+00002	Request : display step size 2
CE	E+00017 (example)	Request: TAC-counter CE 17
CE_17	OK	Calibration sequence active
DS_50	OK	Setting: DS = 50

DP Set decimal point position

[get: cmd 03, index 11, value xxx]
[set: cmd 04, index 11, value xxx]

This command allows the decimal point to be positioned anywhere between leftmost and rightmost digits of the 5-digit output result. Position 0 means no decimal point.

Master (PC / PLC) sends	Device responds	Result
DP	P+00002	Request : position of dec. point
CE	E+00017 (example)	Request: TAC-counter CE 17
CE_17	OK	Calibration sequence active
DP_0	OK	Setting: no decimal point

CZ Set calibration zero point

[get: cmd 03, index 10, value xxx]
[set: cmd 04, index 10, value xxx]

This is the reference point for all weight calculations, and is subject to TAC control.

Master (PC / PLC) sends	Device responds	Result
CE	E+00017 (example)	Request: TAC-counter CE 17
CE_17	OK	Calibration sequence active
CZ	OK	Zero point set

Factory default: approx. 0 mV/V input signal

CG Set calibration gain (span) value

[get: cmd 03, index 04, value xxx]
[set: cmd 04, index 04, value xxx]

This is the reference point for calibration under load, and is subject to TAC control.
Permitted values are 1...65535.

Master (PC / PLC) sends	Device responds	Result
CG	G+20000	Request : span 20000d
CE	E+00017 (example)	Request: TAC-counter CE 17
CE_17	OK	Calibration sequence active
CG_50000	OK	Setting: span 50000d

For calibration an input signal near the display maximum (CM) will give the best system performance. The minimum calibration load of at least 20% is recommended.

Factory default: 200000 d = 2.000 mV/V input signal = 20 kg

AZ Absolute zero point calibration [get: cmd 03, index 02, value xxx]
[set: cmd 04, index 02, value xxx]

The command AZ is used as reference point for all weight calculations and will setup in mV/V. Permitted values are ± 32000 (= ± 3.2000 mV/V).

Master (PC / PLC) sends	Device responds	Result
AZ	Z+0.0005	Request : Zero point @ 0.0005mV/V
CE	E+00017 (example)	Request: TAC-counter CE 17
CE_17	OK	Calibration sequence active
AZ_00500	OK	Setting: new: Zero point @ 0.0500 mV/V

Factory default: 00000 @ 0.0000 mV/V input signal.

AG Absolute gain calibration [get: cmd 03, index 01, value xxx]
[set: cmd 04, index 01, value xxx]

The command AG is used as absolute gain (or measuring range) for all weight calculations and will setup in mV/V. Permitted values are ± 32000 (= ± 3.2000 mV/V).

Master (PC / PLC) sends	Device responds	Result
AG	G+2.0000	Request : Meas. range 2.000 mV/V
CE	E+00017 (example)	Request: TAC-counter CE 17
CE_17	OK	Calibration sequence active
AG_19998_90900	OK	new: Measuring range 1.9998 mV/V @ 90900 d

Factory default: 200000 @ 2.0000 mV/V input signal.

If the AG value has to be set at 2.0000 mV/V, but the load cell capacity is quoted at 2.2 mV/V, you will have to ratio the load cell capacity down.

Example : A 100kg load cell with an Output at Rated Load of 2.2 mV/V would be equivalent to 90.9 kg @ 2 mV/V (exact 1.9998 mV/V)

ZT Zero tracking [get: cmd 18, index 18, value xxx]
[set: cmd 31, index 18, value xxx]

This command enables or disables the zero tracking. Parameter = 0 disables the zero tracking and parameter = 1 enables the zero tracking. Issuing the command without any parameter returns the current ZT value.

Master (PC / PLC) sends	Device responds	Result
ZT	Z:001	Request : ZT status (ON)
CE	E+00017 (example)	Request: TAC-counter CE 17
CE_17	OK	Calibration sequence active
ZT_0	OK	Setting: ZT = OFF

Zero tracking will be performed only on results less than +/- 0.5 d at a rate of 0.4 d/sec, where d = display step size (see DS command). The zero can only be tracked to +/- 2% of maximum (see CM command).
In non legal for trade applications you can exceed the limit +/- 2%. If you require for example a zero tracking range of +/- 10 d then you have to set ZT to be 100 where d is the division size (which means d * 10).

Factory default: ZT=0

FD Factory default settings [set: cmd 08, index __, value __]

This command puts the LDM88.x back to a known state. The data will be written to the EEPROM and the TAC will be incremented by 1.

Note: All calibration and setup information will be lost by issuing this command!

Master (PC / PLC) sends	Device responds	Result
CE	E+00017 (example)	Request: TAC-counter CE 17
CE_17	OK	Calibration sequence active
FD	OK	Factory default setting

CS Save the calibration values [set: cmd 04, index 09, value __]

This command results in the calibration values being saved to EEPROM, and causes the TAC to be incremented by 1.

Master (PC / PLC) sends	Device responds	Result
CE	E+00017 (example)	Request: TAC-counter CE 17
CE_17	OK	Calibration sequence active
CS	OK	Calibration values saved

The CS command saves all of the calibration group values, as set by CZ, CG, CM, DS, DP and ZT. The command returns ERR and has no updating action unless it is preceded by the CE_XXXXX.

4.3 Motion detection Commands – NR, NT

The motion detection facility provides a means of disabling certain functions whenever a condition of instability, or "motion", is detected. The "no-motion", or "stable" condition is achieved whenever the signal is steady for the period of time set by NT, during which it cannot fluctuate by more than NR increments.The stable condition activates the relevant bit of responses to "Info Status" (IS).

The following functions are disabled if motion is detected: "Calibrate Zero" (CZ) "Calibrate Gain" (CG) "Set Zero" (SZ) and "Set Tare" (ST).

NR No Motion range [get: cmd 18, index 10, value xxx]
[set: cmd 31, index 10, value xxx]

This is the range within which the weighing signal is allowed to fluctuate and still be considered as "stable". Permitted values are between 0 and 65535.

Master (PC / PLC) sends	Device responds	Result
NR	R+00010	Request: NR = 10 d
NR_2	OK	Setting: NR = 2
WP	OK	Setting saved

NR = 2 i.e. fluctuations within a maximum of ± 2 d, in the period NT, will be considered "stable".

Factory default: NR = 1.

NT Stabilisation time for in motion band [get: cmd 18, index 11, value xxx]
[set: cmd 31, index 11, value xxx]

This sets the time (in milliseconds) over which the weight signal is checked to see if it is "stable" or has "no-motion". The weight signal has to vary by less than NR divisions over the time period NT to be considered 'stable'.
Permitted range 0-65535 milliseconds.

Master (PC / PLC) sends	Device responds	Result
NT	T+01000	Request: NT = 1000 ms
NT_500	OK	Setting: NT = 500 ms
WP	OK	Setting saved

If the value of NT =500 milliseconds, the output must not fluctuate more than NR increments within 500 milliseconds in order to be considered "stable".

Factory default: NT = 1000 [=1000 ms].

4.4 Filter setting Commands – FM, FL, UR

Using the commands FM and FL, a digital filter type and strength can be set which will eliminate most of the unwanted disturbances. The command UR is used for the average building. Please note that these filters are positioned immediately after the A/D Converter and therefore affect all aspects of the weighing operation.

FM Filter Mode FIR / IIR [get: cmd 18, index 09, value xxx]
[set: cmd 31, index 09, value xxx]

Choose filter mode, permitted values are "0" for IIR and "1" for FIR.

Master (PC / PLC) sends	Device responds	Result
FM	M+00001	Request: FM = 1 (FIR)
FM_0	OK	Setting: FM = 0 (IIR)
WP	OK	Setting saved

The digital IIR filter works as a low-pass filter of 2nd order with Gaussian characteristic, damping is 40 dB/decade; see table mode 0.

The digital FIR filter works as a low-pass filter with quick response; damping see table mode 1.

Factory default: 0

FL Setup filters [get: cmd 18, index 04, value xxx]
[set: cmd 31, index 04, value xxx]

Command for setup cut off frequency, permitted values are 0 ... 8.

Master (PC / PLC) sends	Device responds	Result
FL	F+00003	Request: FL = 3
FL_1	OK	Setting: FL = 1
WP	OK	Setting saved

Filter values can be chosen between 0 and 8, see table below.
FL= 0 means no filter in mode 0 or 1 (command FM).

Factory default: 3

Mode 0 Characteristic (IIR-Filter)

FL	Settling time to 0.1% (ms)	3dB Cut-off frequency (Hz)	Damping @300Hz (dB)	Output-rate* (samples/s)
0	no filtering	**		600
1	55	18	57	600
2	122	8	78	600
3	242	4	96	600
4	322	3	104	600
5	482	2	114	600
6	963	1	132	600
7	1923	0.5	149	600
8	3847	0.25	164	600

* Output-rate = $600/2^{UR}$ samples/s ** Antialiasing filter 17 Hz @ 60 dB/dec

Mode 1 Characteristic (FIR-Filter)

FL	Settling time to 0.1% (ms)	3 dB Cut-off (Hz)	20 dB damping at frequency (Hz)	40 dB damping at frequency (Hz)	Damping in the stopband (dB)	Stopband (Hz)	Output rate max. (samples/s)
0	no filtering	**					600
1	47	19.7	48	64	>90	>80	600
2	93	9.8	24	32	>90	>40	300
3	140	6.5	16	21	>90	>26	200
4	187	4.9	12	16	>90	>20	150
5	233	3.9	10	13	>90	>16	120
6	280	3.2	8	11	>90	>13	100
7	327	2.8	7	9	>90	>11	85.7
8	373	2.5	6	8	>90	>10	75

** Antialiasing filter 17 Hz @ 60 dB/decade

Attention: In mode 1 the output rate is dependant on the selected filter level (FL) and will be automatically adjusted by the LDM88.x.

UR Set the update rate (average building) [get: cmd 18, index 17, value xxx]

This command will define over how many measurements, from the preceeding IIR or FIR filter, an average will be calculated. The average will be calculated over 2^{UR} samples. Permitted values 0...7 (see table below).

UR	0	1	2	3	4	5	6	7
No. of samples	1	2	4	8	16	32	64	128

Check / adjustment update rate:

Master (PC / PLC) sends	Device responds	Result
UR	U+0001	Request: average over 2 samples
UR_4	OK	Setting: average over 16 samples

Factory default: 0 [no average, = 600 samples/s]

Remark to Mode 1

Dependency Output Rate - averaging UR - Filter FL

UR	Output Rate samples/s								
	FL0	FL1 19.7 Hz	FL2 9.8 Hz	FL3 6.5 Hz	FL4 4.9 Hz	FL5 3.9 Hz	FL6 3.2 Hz	FL7 2.8 Hz	FL8 2.5 Hz
0	600	600	300	200	150	120	100	85.7	75
1	300	300	150	100	75	60	50	42.85	37.5
2	150	150	75	50	37,5	30	25	21.42	18.75
3	75	75	37.5	25	18.75	15	12.5	10.71	9.38
4	37.5	37.5	18.75	12.5	9.38	7.5	6.25	5.36	4.69
5	18.75	18.75	9.38	6.25	4.69	3.75	3.13	2.68	2.34
6	9.38	9.38	4.69	3.13	2.34	1.88	1.56	1.34	1.17
7	4.69	4.69	2.34	1.56	1.17	0.94	0.78	0.67	0.59

4.5 Set Zero/Tare and Reset Zero/Tare Commands – SZ, RZ, ST, RT

The following commands allow you to set and reset zero and tare values. The zero set during calibration remains the 'true zero' but new 'current zero' can be set using the SZ command. If the SZ command is issued and accepted then all weight values will then be based on the new 'current zero'. Please remember that zero value will be subject to the Zero tracking function if enabled.

If the weight signal is not stable (as defined by the No motion range NR and the No motion time NT) then both the set zero SZ and set tare ST commands will be disabled.

Also the Set Zero SZ command is not allowed if the new zero value required and the 'calibration zero' differ by more than 2 % of the CM value (maximum allowable value).

SZ Set Zero [set: cmd 32, index __, value __]

This command sets a new "current zero" which is then the basis of all weight values until further updated by the zero tracking function, another SZ command or the "reset zero" command RZ. The SZ command will fail (LDM responds with ERR) if the new "current zero" is more than 2% (of the CM value) higher or lower than the "true zero" set during calibration. The SZ command will also fail if the weight signal is not stable as defined by the No motion range (NR) and the No motion time (NT). If the weight signal is "stable", the response to the IS command (Device Status) will show the "signal stable" bit active and the SZ command will be accepted (OK). If the "signal stable" bit is not active, the SZ command will be rejected and the LDU will respond with ERR (error).

Master (PC / PLC) sends	Device responds	Result
SZ	OK	Set Zero performed

The SZ command is issued without any parameters and will return either the OK or ERR response. If the SZ command is accepted the LDM88.x responds with OK and the "zero action performed" bit of the device status (IS) response will be active.
Is the command acknowledged by the LDM88.x with OK, the status bit for Zero (request IS) is set to 1. A renewed SZ command or the reset zero command [RZ] changes the current zero point. The command is not implemented, if the current measured value is more than ±2% of the maximum display value [CM] of calibrated zero point [CZ]. LDM88.x response is ERR (error). [The 'signal stable' bit is also in the cyclic status word byte 19-20, bit 4]

Note: The LDM allows 20% on the first SZ after power ON.

RZ Reset Zero Point [set: cmd 27, index __, value __]

This command cancels the SZ command and the zero reading reverts to that set by the CZ command during calibration.

Master (PC / PLC) sends	Device responds	Result
RZ	OK	Zero point CZ active again

The LDM88.x responds to the RZ command with either OK or ERR. If OK is returned then the "zero action performed" bit in the Device Status (IS) response will be set to "0".

ST Set Tare [set: cmd 30, index __, value __]

This command will activate the net weighing function by storing the current weight value as a tare.

The weight signal must be "stable" within the limits set by NR (No Motion Range) and NT (No Motion Time) commands for the "signal stable" bit to be active and set tare command to be accepted.

Master (PC / PLC) sends	Device responds	Result
ST	OK	Tare performed

If the weight signal is "stable", the response to the IS command (Device Status) will show the "signal stable" bit active and the ST command will be accepted (OK). If the "signal stable" bit is not active, the ST command will be rejected and the LDU will respond with ERR (error).

RT Reset Tare [set: cmd 26, index __, value __]

The weighing signal returns to gross mode.

Master (PC / PLC) sends	Device responds	Result
RT	OK	Tare deactivated

The LDM88.x responds to the RT command with either OK or ERR. If OK is returned then the "tare active" bit in the Device Status (IS) response will be set to "0".

Note:
Additional to ST and RT commands you can setup a tare value manual as follows:

[get: cmd 18, index 13, value xxx] , where xxx is the actual valid tare value.
[set: cmd 31, index 13, value xxx] , where xxx is the new manual tare value.

4.6 Output Commands – GG, GN, GT, GS

The commands "Get" the Gross and Net values from the LDM88.x are permanent available in the bytes 8 – 11 and 12 – 15, see page 11.

GG Get Gross value [get: cmd 14, index __, value xxx]

OUTPUT (Gateway -> PLC)

Byte 08 – 11	Gross weight; 32 bits IEEE754 floating point, High order byte first

Master (PC / PLC) sends	Device responds	Result
GG	G+01.100	Gros weight 1.100 d

GN Get Net value [get: cmd 15, index __, value xxx]

OUTPUT (Gateway -> PLC)

Byte 12 – 15	Net weight; 32 bits IEEE754 floating point, High order byte first

Master (PC / PLC) sends	Device responds	Result
GN	G+01.000	Net weight 1.000 d

GT Get Tare value [get: cmd 17, index __, value xxx]
[get: cmd 18, index 13 , value xxx]

Master (PC / PLC) sends	Device responds	Result
GT	T+00.100	Tare weight 100 d

GS Get ADC Sample value [get: cmd 16, index __, value xxx]

This command gets the actual Analogue to Digital Converter (ADC) value. This can be useful during development or when calibrating to see how much of the ADC range is being used.

Master (PC / PLC) sends	Device responds	Result
GS	S+125785	AD-value = 125.785 d

For service applications, it is helpful to note the GS values for the "no-load" or "zero" output and when the "calibration load" is applied.

4.7 Setpoint Commands - Sn, Hn, An

The LDM88.x has 4 setpoints where the status is dependent on the weight value. Each of them can be assigned as an independent setpoint value (Sn) with a corresponding hysteresis/switch action (Hn) and base (An – switch on the gross or the net weight).

S1 Setpoint 1

[get: cmd 29, index 49, value xxx]
[set: cmd 29, index 97, value xxx]

Setpoint Sn	Index S1	Index S2	Index S3	Index S4
get	49	50	51	52
set	97	98	99	100

Request / Setting

Master (PC / PLC) sends	Device responds	Result
S1	1+01500	Setpoint S1 = 1500 d
S1_03000	OK	Setting: Setpoint S1 = 3000 d

Setpoint range between ± 1 (minimum) and ± 199999 (maximum).

Similarly to read or set setpoint 2, use S2 instead of S1, etc.

H1 Hysteresis setpoint 1

[get: cmd 29, index 33, value xxx]
[set: cmd 29, index 81, value xxx]

Hysterisis Hn	Index H1	Index H2	Index H3	Index H4
get	33	34	35	36
set	81	82	83	84

Using the H1 command, the hysteresis on the setpoint value is set by the numeric value and the polarity of this numeric value defines whether the setpoint switches on or off when the setpoint value is reached.

Example

Setpoint	Hysteresis	Load	OFF	ON
S1 = 20.00 kg	H1 = -1.00 kg	increasing	≥ 21.01 kg	0 ... 21.00 kg
S1 = 20.00 kg	H1 = -1.00 kg	decreasing	≥ 20.00 kg	19.99 ... 0 kg
S1 = 20.00 kg	H1 = 1.00 kg	increasing	0... 19.99 kg	≥ 20.00 kg
S1 = 20.00 kg	H1 = 1.00 kg	decreasing	19.00. ..0 kg	≥ 19.01 kg

Example of negative hysteresis of 1.00 kg (H1 = -100) on a setpoint (S1) of 20.00 kg (lines 1 & 2 of table above):

When the weight is increasing between 0 kg and 21.00 kg the setpoint is "ON". Once the weight increases above 21.00 kg then the logic output is "OFF". The setpoint will come "ON" again when the weight value drops below 20.00 kg.

Example of positive hysteresis of 100 kg (H1 = +1.00) on a setpoint of 20.00 kg (lines 3 & 4 of table above):

When the weight is increasing between 0 kg and 19.99 kg the setpoint is "OFF". Once the weight increases above 19.99 kg then the setpoint is "ON". The setpoint will switch "OFF" again when the weight value drops below 19.00 kg.

Request / Set Hysteresis value for setpoint 1

Master (PC / PLC) sends	Device responds	Result
H1	1-00100	Request: neg. Hysteresis
H1_100	OK	Setting: pos. Hysteresis
H1_-100	OK	Setting: neg. Hysteresis

Similarly to read or set the setpoint 1 hysteresis, use H2 instead of H1 etc.

A1 Request / Set the base for setpoint 1 [get: cmd 29, index 17, value xxx] [set: cmd 29, index 65, value xxx]

Action on An	Index A1	Index A2	Index A3	Index A4
get	17	18	19	20
set	65	66	67	68

The A1 command defines the base on which the setpoint value acts. If A1 is set to "0" then setpoint 1 acts on the unfiltered gross weight. If A1 is set to "1" then setpoint 1 acts on the unfiltered net weight.

A1 = 0	Not filtered gross weight
A1 = 1	Not filtered net weight

Request / Set base for setpoint 1

Master (PC / PLC) sends	Device responds	Result
A1	1+00000	Allocation gros weight
A1_1	OK	Allocation net weight

Similarly to read or set the setpoint 1 base, use A2 instead of A1 etc.

If two (or more) setpoints have exactly the same settings the setpoint with the higher number will be "hidden".

NOTE: All changes to the setpoint settings have to be stored in EEPROM using the SS command. See chapter 3.11 page 32.

4.8 Trigger Commands – SD, MT, GA, TE, TR, TL

Remark: These commands are only available in firmware 88.183 (see time diagram page 30); the TR command is also available in the 88.184 firmware.

Note: All setups should be stored with the WP command before power off.

SD Start Delay 0 ... 500 ms [get: cmd 18, index 14, value xxx]
[set: cmd 31, index 14, value xxx]

Set the delay between trigger point and start of measurement.
Permitted values are 0 ... 500 ms.

Master (PC / PLC) sends	Device responds	Result
SD	S+00100	Request: SD=100 ms
SD_200	OK	Setting: SD=200 ms

Factory default: 0 [= 0 ms]

MT Measuring Time 0 ... 500 ms [get: cmd 18, index 08, value xxx]
[set: cmd 31, index 08, value xxx]

Set the time over which the average value will be built.
Permitted values are 0 ... 500 ms.

Master (PC / PLC) sends	Device responds	Result
MT	M+00100	Request: MT=100 ms
MT_500	OK	Setting: MT=500 ms

Note: MT = 0 means disabled trigger and average function.

Factory default: 0

GA Get Average [get: cmd 10, index ___, value xxx]

Issuing the GA command the LDM 88.1 returns the latest average weight value by using the MT setup.

Master (PC / PLC) sends	Device responds	Result
GA	A+01.100	Answer: GA=1.100 g

Note: During the time between the trigger condition being accepted and the average value being updated, the GA command will return the value 99999 when it has been triggered or 88888 when it has been retriggered or 99996 when the system tried to change Tare or Zero before end of measurement.

Note: [On MCS-64 it is necessary to monitor the 'average ready' bit in the cyclic status word byte 19-20, bit 4 and proceed a GA command when available. The average result is available in byte 04-07].

TL Trigger Level

[get: cmd 18, index 16, value xxx]
[set: cmd 31, index 16, value xxx]

Set the trigger level for rising edge start of measurement. Permitted values are in the range 0...262143.

Master (PC / PLC) sends	Device responds	Result
TL	T+99999	Request: TL=99999
TL_1000	OK	Setting: TL=1000

With regard to the trigger commands SD and MT, a check weighing will automatically start when the weight overshoots by e.g. 1.000d (increments), e.g. 100,0 g.

Factory default: 199999

TE Trigger Edge

[get: cmd 18, index 15, value xxx]
[set: cmd 31, index 15, value xxx]

Issuing the TE command selects rising or falling edge of a hardware trigger (e.g. light barrier). Parameter = 0 select falling edge and parameter = 1 select rising edge.

Master (PC / PLC) sends	Device responds	Result
TE	E:001	Request: TE=1
TE_0	OK	Setting: TE=0

Factory default: 0 [falling edge]

Note: This command cannot be used together with the TL command.

TR Trigger

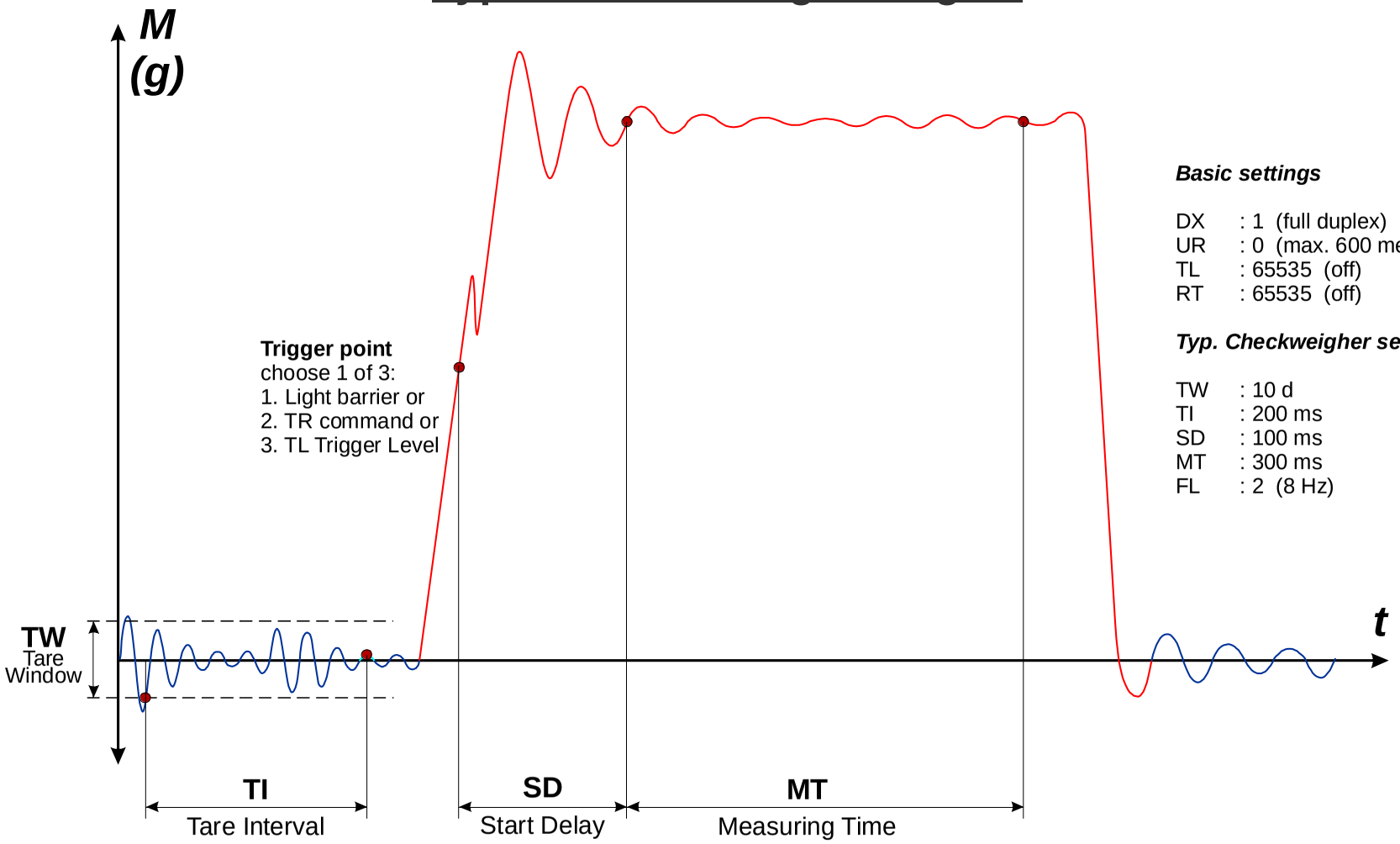
[set: cmd 36, index __, value __]

This command will start the measuring cycle in the same way as the hardware trigger input.

Master (PC / PLC) sends	Device responds	Result
TR	OK	Trigger started

Note: This function can be used as a soft trigger in a check weigher application (firmware 88.183) or to start a filling process (firmware 88.184).

Typical Checkweigher Signal



Basic settings

DX : 1 (full duplex)
UR : 0 (max. 600 meas./s)
TL : 65535 (off)
RT : 65535 (off)

Typ. Checkweigher settings

TW : 10 d
TI : 200 ms
SD : 100 ms
MT : 300 ms
FL : 2 (8 Hz)

4.9 Trigger Special Commands– RW, TT, TS, DT, TW, TI, HT

Remark: These commands are only available in **firmware 88.183** (see time diagram page 33).

Note: All setups should be stored with the **WP** command before power off.

RW Re-Trigger Window [get: cmd 38, index 03, value xxx]
[set: cmd 38, index 131, value xxx]

Set the re-trigger window in counts (digits) without decimal point. If the weight relative to the current average value changes by more than the RW value the average cycle will be restarted using TT as measure time.To automatically issue the re-trigger command, the time period over which an increase of weight average is measured has to be defined by using the command DT.

Master (PC / PLC) sends	Device responds	Result
RW	R+65535	Request: RW=65535
RW_500	OK	Setting: RW=500d

Factory default: 65535

TT Re-Trigger Time [get: cmd 38, index 04, value xxx]
[set: cmd 38, index 132, value xxx]

Set the re-trigger time in milliseconds [ms]. Re-trigger time is the average time used by the re-trigger function. If set to zero the re-trigger function is disabled.

Master (PC / PLC) sends	Device responds	Result
TT	T+65535	Request: TT=65535
TT_300	OK	Setting: TT=300ms

Factory default: 65535

TS Re-Trigger Stop [get: cmd 38, index 08, value xxx]
[set: cmd 38, index 136, value xxx]

Set the re-trigger stop in counts (digits) without decimal point. In case of a (TS) decrease in weight relative to the current average value the re-trigger funtion is stopped.

Master (PC / PLC) sends	Device responds	Result
TS	T+00000	Request: TS=00000
TS_480	OK	Setting: TT=480d

Factory default: 00000

DT Delta Time

[get: cmd 18, index 19, value xxx]
[set: cmd 31, index 19, value xxx]

Set the Delta Time in milliseconds [ms]. During MT and TT timeframes "sub-averages" will be calculated by the system over the time DT. If a sub-average is outside the re-trigger window, the re-trigger function is automatic started.

Master (PC / PLC) sends	Device responds	Result
DT	T+00000	Request: DT=00000
DT_50	OK	Setting: TT=50ms

Factory default: 50

TW Tare Window

[get: cmd 38, index 06, value xxx]
[set: cmd 38, index 134, value xxx]

Set the Tare Window in in counts (digits) without decimal point. Tare window (TW) allows an automatic Tare update. If TW = 0 this function is not active. If TW = 100, this means a new tare value will be taken when the net average weight of an empty scale is within 100 counts or division of zero. The new average tare value is calculated over the average tare time defined by TI. If the tare average is outside tare window, the tare will not be updated.

Master (PC / PLC) sends	Device responds	Result
TW	T+00000	Request: TW=00000
TW_100	OK	Setting: TW=100d

Factory default: 00000

TI Tare Time

[get: cmd 38, index 07, value xxx]
[set: cmd 38, index 135, value xxx]

Set the Tare Time in milliseconds [ms]. During the Tare Time a “tare-average” will be calculated by the system.

Master (PC / PLC) sends	Device responds	Result
TI	T+00000	Request: TI=00000
TI_200	OK	Setting: TI=200ms

Factory default: 00000

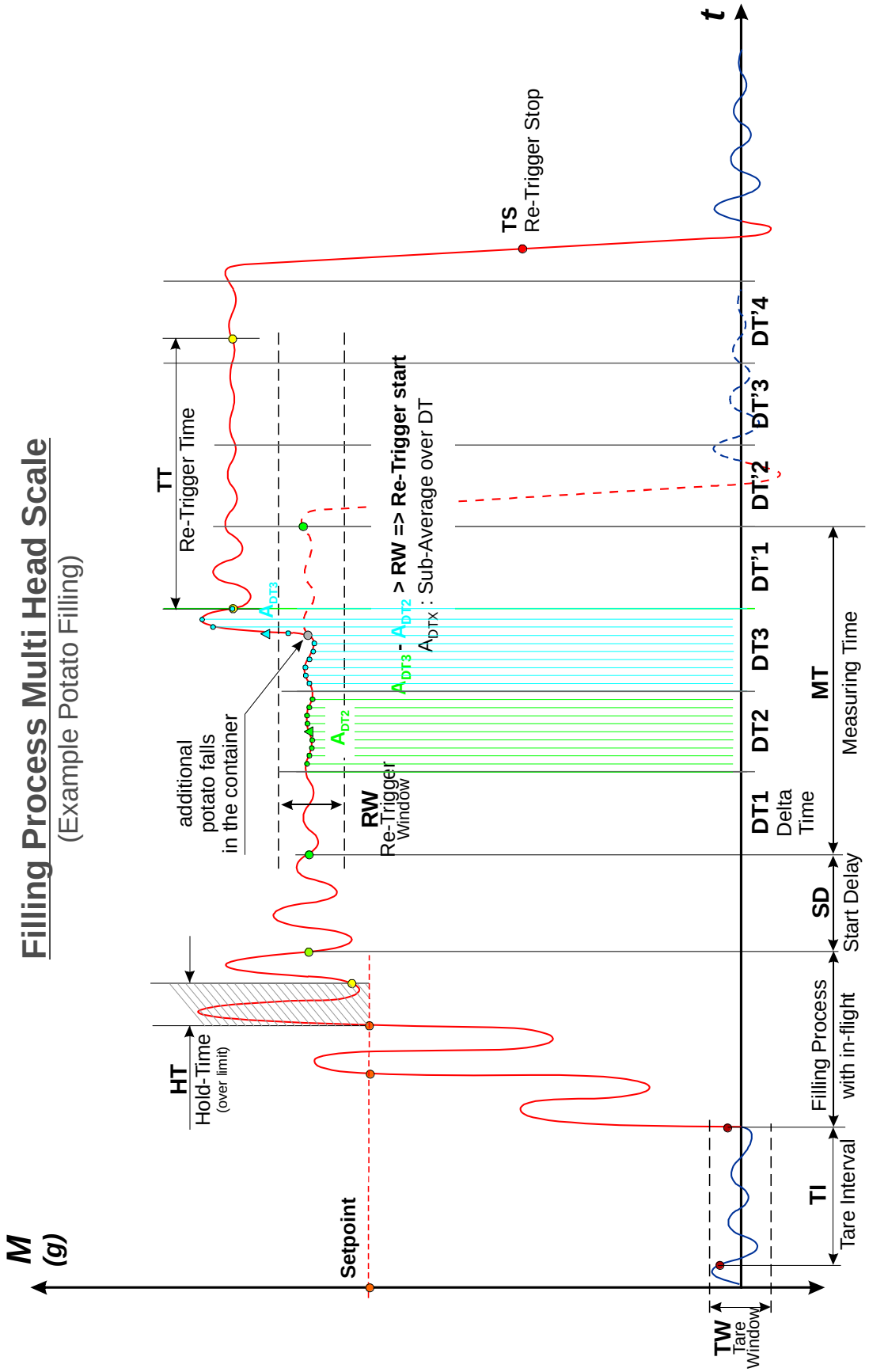
HT Hold Time

[get: cmd 38, index 05, value xxx]
[set: cmd 38, index 133, value xxx]

Set the Hold Time in milliseconds [ms]. During the Hold Time the weight value must be over setpoint that a digital output can be switched. This means that a short signal peak will not lead to the switching of a digital output.

Master (PC / PLC) sends	Device responds	Result
HT	T+00000	Request: HT=00000
HT_200	OK	Setting: HT=200ms

Factory default: 00000


Filling Process Multi Head Scale
(Example Potato Filling)
M
(g)
t
Setpoint
HT
Hold-Time
(over limit)
TT
Re-Trigger Time
TS
Re-Trigger Stop
TW
Tare
Window
TI
Tare Interval
Filling Process
with in-flight
SD
Start Delay
MT
Measuring Time
DT1
Delta
Time
DT2
DT3
DT'1
DT'2
DT'3
DT'4
RW
Re-Trigger
Window
additional
potato falls
in the container
A_DT3
A_DT2
A_DT3 - A_DT2 > RW => Re-Trigger start
A_DTX : Sub-Average over DT

4.10 Save calibration, setup and setpoint parameters Commands – CS, WP, SS

The setup and calibration parameters can be divided into 3 groups:

- Calibration parameter: CZ, CG, DS, DP & ZT are saved by the CS command.
- Setup parameters (other than setpoint): FL, FM, NR, NT, BR, AD, etc. are saved by the WP command.
- Setpoint parameters: Sn, Hn and An are saved by the SS command.

CS Save the calibration parameters [set: cmd 28, index __, value $02]

Note: Calibration parameters can only be saved if the TAC code is known and precedes the CS command. See the CE and CS commands on page 26.

Both the setup parameters and the setpoint parameters are stored in EEPROM using the WP and SS commands respectively.

WP Save the setup parameters [set: cmd 28, index __, value $04]

With this command the settings of the "Filter" (FL, FM) , the "No-Motion" (NR, NT) and the communication (AD, BR) will be saved in the EEPROM.

Master (PC / PLC) sends	Device responds	Result
WP	OK	Parameter saved
WP	ERR	Error

SS Save the "setpoint" set-up parameters [set: cmd 28, index __, value $10]

With this command the settings of the setpoints (Sn), the "setpoint hysteresis" (Hn) and the "setpoint action" (An) will be saved in the EEPROM.

Master (PC / PLC) sends	Device responds	Result
SS	OK	Parameter saved
SS	ERR	Error

4.11 Filling Commands – PD1 to PD21, DI, SC, AC, GD, DT, SD

Remark: These commands are only available in **firmware 88.184**.

Note: All setups should be stored with the SD command before power off.

A separate description of these commands is available on www.flintec.com

4.12 Loss in Weight Commands – PL1 to PL5, LC, LI, GF, GR, GM, SL

Remark: These commands are only available in **firmware 88.185**.

Note: All setups should be stored with the SL command before power off.

A separate description of these commands is available on www.flintec.com

4.13 Speed Estimation Multi-Channel System MCS-64

Gateway Profibus PGM 86.1

No. of Channels	Transfer Rate per Channel	Remark
8	40 Measurements/sec *	* new firmware in gateway required
16	20 Measurements/sec *	* new firmware in gateway required
32	10 Measurements/sec	
64	5 Measurements/sec	

This speed estimation is for example valid for gross / net weight.

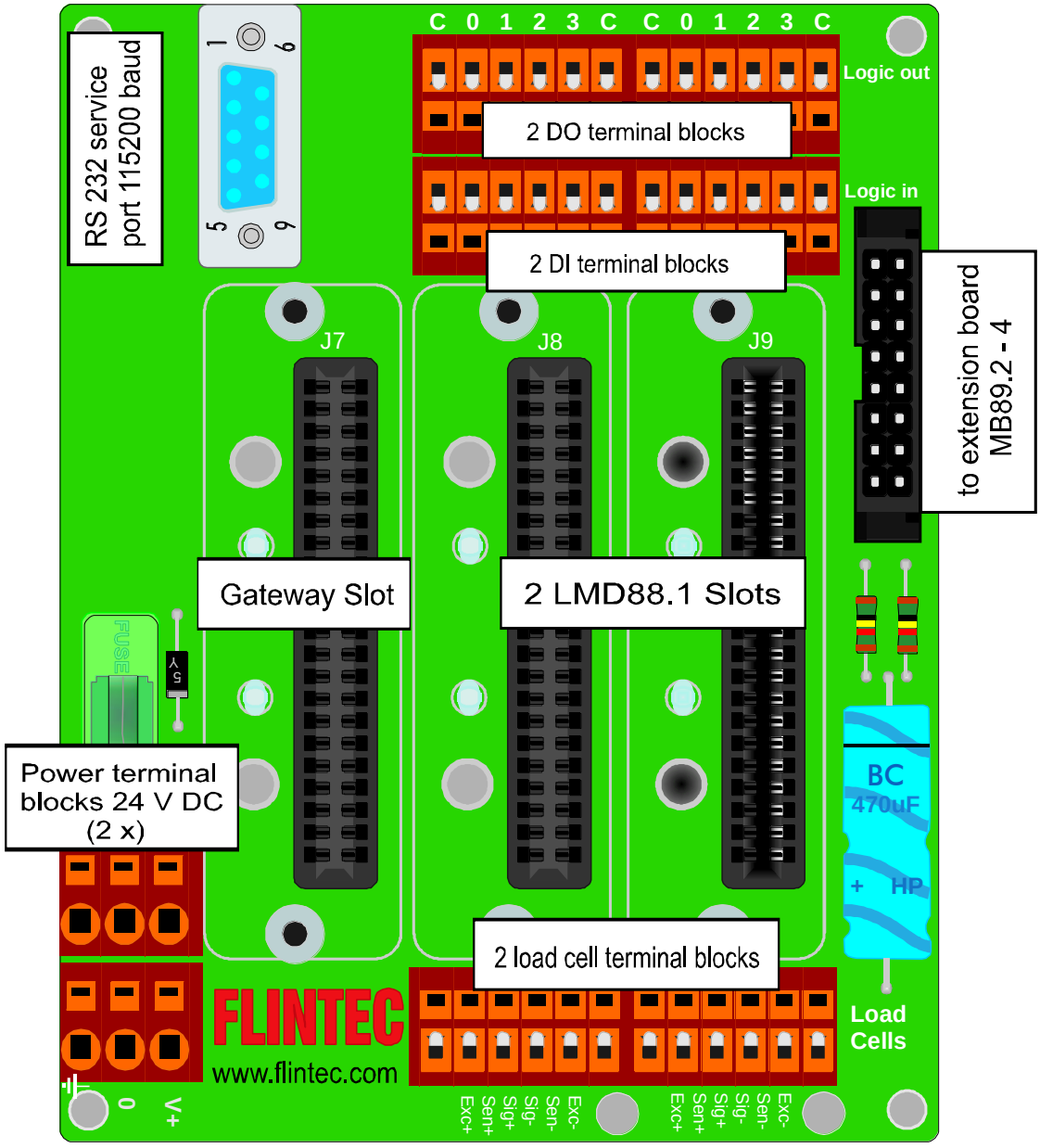
For applications like check weighers, filling, loss in weight etc. each LDM 88.1 calculates the valid result. This means that no "data stream" will overload the Profibus traffic.

For a single channel, the data output via service port can be used for high-speed measurements, e.g. with the DOP software. The measuring rate is up to 600 meas./s.

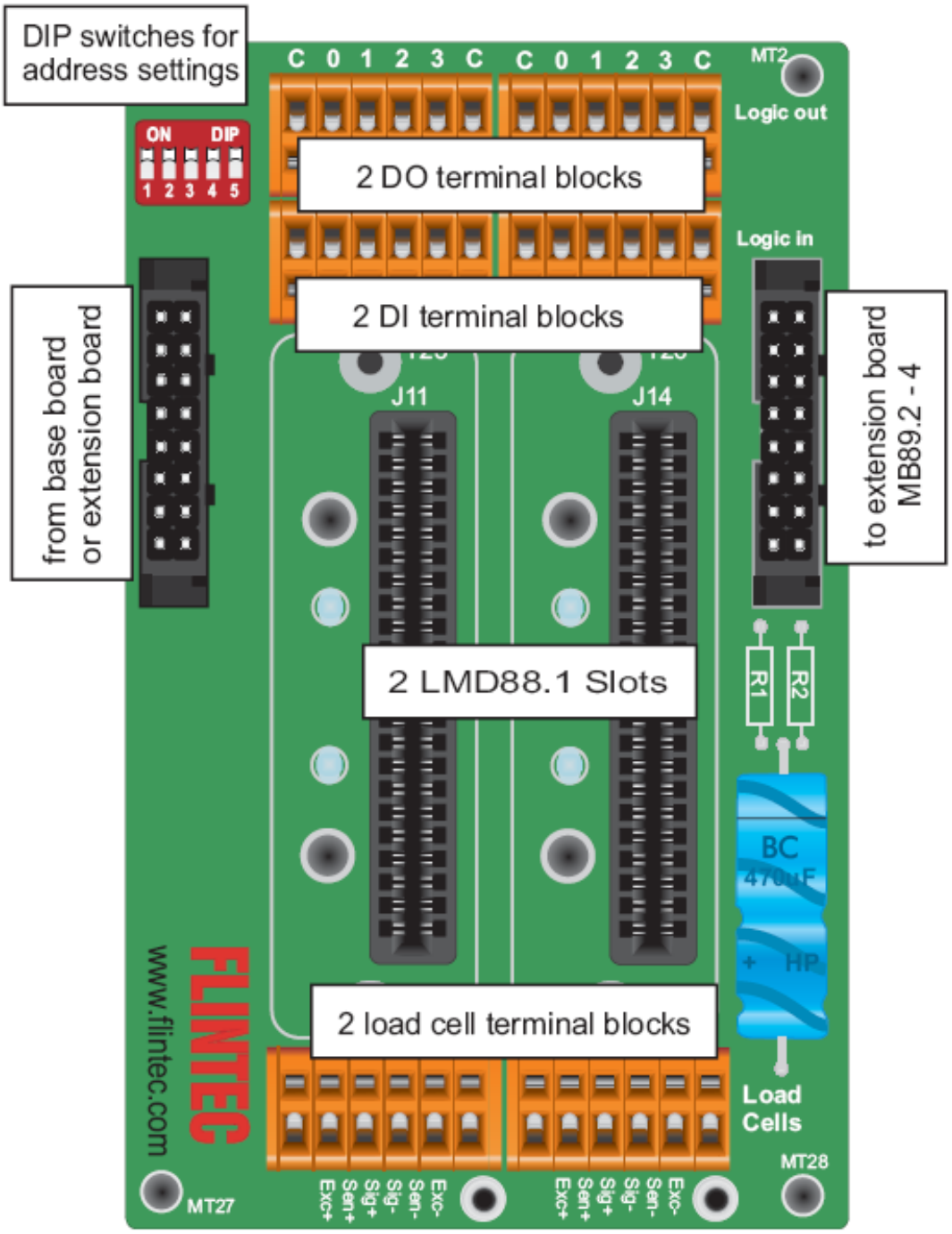
5 MCS-64 Components and Configuration

These pages describe the MCS-64 components and address setup for the extension boards.

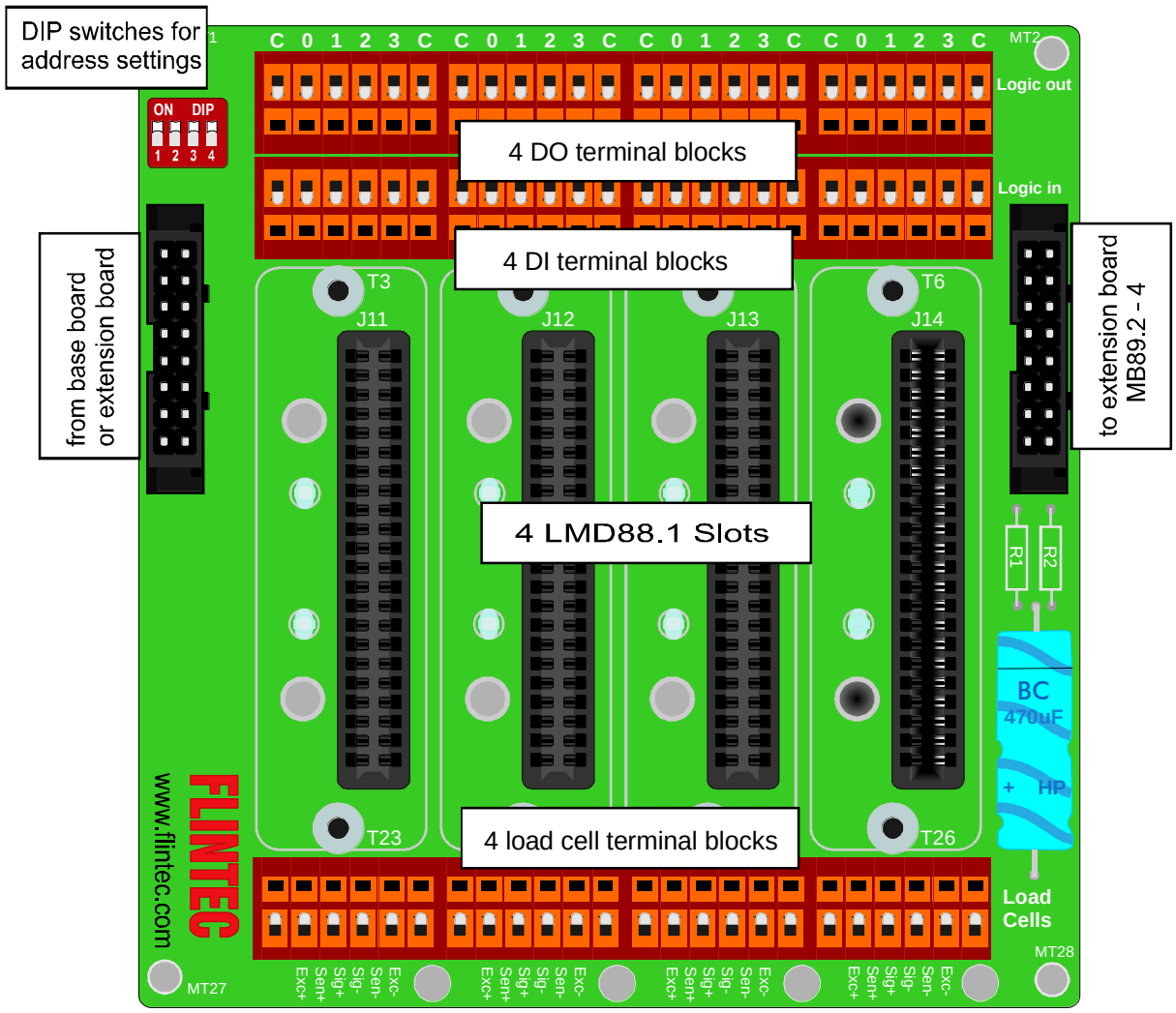
5.1 Base Board MB 89.1 for 1 Gateway and 2 LDM 88.x



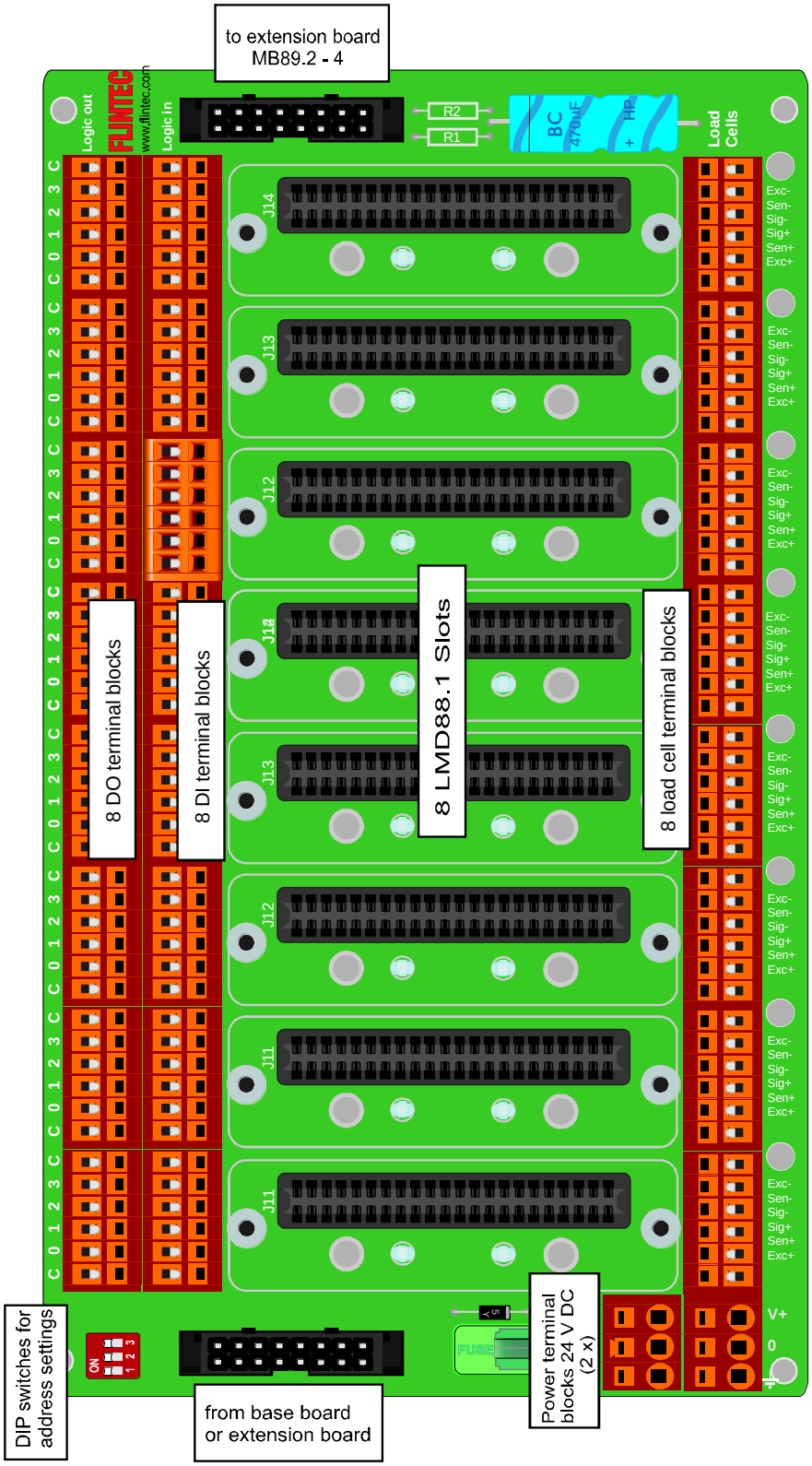
5.2 Extension Board MB 89.2 for 2 LDM 88.x



5.3 Extension Board MB 89.3 for 4 LDM 88.x

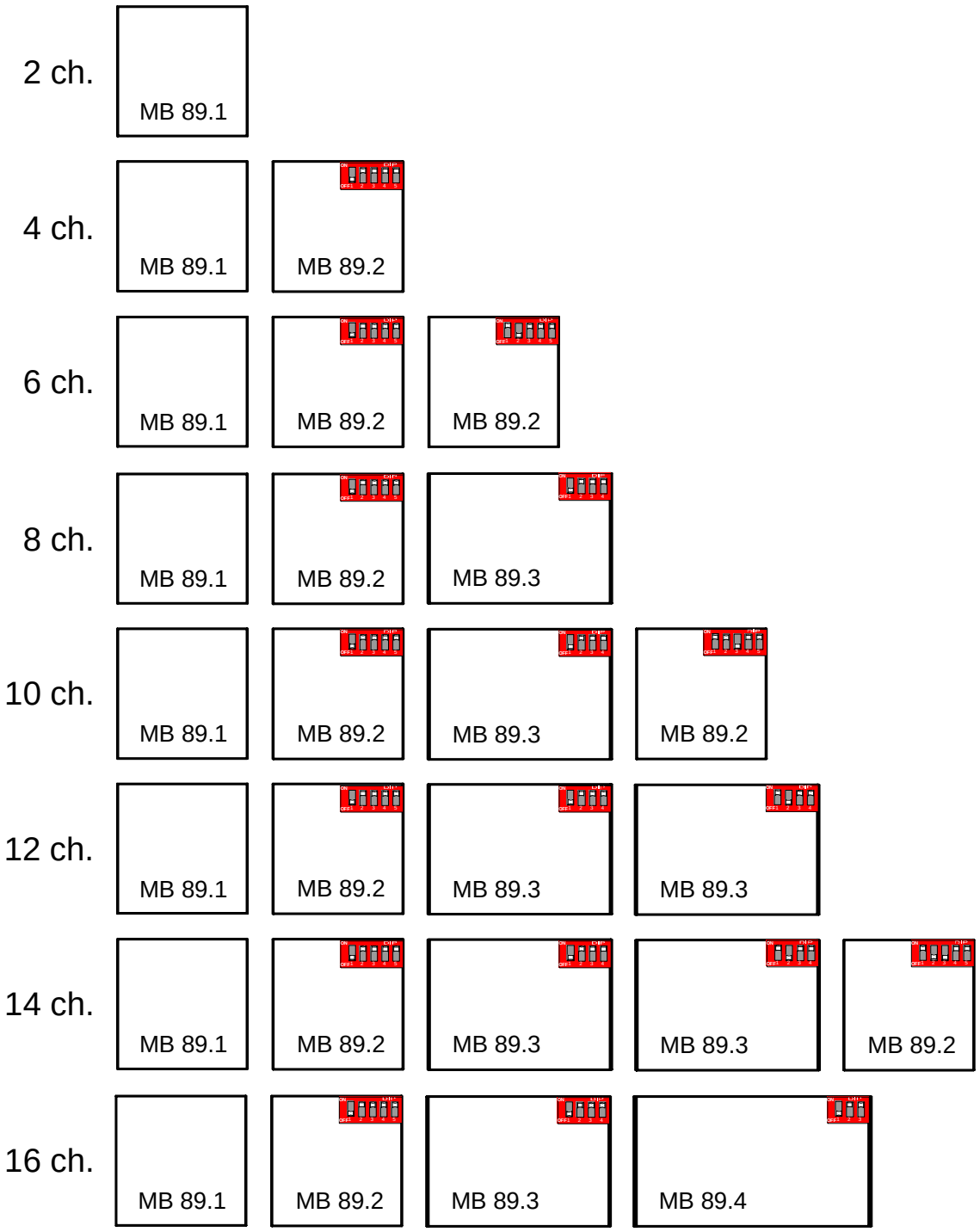


5.4 Extension Board MB 89.4 for 8 LDM 88.x



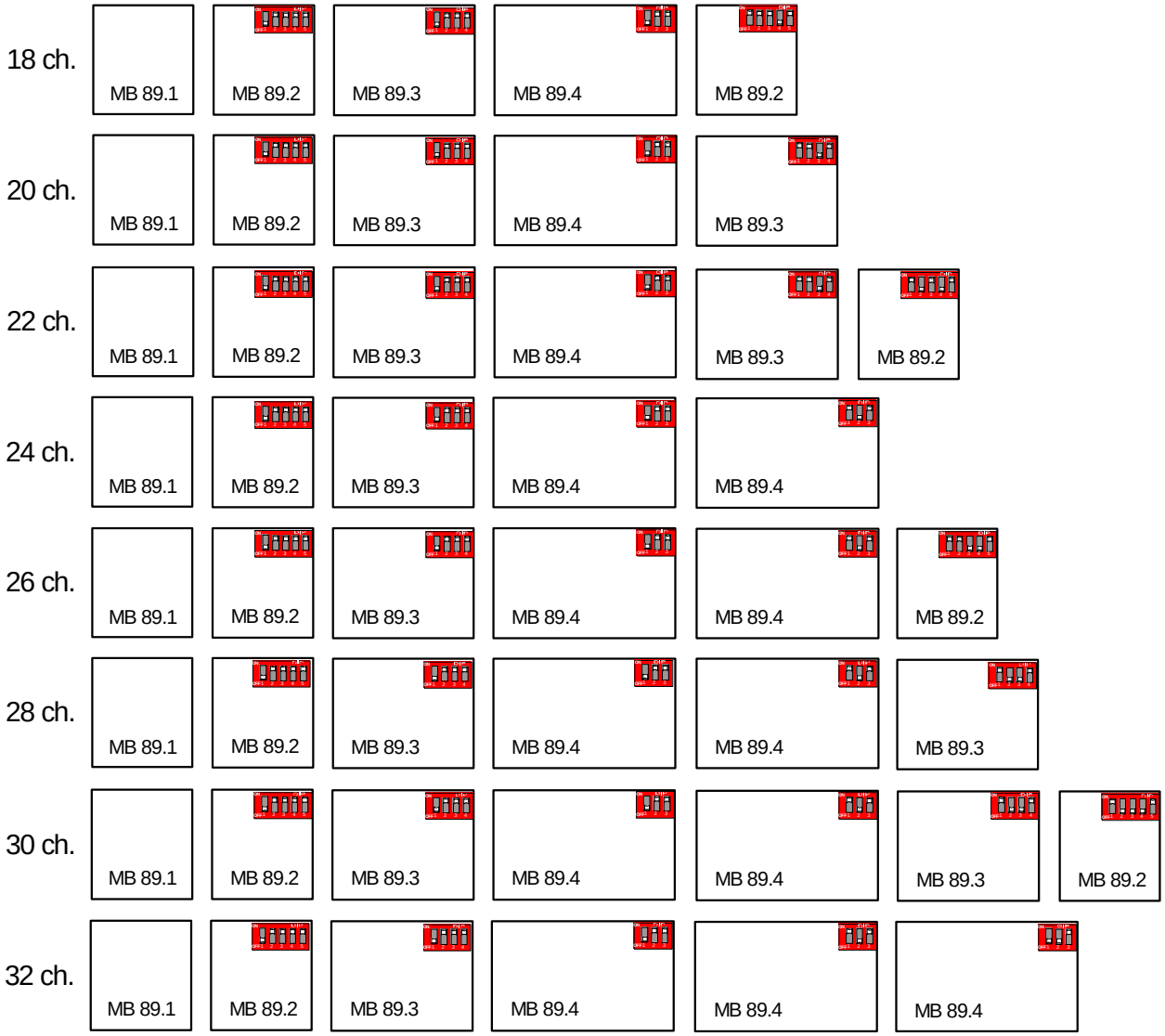
5.5 Address setup guide extension boards for 1 – 16 channels

DIP switch setting see table below



5.6 Address setup guide extension boards for up to 32 channels

DIP switch setting see table below



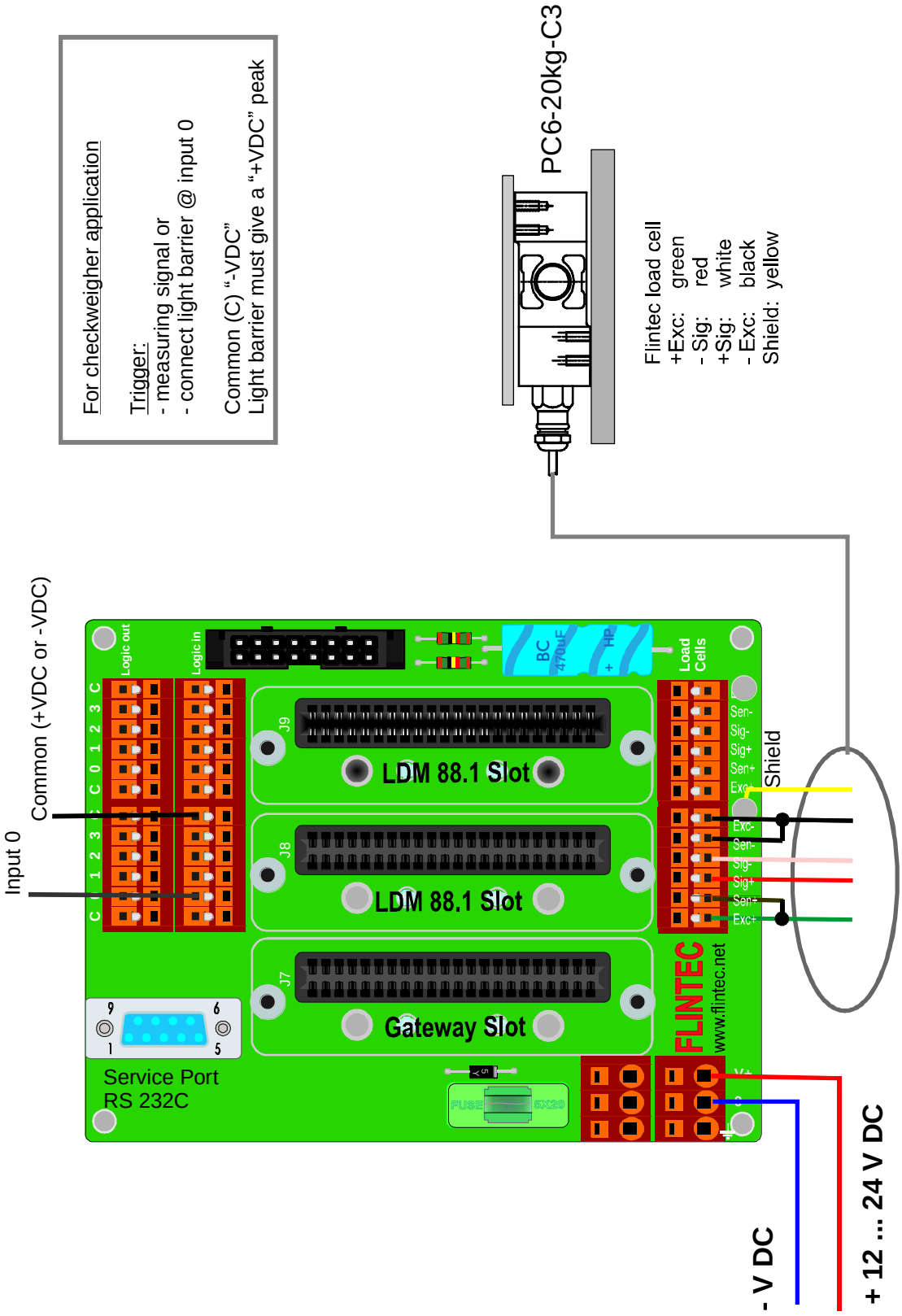
5.7 Board Combinations

	0	2	4	8	12 /16	20 / 24	28 / 32	36 / 40	44 / 48	52 / 56	60 /
02	MB89.1										
04	MB89.1	MB89.2									
06	MB89.1	MB89.2	MB89.2								
08	MB89.1	MB89.2	MB89.3								
10	MB89.1	MB89.2	MB89.3	MB89.2							
12	MB89.1	MB89.2	MB89.3	MB89.3							
14	MB89.1	MB89.2	MB89.3	MB89.3	*MB89.2*						
16	MB89.1	MB89.2	MB89.3	MB89.4							
18	MB89.1	MB89.2	MB89.3	MB89.4	MB89.2						
20	MB89.1	MB89.2	MB89.3	MB89.4	MB89.3						
22	MB89.1	MB89.2	MB89.3	MB89.4	MB89.3	*MB89.2*					
24	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4						
26	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.2					
28	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.3					
30	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.3	*MB89.2*				
32	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4					
34	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.2				
36	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.3				
38	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.3	*MB89.2*			
40	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.4				
42	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.4	MB89.2			
44	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.4	MB89.3			
46	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.4	MB89.3	*MB89.2*		
48	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4			
50	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4	MB89.2		
52	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4	MB89.3		
54	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4	MB89.3	*MB89.2*	
56	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4		
58	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4	MB89.2	
60	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4	MB89.3	
62	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4	MB89.3	*MB89.2*
64	MB89.1	MB89.2	MB89.3	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4	MB89.4	

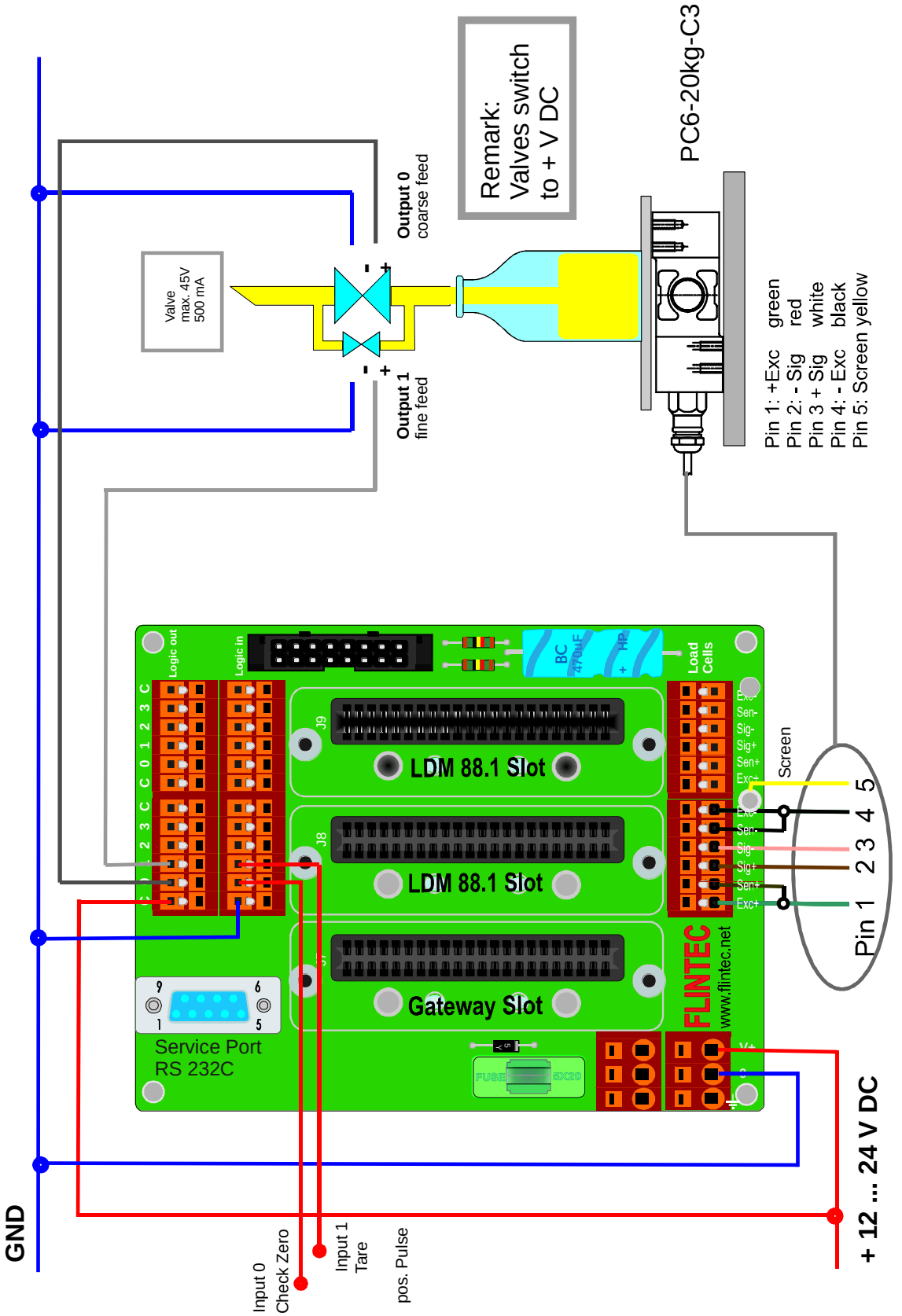
Switch Settings: SWn – SW1:

MB89.2					00110	01010	01110	10010	10110	11010	11110
MB89.2		00001	00010	00100	01000	01100	10000	10100	11000	11100	
MB89.3			0001	0010	0100	0110	1000	1010	1100	1110	
MB89.4				001	010	011	100	101	110	111	

5.8 Example Check Weigher Wiring



5.9 Example Liquid Filling Wiring

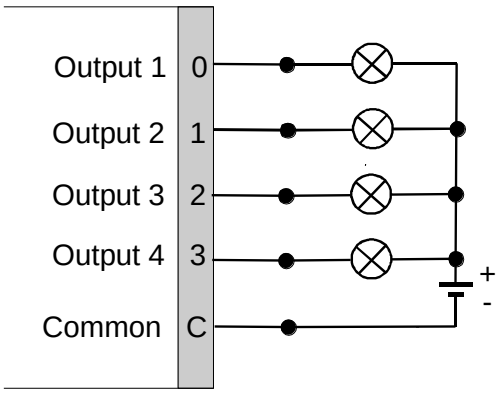


5.10 LDM 88.1 – Digital Input / Digital Output -

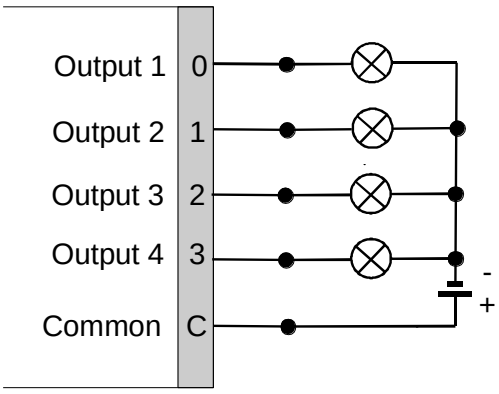
Outputs LDM 88.1

< 35 V DC / 500 mA or < 25 V AC / 500 mA (50/60 Hz)

Common is "**-**" V DC

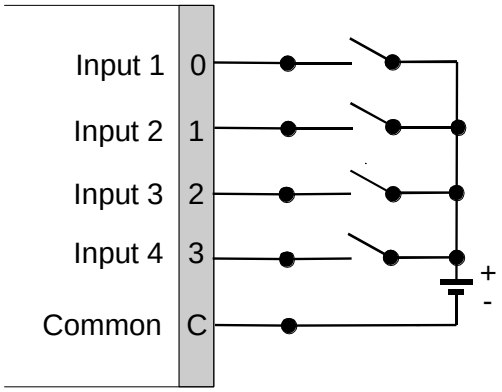


Common is "**+**" V DC



Inputs LDM 88.1

opto-isolated 10 ... 30 V DC, max. 3 mA



5.11 Firmware Versions

- LDM 88.183 for check weighing and dosing/filling of non fluid products
- LDM 88.184 for dosing/filling of fluids
- LDM 88.185 for mass flow, trend and totalizing of fluids/powder

3.1 DOP4 software for Windows OS

For an easy setup or as a service tool you can use the DOP4-Software. This software supports you for calibration, easy setup of all available commands, recording data over time and display the graphs.

For more details see separate manual.