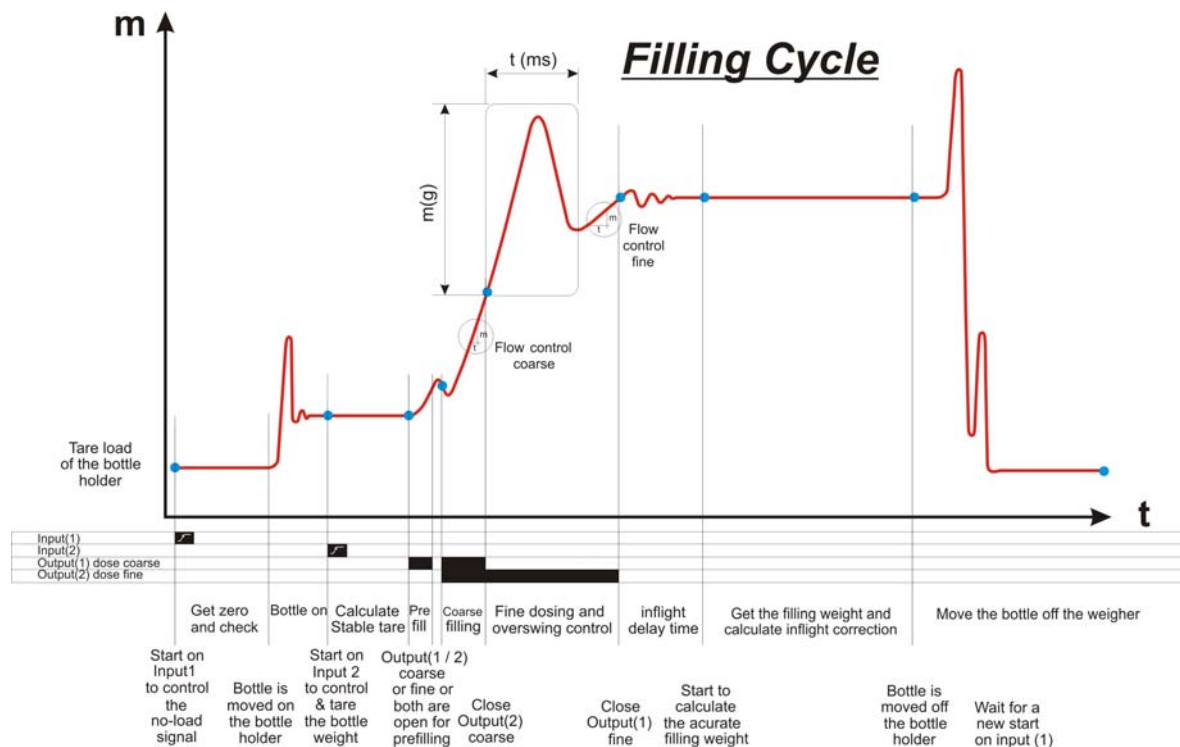


3.11 Filling Commands – PD1 to PD21, DI, SC, AC, GD, DT, SD, TR

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

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

The filling process is controlled by the dosing parameters. The parameters are related to the sections shown in the filling cycle.



The parameters for the filling process are read and set through the internal backplane by the 'Read/modify dose parameters' command.

The following commands enable the set-up and control of the built-in filling controller program. The program assumes that the coarse filling valve is connected to LDM 88.1 Output 0 and the fine filling valve is connected to Output 1. A rising edge on Input 0 will initiate the zero check function of the load cell (load cell OK) and a rising edge on Input 1 will initiate the filling cycle. **Note:** see additional **TR** command for soft triggering page 9.

DI Filling status [get: cmd 05, index __, value xxx]

Issuing the DI command, will return via DOP software a result in the format **I:000** (only low byte). [Profibus has both filling status bytes available.]

Master (PC / PLC) sends	Device responds	Result
DI	I:000	Status filling process
DI	I:068	- Dose program running - Tare out of range (no filling)

This result can be decoded according to the table below:

Low byte filling status	[high byte filling status]
0 Idle	0 Idle
1 Coarse valve open	256 Waiting for 2nd trigger
2 Fine valve open	512 Bottle on, calculating tare
4 Dose program running	768 Pre-filling
8 Not used	1024 Main Filling
16 Not used	1280 Fine Filling
32 Not used	1536 In-flight delay
64 Tare out of range – no filling this cycle	1792 Post fill calculations
128 Zero out of range	2048 Post Filling

SC Start cycle [set: cmd 34, index __, value __]

Issuing the **SC** command (which has no parameters), will start the filling cycle, i.e. the 'Dose program running' status bit will be set and the program will wait for a trigger pulse on input 0. If the load cell zero check function is not required, set PD3 to "0". The system then waits for a trigger pulse on input 1.

AC Abort cycle [set: cmd 01, index __, value __]

Issuing the AC command (which has no parameters), will abort the filling cycle immediately, i.e. the 'Dose program running' status bit will be reset, the valves will be shut off and the dosing program will stop.

GD Get the last dosed weight [get: cmd 11, index __, value xxx]

Issuing the GD command, will return the last dosed weight value in the format **D+01.100**.

Master (PC / PLC) sends	Device responds	Result
GD	D+01.100	Dosed weight 1.100 d

[The Profibus PLC has to monitor the qualifier field bits (byte 16 – 17, bit 13) and ask for the dosed weight when ready . The weight value will be the dosed weight if everything is OK, or zero if the filling was aborted internally, e.g. Bag Rupture.]

DT Get the last tare weight

[get: cmd 12, index __, value xxx]

Issuing the DT command, will return the last tare weight value recorded by the filling program, in the format **T+00.500** .

Master (PC / PLC) sends	Device responds	Result
DT	T+00.500	Tare weight 500 d

PDn Read/modify dosing parameters

Issuing the PD command with one parameter (PDn) will return the value of the n'th parameter in the format **P15:+00500**. Issuing the PD command with two parameters (PDn x) will change the n'th parameter to the value x.

Note: In this version of software all the parameters will be set to zero by the factory default (FD) command.

Available parameters:

“ _ ” means Space button on keyboard

PD1 Pre-fill mode

[get: cmd 06, index 01, value xxx]

[set: cmd 06, index 129, value xxx]

Available 1 st Pre-fill modes are:	Available 2nd Pre-fill modes are:
0 = No 1 st pre-filling	0 = No 2nd pre-filling
1 = 1 st Pre-filling with the coarse valve only	4 = 2 nd Pre-filling with the coarse valve only
2 = 1 st Pre-filling with the fine valve only	8 = 2 nd Pre-filling with the fine valve only
3 = 1 st Pre-filling with both valves	12 = 2 nd Pre-filling with both valves

Secondary pre-filling mode: add to the values of 1st pre-filling mode.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD1	P1:+00000	No pre-filling
PD1_2	OK	Pre-filling with fine valve only

PD2 In-flight correction

[get: cmd 06, index 02, value xxx]

[set: cmd 06, index 130, value xxx]

Correction factor for the in-flight value in percent. Range: 0 ... 50 %.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD2	P2:+00010	In-flight correction 10%
PD2_25	OK	Set In-flight correction to 25%

PD3 Average Time zero check load cell

[get: cmd 06, index 03, value xxx]
 [set: cmd 06, index 131, value xxx]

Time (in milliseconds = ms) during which the load cell zero check average is calculated.
 Range: 0 ... 65535 msec.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD3	P3:+00200	Average zero check over 200 ms
PD3_400	OK	Set zero check time to 400 ms

Note: By setting PD3 to 0 the zero check function of the load cell will be skipped, no pulse on input 0 is required.

PD4 Delay Time tare average

[get: cmd 06, index 04, value xxx]
 [set: cmd 06, index 132, value xxx]

Delay time between the trigger pulse being applied to input 1 and the start of tare averaging.
 Range: 0 .. 65535 msec.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD4	P4:+00200	Delay time tare average 200 ms
PD4_100	OK	Set delay time to 100 ms

PD5 Average Time tare weight

[get: cmd 06, index 05, value xxx]
 [set: cmd 06, index 133, value xxx]

Time during which the tare weight average is calculated. This function allows the correct tare value to be acquired although there may be a lot of vibrations on a (rotating) filling machine.
 Range: 0 ... 65535 msec.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD5	P5:+00300	Tare average time 300 ms
PD5_250	OK	Set tare average time to 250 ms

PD6 Delay time after pre-filling

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

Delay time at end of pre-filling, after valve(s) shut off. Range: 0 ... 65535 msec.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD6	P6:+00000	No delay time
PD6_250	OK	Set delay time to 250 ms

PD7 Blanking time after coarse valve shuts off [get: cmd 06, index 07, value xxx]
[set: cmd 06, index 135, value xxx]

After the coarse valve shuts off, a weight peak may occur because of a surge or splash of the product being filled. Range: 0 ... 65535 msec.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD7	P7:+00100	Blanking time is 100 ms
PD7_250	OK	Set blanking time to 250 ms

PD8 In-flight delay time after fine valve shuts off [get: cmd 06, index 08, value xxx]
[set: cmd 06, index 136, value xxx]

After the fine valve shuts off, a weight peak may occur because of a surge or splash of the product being filled. Range: 0 ... 65535 msec.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD8	P8:+00100	Delay time is 100 ms
PD8_250	OK	Set delay time to 250 ms

PD9 Dosed weight average time [get: cmd 06, index 09, value xxx]
[set: cmd 06, index 137, value xxx]

Time during which the filled weight average will be calculated. This function allows you to acquire the correct filled weight although there may be a lot of vibrations on a (rotating) filling machine. Range: 0 ... 65535 msec.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD9	P9:+00100	Average time is 100 ms
PD9_500	OK	Set average time to 500 ms

PD10 Zero tolerance

[get: cmd 06, index 10, value xxx]
[set: cmd 06, index 138, value xxx]

Load cell zero tolerance check (in increments). This is the allowable deviation from the unloaded load cell zero (no bottle or box). If the unloaded load cell zero is outside this window, the filling process will not start. With this function you can easily check to see if a load cell has been over-loaded. Range: 0 ... 99999 increments.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD10	P10:+00100	Load cell zero check tol. is 100 d
PD10_5000	OK	Set tolerance to 5000 d

Example: PD10_5000 means that the zero point of unloaded load cell must be within the window ± 500.0 g relative to the reference zero [when cal. 1 kg = 10.000 increments].

PD11 Tare reference weight

[get: cmd 06, index 11, value xxx]
[set: cmd 06, index 139, value xxx]

Tare reference weight (in increments). This is the nominal weight of the empty bottle/box. Range: 0 ... 99999.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD11	P11:+00400	Tare reference weight is 400 d
PD11_230	OK	Set tare reference to 230 d

Example: PD11_230 means the reference tare weight is 23.0 g [when cal. 1 kg = 10.000 increments].

PD12 Tare weight tolerance

[get: cmd 06, index 12, value xxx]
[set: cmd 06, index 140, value xxx]

Tare weight tolerance (in increments). This is the allowable deviation of the tare weight (bottle or box). If the tare weight value is outside this window the filling process will not start. Range: 0 ... 99999.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD12	P12:+00020	Tare weight tolerance is 20 d
PD12_50	OK	Set tare tolerance to 50 d

Example: PD12_20 means the deviation of tare weight is 2.0 g [when cal. 1 kg = 10.000 increments].

PD13 Pre-fill level 1st set-point

[get: cmd 06, index 13, value xxx]
 [set: cmd 06, index 141, value xxx]

Pre-fill level (in increments). This is the weight value required at the end of the 1st pre-filling process. Range: 0 ... 99999.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD13	P13:+00500	Pre-filling level is 500 d
PD13_750	OK	Set pre-filling to 750 d

Example: PD13_750 means pre-filling with 75.0 g [when cal. 1 kg = 10.000 increments].

PD14 Fine-fill weight

[get: cmd 06, index 14, value xxx]
 [set: cmd 06, index 142, value xxx]

Fine-fill weight (in increments). This is the part of the total filling weight carried out by the fine filling valve. Range: 0 ... 99999.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD14	P14:+00500	fine-fill weight is 500 d
PD14_1000	OK	Set fine-fill weight to 1000 d

Example: PD14_1000 means fine filling with 100.0 g [when cal. 1 kg = 10.000 increments].

PD15 Filling weight

[get: cmd 06, index 15, value xxx]
 [set: cmd 06, index 143, value xxx]

This is the target filling weight (in increments). Range: 0 ... 99999.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD15	P15:+04000	filling weight is 4000 d
PD15_5000	OK	Set filling weight to 5000 d

Example: PD15_5000 means total filled weight is 500.0 g [when cal. 1 kg = 10.000 increments]

Remark: Coarse filling weight is automatically calculated as the result of:
filling weight minus fine filling weight minus in-flight weight.

PD16 In-flight weight

[get: cmd 06, index 16, value xxx]
 [set: cmd 06, index 144, value xxx]

In-flight weight (in increments) is the weight falling into the container after the fine valve shuts off. Range: 0..99999.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD16	P16:+00108	In-flight weight is 108 d
PD16_200	OK	Set in-flight weight to 200 d

Example: PD16_108 means an In-flight weight value of 10.8 g [when cal. 1 kg = 10.000 increments].

Note: Refer to the correction factor PD2, the shut off setpoint for the fine valve will be optimized for the next filling cycle etc..

PD17 Pre-fill level, 2nd set-point

[get: cmd 06, index 17, value xxx]
 [set: cmd 06, index 145, value xxx]

Pre-fill level (in increments). This is the weight value required at the end of the 2nd pre-filling process. Range: 0 ... 99999.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
PD17	P17:+00550	Sec. pre-filling level is 550 d
PD17_750	OK	Set sec. pre-filling to 750 d

Example: PD17_750 means a secondary pre-fill level of 75.0 g [when cal. 1 kg = 10.000 increments].

PD18 Filling timeout value

[get: cmd 06, index 18, value xxx]
 [set: cmd 06, index 146, value xxx]

The LDM subtracts the various delays and average times (P3..P9) from the timeout period 'PD18' and uses the 'remaining' fill time and Fill-weight to calculate a minimum filling slope. If the weight doesn't stay between this minimum slope and twice the minimum slope the LDM aborts the filling cycle and reports a filling failure. The Filling cycle will also be aborted if the timeout value P18 expires.

Master (PC / PLC) sends	Device responds	Result
PD18	P18:+02000	Timeout is 2000 ms
PD18_3000	OK	Set timeout to 3000 ms

Note: If P18 = 0, the timeout is disabled.

PD19 Underweight post-fill time

[get: cmd 06, index 19, value xxx]
 [set: cmd 06, index 147, value xxx]

If the averaged dosed value is less than the required weight this parameter controls the post fill time in milliseconds. After a post-fill the dosed weight is recalculated. If this parameter is zero no post filling occurs.

Master (PC / PLC) sends	Device responds	Result
PD19	P19:+00080	Post-fill time is 80 ms
PD19_100	OK	Set post-fill time to 100 ms

Note: If P19 = 0, the post filling is disabled.

PD20 Tare interval

[get: cmd 06, index 20, value xxx]
 [set: cmd 06, index 148, value xxx]

In some cases where the object being filled is not a new bottle, but say a box that is being emptied after each fill, the tare function is not necessary in every filling cycle. When parameter 20 is 0 (zero) taring only takes place in the very first filling cycle. When parameter 20 is 1 (one, default) the taring takes place in every filling cycle. Otherwise parameter 20 can be set to the number of filling cycles which have to occur before a tare measurement is taken again.

Master (PC / PLC) sends	Device responds	Result
PD20	P20:+00001	Tare each filling cycle
PD20_100	OK	Set tare at each 100 th filling cycle

Example: PD20_100 means next tare after 100 filling processes.

PD21 Bag Rupture Blanking

[get: cmd 06, index 21, value xxx]
 [set: cmd 06, index 149, value xxx]

The control of filling slope is disabled for P21 milli-seconds from opening the coarse valves to allow oscillation on the weight during the first part of the filling.

Master (PC / PLC) sends	Device responds	Result
PD21	P21:+00200	Filling slope disabled for 200 ms
PD21_500	OK	Set fill. slope disabled for 500 ms

SD Save the dosing setup parameters

[set: cmd 28, index __, value \$08]

With this command the settings of the “Dosing Parameters” will be saved in the EEPROM.

Request / Setting

Master (PC / PLC) sends	Device responds	Result
SD	OK	Dosing parameters saved
SD	ERR	Error

TR Trigger

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

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

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

Note: This function can be used as a soft trigger to start a filling process (firmware 88.184)

[The Profibus PLC has to monitor the qualifier field bits (byte 16 – 17, bit 13) and ask for the dosed weight when ready. The weight value will be the dosed weight if everything is OK, or zero if the filling was aborted internally, e.g. Bag Rupture.]

3.11.1 Filling Process

The filling process is started by a 'Start cycle' command from the Profibus gateway once the LDM 88.1 filling parameters have been loaded.

Once started, the filling process can be either waiting for a trigger or be in the process of filling. While waiting for the trigger, the filling cycle can be started by a 'Trigger' command. If a 'Trigger' is sent while filling is in progress the LDM 88.1 will respond with a 'Not ready' message.

If PD5 isn't zero the LDM will wait PD4 milliseconds before determining the tare weight by averaging the weight for PD5 milliseconds.

If PD5 is zero a tare of zero will be used, and no tare phase takes place.

If PD1 is not zero the LDM will pre-fill in the mode as set by PD1 until the weight reaches PD13, then a second pre-fill takes place until the weight reaches PD17. Then if PD6 is not zero the LDM88.1 will turn off the valves and wait PD6 milliseconds.

Then the LDM 88.1 enter the main filling phase with both valves opened until "PD15-PD14", where the coarse valve will be closed, and fine-filling will continue until target weight PD15, where all valves are closed (if the coarse valve has been closed by external command, fine-filling will just continue anyway: the fine fill will just have started somewhat earlier).

After the filling is complete the actual dosed weight is measured by averaging the weight for PD9 milliseconds, and a difference from the actual desired weight is calculated and used to fine-tune the cut-off setting for the fine-fill phase. If PD19 is not zero and the dosed weight is less than the desired filling weight then the fine filling is resumed for PD19 milliseconds and the new dosed weight is averaged. The post fill step will be repeated until the measured weight is higher than or equal to the desired filling weight. The new weight is not used in the calculation of the in-flight value. The Profibus PLC has to monitor the qualifier field bits (byte 16 – 17, bit 13) and ask for the dosed weight when ready.

The filling cycle can be aborted at any time. The **AC** command terminates the filling process completely. After that you must issue a **SC** command before you can trigger another filling.

Whilst any valves are open the filling rate is monitored according to which valves are actually open. If a direct command alters the valve state, the monitoring changes its internal control slope according to the new setting. In this way the Profibus master (PLC) may introduce different filling algorithms while still maintaining monitoring of the filling slope.

In the post-fill situation the LDM 88.1 checks that the weight actually increases.