

18.6 Bolus Calculation

The bolus advice feature calculates your insulin doses based on different pieces of information. Examples:

- ▶ Your current blood glucose result
- ▶ Your current blood glucose target value
- ▶ Your current insulin sensitivity
- ▶ Your estimated carbohydrate amount for a meal
- ▶ Your current carbohydrate ratio
- ▶ Your current health events
- ▶ Correction insulin that is still acting in the body
- ▶ Your bolus and/or meal history

Consider the following information when calculating bolus advice:

- ▶ How you are currently feeling: It may happen that the values entered when setting up bolus advice do not match how you are currently feeling. Increase or decrease the suggested bolus amount according to your current needs.
- ▶ Bolus amounts and meals that were delivered or consumed, but not entered in the diabetes manager.
- ▶ If you have delivered a bolus without using bolus advice, you can manually enter the bolus information in the electronic logbook. It is important that you enter bolus and carbohydrate information in the logbook in order to obtain accurate bolus advice recommendations.

18.6.1 Meal Bolus

A meal bolus is the amount of insulin that needs to be delivered to compensate for the amount of carbohydrates you are planning to eat. If you are planning to eat several meals or snacks within a short period of time, you should deliver a meal bolus for each meal.

The carbohydrate ratio is specified in insulin units (U) per carbohydrate amount, for example, 1 U : 12 g.

Calculation:

Meal bolus = carbohydrate amount x carbohydrate ratio

Example

Carbohydrate amount: 63 g carbohydrate ratio: 1/12

Meal bolus = $63 \text{ g} \times 1/12 = 5.25 \text{ U}$

18.6.2 Correction Bolus

If your current blood glucose level does not match your blood glucose target value, a correction bolus is suggested. The correction bolus calculation is based on your current blood glucose result and your insulin sensitivity in the current time block.

Calculation:

(Current BG - target BG) x insulin sensitivity

Example

Current BG: 8.3 mmol/L

Target BG: 6.1 mmol/L

Insulin sensitivity: 0.033 (calculated from 1 U : 1.7 mmol/L)

Correction bolus = (8.3 mmol/L - 6.1 mmol/L) x 0.033 = **1.3 U**

18.6.3 Correction Bolus After a Meal

After a meal, it is normal for your blood glucose level to increase even if you delivered the correct meal bolus. The allowed increase in the blood glucose level is called *meal rise*. After a certain period of time, the so-called *offset time*, the blood glucose level decreases slowly until it has returned to the target level. The period of time from the start of the meal rise until your blood glucose level has returned to its target level, is defined as *acting time*.

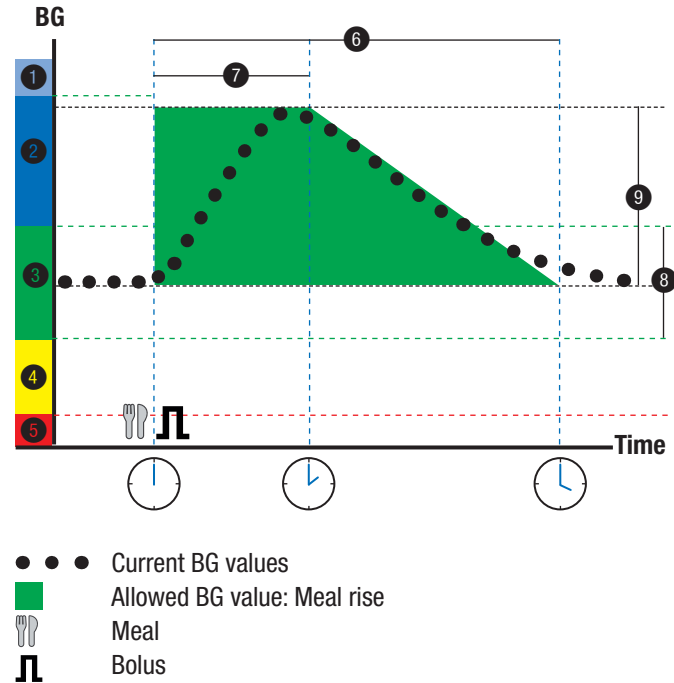
During this time, a correction bolus is only recommended if the increase in your blood glucose level exceeds the allowed meal rise value.

Bolus Advice Graph

The dotted line in the adjacent graph shows how your blood glucose level might change after a meal bolus. Bolus advice tolerates an increase in your blood glucose level within the allowed meal rise range (green). If your blood glucose result is within the green range, a correction bolus will not be recommended. If your blood glucose result is above the green range, a correction bolus will be recommended.

If you enter a carbohydrate amount that is greater than the snack size, the meal rise is added to the current blood glucose value. If no current blood glucose value is available, the meal rise is added to the blood glucose target value. The snack size is a small amount of carbohydrates (maximum 24 grams). A meal rise will only be taken into account if the snack size is exceeded. Since the meal rise is not taken into account when calculating bolus advice for meals up to the snack size, an increase in the blood glucose result above the target range is not tolerated after eating a snack.

The shape of the meal rise (the width of the green area) is determined by the offset time and the acting time.



- ① Hyperglycaemia (hyper)
- ② Above target range
- ③ Within target range
- ④ Below target range
- ⑤ Hypoglycaemia (hypo)

- ⑥ Acting time
- ⑦ Offset time
- ⑧ Target range
- ⑨ Meal rise

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Glossary

Term	Definition
Acting time	The period of time from the start of bolus delivery until the point in time when the blood glucose level is expected to return to the target range.
Active insulin	A calculated value representing the amount of insulin currently in the body that was delivered to lower the blood glucose level. This value does not include any insulin amounts that were delivered to compensate for carbohydrate intake.
Alarm clock	Audible or vibrating (silent) notification indicating a reminder.
Automatic off	The automatic off feature stops insulin delivery if you have not touched any keys on the micropump or not established a <i>Bluetooth</i> wireless connection to the pump for the selected number of hours.
Basal rate	The basal rate is the insulin amount delivered per hour to cover your meal-independent insulin needs. In insulin pump therapy, your basal rate is determined together with your healthcare team and can be adjusted to meet your individual physiological needs that can change as the day progresses.
Basal rate profile	The Accu-Chek Solo micropump offers you up to 5 different basal rate profiles in order to easily adjust insulin delivery to meet your changing insulin needs (for example, during the week compared to at the weekend). A basal rate profile consists of up to 24 basal rates.
BG threshold	The lower and upper BG thresholds define the target range. The upper BG threshold can be used for test reminders after a high blood glucose result. The lower BG threshold can be used for test reminders after a low blood glucose result.
Blood glucose (BG)	The blood glucose level

Glossary

Term	Definition
Blood glucose result	Result of a blood glucose test.
<i>Bluetooth</i> ® wireless technology	Wireless transfer technology that digital devices use to exchange data.
Bolus	The insulin amount required to cover the intake of food and correct an elevated blood glucose level. The bolus amount is determined by your healthcare team's guidelines, your blood glucose level, your eating behaviour and your physical activity.
Bolus advice	When enabled, bolus advice provides the user with suggestions as to how much insulin should be delivered for a meal and/or to correct the blood glucose level.
Bolus advice options	Factors that influence bolus advice calculation, including meal rise, snack size, acting time and offset time.
Broteinheit (Bread Equivalent) (BE)	One of the 4 units for the carbohydrate amount that you can select when setting up the micropump system. 1 BE = 12 grams of carbohydrates
Carbohydrate Choice (CC)	One of the 4 units for the carbohydrate amount that you can select when setting up the micropump system. 1 CC = 15 grams of carbohydrates
Carbohydrate ratio	Insulin amount required to compensate for a certain amount of carbohydrates.
Carbohydrate unit (KE)	One of the 4 units for the carbohydrate amount that you can select when setting up the micropump system. 1 KE = 10 grams of carbohydrates
Carbohydrates	Carbohydrates are nutrients that are broken down into sugar during digestion and increase blood glucose. Carbohydrates are generally counted to calculate a bolus insulin dose.

Term	Definition
Control result	The value displayed on the diabetes manager after a control test. If the control result is within the range shown on the label of the test strip container, the test strips and the meter unit of the diabetes manager are working properly.
Control test	A meter test using control solution that lets you know whether the meter unit of the diabetes manager and the test strips are working properly.
Current time	The time you set via the <i>Settings</i> menu on the <i>Date and time</i> display.
Delivery lag time	Period of time before delivery of a programmed bolus begins.
End time	Time at which a time block ends.
Error	An error message indicates that the micropump system is not working properly at the moment. After the micropump has issued an error message, it switches to Stop mode.
Extended bolus	A bolus delivered over a certain period of time. This can be helpful during long meals or for meals that are digested slowly.
Factory settings	The initial settings on the micropump system before you change or customise them.
Flight mode	Setting that deactivates all wireless communication of the micropump system. Turn on flight mode when you are in an aeroplane or in other situations where radio connections are not allowed or not desirable. Exchanging data between the diabetes manager and the micropump is not possible in flight mode.
Gram	One of the 4 units for the carbohydrate amount that you can select when setting up the micropump system.

Glossary

Term	Definition
Health event	Information on your current state of health or your activities. Each state of health or activity (health event) stands for a certain percentage according to your settings and is used to adjust bolus advice recommendations. Up to 4 health events can be selected and stored with a blood glucose result.
HI	Appears on the screen when the test result is above the diabetes manager's measurement range. HI stands for high.
Hyper	Hyperglycaemia
Hypo	Hypoglycaemia
Immediate amount	Insulin amount that is delivered at the beginning of a multiwave bolus and corresponds to a standard bolus.
Infusion site	Site at which the cannula is inserted into the subcutaneous tissue for insulin delivery.
Insulin	Insulin is a hormone that is necessary to process glucose. Insulin is produced in the beta cells of the pancreas.
Insulin analogue	Insulin type whose chemical structure was changed specifically. Some insulin analogues act more quickly than regular insulin.
Insulin increment	The amount in units (U) by which your insulin dose is adjusted when programming a bolus or when making a manual logbook entry.
Insulin sensitivity	Insulin amount required to lower the blood glucose level by a certain value.
LO	Appears on the meter when the test result is below the meter's measurement range. LO stands for low.

Term	Definition
Maintenance	Maintenance messages are issued when the micropump system requires you to take action to maintain or restore its functionality.
Meal rise	Increase in the blood glucose level during or after a meal that is considered normal, even if a bolus was delivered.
Multiwave bolus	Bolus that combines a standard bolus with an extended bolus. A part of the bolus amount is delivered immediately, whereas the other part is delivered over a specified period of time.
Occlusion	An occlusion prevents the insulin from flowing correctly from the micropump into your body.
Offset time	The amount of time before the insulin starts to lower your blood glucose level.
Paired	The diabetes manager and the micropump communicate with each other and transfer information to each other when they are paired.
Pen/syringe bolus	A bolus delivered using an insulin pen or syringe.
Quick bolus	Bolus that is programmed and delivered using the quick bolus buttons on the micropump.
Regular insulin	Insulin that has the same chemical structure as insulin produced by the human pancreas. Regular insulin usually needs 30 to 45 minutes to take effect.
Reminder	When this feature is enabled, the meter reminds you to test your blood glucose, to retest your blood glucose, or of an event, a task or a planned activity.
Settings	Settings are individually adjustable values and parameters that define the way the micropump system works.

Glossary

Term	Definition
Snack size	A small amount of carbohydrates (maximum 24 g) that is to be compensated for by delivering a bolus, but for which no significant meal rise is expected. After a snack, a correction bolus is suggested for each blood glucose value that exceeds the target range or the maximum blood glucose value currently permitted.
Snooze	Reschedules a reminder or message to reoccur after a preset period of time (for example, after 15 minutes).
Standard bolus	Bolus for which the micropump delivers the insulin as quickly as possible.
Standard deviation (SD)	In this User's Manual, standard deviation indicates how the blood glucose results are scattered in relation to the BG average. If the blood glucose results are close to the BG average, the standard deviation is small.
Start time	The start time of a time block.
Stop mode	When your micropump is in Stop mode, it does not deliver any insulin. Insulin delivery is only stopped if you switch to Stop mode, change the basal rate profile, make settings using a PC or when certain error or maintenance messages are issued. Ongoing boluses or Temporary Basal Rates are interrupted when the micropump switches to Stop mode.
Target range	The upper and lower BG thresholds considered acceptable when fasting or before a meal, as set by your healthcare professional.
Temporary Basal Rate (TBR)	Temporary increase or decrease in your basal rate profile to match changing insulin needs due to increased or decreased activity level, illness or stress.
Time block	Time blocks help you to set the target range and parameters for bolus advice for certain times of day. Up to 8 time blocks can be specified.

Term	Definition
Time of test	Information on the point in time when a blood glucose result was obtained. The information can be stored together with a blood glucose result. When the results are subsequently analysed, either all test results can be displayed or only the test results for a specific time of test.
Total daily dose	The total amount of insulin (basal rate plus boluses) delivered in a 24-hour period, beginning at midnight.
U100	U100 indicates the insulin concentration. Each millilitre of liquid contains 100 units of insulin
Unit (U)	International Unit (IU); unit of measurement for insulin
Warning	Describes situations that require your attention and indicate a potentially dangerous situation. The micropump system issues a warning shortly before your intervention will be required.
Warning limit	A limit value set in the diabetes manager. When your blood glucose result is above or below the hyper or hypo warning limit, a warning is displayed. You should set the hyper and hypo warning limits together with your healthcare professional.

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