

Full Closed Loop (FCL) using autoISF .. V2.6

in green: missing parts (texts, or software features not included in autoISF vet)

0. Introduction

1. Pre-Requisites for Full Closed Loop

- 1.1 Well tuned hybrid closed loop
- 1.2 Fast insulin
- 1.3 Reliable insulin delivery from pump and cannula
- 1.4 Excellent CGM
- 1.5 Meal-related limitations
- 1.6 Lifestyle-related limitations
- 1.7 Time required for setting-up

[Case study 1.1: Occlusion](#)

[Case study 1.2: Comparing insulins for FCL](#)

[Case study 1.3: Jumpy CGM](#)

[Case study 1.4: Lost pump connection](#)

[Case study 1.5: Permanent CGM values w/ 2x G6](#)

2. General Settings for Full Closed Loop

- 2.1 Range Extension (smb_max_range_extension)
- 2.2 Max and Min autoISF Ratio (autoISF_min / autoISF_max)
- 2.3 SMB Delivery Ratio (smb_delivery_ratio)
- 2.4 iobTH (iob_threshold_percent)
- 2.5 Eating Soon TT ?

3. Description of autoISF 3.0 Features

- 3.1 Overview
- 3.2 ISF modulation flowcharts
- 3.3 dynamic iobTH and exercise button
- 3.4 Automation options with autoISF parameters
- 3.5 Activity monitor
- 3.6 Using one-minute CGM (Libre 3)

4. Meals: Setting ISF_weights in AAPS/Preferences

- 4.1 Getting started
- 4.2 bgAccel_ISF_weight
- 4.3 pp_ISF_weight
- 4.4 bgBrake_ISF_weight
- 4.5 dura_ISF_weight
- 4.6 Tuning your initial settings
- 4.7 Complex scenarios
- 4.8 [Profile helper](#)

[Case study 4.1: Pizza](#)

[Case study 4.3: Hands-off FCL around Christmas](#)

5. Temp. Modulation of autoISF Aggressiveness

5.1 Automatic modulation of loop aggressiveness

- 5.1.1 autoISF off outside of meal windows
- 5.1.2 SMB off @ odd profile target
- 5.1.3 SMB off @ odd temp. target
- 5.1.4 Automatic diff. of FCL aggressiveness via Automations
- 5.1.5 Automatic diff. of FCL aggressiveness via Activity Monitor
- 5.1.6 Pro/con completely hands-off FCL

5.2 Manual modulation of FCL aggressiveness via DIY cockpit

- 5.2.1 Status recognition
- 5.2.2 Manual interventions from DIY cockpit
 - 5.2.2.1 Temp. %profile or TT settings
 - 5.2.2.2 Temp. settings in /preferences
 - 5.2.2.3 Grey DIY cockpit buttons for pre-programmed FCL responses
- 5.2.3 Temporary exit from FCL

5.3 Manual modulation of FCL aggressiveness via improved cockpit

- 5.3.1 [Violet FCL icon and underlying buttons](#)



58	5.3.2 Bottom buttons “insulin” etc.
59	5.3.3 Top three fields
60	5.3.3.1 TT dialogue field
61	5.3.3.2 Exercise button / dialogue field
62	5.3.3.3 Profile dialogue field
63	5.4 Recognizing loop state from the AAPS home screen
64	5.4.1 Color scheme (grey/yellow) of the top 3 fields (profile, exercise, TT)
65	5.4.2 Info on the top 3 fields (profile, exercise, TT)
66	5.4.3 FCL related indicator fields
67	5.4.4 Overall AAPS home screen
68	Case study 5.2: Sweet snacks / Glühwein w/ DIY cockpit
69	6. Temp. Modulation for Exercise and light (In-)Activity
70	6.1 Dynamic iobTH and sensitivity ratio
71	6.1.1 Manual (direct) iobTH modulation
72	6.1.2 Automations for iobTH modulation
73	6.1.3 Dynamic iobTH
74	6.2 Temp. % profile switch
75	6.3 DIY cockpit based on User action Automations
76	6.4 Improved FCL cockpit
77	6.4.1 Manual (direct) iobTH modulation
78	6.4.2 pre-set 4 kinds of exercise
79	6.4.3 optional meal pre-sets
80	6.4.4 optional hypo management pre-sets
81	6.5 Mastering the exercise after meal challenge
82	6.5.1 Manual mode
83	6.5.2 DIY cockpit button for User action Automation
84	6.5.3 Using pre-sets in improved FCL cockpit
85	6.6 Activity monitor based on stepcounter
86	Case study 6.2 Biking day with hi carb lunch; DIY cockpit
87	7. Kids: Mastering additional Challenges (fragment, to be completed NN)
88	8. Performance Monitoring and Tuning
89	Case study 8.2: Futility of tuning based on 1 extreme meal
90	9. Trouble Shooting
91	10. Emulator on PC to Determine Settings (fragment, to be completed NN)
92	10.1 Logfile Analysis
93	10.2 What-if investigations
94	11. Emulator on the Smartphone (fragment, to be completed NN)
95	11.1 AAPS home screen access to table, chart of ISF contributors for last 3 hours
96	11.2 „what-if“: Real time alternative suggestions with speech synthesis)
97	12. Remarks for Users of previous autoISF Versions
98	13. Other Avenues to Full Closed Loop
99	13.1 FCL using AAPS Master and Automations
100	Case study 13.1: Comparison 1 mo FCL Automation vs autoISF
101	13.2 dynamicISF used for Full Closed Loop
102	Case study 13.2: Using dynISF for FCL (NN)
103	13.3 Methods involving simple Meal Announcement that might be stretched into a FCL
104	13.3.1 Boost
105	Case study 13.3: Boost-based FCL for a child
106	13.3.2 AIMI,
107	13.3.3 EatNow
108	13.3.4 Tsunami
109	13.4 No-bolus Looping with precise Carb Inputs
110	13.5 Machine Learning (AI)
111	13.6 Dual Hormone Systems

0. Introduction

V.2.6



Exploring Full Closed Loop potential of-autoISF

Disclaimer – Important to read and understand

Authors are no medical professionals but T1 diabetics (or parents of a T1D child) who report their - limited - understanding and experience, in an effort to contribute to a growing body of knowledge, and to facilitate development of patient centered solutions.

Nothing in this site is medical advice, but meant to stimulate patient-driven self-responsible research, and is meant also to stimulate product developments by the medical industry. Anything you try to conclude for yourself you do on own risk. **This is by no means a medical product but what is offered is a toolset for participating in development.**

Never copy what others report to use, but **investigate and adjust to your data**. Neglecting safety instructions, and just using the “buttons” that are made available in a supposed “learning by doing” mode, would be very dangerous with the early development stage tools this research paper is about.

In case you choose to get deeper involved, **run the system disconnected**, parallel to your current glucose management, to learn its behavior before eventually considering (on own risk) to go any further. Please stay connected and share experiences, too.

Introduction

Full Closed Loop using Automations is represented in AAPS Master and in the related readthedocs since autumn 2023. (<https://androidaps.readthedocs.io/en/latest/Usage/Full-ClosedLoop.html>).).

Pre-requisites and the principal function of a Full Closed Loop, *without the user ever giving a bolus and without entering any carb info* are explained, also in a couple of other languages, there.

The essential points are summarized also below, in [section 1](#).

autoISF is being developed as a much more **sophisticated alternative for FCL**, aiming at **higher %TIR performance and/or higher degree of daily „freedom“** than simpler approaches to FCL could provide.

However, this demands much higher degree of involvement by the user. **Setting up your FCL is a very serious multi-week project, and it is important that you follow us through the material in the sequence of suggested steps.**

Of note, parts of this paper **marked in green color**, notably sections 5.3 and 6.4 describing functions of the "improved FCL cockpit" **are not implemented at launch** because development focus had to be on more core functions. For most of these "missing elements", work arounds are described, often involving a similarly ease to use (but requiring some extra work in your set-up) DIY FCL cockpit (see [section 5.2](#) and [6.3](#) and [case studies 5.2](#) and [6.2](#))

With autoISF, and especially with the intention to use it for Full Closed Loop, you are in the early development area. It is therefore important to observe the disclaimer given above, and the warnings given in the e-book sections, as well as the hints given by the developers in the respective manuals and readme files on their Github pages:

- For autoISF with **AAPS**, the main ones are <https://github.com/T-o-b-i-a-s/AndroidAPS/> and <https://github.com/ga-zelle/autoISF/>).
- Note there is **no** FCL solution for **iOS Loop** because their algorithm depends very much on carb inputs. However, the oref(1) algorithm (UAM+SMB as in AAPS) has been developed also for i-Phone based systems on the so-called **iAPS** platform. And autoISF has also been ported into an early development branch of iAPS: <https://github.com/mountrcg/iAPS> .

Unless you are ready to read a lot, re-set some things about your HCL iAPS first, and do a rather disciplined, well structured, several weeks if not months long project to get FCL running, please stay with what you have. Trial and error won't get you anywhere, with this complicated program! Besides lacking mandatory "education" by "Objectives", iAPS users also are disadvantaged re. FCL because of the lack of an Automation feature (and also because of partially different other feature details, or nomenclature, in iAPS, compared to AAPS).

First of all, a tip: If the following "e-book" looks too complicated for you - and it's not just about understanding, but also about time requirements and discipline during experimentation and data analysis - you would be well advised to first try the **Full Closed Loop in a simpler form** with Automations (reference see above, and [section 13.1](#)): Depending on the quality of their HCL tuning they are starting from, their expectations for %TIR, and on rapid carb contents of their diet, an increasing number of people succeed in making a respectable start the first time they try using AAPS in that much simpler Full Closed Loop mode.

See also the first published medical study that included 16 patients using AAPS, who found, on average, comparable %TIR performance when using a basic Full Closed Loop mode: <https://pub-med.ncbi.nlm.nih.gov/36826996/>

181 Alternatively you can use some techniques used in hybrid closed loop, such as using a pre-bolus
182 with autoISF, or explore other early-DEV-variants mentioned in [section 13.3](#), which also undergo
183 permanent further development (Boost, AIMI, EatingNow, Tsunami).

184

185