
Turbo Process ISO Machines

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1 Introduction

1.1 Discover the "Turbo" process!!

Tornos now provides its customers with a new part machining process.

Up until now, Tornos offered 2 model program families, that is to say the "Standard" model and the "Double barfeeding" model.

From now on, a third model program family has been introduced: in other words, the "Turbo" model.

This "Turbo" model is intended for users wishing to achieve optimal cycle time thanks to an innovative process.

1.2 "Turbo" process versus "Standard" process

As a reminder, the "Standard" model program is a program allowing you to process a blank simply and entirely securely.

The "Turbo" model also allows you to process a blank simply, yet also obtaining optimal cycle time thanks to an innovative process.

Here are some concrete examples:

SwissGT26: saves 7.1 seconds (out of 14.1 sec.)

CT20: saves 11 seconds (out of 18 sec.)

SwissNano: saves 7.6 seconds (out of 11.8 sec.)

The improved cycle time is among other things due to:

- A new order of sequences
- Minimised idling time
- The parallel positioning of the bar and counter-spindle at the time of part pickoff
- The possibility of parallelising the part cutting and the feeding of the next part
- The optimisation of counter-spindle positioning movements for part pickoff
- The optimisation of counter-spindle retraction movements after part pickoff

1.3 How do you use this new process?

This process is available across all our latest-generation ISO machines. In order to make use of it, simply update the NC software on your machines and the TISIS software on your computer.

2 The Turbo process

In order to use this new process, simply use the "Turbo" model program, where you will find some new macros.

Four new macros allow you to use this model:

- G805 allows you to configure your process automatically
- G940 allows you to prepare the machine for part pickoff by the counter-spindle
- G941 allows you to cut the part, feed the next part and also retract the counter-spindle
- G942 allows you to manage the program loopback quickly.

2.1 New order of sequences

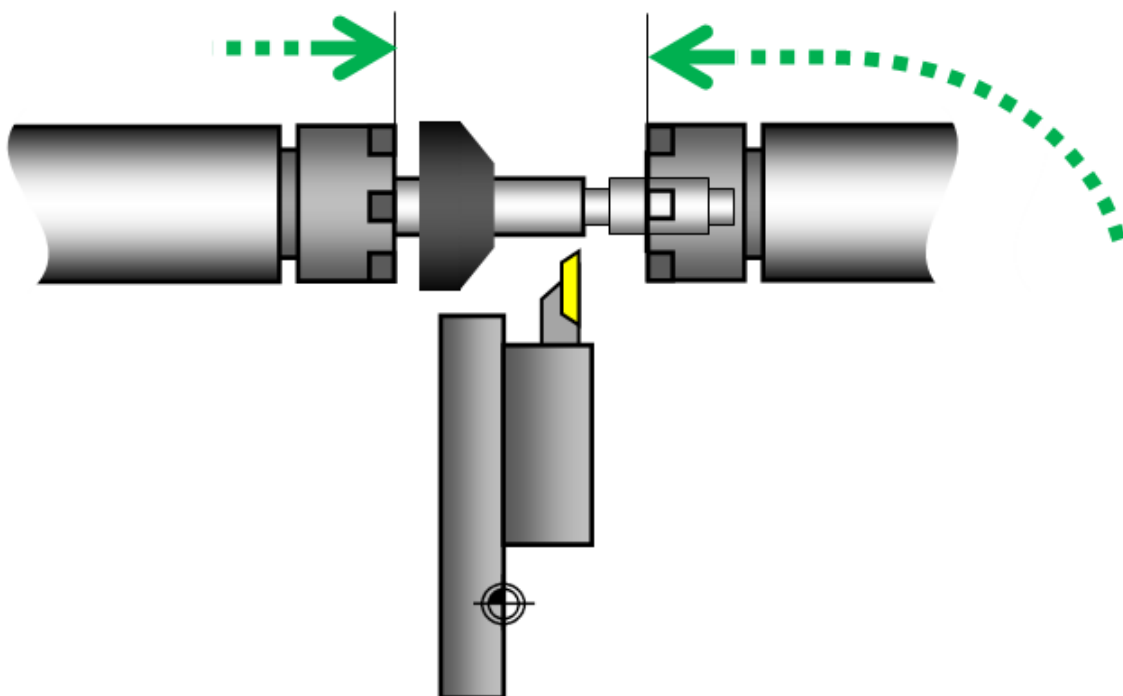
An essential difference in the "Turbo" model compared to the "Standard" model lies in the fact that a new part is fed at the end of the loop and no longer at the start of the loop. This opens up a host of possibilities, allowing you to minimise your cycle time.

Another improvement lies in the improved counter-spindle part ejection phase sequencing.

2.2 Parallelisation of movements for part pickoff

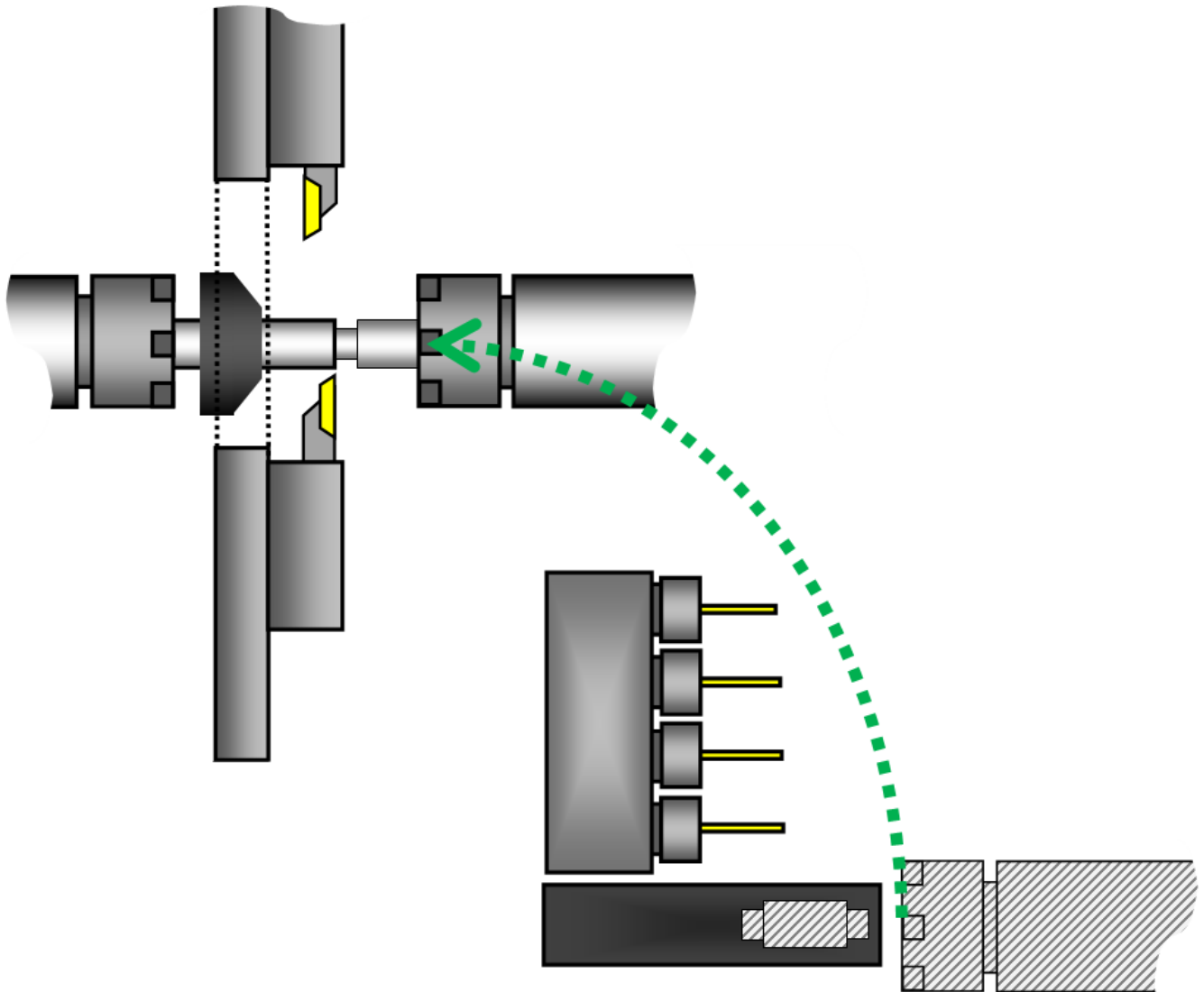
In the standard model, you need to position the spindle (Z1) in part pickoff position, then recalculate the zero offset (G915) for part pickoff and then finally grab the part with the counter-spindle (Z4).

Thanks to the macros designed for the functioning of the "Turbo" model (G940), the spindle and counter-spindle positioning can be carried out in parallel if necessary (this depends on the duration of the machining operations in the program).



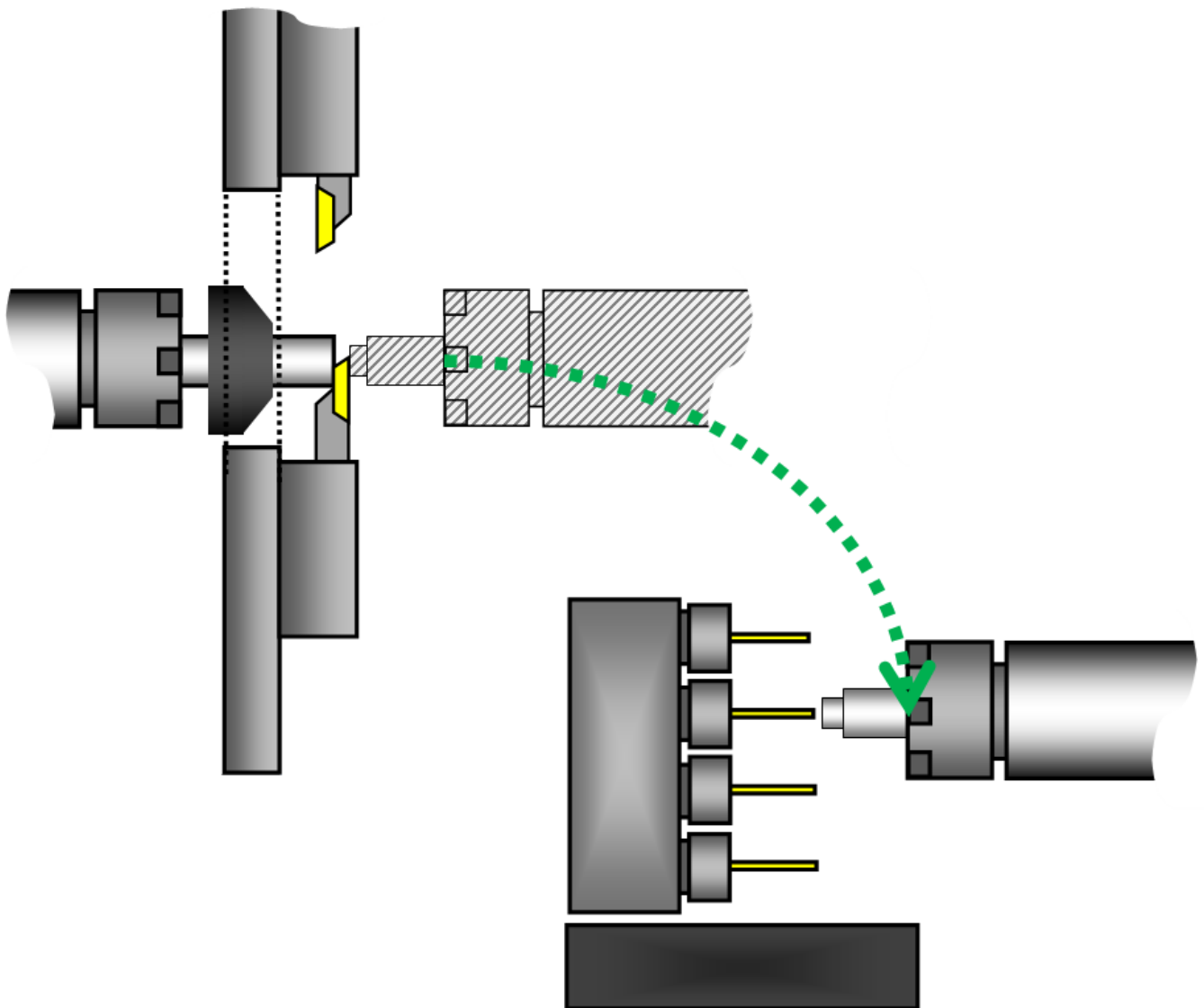
2.3 Counter-spindle approach for part pickoff

Another improvement lies in the non-productive movements of the counter-spindle. Indeed, once the counter-spindle has extracted the part, it moves directly into the part pickoff position via circular interpolation (G940), thus contouring the backwork tool block. In addition, the rotation speed of the counter-spindle is automatically adapted during movement.



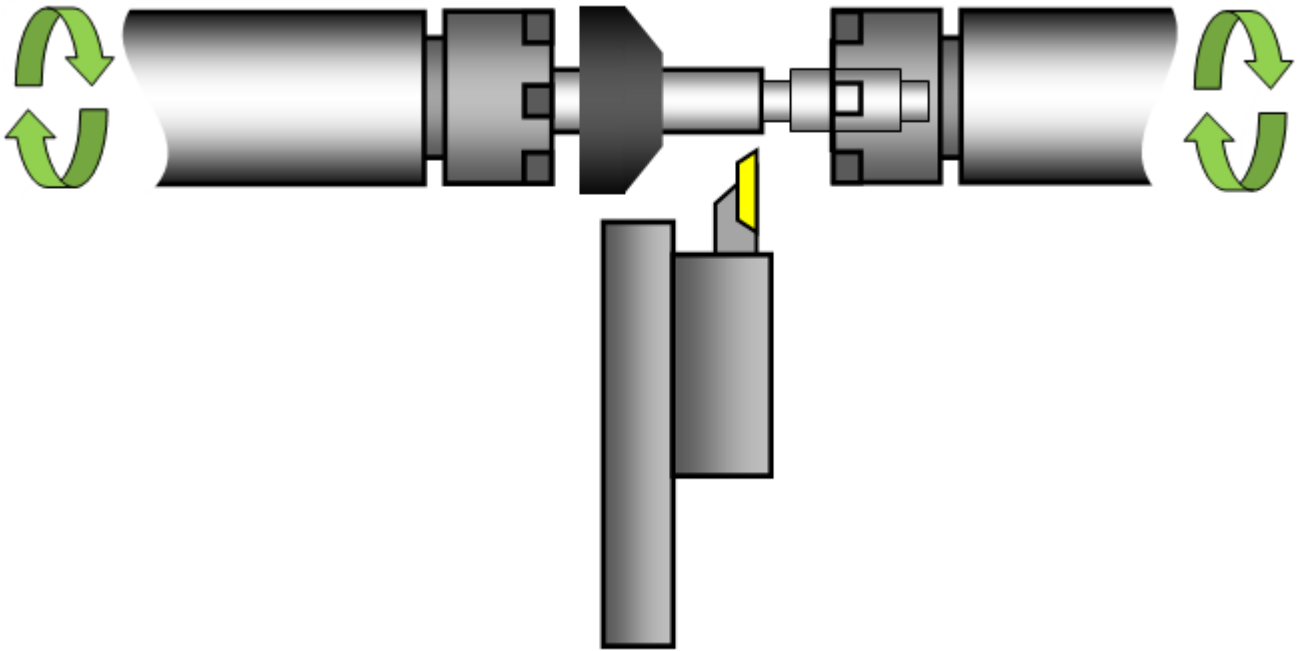
2.4 Counter-spindle retraction after part pickoff

Once the part cutting is complete, the counter-spindle retracts in circular interpolation (G941) to a position set by the user (G805). The parameters for a new counter-spindle speed (G805) can also be set, so that the counter-spindle re-adapts its speed as it retracts.



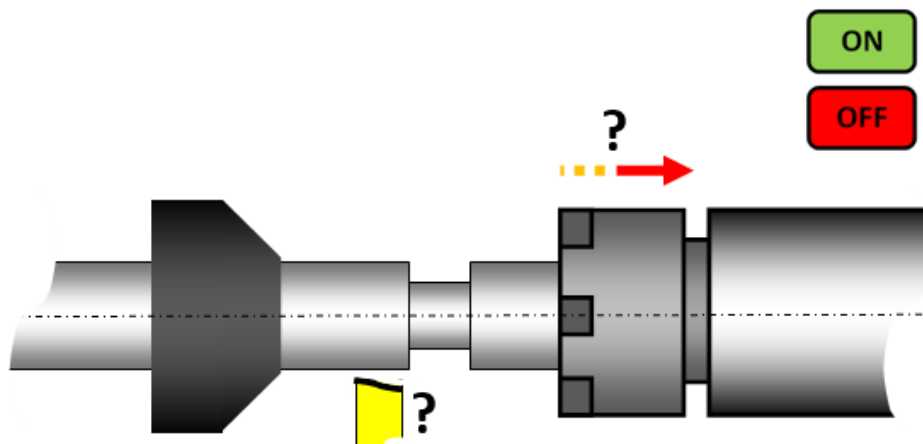
2.5 Synchronisation of spindle and counter-spindle speed

By default, before part pickoff a spindle and counter-spindle speed synchronisation is applied (M417), which is faster than a phase synchronisation (M418). Phase synchronisation should only be used for a part pickoff intended for profiled parts, since a parameter nevertheless offers this possibility (G805).



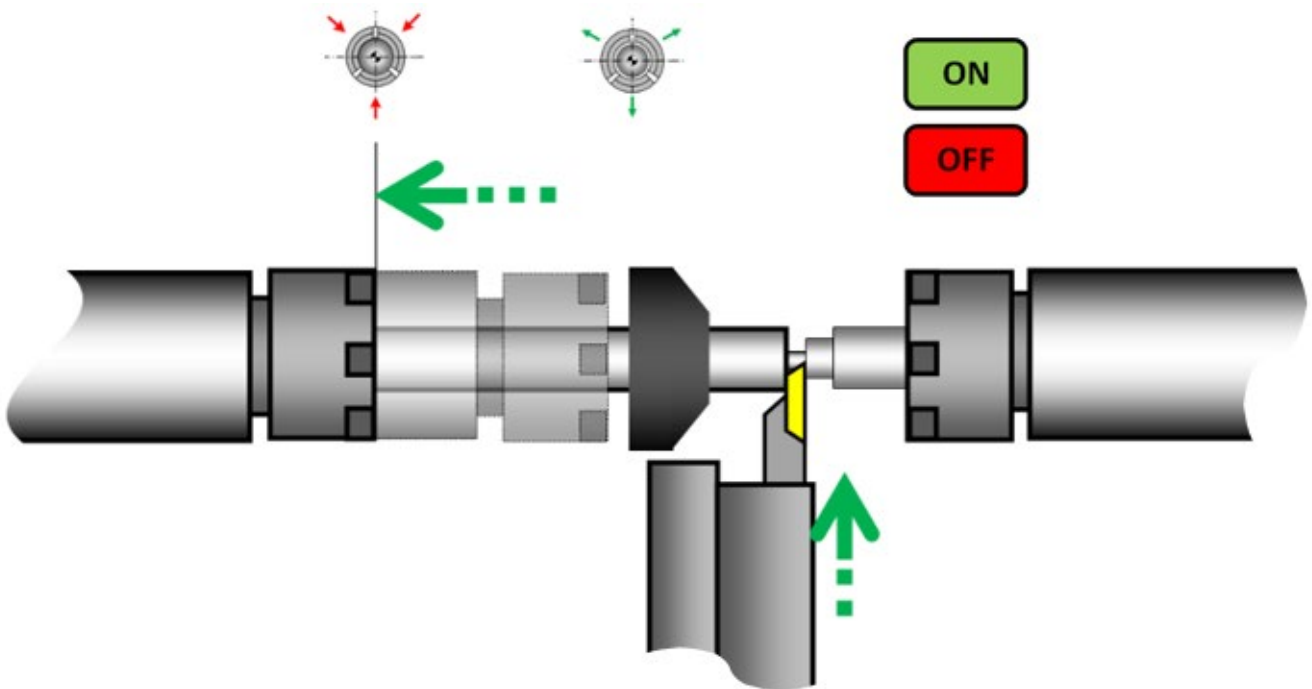
2.6 Checking cutting tool breakage

Again with the aim of maintaining optimal cycle time, the cutting tool breakage check during counter-spindle retraction is deactivated by default. If you deem this check to be truly necessary, you can nevertheless activate it (G805).



2.7 Possibility of parallelising cutting and part feeding

This new process also makes it possible, should you wish, to feed the next part during cutting (G941). In the majority of cases, this makes it possible to delete the part feeding time entirely. This feat is possible because the counter-spindle is capable of driving the bar by itself when the spindle collet is open for feeding.



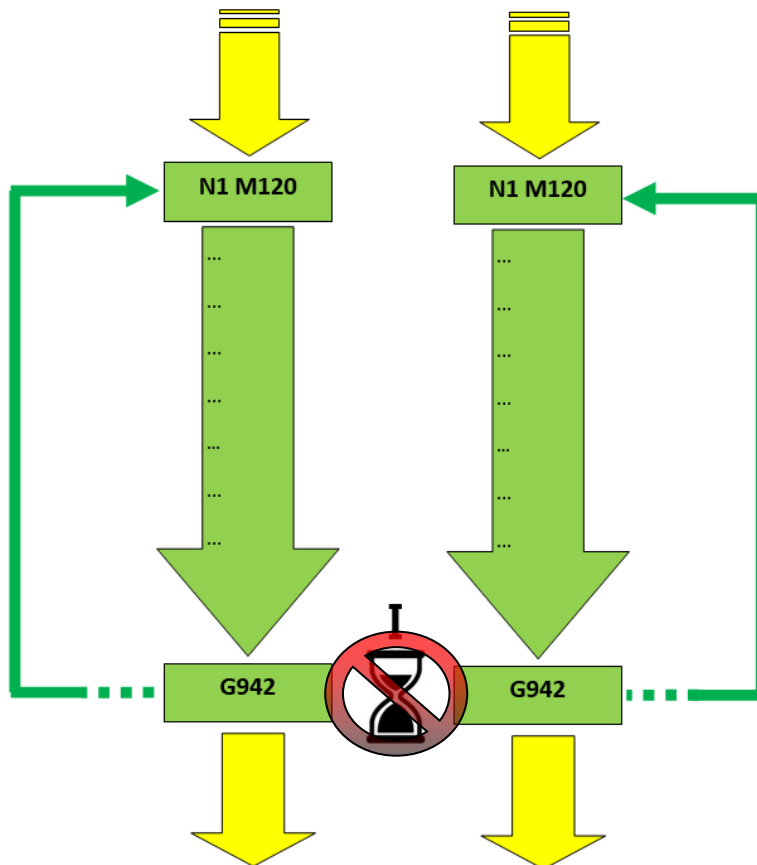
2.8 Pre-calculation of variables

The process was designed to calculate a maximum of data before the loop start during program initialisation. The advantage is that the values are only calculated once and therefore minimise idling time.

$$\frac{\lim_{n \rightarrow \infty} \frac{2^{2n} (n!)^2 \log 7}{(2n)! \sqrt{n}}}{\left[e^{\int_0^\infty e^{-t^2} dt} - e^i \sum_{k=0}^\infty \frac{8}{(4k+1)(4k+3)} \int_0^\infty \frac{2t}{e^t - 1} dt \right]} \cdot \frac{1}{\left[\int_0^\infty \frac{\sqrt{3} dt}{t^6 + 1} \right]^2 \left[\int_{-\infty}^\infty e^{-\pi t^2} dt \right] \left[\int_0^\infty e^{-t} dt \right]} = 50$$

2.9 High performance mode

The high performance mode (G805) can also be activated. When this mode is active, the cycle loops back directly along the channel. This means the machine does not wait on the slowest channel. This means there is no idling time at the machining loop end and the cycle time is reduced.



2.10 Use of variables in the program

There are certain variables in the model program, which allow you to automate optimal movements without having to worry about them.

