DOCUMENTATION ISG-kernel

Functional description
Gantry operation

Short Description:
FCT-C11

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Preface

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No claims may be made for products which have already been delivered if such claims are based on the specifications, figures and descriptions contained in this documentation.

Personnel qualifications

This description is solely intended for skilled technicians who were trained in control, automation and drive systems and who are familiar with the applicable standards, the relevant documentation and the machining application.

It is absolutely vital to refer to this documentation, the instructions below and the explanations to carry out installation and commissioning work. Skilled technicians are under the obligation to use the documentation duly published for every installation and commissioning operation.

Skilled technicians must ensure that the application or use of the products described fulfil all safety requirements including all applicable laws, regulations, provisions and standards.

Further information

Links below (DE)

https://www.isg-stuttgart.de/produkte/softwareprodukte/isg-kernel/dokumente-und-downloads

or (EN)

https://www.isg-stuttgart.de/en/products/softwareproducts/isg-kernel/documents-and-downloads

contains further information on messages generated in the NC kernel, online help, PLC libraries, tools, etc. in addition to the current documentation.

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It is forbidden to make any changes to the software configuration which are not contained in the options described in this documentation.

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General and safety instructions

Icons used and their meanings

This documentation uses the following icons next to the safety instruction and the associated text. Please read the (safety) instructions carefully and comply with them at all times.

Icons in explanatory text

➢ Indicates an action.

⇨ Indicates an action statement.

⚠ DANGER

Acute danger to life!

If you fail to comply with the safety instruction next to this icon, there is immediate danger to human life and health.

⚠ CAUTION

Personal injury and damage to machines!

If you fail to comply with the safety instruction next to this icon, it may result in personal injury or damage to machines.

Attention

Restriction or error

This icon describes restrictions or warns of errors.

Notice

Tips and other notes

This icon indicates information to assist in general understanding or to provide additional information.

Example

General example

Example that clarifies the text.

Programing Example

NC programming example

Programming example (complete NC program or program sequence) of the described function or NC command.

Release Note

Specific version information

Optional or restricted function. The availability of this function depends on the configuration and the scope of the version.

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1 Overview

Description

In addition to default path programming, axes can also be operated in coupled state. This is referred to as gantry mode. Contrary to normal synchronous mode, additional position deviation monitoring mechanisms are active and specific error reactions apply.

Properties

The following conditions apply to gantry mode with several axes

- identical drive types
- identical axis dynamic and control parameters
- identical error response (or no internal drive error response)

A distinction is made between:

- Soft gantry (programmable) Machines that do not require any mechanical gantry mode due to their basic structure can be operated by programming them in gantry mode
- Hard gantry (mechanical): Static gantry mode is defined by configuration since the axis are firmly coupled to one another due to the machine structure.

Parameterisation

Extensive settings are required in the channel and axis parameter lists to configure soft and hard gantry modes.

Programming

Soft gantry: The #SET AX LINK and #AX LINK NC commands are provided in extended syntax for the programmable gantry mode: The coupled axes are defined by programming.

Hard gantry: Only the master axis in the channel is known for a hard gantry coupling. This can be programmed in the NC program. The coupled axes are defined by configuration.

Mandatory note on references to other documents

For the sake of clarity, links to other documents and parameters are abbreviated, e.g. [PROG] for the Programming Manual or P-AXIS-00001 for an axis parameter.

For technical reasons, these links only function in the Online Help (HTML5, CHM) but not in pdf files since pdfs do not support cross-linking.

2 Description

Hard gantry (mechanical)

In the case of mechanical (also static) gantry, the axes are firmly coupled to one another due to the machine structure and are defined by the machine configuration (see figure).

Notice

In the case of a mechanical gantry, a dynamic change to gantry coupling is not possible after controller start-up.

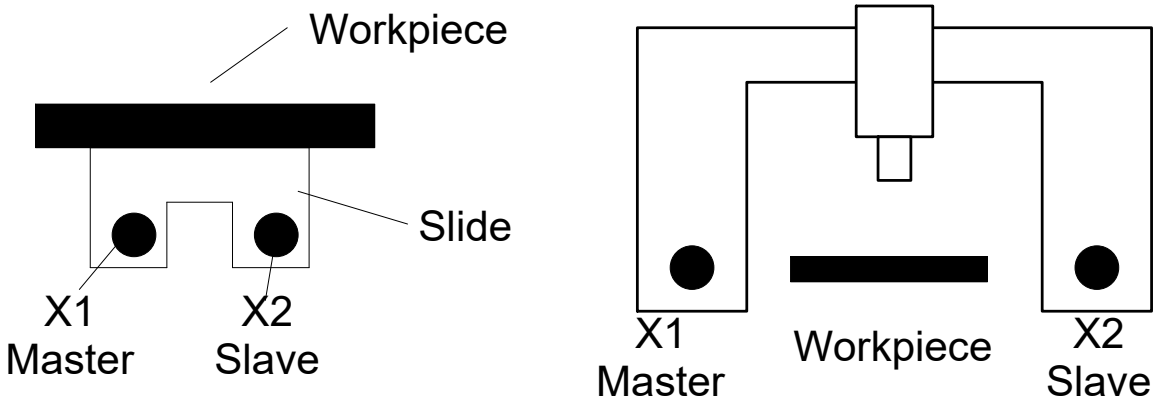

Fig. 1: Mechanical gantry mode

Soft gantry (programmable)

Machines that require no mechanical gantry mode due to their basic structure, for example milling machines with two independent slides, can be run by programming them in gantry mode. For example, this is necessary when slides must be linked to one another for clamping and machining large workpieces (see figure below).

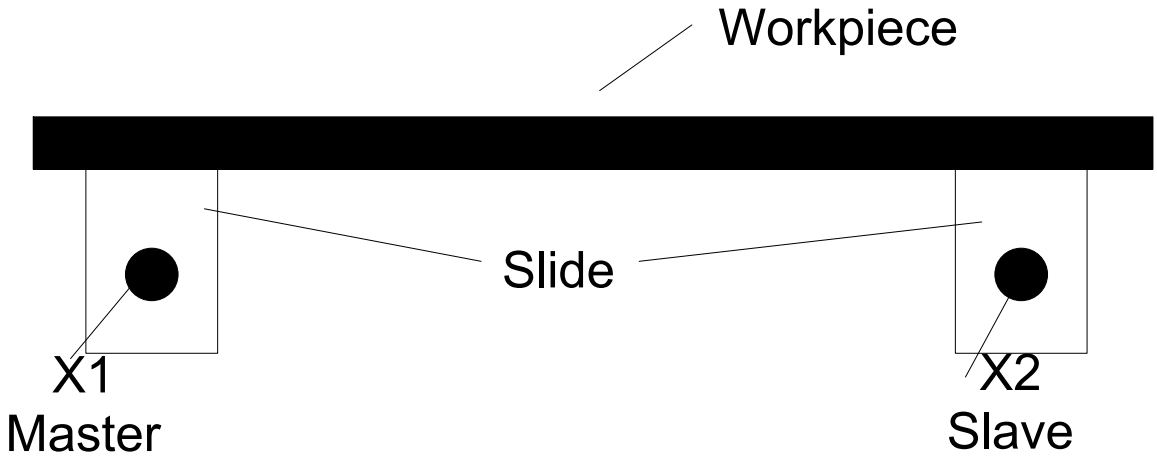

Fig. 2: Programmable gantry ("soft gantry")

Monitoring functions

- The axes specified in the gantry combination are coupled by setpoints. Coupling is monitored by actual values.
- A coupling offset can be specified between individual gantry axes.
- Two limits can be specified for monitoring.
- Monitoring is absolute after axis referencing or relative before referencing.

3 Soft gantry

3.1 Configuration

Dynamic gantry mode

Additional monitoring mechanisms to monitor the deviation of axis positions and special strategies to compensate for these deviations apply to gantry axes.

Dynamic gantry mode can be defined in the NC program. In addition, the axis and channel parameters listed in the table below must be assigned:

Parameter		**Required for dynamic Gantry mode**
P-AXIS-00070	gantry_ax_nr	
P-AXIS-00072	gantry_max_diff_resetable	X
P-AXIS-00071	gantry_max_diff_reset_locked	X
P-AXIS-00073	gantry_offset	
P-AXIS-00074	gantry_slave_no_homing	
P-AXIS-00075	gantry_vb_korr	X
P-AXIS-00249	gantry_diff_check_without_homing	
P-AXIS-00253	gantry_synchronous_slave_homing **	
P-AXIS-00254	cnc_controlled_stop_after_error **	

**only for SERCOS-drives

P-CHAN-00104	restore_coupling_after_reset	Restore coupling after reset
P-CHAN-00105	preserve_coupling_after_prog_end	Restore coupling at program end

3.2 Programming

Syntax, definition of a gantry coupling

The #SET AX LINK and #AX LINK NC commands are provided in extended syntax for the programmable gantry mode:

#SET AX LINK [<*coupling_group*>, **[** <*slave*>=<*master*>,**G** [,<*limit_1*>, *limit_2*>] **]**
{, **[** <*slave*>=<*master*>,**G** [,<*limit_1*>, *limit_2*>] **]** } **]**

or alternatively

#AX LINK [**NBR**] **[** <*coupling_group*>, **[** <*slave*>=<*master*>,**G** [,<*limit_1*>, *limit_2*>] **]**
{, **[** <*slave*>=<*master*>,**G** [,<*limit_1*>, *limit_2*>] **]** } **]**

<coupling_group>	Number of the coupling group 1 ... [Max. number of coupling groups(1) -1] , positive integer.
<*Slave*>	Designation or logical axis number of the slave axis of the coupling pair i
<*Master*>	Designation or logical axis number of the master axis of the coupling pair i Max. number of coupling pairs (2)
NBR	Evaluation can be changed from logical axes names to axes numbers with the logic switch NBR. The axis couplings must then be defined with logical axis numbers. The axes need not be present in NC channel. Their availability in NC channel is checked only at activation of the coupling group!
G	Keyword for gantry coupling With a gantry coupling the position difference is checked between the actual positions of the coupled axes and the <limit_1> and <limit_2> positions in the specified limits. Any existing position offset is taken into account when gantry coupling is activated.

With a gantry coupling the following values are used for two-stage monitoring of the permitted position difference between the gantry axes. Specified in [mm]. Positive real number:

<*limit_1*>	1st monitoring limit: If this limit is exceeded, the motion is aborted and the control system assumes the error state. In the default case, the position difference is cancelled during RESET. Depending on the specific application, deviating motion can still be realised.
<*limit_2*>	2nd monitoring limit: An error that cannot be RESET is output if this limit is exceeded. The controller must be switched off and the position difference must be eliminated manually.

Notice

If the monitoring limits are not programmed, the defaults apply from the axis parameter data records P-AXIS-00072 and P-AXIS-00071 of the slave axis.

Handling and operating principle

- Gantry coupling takes place at precisely the positions where the axes are located at the time when coupling is selected. There is no need to specify an offset in the NC command because the offset is calculated internally in the position controller via the nominal positions.
- The dynamic data of the slave axis is taken into account in the contouring motion.
- If programmed accordingly (P-CHAN-00104/P-CHAN-00105), a coupling that is still active on RESET or at program end is implicitly restored for safety reasons the next time the program is started.

3.3 Programming examples

Programing Example

Soft gantry coupling

```
:
N10 #SET AX LINK[1, [Y2 = Y1,G,0.01,0.25]]
# Gantry coupling of Y1 as master axis and Y2 as slave
# axis. 1st limit is 10µm, 2. Limit is 250 µm.

N20 #SET AX LINK[2, [Y2 = Y1,G]]
# Gantry coupling of Y1 (master) and Y2 (slave). The
# monitoring limits of the axis parameter data record of Y2 apply.

N30 #SET AX LINK [3,[Y2 = Y1]]
# Default coupling of Y2 with Y1. No gantry mode.
# or alternative
N10 #AX LINK[1, [Y2 = Y1,G,0.01,0.25]]

N20 #AX LINK NBR[2, [8 = 2,G]]
# Gantry coupling via logical axis numbers
```

Parallel machining of workpieces with a symmetrical or scaled contour can also be programmed by an extended syntax of the #SET AX LINK command. Position differences are not monitored in these modes (mirroring or scaling).

#SET AX LINK [*<coupling_group>*, **[** *<slave>*=*<master>*,*<nominator>*, *<denominator>* **]**
{, **[** *<slave>*=*<master>*,*<numerator>*, *<denominator>* **]** } **]**
or alternatively
#AX LINK [**NBR**] **[** *<coupling_group>*, **[** *<slave>*=*<master>*,*<numerator>*, *<denominator>***]**
{, **[***<slave>*=*<master>*,*<numerator>*, *<denominator>* **]** } **]**

<coupling_group>	Number of the coupling group 1 ... [Max. number of coupling groups(1) -1] , positive integer.
<Slave>	Designation or logical axis number of the slave axis of the coupling pair i
<Master>	Designation or logical axis number of the master axis of the coupling pair i Max. number of coupling pairs (2)
NBR	Evaluation can be changed from logical axes names to axes numbers with the logic switch NBR. The axis couplings must then be defined with logical axis numbers. The axes need not be present in NC channel. Their availability in NC channel is checked only at activation of the coupling group!
<numerator>, *<denominator>*	Integers are used to calculate a coupling factor between: • -1 : Mirror coupling • 1 : Default coupling; equivalent to the previous syntax • 0 : Output of an error message

Attention

coupling factors unequal to -1 or 1 that have a scaling effect are not permitted. A warning is output and the coupling factor is assigned the value 1 (default coupling).

Programing Example

Soft gantry: Mirror and default coupling

```
:
N10 #SET AX LINK[1, [Y2 = Y1,1,-1]] Mirror coupling (factor -1)
N20 #SET AX LINK[1, [Y2 = Y1,-1,1]] Mirror coupling (factor -1)
N30 #SET AX LINK[1, [Y2 = Y1,-2,2]] Mirror coupling (factor -1)
N40 #SET AX LINK[1, [Y2 = Y1,1,1]] Default coupling
N50 #SET AX LINK[1, [Y2 = Y1,2,2]] Default coupling
N60 #SET AX LINK[1, [Y2 = Y1,0,1]] Error message, program is aborted
N70 #SET AX LINK[1, [Y2 = Y1,1,0]] Error message, program is aborted
N80 #SET AX LINK[1, [Y2 = Y1,1,2]] Warning (factor 0.5), default cpl.
N90 #SET AX LINK[1, [Y2 = Y1,2,3]] Warning (factor 0.666), default cpl.
N100 #SET AX LINK[1, [Y2 = Y1,3,2]] Warning (factor 1.5), default cpl.
N110 #SET AX LINK[1, [Y2 = Y1,-1,2]] Warning (factor -0.5), default cpl.
N120 #SET AX LINK[1, [Y2 = Y1,-3,2]] Warning (factor -1.5), default cpl.

or alternatively

N40 #AX LINK[1, [Y2 = Y1,1,1]] Default coupling
N50 #AX LINK NBR[1, [8 = 2,2,2]]     Standard coupling via log. axis
numbers
```

Syntax, selecting and deselecting a gantry coupling

A (gantry) coupling group can be activated and deactivated with the following NC commands:

#ENABLE AX LINK [<*coupling_group*> **]**
or
#ENABLE AX LINK *(Coupling group 0, defined in the channel parameter list)*
or alternatively
#AX LINK ON [<*coupling_group*> **]**
or
#AX LINK ON *(Coupling group 0, defined in the channel parameter list)*

#DISABLE AX LINK [<*cooupling_group*> **]**
or
#DISABLE AX LINK *(Deselect the last activated coupling group)*
or alternatively
#AX LINK OFF [<*coupling_group*> **]**
or
#AX LINK OFF *(Deselect the last activated coupling group)*

#AX LINK OFF ALL *(Deselect all active coupling groups)*

Handling and operating principle

- No coupling group is active after start-up in the initial position of the NC kernel. Activation of axis coupling begins with programming in the NC program and ends, if not cancelled, when the program ends (M30, M02). If active axis couplings are to remain effective for the next program (program global), a specific channel parameter P-CHAN-00105 must be set.
- Several coupling groups can be activated simultaneously.
- Unassigned coupling groups cannot be activated. A coupling group is considered assigned if at least one valid master-slave coupling pair was defined.
- The NC command must be a single instruction in the NC block.
- The number of the coupling group can also be programmed via mathematical expressions.
- WRK must not be selected when synchronous operation is selected or cancelled.
- Manual mode with parallel interpolation (G201) may not be active for the slave axes when synchronous mode is selected
- Positions of slave axes may not be addressed in the NC program when synchronous mode is active.

Programing Example

Tool change and subroutine for contour machining

Axis designations used: Master axis system X, Y, Z, C
Slave axis system Y_S, Z_S, C_S

```
(Initialisation program)
%L UP_INIT_ACHS_KOPPL
(initialise axis coupling 1)
N10 #SET AX LINK[1, Y_S=Y, Z_S=Z, C_S=C]
(or #AX LINK[1, Y_S=Y, Z_S=Z, C_S=C]
N20 M17

(tool changing program)
%L UP_WZ
N30 #DISABLE AX LINK (oder #AX LINK OFF)
(Approach tool change position)
N40 G01 G90 Y1000 Z100 C0 Y_S=1000 Z_S=100 C_S=0
(Tool change; T10 contains all tool axis offsets and the tool lengths of
master and slave tools; or these values are explicitly included in the
calculation.) )
N50 T10 D10
:
(Further commands for physical tool change)
:
(Approach old coupling position. The coupling position may also be
defined by parameter programming and then be used by the subroutine.)
N80 G01 G90 X20 Y20 Z40 C50 Y_S=20 Z_S=40 C_S=50
N90 #ENABLE AX LINK[1] (or #AX LINK ON[1])
N110 M17


(Subroutine for contour machining)
%L UP1
N150 G01 G91 X10 Y10 Z-20 C90
N160 G02 X20 Y20 I10 J10
N170 LL UP_WZ
N180 G01 G91 X10 Y10 Z-20 C90
N190 G02 X20 Y20 I10 J10
N200 M17


(Main program; initial condition: Both tools were changed.)
(Move both axis systems to coupling position first.)
N300 G01 G91 X20 Y20 Z40 C50 Y_S=20 Z_S=40 C_S=50 F300
(Start synchronous operation)
N310 #ENABLE AX LINK[1] (or #AX LINK ON[1])
N320 LL UP1
:
N400 #DISABLE AX LINK (or #AX LINK OFF)
N410 M30
```

4 Hard gantry

4.1 configuration

Static gantry mode

Additional monitoring mechanisms to monitor the deviation of axis positions and special strategies to compensate for these deviations apply to gantry axes.

Static (mechanical) gantry mode is defined by configuration since the axes are always firmly coupled to one another due to the machine structure.

It is possible to define gantry groups that assign a master axis to several slave axes.

4.1.1 Master axis

Master axis configuration

For gantry master axes bit 0x00010000 must be set in axis mode (P-AXIS-00015).

If required, the axis can be assigned by default to an NC channel (P-CHAN-00006, P-CHAN-00035).

Make sure that the following parameters for master and slave axes are identical:

- Modulo mode (P-AXIS-00018, P-AXIS-00015 bit 0x00000004)
- Modulo range (P-AXIS-00126, P-AXIS-00127)
- Maximum acceleration (P-AXIS-00008)
- Emergency stop delay (P-AXIS-00003)
- CNC-controlled error reaction (P-AXIS-00254)
- Homing type (P-AXIS-00299)
- Delay after PLC watchdog error (P-AXIS-00367)

If these parameters are different, a warning is output at controller start-up and the master axis values are adopted.

4.1.2 Slave axis

Configuration of salve axis

For gantry slave axes, bit 0x00020000 must be set in axis mode (P-AXIS-00015).

The following must also be configured for the slave axis:

- Axis number of master axis (P-AXIS-00070)
- Offset to master axis (P-AXIS-00073)
- Permitted resettable gantry error (P-AXIS-00072)
- Permitted non-resettable gantry error (P-AXIS-00071)
- Velocity to clear the position difference to the master axis (P-AXIS-00075)

A gantry slave axis may not be assigned to any NC channel (P-CHAN-00006, P-CHAN-00035).

Make sure that the following parameters for master and slave axes are identical:

- Modulo mode (P-AXIS-00018, P-AXIS-00015 Bit 0x00000004)
- Modulo range (P-AXIS-00126, P-AXIS-00127)
- Maximum acceleration (P-AXIS-00008)

- Emergency stop delay (P-AXIS-00003)
- CNC-controlled error reaction (P-AXIS-00254)
- Homing type (P-AXIS-00299)
- Delay after PLC watchdog error (P-AXIS-00367)

If these parameters are different, a warning is output at controller start-up and the master axis values are adopted.

Other axis parameters can be set in the slave axis as required.

Parameter		**Required for Gantry mode Master axis**	**Required for Gantry mode slave axis**
P-AXIS-00015	achs_mode	X	X
P-AXIS-00070	gantry_ax_nr		X
P-AXIS-00072	gantry_max_diff_resetable		X
P-AXIS-00071	gantry_max_diff_reset_locked		X
P-AXIS-00073	gantry_offset		X
P-AXIS-00074	gantry_slave_no_homing		X
P-AXIS-00075	gantry_vb_korr		X

4.2 Programming

Only the master axis in the channel is known for a hard gantry coupling. This can be programmed in the NC program.

Gantry slave axes have no axis identifier and therefore cannot be programmed in the NC program.

4.2.1 Gantry start-up

Attention

Only use the #GANTRY command for start-up

Possible machine damage if command used incorrectly.

To start up a machine, it may be helpful to disable the gantry combination of one or even several axes.

This is done by assigning the axis parameter P-AXIS-00704

```
kenngr.gantry_on_mode CONFIG
```

and this must be set for all gantry slave axes.

The following gantry combination is defined for the programming examples below:

Combination 1:

- X (Master) with logical axis number 1
  - Axis_X1 (Slave 1), logical axis number 5
  - Axis_X2 (Slave 2), logical axis number 6

4.2.1.1 Disable gantry combination (#GANTRY OFF, #GANTRY OFF ALL)

```
Syntax for Disable gantry combination:
```

#GANTRY OFF [{ **AXNR**=.. | **AX**=<*axis_name*> } **]**

AXNR=..	Logical axis number (P-AXIS-00016) of master axis
AX=<*axis_name*>	Name of the master axis of a gantry combination

Syntax for Disable all gantry combinations:

#GANTRY OFF ALL

To start up, the gantry combination of a gantry master axis located in the channel can be disabled by the command

#GANTRY OFF [AX=<master_axis_name>]

. Gantry slave axes are then free and cannot be assigned to any master axis. They are then treated as independent CNC axes. The gantry master axis can continue to move as an independent CNC channel axis. The previous slave axes are no longer influenced by movements of the previous gantry master axis. However, in this state they cannot be programmed or moved since they do not belong to any channel.

If the master axis is not in the channel, the combination can be disabled in the same way by the logical axis number.

#GANTRY OFF [AXNR=..]

If all existing gantry combinations need to be disabled, this is done by using

#GANTRY OFF ALL

.

Notice

Disabling gantry couplings using #GANTRY OFF is modal beyond program end and reset.

The gantry combination is only re-enabled after a controller restart or if #GANTRY ON[ ] is programmed explicitly.

Notice

The #GANTRY OFF command adopts no slave axes in the channel.

Use of gantry slave axes.

If free gantry slave axes are to remain programmable even after the combination is disabled, they must be previously requested by the NC channel. After a request is successful, free slave axes respond in the same way as normal CNC axes.

Requesting and releasing slave axes is executed using Axis exchange commands

For example, the following command requests an axis:

#CALL AX[Axis_X1, 5, 4]

Similarly, the following command releases a CNC axis as usual:

#PUT AX[Axis_X1]

All other NC commands applicable to an axis can also be released for slave axes.

Programing Example

Request free gantry slave axes

```
#GANTRY OFF [AX=X]
; Request free slave axes
#CALL AX [Axis_X1, 5, 4] ; log. axis no.4 at Index 3
#CALL AX [Axis_X2, 6, 5] ; log. axis no.4 at Index 4
; Move axes as independent CNC axes
G0 X=47;X previous master axis of gantry combination 1
G0 Axis_X1=11 ; Axis_X1 previous slave axis 1 of X
G0 Axis_X2=12 ; Axis_X2 previous slave axis 2 of X
M30
```

4.2.1.2 Restore gantry combination (#GANTRY ON, #GANTRY ON ALL)

Syntax for Restore a gantry combination:

#GANTRY ON [{ **AXNR=..** | **AX=**<*axis_name*> } **]**

AXNR=..	Logical axis number (P-AXIS-00016) of master axis
AX=<*axis_name*>	Name of the master axis of a gantry combination

Syntax for Restore a gantry combination:

#GANTRY ON ALL

The command

```
#GANTRY ON [AX=<master_axis_name>]
```

restores the gantry combination of the master axis <master_axis_name> based on the original machine data. All previous slave axes in the NC channel are implicitly released.

Similarly, the gantry combination can also be restored by the logical axis number.

```
#GANTRY ON [ AXNR=..]
```

The gantry difference is not cleared as long as parameter (P-AXIS-00704)

```
kenngr.gantry_on_mode = CONFIG
```

is set.

Programing Example

Restore a gantry combination

```
#GANTRY OFF [AX=X]
; Request free slave axes
#CALL AX [Axis_X1, 5, 4]
#CALL AX [Axis_X2, 6, 5]
; Move axes as independent CNC axes
G0 X=47;X previous master axis of gantry combination 1
G0 Axis_X1=11 ; Axis_X1 previous slave axis 1 of X
G0 Axis_X2=12 ; Axis_X2 previous slave axis 2 of X
;…
#GANTRY ON [AX=X] ; Restore gantry combination 1
G0 X=65 ; Assigned slave axes 1 and 2 also move with
M30
```

In analogy to #GANTRY OFF ALL the command

```
#GANTRY ON ALL
```

all gantry combinations are restored.

4.3 Referencing

CNC-controlled

All gantry axes are referenced sequentially if homing is performed by the CNC. The homing logic is always executed for one axis and the remaining axes in the gantry combination are also interpolated uniformly. This is then repeated for the next axis in the gantry combination until all gantry axes are referenced.

During the homing motion, no relative motion of the gantry axes to one another occurs.

Drive-controlled

Intelligent drives (e.g. SERCOS) execute homing independently. In a gantry system, it must also be ensured that the gantry combination always moves uniformly. In other words,

- the parameter definitions must ensure that the drive covers an identical path during homing motion (RPF).
- The homing motion is started simultaneously for all gantry axes.

This behaviour is set by the parameter P-AXIS-00253.

Notice

Drive-controlled reference point travel must run identically in the case of both drives (e.g. without cam and distance-coded measurement system). This must be initiated by respective parameters.

Attention

For security reasons the torque can be reduced during homing procedure.

Only on the master side

The parameter P-AXIS-00074 (*gantry_slave_no_homing*) can suppress homing for gantry slave axes.

When master axis homing is completed, the reference positions entered in the axis parameter list of slaves axes are adopted. Monitoring is started for the gantry difference between master and slave axes.

Monitoring before referencing

The parameter P-AXIS-00249 (*gantry_diff_check_without_homing*) is used to activate monitoring of the gantry difference between master and slave axes before homing is executed.

The offset between the master and slave axes at the time of controller start-up is used as the position offset.

4.4 Error handling

Error handling for gantry systems

In case of an error an intelligent drive executes an error reaction by itself in most cases and reports this to the CNC. Then the CNC can stop the other related axis.

With gantry axes, it is not permitted for one axis in the gantry combination to stop independently. This is why the CNC can stop the entire gantry combination in a controlled operation if an error occurs in one axis.

The functions for master and slave axes are set using the parameter P-AXIS-00254 (cnc_controlled_stop_after_error). A check is made whether the settings for master and slave axes are identical and this is corrected in the slave axes if necessary.

Attention

The parameter P-AXIS-00254 is currently used for SERCOS axes only.

In addition, the drive must be parameterised so that no or possibly a delayed error response is executed (see EcoDrive P-0-0117).

Notice

In a CNC-controlled error reaction the system is stopped at the defined emergency deceleration P-AXIS-00003 (a_emergency).

5 Parameter

5.1 Overview

5.1.1 Channel parameters for dynamic gantry mode

ID	Parameter	Description
P-CHAN-00104	restore_coupling_after_reset	Restore coupling after reset
P-CHAN-00105	preserve_coupling_after_prog_end	Restore coupling at program end

5.1.2 General axis parameters

ID	Parameter	Description
P-AXIS-00003	a_emergency	Emergency axis acceleration

5.1.3 Axis parameters for dynamic gantry mode

ID	Parameter	Description
P-AXIS-00071	gantry_max_diff_reset_locked	Maximum path difference
P-AXIS-00072	gantry_max_diff_resetable	Resettable path difference
P-AXIS-00075	gantry_vb_korr	Compensation velocity

5.1.4 Axis parameters for static gantry mode

ID	Parameter	Description
P-AXIS-00015	achs_mode	Axis mode
P-AXIS-00070	gantry_ax_nr	Axis number of the master axis
P-AXIS-00071	gantry_max_diff_reset_locked	Maximum path difference
P-AXIS-00072	gantry_max_diff_resetable	Resettable path difference
P-AXIS-00073	gantry_offset	Static offset
P-AXIS-00074	gantry_slave_no_homing	Suppress homing for gantry slave axis
P-AXIS-00075	gantry_vb_korr	Compensation velocity
P-AXIS-00249	gantry_diff_check_without_homing	Monitor gantry difference before homing
P-AXIS-00253	gantry_synchronous_slave_homing	Drive-controlled referencing of gantry combination

ID	Parameter	Description
P-AXIS-00254	cnc_con-trolled_stop_after_error	CNC-controlled error reaction
P-AXIS-00297	kopf.log_achs_name	Default axis name
P-AXIS-00704	kenngr.gantry_on_mode	Conditions for clearing the gantry difference

5.2 Description

5.2.1 Channel parameters

P-CHAN-00104	Restore coupling after reset (synchronous operation)
Description	An active axis coupling (synchronous operation) is deselected by NC reset. Set this parameter to 1 if the axis coupling is to be reactivated automatically in the following NC program.
Parameter	synchro_data.restore_coupling_after_reset
Data type	BOOLEAN
Data range	0/1
Dimension	----
Default value	0
Remarks	This parameter may only be used if all axes participating in the coupling exist in the basic configuration of the NC channel.

P-CHAN-00105	Restore coupling after program end (synchronous operation)
Description	An active axis coupling (synchronous operation) is deselected at NC program end (#DISABLE AXLINK) if it is not ended explicitly in the NC program. Set this parameter to 1 if the axis coupling is to be reactivated automatically in the following NC program.
Parameter	synchro_data.preserve_coupling_after_prog_end
Data type	BOOLEAN
Data range	0/1
Dimension	----
Default value	0
Remarks	This parameter may only be used if all axes participating in the coupling exist in the basic configuration of the NC channel.

5.2.2 Axis parameters

P-AXIS-00003	**Deceleration for an emergency stop**	
Description	The parameter defines the used deceleration for an emergency stop. If errors of error reaction class 4 occur, the NC decelerates at the rate for specific axes. The path then leaves the trajectory.	
Parameter	getriebe[i].dynamik.a_emergency	
Data type	UNS32	
Data range	1 ≤ a_emergency ≤ 2*P-AXIS-00008	
Axis types	T, R, S	
Dimension	T: mm/s²	R,S: °/s²
Default value	0	
drive types.	----	
Remarks	When the parameter has the value 0, the value of P-AXIS-00008 (a_max) is used.	

P-AXIS-00015	**Axis mode**	
Description	Axes can be traversed in different operating modes.	
Parameter	kenngr.achs_mode	
Data type	UNS32	
Data range	0x00000001 - 0x10000000	
Axis types	T, R, S	
Dimension	T: ----	R,S: ----
Default value	0x00000001	
Drive types	----	
Remarks		

P-AXIS-00070	Axis number of master axis	
Description	In the axis parameter list of the slave axis the logical number of its master axis is entered. If this parameter is assigned, the master and slave axes are assigned to one another during start-up. This so-called static gantry coupling exists at the position controller level. The slave axis is not known in the channel. A movement is only executed by programming their master axis.	
Parameter	kenngr.gantry_ax_nr	
Data type	UNS16	
Data range	1 ≤ gantry_ax_nr ≤ MAX (UNS16)	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	0	
Drive types	----	
Remarks	This entry is not adopted when the axis parameter list is updated. Updates only become effective when the controller is rebooted.	

P-AXIS-00071	Non resettable path distance between master and slave axes	
Description	Maximum permissible path distance between master and slave gantry axes. Error that cannot be remedied by NC reset.	
Parameter	kenngr.gantry_max_diff_reset_locked	
Data type	UNS32	
Data range	0 < gantry_max_diff_resetable < gantry_ max_diff_reset_locked < MAX(UNS32)	
Axis types	T, R	
Dimension	T: 0.1 µm	R: 0.0001°
Default value	0	
Drive types	----	
Remarks		

P-AXIS-00072	Resettable path distance	
Description	Maximum permissible path distance between master and slave gantry axes. Error that can be remedied by NC reset.	
Parameter	kenngr.gantry_max_diff_resetable	
Data type	UNS32	
Data range	0 < gantry_max_diff_resetable < MAX(UNS32)	
Axis types	T, R	
Dimension	T: 0.1 µm	R,S: 0.0001°
Default value	0	
Drive types	----	
Remarks		

P-AXIS-00073	Static offset between master and slave axes	
Description	Static difference between the master and slave axes in the event of differences between the master and slave axes. The offset sign results from the calculation instruction: OFFSET = SLAVE - MASTER	
Parameter	kenngr.gantry_offset	
Data type	SGN32	
Data range	MIN(SGN32) < gantry_offset < MAX(UNS3	
Axis types	T, R	
Dimension	T: 0.1 µm	R: 0.0001°
Default value	0	
Drive types	----	
Remarks		

P-AXIS-00074	Suppress homing for gantry slave axis	
Description	This parameter can suppress the homing of gantry slave axes. When homing of the master axis is completed, the reference positions entered in the axis parameter lists of the slave axes are also adopted and monitoring of the gantry difference is started.	
Parameter	kenngr.gantry_slave_no_homing	
Data type	BOOLEAN	
Data range	0/1	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	0	
drive types.	----	
Remarks	This parameter is not supported in the case of spindle axes.	

P-AXIS-00075	Velocity of correction for compensation of gantry difference	
Description	The parameter defines the velocity at which the axis position of the slave axis is corrected until the distance between master and slave is less than P-AXIS-00073 .	
Parameter	kenngr.gantry_vb_korr	
Data type	UNS32	
Data range	0 < gantry_vb_korr < P-AXIS-00212	
Axis types	T, R	
Dimension	T: 1µm/s	R: 0.001°/s
Default value	0	
Drive types	----	
Remarks		

P-AXIS-00249	Gantry difference monitoring before homing	
Description	By default, the position difference between the gantry master and the slave axis is not monitored until both the master and the slave axes have been homed. This parameter activates gantry difference monitoring before homing (*gantry_diff_check_without_homing = 1*). The parameters P-AXIS-00072 and P-AXIS-00071 are used as limits during monitoring. The offset between master and slave axis at the time of controller start-up is used for position offset instead of P-AXIS-00073 . On completion of homing, the parameter P-AXIS-00073 is used as position offset.	
Parameter	kenngr.gantry_diff_check_without_homing	
Data type	BOOLEAN	
Data range	0/1	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	0	
Drive types	----	
Remarks		

P-AXIS-00253	Drive-controlled homing of gantry axis (SERCOS)	
Description	With drive-controlled homing (digital drives, SERCOS) the homing procedure is started synchronously for all gantry axes. The user must also ensure that the homing parameter settings are the same for all drives.	
Parameter	kenngr.gantry_synchronous_slave_homing	
Data type	BOOLEAN	
Data range	0/1	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	0	
Drive types	SERCOS	
Remarks	Drive-controlled homing must run identically for both drives (e.g. without cam and distance-coded measurement system). This must be initiated by corresponding parameters. For safety reasons, torque can be reduced during the homing procedure.	

P-AXIS-00254	**CNC-controlled error reaction for gantry axes**	
Description	In case of an error, an intelligent drive executes an error reaction independently in most cases and reports this to the CNC. The CNC can then stop other axes in the gantry system running with an incorrect axis. With gantry axes it is not allowed for one axis in the gantry system to stop independently. For this reason the CNC can execute a controlled stop of the complete gantry system in the event of an axis error. The function must be set for the master and the slave axes. A check is made whether the settings for master and slave axes are identical and as required, they are corrected in the slave axes.	
Parameter	kenngr.cnc_controlled_stop_after_error	
Data type	BOOLEAN	
Data range	0: Drive-internal error reaction 1: CNC-controlled error reaction	
Axis types	T, R	
Dimension	T: ----	R: ----
Default value	0	
Drive types	SERCOS, CANopen	
Remarks	In the case of a CNC-controlled error response, the axis is stopped at the specified emergency stop acceleration P-AXIS-00003 (a_emergency). This parameter can be used with SERCOS and CANopen drives. In addition a SERCOS drive must be parameterised so that it does not execute any independent (or only delayed) error response (see EcoDrive P-0-0117).	

P-AXIS-00297	**Default name of an axis**	
Description	The parameter defines the default name of the axis in the system and should therefore be unique system-wide in the same way as the logical axis number. It is used for: • Name conflicts in connection with extended axis exchange operations [PROG//Section - Axis exchange commands]. • In robotics in connection with the programming of axis-specific movements (P-CHAN-00253). Besides this, the default name has no meaning because the axis name is defined in the channel configuration (P-CHAN-00006).	
Parameter	kopf.log_achs_name	
Data type	STRING	
Data range	Maximum 16 characters (length of axis designation, application-specific)	
Axis types	T, R, S	
Dimension	T: ----	R,S: ----
Default value	X_Achse	
Drive types	----	
Remarks	The axis designations must begin with the letters A, B, C, U, V, W, X, Y, Z or Q. After that, all letters and digits are possible. Caution: If the parameter P-CHAN-00253 is set, only the names ‘A1’ and ‘A32’ may be used.	

P-AXIS-00704	**Conditions for clearing the gantry difference**	
Description	This parameter determines the conditions for the clearance of the gantry difference.	
Parameter	kenngr.gantry_on_mode	
Data type	STRING	
Data range	**Mode**	**Meaning**
	DEFAULT	The gantry difference is cleared at reset or when the control unit 'gantry_on' ([HLI]) is set.
	ONLY_CONTROL_UNIT	The gantry difference is only cleared when the drive enables are set, the drive status is 'ready' and the control unit 'gantry_on' is set.
	EDGE_TRIGGERED	The gantry difference is cleared on a rising edge of the control unit 'gantry_on'. The behaviour of this setting is equivalent to the behaviour of a set axis parameter P-AXIS-00261.
	CONFIG :	Deactivates gantry control and prevents the clearing of a gantry difference.
Axis types	T, R, S	
Dimension	T: ----	R,S: ----
Default value	DEFAULT	
Drive types	----	
Remarks	When the axis parameter P-AXIS-00261 is set, only DEFAULT or EDGE_TRIGGERED are used for P-AXIS-00704, otherwise the error message P-ERR-110606 is output. The parameter is available as of V2.11.2034.02.	

6 Appendix

6.1 Suggestions, corrections and the latest documentation

Did you find any errors? Do you have any suggestions or constructive criticism? Then please contact us at documentation@isg-stuttgart.de. The latest documentation is posted in our Online Help (DE/EN):

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Keyword index

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