

## **SOFTWARE**

## **KR C...**

## **System Variables**

## **KUKA System Software (KSS)**

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We have checked the content of this documentation for conformity with the hardware and software described. Nevertheless, discrepancies cannot be precluded, for which reason we are not able to guarantee total conformity. The information in this documentation is checked on a regular basis, however, and necessary corrections will be incorporated in subsequent editions.  
Subject to technical alterations without an effect on the function.

## Contents

1	How to use this documentation .....	5
2	A .....	7
3	B .....	29
4	C .....	34
5	D .....	41
6	E .....	53
7	F .....	63
8	G .....	66
9	H .....	68
10	I .....	70
11	J .....	77
12	K .....	78
13	L .....	81
14	M .....	85
15	N .....	92
16	O .....	95
17	P .....	100
18	R .....	115
19	S .....	124
20	T .....	139
21	U .....	158
22	V .....	159
23	W .....	166
24	Z .....	170



## 1 How to use this documentation

This tabular summary of the system variables is intended to serve as an aid for programmers with good knowledge of the functions of the KUKA robot system and the KR C... controller, and who are thoroughly familiar with programming.

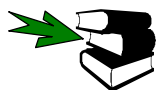
Many variable values are preset by the manufacturer (default values) and should not be changed without a compelling reason. If changes are nevertheless necessary, they can be carried out using the variable modification function or by editing the files.



**Change the values of variables only if you have sufficient knowledge of the functions of the system variables and their effects!**



**The manufacturer accepts no liability and provides no warranty whatsoever for damage of any kind arising from improper modification of variable values or their modification for a purpose other than the intended one.**



**Please also observe the chapter [Safety] in the handbook.**

**Please note:**

Each table is preceded by a title with the name and function of the system variable, e.g.:

### Variable name

### Function of the variable

Data type		Value	min.	
Unit			max.	
In file				
Original line				
Comments				

Options	Effect

If no **Options** are specified, then the second table is omitted.

## Table entries:

Data type	Real, Integer, Boolean, Character, Structure, Signal declaration, Enum, Frame, Array
Unit	ms, mm, m/s <sup>2</sup> , s, °, %, V, A, increments, bits, bit sequence, motion instructions
In file	KRC\Roboter\KRC\R1\Mada\... ... \Steu\Mada\...
Original line	Source text ;Comment
Comments	Functional description
Value min. max.	Minimum and maximum values depending on the specific data type
Option	Options depending on the data type (TRUE, FALSE, 1, 2, etc.)

A **group** of system variables is indicated at the beginning with a framed name box:

**Variable name**

## Function of the variable

Data type	Structure	Value	min.	
Unit			max.	
In file				
Original line				
Comments				

If the description contents of subsequent system variables remain the same, only their title lines are displayed.

**Variable name.1**

## Function of the variable

If there is a change, the corresponding section of the table is shown under the title line. This change then applies to all subsequent variables of the group.

**Variable name.2**

## Function of the variable

Data type	Real	Value min. max.	0
Unit	mm, °		

**Variable name.3**

## Function of the variable

## 2 A

**\$A4PAR****Set axis 4 parallel to the last rotational main axis**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$A4PAR			
Comments				

Options	Effect
0	Not set
1	Set

**\$ABS\_ACCUR****Switch absolutely accurate robot model on/off**

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$ABS_ACCUR=FALSE ;Absolutgenaues Robotermodell			
Comments				

Options	Effect
TRUE	Switched on
FALSE	Switched off

**\$ABS\_CONVERT****Conversion of point coordinates into absolutely accurate robot model**

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\custom.dat			
Original line	BOOL \$ABS_CONVERT=FALSE ;Konvertierung der Punktkoordinaten			
Comments				

Options	Effect
TRUE	
FALSE	

### \$ABS\_RELOAD

Reload absolutely accurate robot model

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\\$_operate.dat			
Original line	BOOL \$ABS_RELOAD			
Comments				

### \$ACC

Path, swivel and rotational accelerations in the advance run

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL CP \$ACC			
Comments	Accelerations in the advance run CP = m/s <sup>2</sup> , ORI1 = °/s <sup>2</sup> , ORI2 = °/s <sup>2</sup>			

### \$ACC\_ACT\_MA

Limit value of axial command acceleration

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\\$_machine.dat			
Original line	INT \$ACC_ACT_MA=250 ;Grenzwert Sollbeschleunigung [%]			
Comments				

### \$ACC\_AXIS[n]

Acceleration of the axes in the advance run

Data type	Integer	Value	min.	
Unit	%		max.	
In file	---			
Original line	INT \$ACC_AXIS[n] Beschleunigung der Achsen [%] Vorlauf			
Comments	[n] = [1] ... [6] axes A1 ... A6			



**\$ACC\_AXIS\_C[n]** Acceleration of the axes in the main run

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\operate.dat			
Original line	INT \$ACC_AXIS_C[n] Beschleunigung der Achsen [%] Hauptlauf			
Comments	[n] = [1] ... [6] axes A1 ... A6			

**\$ACC\_C** Path, swivel and rotational accelerations in the main run

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\operate.dat			
Original line	DECL CP \$ACC_C			
Comments	Accelerations in the main run CP = m/s <sup>2</sup> , ORI1 = °/s <sup>2</sup> , ORI2 = °/s <sup>2</sup>			

**\$ACC\_CAR\_ACT** The current values of the acceleration components and the total acceleration

Data type	Frame	Value	min.	
Unit	m/s <sup>2</sup>		max.	
In file	R1\Mada\operate.dat			
Original line	DECL ACC_CAR \$ACC_CAR_ACT			
Comments	<p>The X, Y and Z components of “\$ACC_CAR_ACT” contain the acceleration components along the axes of “\$ACC_CAR_TOOL”. “\$ACC_CAR_ACT.ABS” contains the associated total acceleration value. Components A, B and C are each set to “0”.</p> <p>This variable is write-protected.</p> <p>Acceleration due to gravity (9.81 m/s<sup>2</sup>) is automatically calculated into the acceleration caused by the motion.</p>			

## \$ACC\_CAR\_LIMIT

Used to set the maximum permissible value for the acceleration components and the total acceleration

Data type	Frame	Value	min.	
Unit	m/s <sup>2</sup>		max.	
In file	R1\Mada\machine.dat			
Original line	DECL ACC_CAR \$ACC_CAR_LIMIT={X 0.0,Y 0.0,Z 0.0,A 0.0,B 0.0,C 0.0,ABS 0.0}			
Comments	<p>If the variable “\$ACC_CAR_STOP” is set to “TRUE”, then if the acceleration value is exceeded the robot is stopped (ramp-down braking) and an acknowledgement message is generated.</p> <p>The values can only be modified by editing the machine data.</p>			

## \$ACC\_CAR\_MAX

Saves the greatest absolute values of “\$ACC\_CAR\_ACT”

Data type	Frame	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL ACC_CAR \$ACC_CAR_MAX			
Comments	This variable can be set to “0” to determine the maximum values.			

## \$ACC\_CAR\_STOP

The robot can be stopped if “\$ACC\_CAR\_LIMIT” is exceeded

Data type	Boolean	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	BOOL \$ACC_CAR_STOP=FALSE			
Comments	<p>Activates or deactivates the stop reaction when the value specified in “\$ACC_CAR_LIMIT” is exceeded.</p> <p>The values can only be modified by editing the machine data.</p>			

Options	Effect
TRUE	Stop reaction is activated.
FALSE	Stop reaction is deactivated.

**\$ACC\_CAR\_TOOL**

**A point on the tool mounted on the robot at which the current effective acceleration is measured**

Data type	Frame	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	FRAME \$ACC_CAR_TOOL={x 0.0,y 0.0,z 0.0,a 0.0,b 0.0,c 0.0}			
Comments	<p>In the same way as "\$TOOL", \$ACC_CAR_TOOL is also specified relative to the flange by means of the X, Y and Z coordinates. The angles of rotation A, B and C indicate the positions of the 3 axes of the coordinate system in which the acceleration components are then specified. The individual acceleration components and the total acceleration are all evaluated cyclically.</p> <p>Acceleration caused by gear unit torsion or flexion of the robot is not taken into consideration. These values can only be modified by editing the machine data.</p>			

**\$ACC\_EXTAX[6]**

**Acceleration of the external axes in the advance run**

Data type	Integer	Value	min.	
Unit	%		max.	
In file	---			
Original line	INT \$ACC_EXTAX[6] ;Beschleunigung der externen Achsen [%] Vorlauf			
Comments				

**\$ACC\_EXTAX\_C[6]**

**Acceleration of the external axes in the main run**

Data type	Integer	Value	min.	
Unit	%		max.	
In file	---			
Original line	INT \$ACC_EXTAX_C[6] ;Beschleunigung der externen Achsen [%] Hauptlauf			
Comments				

## \$ACC\_MA

**Maximum values for path acceleration, swivel acceleration and rotational acceleration**

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL CP \$ACC_MA={CP 4.6,ORI1 200.0,ORI2 200.0}			
Comments	CP = Max. path acceleration [m/s <sup>2</sup> ], ORI1 = Max. swivel acceleration [°/s <sup>2</sup> ], ORI2 = Max. rotational acceleration [°/s <sup>2</sup> ]  When calculating the values, make sure that no axis goes to current limitation.			

## \$ACC\_OV

**Data for acceleration with changes of override**

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\smachine.dat			
Original line	DECL CP \$ACC_MA={CP 4.6,ORI1 200.0,ORI2 200.0}			
Comments	CP = Path acceleration with change of override [m/s <sup>2</sup> ], ORI1 = Swivel acceleration with change of override [°/s <sup>2</sup> ], ORI2 = Rotational acceleration with change of override [°/s <sup>2</sup> ]			

## \$ACT\_BASE

**Number of the current BASE system**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$ACT_BASE ;Aktuelle Base-Nummer			
Comments				

## \$ACT\_EX\_AX

**Number of the current external base kinematic system**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$ACT_EX_AX ;Aktuelle externe Kinematik			
Comments				

**\$ACT\_TOOL**      **Number of the current tool coordinate system**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$ACT_TOOL ;Aktuelle Toolnummer			
Comments				

**\$ACT\_VAL\_DIF**      **Max. permissible difference of encoder actual values when switching on system**

Data type	Integer	Value	min.	
Unit	Increments		max.	
In file	R1\Mada\\$_machine.dat			
Original line	INT \$ACT_VAL_DIF ;Geberistwertdifferenz [Inkr]			
Comments	If the limit values are exceeded, the message “Perform mastering” appears.			

**\$ADAP\_ACC**      **Activation of acceleration adaptation**

Data type	Enum	Value	min.	
Unit			max.	
In file	R1\Mada\\$_robcor.dat			
Original line	DECL ADAP_ACC \$ADAP_ACC=#STEP1 ;Beschleunigungsanpassung (#NONE, #STEP1 )			
Comments	*) #STEP1 and #STEP2 require valid dynamic data (\$DYN_DAT)			

Options	Effect
#NONE	Not activated
#STEP1	Dynamic model without kinetic energy *)
#STEP2	Dynamic model with kinetic energy *)

## \$ADVANCE

### Specification of the advance run (max. 5 motion blocks)

Data type	Integer	Value	min.	0
Unit	Motion blocks		max.	5
In file	---			
Original line	INT \$ADVANCE ;Vorlauf [max. 5 Bewegungssätze]			
Comments				

## \$ALARM\_STOP

### Signal declaration for short-circuit braking (dynamic braking)

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$ALARM_STOP \$OUT[1013]			
Comments				

## \$ANA\_DEL\_FLT

### Analog output filter

Data type	Enum	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL SW_ONOFF \$ANA_DEL_FLT=#OFF			
Comments				
Options	Effect			
#ON	Switched on			
#OFF	Switched off			

## \$ANIN[n]

### Analog inputs

Data type	Real	Value	min.	-1.0
Unit	V		max.	+1.0
In file	---			
Original line	REAL \$ANIN[n]			
Comments	[n] = [1] ... [8] -1.0 --> -10 V +1.0 --> +10 V			


**\$ANOUT[n]**      **Analog outputs**

Data type	Real	Value	min.	-1.0
Unit	V		max.	+1.0
In file	---			
Original line	REAL \$ANOUT[n]			
Comments	[n] = [1] ... [16] -1.0 --> -10 V +1.0 --> +10 V			

**\$APO\_DIS\_PTP[n]**      **Maximum approximation distance for PTP axis[n]**

Data type	Real	Value	min.	
Unit	mm, °		max.	
In file	R1\Mada\\$.machine.dat			
Original line	REAL \$APO_DIS_PTP[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$ASYNC\_AX**      **Motion input for asynchronous external axes E1 - E6, negative or positive direction**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\\$.machine.dat			
Original line				
Comments				

**\$ASYNC\_AX1\_M**  
...  
**\$ASYNC\_AX6\_M**      **Motion input for asynchronous external axes E1 - E6, negative direction**

Original line	SIGNAL \$ASYNC_AX1_M \$IN[1026] ... SIGNAL \$ASYNC_AX6_M \$IN[1026]			
---------------	---	--	--	--

**\$ASYNC\_AX1\_P**

...

**\$ASYNC\_AX6\_P**

**Motion input for asynchronous external axes E1 - E6, positive direction**

Original line	SIGNAL \$ASYNC_AX1_P \$IN[1026]
...	SIGNAL \$ASYNC_AX6_P \$IN[1026]

**\$ASYNC\_AXIS**

**Bit arrays to switch external axes to asynchronous mode**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$ASYNC_AXIS ;Aktive asynchrone Zusatzachsen			
Comments	<p>When \$ASYNC_AXIS is assigned in a KRL program, the newly-defined asynchronous axes are valid from this position until a new assignment is made.</p> <p>When \$ASYNC_AXIS is defined, the advance run will be stopped if the value of \$ASYNC_AXIS changes. Before a new value of \$ASYNC_AXIS is saved, the system will wait until all synchronous motions (through advance run stop) and all asynchronous motions have been completed, and all axes are in position. Thus the instruction "\$ASYNC_AXIS=..." can be used – along with the system variable \$ASYNC_STATE – to synchronize in time synchronous and asynchronous motions.</p> <p>\$ASYNC_AXIS can only be modified in the KRL program, and not in the interrupt or in the SUBMIT interpreter.</p> <p>The bits correspond to the external axes in ascending order: Bit 0 = external axis 1, Bit 1 = external axis 2, etc.</p> <p>If the bit is set, the external axis will be switched to asynchronous mode; if it is reset, the external axis will be switched back to synchronous mode.</p>			

Options	Effect
Bit = 1	The corresponding external axis is switched to asynchronous mode
Bit = 0	The corresponding external axis is switched to synchronous mode



**\$ASYNC\_FLT** Filter for asynchronous external axes

Data type	Integer	Value	min.	0
Unit	ms		max.	16
In file	---			
Original line	INT \$ASYNC_FLT			
Comments	The value of \$ASYNC_FLT is the filter length in milliseconds for all asynchronously coordinated motions; it corresponds to the system variable \$FILTER for synchronous motions.			

**\$ASYNC\_MODE** Mode for asynchronous external axes

Data type	Integer	Value	min.	0
Unit			max.	16
In file	Steu\Mada\Scustom.dat			
Original line	INT \$ASYNC_MODE='B0000' ;Mode für asynchrone Zusatzachsen			
Comments	<p>In the machine data of the controller, the bit mask \$ASYNC_MODE can be used to set various asynchronous motion execution modes.</p> <p>It is not possible to change modes while the robot controller is running.</p> <p>The modes can be combined in any way desired.</p> <p>Certain modes must be set in order to use special applications.</p> <p>In the standard setting (default mode) no \$ASYNC_MODE bits are set.</p> <p>Only bit 0 is used at this time:</p> <p>Bit 0 = 0 (1st bit): default mode</p> <p>Bit 0 = 1 (1st bit): mode 1</p> <p>Bit 1 = (2nd bit): mode 2 block selection response</p>			

**\$ASYNC\_OPT** Option flag for "Asynchronous axes are possible"

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\Option.dat			
Original line	BOOL \$ASYNC_OPT=FALSE			
Comments				

Options	Effect
TRUE	Asynchronous axes possible
FALSE	Asynchronous axes not possible

## \$ASYNC\_STATE

Current asynchronous motion execution state

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL ASYNC_STATE \$ASYNC_STATE ;Zustand der asynchronen Achsen			
Comments	<p>\$ASYNC_STATE can be used to check the current asynchronous motion execution state.</p> <p>The value is read-only; no assignments are possible.</p> <p>Asynchronous and "normal" robot motions can be synchronized using this variable.</p>			

Options	Effect
#BUSY	Asynchronous motions active, stopped or temporarily stored.
#IDLE	No asynchronous motions active or stopped (queue is empty); last motion terminated without an interrupt.
#CANCELLED	No asynchronous motions active or stopped (queue is empty); last motion was canceled.
#PEND	Asynchronous motion is planned, but is not currently being executed

## \$ASYNC\_T1\_FAST

Control of the velocity reduction factor in Test1 mode

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\\$.machine.dat			
Original line	INT \$ASYNC_T1_FAST='B0000' ;Geschw.-Red. Deaktiviert ( T1 )			
Comments				

Options	Effect
0	Activated
1	Deactivated

**\$ASYS Assignment of the jog keys**

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL ASYS \$ASYS ;Verfahrtastenbelegung (ROBOT = Roboter, EXTAX = Externe Achsen)			
Comments				

Options	Effect
#ROBOT	Robot axes A1 - A6
#EXTAX	External axes E1 - E6
#EXTAX2	External kinematic system

**\$AUT Signal declaration "Automatic mode"**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$AUT \$OUT[995] ;Betriebsart Automatik			
Comments				

**\$AUX\_POWER Signal declaration for external power supply**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$AUX_POWER \$IN[1026] ;Externe Spannungsversorgung aktiv			
Comments	If “\$AUX_POWER” has the value “TRUE”, the external power supply is active; if the value is “FALSE”, the external power supply is not active.			

## \$AX\_SIM\_ON

**Simulation of the closed speed control loop for the individual axes on a desktop PC**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$AX_SIM_ON='B111111' ;Achssimulation			
Comments	Bit sequence: LSB: Axis 1 MSB: Axis 12			

## \$AXIS\_ACT

**Current axis-specific robot position**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	E6AXIS \$AXIS_ACT ;Aktuelle Roboterposition achsspezifisch [mm,Grad]			
Comments				

## \$AXIS\_ACT.A1

...  
\$AXIS\_ACT.A6

**Current axis-specific robot position, axis 1 - 6**

Data type	Real	Value	min.	0
Unit	mm, °		max.	

## \$AXIS\_ACT.E1

...  
\$AXIS\_ACT.E6

**Current axis-specific robot position, external axis 1 - 6**

## \$AXIS\_ACTMOD

**Display of axis angle modulo 180°**

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	E6AXIS \$AXIS_ACTMOD			
Comments				

**\$AXIS\_BACK****Start position of the current motion block, axis-specific**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	E6AXIS \$AXIS_BACK ;Anfangsposition des aktuellen Bewegungssatzes achsspezifisch [mm,Grad]			
Comments				

**\$AXIS\_BACK.A1****Start position of the current motion block,  
axis A1 - A6****...  
\$AXIS\_BACK.A6**

Data type	Real	Value	min.	0
Unit	mm, °		max.	

**\$AXIS\_BACK.E1****Start position of the current motion block,  
external axis E1 - E6****...  
\$AXIS\_BACK.E6****\$AXIS\_CAL****Display whether axis is referenced**

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL AXIS_CAL \$AXIS_CAL			
Comments	Display of referenced axes			

**\$AXIS\_CAL.A1****Display whether axis A1 ... A6 is referenced****...  
\$AXIS\_CAL.A6**

Data type	Boolean	Value	min.	
Unit			max.	

Options	Effect
TRUE	Axis is referenced
FALSE	Axis is not referenced

**\$AXIS\_CAL.E1**  
...  
**\$AXIS\_CAL.E6**

**Display whether external axis E1 ... E6 is referenced**

**\$AXIS\_DIR[n]**

**Direction of rotation of axis[n]**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\smachine.dat			
Original line	INT \$AXIS_DIR[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

Options	Effect
1	Positive direction
-1	Negative direction

**\$AXIS\_FOR**

**Target position of the current motion block, axis-specific**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	E6AXIS \$AXIS_FOR ;Zielposition des aktuellen Bewegungssatzes achsspezifisch [mm,Grad]			
Comments				

**\$AXIS\_FOR.A1**  
...  
**\$AXIS\_FOR.A6**

**Target position of the current motion block, axis A1 ... A6**

Data type	Real	Value	min.	0
Unit	mm, °		max.	

**\$AXIS\_FOR.E1**  
...  
**\$AXIS\_FOR.E6**

**Target position of the current motion block, external axis E1 ... E6**

**\$AXIS\_HOME[5]** Definition of the various home positions

Data type	Array	Value	min.	
Unit			max.	
In file	R1\Mada\\$.machine.dat			
Original line	E6AXIS \$AXIS_HOME[5]			
Comments				

**\$AXIS\_INC** Incremental actual values of the axes

Data type	Structure	Value	min.	
Unit	Increments		max.	
In file	---			
Original line	DECL AXIS_INC \$AXIS_INC			
Comments	Indication of the axis position in increments.			

**\$AXIS\_INC.I1**  
**...**  
**\$AXIS\_INC.I6** Incremental actual value, axis A1 ... A6

Data type	Integer	Value	min.	0
Unit	Increments		max.	

**\$AXIS\_INC.E1**  
**...**  
**\$AXIS\_INC.E6** Incremental actual value, external axis E1 ... E6

**\$AXIS\_INT** Robot position at the time of an interrupt

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	E6AXIS \$AXIS_INT ;Unterbrechungsposition achsspezifisch [mm,Grad]			
Comments				

**\$AXIS\_INT.A1**  
...  
**\$AXIS\_INT.A6**

**Robot position at the time of an interrupt,  
axis A1 ... A6**

Data type	Real	Value	min.	0
Unit	mm, °		max.	

**\$AXIS\_INT.E1**  
...  
**\$AXIS\_INT.E6**

**Robot position at the time of an interrupt,  
external axis E1 ... E6**

**\$AXIS\_JUS**

**Display whether axis is mastered**

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL AXIS_CAL \$AXIS_JUS ;Anzeige justierter Achsen			
Comments				

**\$AXIS\_JUS.A1**  
...  
**\$AXIS\_JUS.A6**

**Display whether axis A1 ... A6 is mastered**

Data type	Boolean	Value	min.	
Unit			max.	
Options	Effect			
TRUE	Axis mastered			
FALSE	Axis not mastered			

**\$AXIS\_JUS.E1**  
...  
**\$AXIS\_JUS.E6**

**Display whether external axis E1 ... E6 is mastered**

**\$AXIS\_RESO**

**Resolution of the position sensing system**

Data type	Integer	Value	min.	
Unit	Increments / revolution		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$AXIS_RESO[12] ;Auflösung des Meßsystems Achse(i) (i=1:A1, i=7:E1) [Inkr]			
Comments	Number of pulses per revolution of the encoder			



**\$AXIS\_RET****Axis positions when leaving the programmed path, axis-specific**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	E6AXIS \$AXIS_RET ;Rückpositionieren achsspezifisch [mm,Grad]			
Comments				

**\$AXIS\_RET.A1**

...

**\$AXIS\_RET.A6****Position of axis A1 ... A6 when leaving the programmed path**

Data type	Character	Value	min.	0
Unit	mm, °		max.	

**\$AXIS\_RET.E1**

...

**\$AXIS\_RET.E6****Position of external axis E1 ... E6 when leaving the programmed path****\$AXIS\_SEQ[n]****Change in sequence of axis ... to axis ...**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$AXIS_SEQ[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

## \$AXIS\_TYPE[n]

### Axis identification

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$AXIS_TYPE[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

Options	Effect
1	Linear
2	Spindle
3	Rotational
4	Finitely rotating
5	Infinitely rotating

## \$AXWORKSPACE[n]

### Definition of axis-specific workspace monitoring

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL AXBOX\$AXWORKSPACE[n]			
Comments	[n] = [1] ... [8]			

**\$AXWORKSPACE[n].MODE****Functional principle of the axis-specific workspace monitoring function**

Data type	Enum	Value	min.	
Unit			max.	
In file	R1\Mada\Smachine.dat			
Original line	DECL AXBOX\$AXWORKSPACE[n]			
Comments	[ n ] = [1] ... [8]			

Options	Effect
#OFF	Work envelope monitoring deactivated
#INSIDE	The output is set if the TCP is located inside the work envelope
#OUTSIDE	The output is set if the TCP is located outside the work envelope
#INSIDE_STOP	The output is set and the robot stopped if the TCP is located inside the work envelope
#OUTSIDE_STOP	The output is set and the robot stopped if the TCP is located outside the work envelope

**\$AXWORKSPACE[n].STATE****Violation of the axis-specific workspace**

Data type	Boolean	Value	min.	
Unit			max.	

Options	Effect
TRUE	The workspace has been violated
FALSE	The workspace has not been violated

**\$AXWORKSPACE\_NAME[n]****Name of the particular axis-specific workspace**

Data type	Character	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	CHAR \$AXWORKSPACE_NAMEn[24] \$AXWORKSPACE_NAMEn[]="AXWORKSPACE_NAME n"			
Comments	[ n ] = [1] ... [8]			

**\$AXWORKSTATE1**

...

**\$AXWORKSTATE8**

**Signal declaration “Violation of workspace”**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$AXWORKSTATE1 \$OUT[969] . . SIGNAL \$AXWORKSTATE8 \$OUT[976] ; Ausgang der Achsarbeitsraumüberwachung .			
Comments				

Options	Effect
\$OUT[n]	Output 1 ... 4096
FALSE	Outputs that are not required can be set to “FALSE”, e.g. SIGNAL \$AXWORKSTATE1 FALSE



## 3 B

**\$BASE**

**Offset and rotation of the base coordinate system in relation to the world coordinate system in the advance run**

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\\$\operate.dat			
Original line	FRAME \$BASE ;Basis im Weltkoordinatensystem Vorlauf			
Comments				

**\$BASE.A**

**Rotation of the base coordinate system about the Z axis in relation to the world coordinate system in the advance run**

Data type	Real	Value	min.	
Unit	°		max.	

**\$BASE.B**

**Rotation of the base coordinate system about the Y axis in relation to the world coordinate system in the advance run**

**\$BASE.C**

**Rotation of the base coordinate system about the X axis in relation to the world coordinate system in the advance run**

**\$BASE.X**

**Offset of the base coordinate system in the X direction in relation to the world coordinate system in the advance run**

Data type	Real	Value	min.	
Unit	mm		max.	

**\$BASE.Y**

**Offset of the base coordinate system in the Y direction in relation to the world coordinate system in the advance run**

**\$BASE.Z**

**Offset of the base coordinate system in the Z direction in relation to the world coordinate system in the advance run**

**\$BASE\_C**

**Offset and rotation of the base coordinate system in relation to the world coordinate system in the main run**

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	FRAME \$BASE_C ;Basis im Weltkoordinatensystem Hauptlauf			
Comments				

**\$BASE\_C.A**

Rotation of the base coordinate system about the Z axis in relation to the world coordinate system in the main run

Data type	Real	Value	min.	
Unit	°		max.	

**\$BASE\_C.B**

Rotation of the base coordinate system about the Y axis in relation to the world coordinate system in the main run

**\$BASE\_C.C**

Rotation of the base coordinate system about the X axis in relation to the world coordinate system in the main run

**\$BASE\_C.X**

Offset of the base coordinate system in the X direction in relation to the world coordinate system in the main run

Data type	Real	Value	min.	
Unit	mm		max.	

**\$BASE\_C.Y**

Offset of the base coordinate system in the Y direction in relation to the world coordinate system in the main run

**\$BASE\_C.Z**

Offset of the base coordinate system in the Z direction in relation to the world coordinate system in the main run

**\$BASE\_KIN**

External kinematic / axes in base

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$BASE_KIN[29] ;Externe Kinematik / Achsen in Base			
Comments				

**\$BOUNCE\_TIME**

Bounce time for EMT signals

Data type	Integer	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$BOUNCE_TIME ;Prellzeit für EMT-Taster [ms]			
Comments	The signal is only accepted if it remains stable over the entire time period defined in \$BOUNCE_TIME.			

**\$BRAKE\_SIG** Bit array for axis brakes, A1 ... A6 and E1 ... E6

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$BRAKE_SIG ;Bit-Feld Bremsensignale			
Comments				

Options	Effect
0	Brake closed
1	Brake open

**\$BRK\_DEL\_COM** Time after which the axis brakes are closed on completion of positioning during jogging

Data type	Integer	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$BRK_DEL_COM ;Bremsverzögerungszeitkommando-Modus [ms]			
Comments				

**\$BRK\_DEL\_EX** Brake delay time for external axes

Data type	Integer	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$BRK_DEL_EX ;Bremsverzögerungszeit für Zusatzachsen			
Comments				

### \$BRK\_DEL\_PRO

**Time after which the axis brakes are closed on completion of positioning in the program**

Data type	Integer	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$BRK_DEL_PRO ;Bremsverzögerungszeit im Programm [ms]			
Comments				

### \$BRK\_MAX\_TM

**Maximum deceleration time for path-maintaining Emergency Stop**

Data type	Integer	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$BRK_MAX_TM			
Comments				

### \$BRK\_MODE

**Brake control mode**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\smachine.dat			
Original line	INT \$BRK_MODE='B0101'			

Comments	<p>The bits are counted from right to left.</p> <p>Bit 0: Axes A 1 – A 6 close at command end (bit 0 = 1) / do not close (bit 0 = 0)</p> <p>Bit 1: Axes A 1 – A 6 close individually<sup>1)</sup> (bit 1 = 1) / together (bit 1 = 0)</p> <p>Bit 2: Axes A 1 – A 6 close during pauses in the motion (bit 2 = 1) / do not close (bit 2 = 0)</p> <p>Bit 3: External axis brakes close during motion pauses individually (bit 3 = 1) / together with axes A 1 – A 6 (bit 3 = 0)</p> <p><sup>1)</sup>Special case</p>			
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**\$BRK\_OPENTM**

**Time delay of command value output after axis brakes have been opened**

Data type	Integer	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$BRK_OPENTM ;Bremsöffnungszeit [ms]			
Comments				

**\$BUS\_PAR**

**L2 bus interface (KRC32)**

Data type	Structure	Value	min.	
Unit			max.	
In file	Steu\Mada\custom.dat			
Original line	DECL BUS \$BUS_PAR={PROTO 1,PROC 5,RCO 5,BL 128,PT 0,TS 1,BAUD 187500,TSL -1,MIN_TDSR -1,MAX_TDSR -1,TTR -1,HSA -1,G -1,DFLT_SAP -1}			
Comments				

## 4 C

### \$CABLE2\_MON

#### Additional motor cable monitoring

Data type	Boolean	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	BOOL \$CABLE2_MON=FALSE			
Comments	Specifies whether the connection of the second motor cable should be monitored (TRUE for special machines)			

Options	Effect
TRUE	Monitoring activated
FALSE	Monitoring deactivated

### \$CAL\_DIFF

#### Mastering difference for EMT mastering with check run

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$CAL_DIFF ;Justage-Differenz			
Comments				

### \$CALP

#### Reference point offset between mathematical zero point and encoder zero point

Data type	Structure	Value	min.	0
Unit			max.	
In file	---			
Original line	E6AXIS \$CALP ;Referenzpunktverschiebung			
Comments				

**\$CALP.A1**

...

**\$CALP.A6**

**Reference point offset between mathematical zero point and encoder zero point, axis A1 ... A6**

Data type	Real	Value	min.	0
Unit	°		max.	

**\$CALP.E1**

...

**\$CALP.E6**

**Reference point offset between mathematical zero point and encoder zero point, external axis E1 ... E6**

**\$CIRC\_TYPE**

**Orientation control with CIRC blocks in the advance run**

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL CIRC_TYPE \$CIRC_TYPE ;Bezugssystem für die Orientierungsinterpolation bei CIRC-Sätzen (Vorlauf)			
Comments				

Options	Effect
#BASE	Space-related orientation control
#PATH	Path-related orientation control

**\$CIRC\_TYPE\_C**

**Orientation control with CIRC blocks in the main run**

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL CIRC_TYPE \$CIRC_TYPE_C ;Bezugssystem für die Orientierungsinterpolation bei CIRC-Sätzen (Hauptlauf)			
Comments				

Options	Effect
#BASE	Space-related orientation control
#PATH	Path-related orientation control

**\$CMD** Display assignment number (handle) for command channel

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$CMD			
Comments				

**\$COM\_NAME** Command which is to be processed after next start

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$COM_NAME[486] ;Kommando, welches beim nächsten Start abgearbeitet wird			
Comments				

**\$COM\_VAL\_MI[n]** Limitation of command speed, axis[n]

Data type	Real	Value	min.	
Unit	%		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$COM_VAL_MI[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$CONF\_MESS** Signal declaration "Reset acknowledgement messages"

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$CONF_MESS \$IN[1026]			
Comments	External confirmation			

**\$COSYS****Coordinate system for jogging**

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL COSYS \$COSYS			
Comments				

Options	Effect
#AX	Motions are relative to the axis-specific coordinate system.
#CAR	Motions are relative to the Cartesian coordinate system.

**\$COUNT\_I[n]****Freely usable integer variables**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$COUNT_I[n]			
Comments	[n]=[1] ... [32] Used as counters in the VW package			

**\$COUP\_COMP[N,D]****Axis coupling factors**

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\\$.machine.dat			
Original line	DECL FRA \$COUP_COMP[6,6]			
Comments	Axis coupling factor: N = numerator; D = denominator			

## \$CP\_VEL\_TYPE

### Reduction of the CP path velocity

Data type	Enum	Value	min.	
Unit			max.	
In file	Steu\Mada\Scustom.dat			
Original line	DECL CP_VEL_TYPE \$CP_VEL_TYPE=#CONSTANT			
Comments	If the axis limit values are exceeded, the CP velocity is reduced. Reduction is always active in Cartesian jogging.			

Options	Effect
#Constant	No reduction
#VAR_T1	Reduction in jog mode SStep(T1)
#VAR_ALL	Reduction in all modes

## \$CPVELREDMELD

### Generation of message if path velocity reduced

Data type	Real	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$CPVELREDMELD			
Comments	The message contains the point name and the maximum reduction in the specific motion command.			

Options	Effect
0	Generation of message deactivated.
1	Generation of message in the event of block change in jog mode.
100	Generation of message in the event of block change in all modes.

## \$CURR\_ACT

### Actual current of axes 1 - 12

Data type	Real	Value	min.	
Unit	%		max.	
In file	---			
Original line	REAL \$CURR_ACT[12] ;Aktueller Motorstrom in %			
Comments	Current value of current of axes 1 - 12 in % of maximum servo drive module current \$CURR_MAX (-100% to +100%)			

**\$CURR\_CAL**      **Current calibration in the power module**

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$CURR_CAL[12] ;Stromkalibrierung Powermodul (Stromwandler)			
Comments	For KRC 1a and KRC 2, calibration = 1			

Options	Effect
1	High power
2	Medium / low power
4	Low power

**\$CURR\_COM\_EX**      **Current limitation for external axes in jog mode**

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$CURR_COM_EX[6] ;Stromgrenze externer Achsen für Handverfahren			
Comments				

**\$CURR\_LIM[n]**      **Current limitation, axis[n]**

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$CURR_LIM[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$CURR\_MAX**      **Maximum effective current on power module output**

Data type	Real	Value	min.	
Unit	A		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$CURR_MAX[12]			
Comments	Effective current must be present			

**\$CURR\_MON[n]** Permissible rated current

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$CURR_MON[n] ;Zulässiger Nennstrom			
Comments	Defines the limit for i²t monitoring for 55 °C [n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$CURR\_RED** Current limitation of axes 1 - 12 in % of maximum current

Data type	Real	Value	min.	
Unit	%		max.	
In file	---			
Original line	REAL \$CURR_RED[12,2]			
Comments	1st digit: axis 2nd digit: 1 = positive limit 2 = negative limit			

**\$CYC\_DEF1 ... 32** Input text for the corresponding cyclical flag

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$CYC_DEF1[470] ... CHAR \$CYC_DEF32[470]			
Comments				

**\$CYCFLAG[n]** Cyclical flags

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$CYCFLAG[32]			
Comments	[n]=[1] ... [256] There are 32 cyclical flags available; these flags are cyclically updated independently of program execution. The default value is FALSE.			



## 5 D

**\$DATA\_SERx** Number of serial receive messages read in the channel x buffer

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$DATA_SER1 ;Zähler für Datenpakete die über: SER1 eintreffen			
Comments				

**\$DATA\_INTEGRITY** A variable of type "Signal" is output either as groups of bits or one bit at a time

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\Option.dat			
Original line	BOOL \$DATA_INTEGRITY=FALSE ;Signal-Datenkonsistenz Ein/Aus			
Comments	If the signal variable is output as groups of bits, the signal must be defined in one of the defined data objects "OUTB", "OUTW" or "OUTDW"			

Options	Effect
TRUE	Data are output as groups of bits
FALSE	Data are output one bit at a time

**\$DATAPATH** Name of the SRC file whose variables in the data list are to be accessed using the variable modification function

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$DATAPATH[16] ;Kommandocompiler-Suchpfad			
Comments				

## \$DATE

### System time and system date

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL DATE \$DATE ;Interne Systemzeit			
Comments				

## \$DECEL\_MB

### Deceleration time during maximum braking

Data type	Real	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$DECEL_MB[12]			
Comments	Braking ramp for dynamic braking [ms].  In maximum braking, the current actual speed value is taken as the command speed value and run down the ramp set in the machine datum \$DECEL_MB to zero.			

## \$DEF\_A4FIX

### Fixing of axis 4 when palletizing

Data type	Boolean	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	BOOL \$DEF_A4FIX=FALSE ;Achse 4 fixiert			
Comments	Defines whether the robot has 5 or 6 axes.  When a program is loaded or reset, \$PAL_MODE = \$DEF_A4FIX is set, i.e. palletizing mode is thus automatically activated for a 5-axis robot and not for a normal 6-axis robot.			

Options	Effect
TRUE	5-axis robot (axis 4 fixed)
FALSE	6-axis robot


**\$DEF\_FLT\_CP**      **Default filter for CP motion**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\smachine.dat			
Original line	INT \$DEF_FLT_CP ;Defaultfilter CP			
Comments				

**\$DEF\_FLT\_PTP**      **Default filter for PTP motion**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$DEF_FLT_PTP ;Defaultfilter PTP			
Comments				

**\$DEF\_L\_CM**
**Center of mass frame for the default load on the flange  
in the flange coordinate system**

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\\$,robcor.dat			
Original line	FRAME \$DEF_L_CM={x 230.0,y 0.0,z 210.0,a 0.0,b 0.0,c 0.0} ;Massenschwerpunkt-Frame			
Comments				

**\$DEF\_L\_CM.A**      **Rotation about the Z axis**

Data type	Real	Value	min.	
Unit			max.	

**\$DEF\_L\_CM.B**      **Rotation about the Y axis**
**\$DEF\_L\_CM.C**      **Rotation about the X axis**
**\$DEF\_L\_CM.X**      **Offset in the X direction**
**\$DEF\_L\_CM.Y**      **Offset in the Y direction**
**\$DEF\_L\_CM.Z**      **Offset in the Z direction**

## \$DEF\_L\_J

**Default moment of inertia of the load on the flange in the default center of mass coordinate system of the load**

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada,\$robcor.dat			
Original line	DECL INERTIA \$DEF_L_J={X 17,5,Y 17,5,Z 17,5} ;Eigentraegheitsmomente der Last			
Comments				

## \$DEF\_L\_M

**Default mass of the load on the flange**

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\\$_robcor.dat			
Original line	REAL \$DEF_L_M			
Comments				

## \$DEF\_LA3\_CM

**Center of mass frame for the default mass of the supplementary load on axis 3 in the flange coordinate system**

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\\$_robcor.dat			
Original line	FRAME \$DEF_LA3_CM={x -505.0,y 0.0,z -1110.0,a 0.0,b 0.0,c 0.0} ;Massenschwerpunkt-Frame A3			
Comments				

## \$DEF\_LA3\_CM.A

**Rotation about the Z axis**

Data type	Real	Value	min.	
Unit			max.	

## \$DEF\_LA3\_CM.B

**Rotation about the Y axis**

## \$DEF\_LA3\_CM.C

**Rotation about the X axis**

## \$DEF\_LA3\_CM.X

**Offset in the X direction**

## \$DEF\_LA3\_CM.Y

**Offset in the Y direction**

## \$DEF\_LA3\_CM.Z

**Offset in the Z direction**


**\$DEF\_LA3\_J** Default moment of inertia of the supplementary load on axis 3

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\\$_robcor.dat			
Original line	DECL INERTIA \$DEF_LA3_J={X 16,8,Y 16,8,Z 16,8}			
Comments				

**\$DEF\_LA3\_M** Default mass of the supplementary load on axis 3

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\\$_robcor.dat			
Original line	REAL \$DEF_LA3_M			
Comments				

**\$DEF\_OV\_JOG** Default value for override in jog mode

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\\$_machine.dat			
Original line	INT \$DEF_OV_JOG			
Comments				

**\$DEVICE** Operator control device status

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL DEVICE \$DEVICE ;Bediengerätzustand (ACTIVE, BLOCK, PASSIVE, OFF)			
Comments				

Options	Effect
#ACTIVE	
#BLOCK	
#PASSIVE	
#OFF	

### \$DH\_4 Denavit-Hartenberg parameters for the wrist (frame between axes 4 and 5)

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL DHART \$DH_4={DHART_A 0.0,DHART_D 0.0,DHART_ALPHA 90.0} ;A = Länge A, D = Länge D, ALPHA = Winkel ALPHA			
Comments	Defines the frame between axes 4 and 5.			

### \$DH\_4.DHART\_A Denavit-Hartenberg parameters for the wrist – Length A

Data type	Real	Value	min.	
Unit	mm		max.	

### \$DH\_4.DHART\_D Denavit-Hartenberg parameters for the wrist – Length D

### \$DH\_4.DHART\_ALPHA Denavit-Hartenberg parameters for the wrist – Angle alpha

Data type	Real	Value	min.	
Unit	°		max.	

### \$DH\_5 Denavit-Hartenberg parameters for the wrist (frame between A5 and A6)

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL DHART \$DH_5={DHART_A 0.0,DHART_D 0.0,DHART_ALPHA -90.0} ;A = Laenge A, D = Laenge D, ALPHA = Winkel ALPHA			
Comments	Defines the frame between axes 5 and 6.			

### \$DH\_5.DHART\_A Denavit-Hartenberg parameters for the wrist – Length A

Data type	Real	Value	min.	
Unit	mm		max.	

### \$DH\_5.DHART\_D Denavit-Hartenberg parameters for the wrist – Length D

### \$DH\_5.DHART\_ALPHA Denavit-Hartenberg parameters for the wrist – Angle alpha

Data type	Real	Value	min.	
Unit	°		max.	



**\$DIGIN1**  
...  
**\$DIGIN6**

**Signal declaration defining the input to which the digital input “\$DIGIN1 ... 6” is assigned**

Data type	Signal declaration	Value min. max.	
Unit			
In file	Steu\Mada\machine.dat		
Original line	SIGNAL \$DIGIN1 \$IN[1026] TO \$IN[1026] ... SIGNAL \$DIGIN6 \$IN[1026] TO \$IN[1026]		
Comments	Assignment of digital inputs 1 to 6		

**\$DIGIN1CODE**  
...  
**\$DIGIN6CODE**

**Defines whether or not the value for “\$DIGIN1 ... 6” is preceded by a sign**

Data type	Enum	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	DECL DIGINCODE \$DIGIN1CODE=#UNSIGNED ... DECL DIGINCODE \$DIGIN6CODE=#UNSIGNED			
Comments	Sign assignment for \$DIGIN1 ... 6			

Options	Effect
#SIGNED	With sign
#UNSIGNED	Without sign

**\$DIR\_CAL**

**Defines the referencing direction for each axis**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$DIR_CAL='B000111111111' ;Referier-Richtung			
Comments				

Options	Effect
Bit (n)= 0	Reference point of axis n is approached in the positive direction
Bit (n)= 1	Reference point of axis n is approached in the negative direction

## \$DIRECTION

**Direction of the start key –  
program is executed either forwards or backwards**

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL DIRECTION \$DIRECTION			
Comments				

Options	Effect
#FORWARD	Forwards execution
#BACKWARD	Backwards execution

## \$DIS\_WRP1

**Average distance of wrist point from singularity 1  
(Alpha 1 singularity)**

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$DIS_WRP1 ;Mittlerer Abstand Handpunkt zur Singularitaet1			
Comments				

## \$DIS\_WRP2

**Average distance of wrist point from singularity 2  
(Alpha 5 singularity)**

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$DIS_WRP2 ;Mittlerer Abstand Handpunkt zur Singularitaet2			
Comments				



**\$DISPLAY\_REF**

New form output when “\$DISPLAY\_VAR” is changed

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$DISPLAY_REF ;Formularneuausgabe bei Aenderung von \$DISPLAY_VAR			
Comments				

**\$DISPLAY\_VAR.NAME[32]**

Name of observable variables

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL DISPLAY_VAR \$DISPLAY_VAR[32] ;Beobachtbare Variablen			
Comments				

**\$DISPLAY\_VAR[1]...[32]**

Observable variables

**\$DISPLAY\_VAR.PATH[12]**

Corresponding file list name

Data type	Character	Value	min.	
Unit			max.	

**\$DISPLAY\_VAR.TITLE[12]**

Name to be displayed for the variable

**\$DIST\_NEXT**

Distance still to be covered to the next point

Data type	Real	Value	min.	
Unit			max.	
In file	---			
Original line	REAL \$DIST_NEXT			
Comments				

## \$DISTANCE

### Curve length, CP motion

Data type	Real	Value	min.	
Unit	mm		max.	
In file	---			
Original line	REAL \$DISTANCE ;Bogenlaenge CP-Bewegung in [mm]			
Comments				

## \$DRIVE\_CART

### Option bit: PTP points with Cartesian coordinates

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\Option.dat			
Original line	BOOL \$DRIVE_CART=TRUE ;PTP mit kartesischen Koordinaten			
Comments				

Options	Effect
TRUE	PTP points can have Cartesian coordinates
FALSE	PTP points cannot have Cartesian coordinates

## \$DRIVE\_CP

### Option bit: Cartesian robot motion possible (LIN, CIRC)

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\Option.dat			
Original line	BOOL \$DRIVE_CP=TRUE			
Comments				

Options	Effect
TRUE	Cartesian robot motion possible
FALSE	Cartesian robot motion not possible

**\$DRIVES\_OFF****Signal declaration "Drives OFF"**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\Smachine.dat			
Original line	SIGNAL \$DRIVES_OFF \$IN[1025]			
Comments	Drives OFF			

**\$DRIVES\_ON****Signal declaration "Drives ON"**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\option.dat			
Original line	SIGNAL \$DRIVES_ON \$IN[1026]			
Comments	Drives ON			

**\$DSECHANNEL****Assignment of axes to channels of the digital servoelectronics (DSE)**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$DSECHANNEL[12] ;Achszuordnung auf DSE			
Comments				

**\$DYN\_DAT[350]****Model data of the robot for acceleration adaptation, higher motion profile and kinetic energy**

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\\$robcor.dat			
Original line	REAL \$DYN_DAT[350]			
Comments	Contains the model data of the robot, which are required for acceleration adaptation, the higher motion profile and the calculation of kinetic energy (moments of inertia, friction values, etc.)			



## 6 E

**\$EMSTOP\_ADAP****Model-based Emergency Stop**

Data type	Boolean	Value	min.	
Unit			max.	
In file	R1\Mada\\$_robcor.dat			
Original line	BOOL \$EMSTOP_ADAP=FALSE ;NOT-AUS mit Dynamikmodell			
Comments	<p>The system variable “\$ADAP_ACC” must not be set to “#NONE” (dynamic model for the kinematic system must be present).</p> <p>The path-maintaining EMERGENCY STOP motion for PTP and CP paths is executed with maximum deceleration; this is determined by the motor and gear torques calculated in the dynamic model.</p> <p>External axes are still braked as before, thus affecting the robot axes.</p> <p>Internally, both the new and the old functionality are calculated and compared with one another. If this comparison indicates significantly higher deceleration using the old method (e.g. due to completely incorrect model or load data), braking is carried out using the old functionality.</p>			
Options	Effects			
TRUE	Model-based Emergency Stop activated			
FALSE	Model-based Emergency Stop not activated (old functionality)			

**\$EMSTOP\_GEARTORQ[n]****Maximum gear torque for Emergency Stop**

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\\$_robcor.dat			
Original line	REAL \$EMSTOP_GEARTORQ[n] ;Max. Getriebemoment bei modellbasiertem NOT-AUS [Nm]			
Comments	[n] = [1] ... [6]			

**\$EMSTOP\_MOTTORQ[n]****Maximum motor torque for Emergency Stop**

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\\$_robcor.dat			
Original line	REAL \$EMSTOP_MOTTORQ[n] ;Max. Motormomente bei modellbasiertem NOT-AUS [Nm]			
Comments	[n] = [1] ... [6]			

## \$EMSTOP\_PATH

**Configuration of path-maintaining Emergency Stop for operating modes T1, T2, AUT, EX**

Data type	Structure	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	DECL EMSTOP_PATH \$EMSTOP_PATH={T1 #ON,T2 #ON,AUT #ON,EX #ON} ;Projektierung des bahntreuen NOT-AUS für T1, T2, AUT, EX			
Comments				

Options	Effects
#ON	Path-maintaining emergency stop for the corresponding operating mode is on
#OFF	Path-maintaining emergency stop for the corresponding operating mode is off

## \$EMSTOP\_PATH.AUT

**Configuration of path-maintaining Emergency Stop for operating mode "AUT"**

Data type	Enum	Value	min.	
Unit			max.	

Options	Effects
#ON	Path-maintaining emergency stop for operating mode "AUT" is on
#OFF	Path-maintaining emergency stop for operating mode "AUT" is off

## \$EMSTOP\_PATH.EX

**Configuration of path-maintaining Emergency Stop for operating mode "EX"**

Options	Effects
#ON	Path-maintaining emergency stop for operating mode "EX" is on
#OFF	Path-maintaining emergency stop for operating mode "EX" is off

## \$EMSTOP\_PATH.T1

**Configuration of path-maintaining Emergency Stop for operating mode "T1"**

Options	Effects
#ON	Path-maintaining emergency stop for operating mode "T1" is on
#OFF	Path-maintaining emergency stop for operating mode "T1" is off

## \$EMSTOP\_PATH.T2

**Configuration of path-maintaining Emergency Stop for operating mode "T2"**

Options	Effects
#ON	Path-maintaining emergency stop for operating mode "T2" is on
#OFF	Path-maintaining emergency stop for operating mode "T2" is off

**\$EMSTOP\_TIME****Time monitoring for path-maintaining Emergency Stop**

Data type	Integer	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$EMSTOP_TIME ;Zeitueberwachung für bahntreuen NOT-AUS [ms]			
Comments				

**\$EMSTOP\_TORQRATE****Maximum changing of motor and gear torques**

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\\$_robcor.dat			
Original line	REAL \$EMSTOP_TORQRATE ;Max. Aenderung der Momente bei NOT-AUS mit Dynamikmodell [Nm/ms]			
Comments	For setting jolt limitation in the event of a model-based Emergency Stop			

**\$EMT\_MODE****Method for EMT mastering**

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL EMT_MODE \$EMT_MODE			
Comments				

Options	Effects
#FIRST_CAL	First mastering
#TOOL_TEACH	Learn tool
#CHECK_CAL	Check
#RECALC_CAL	Restore

## \$ENDLESS

### Flag for infinitely rotating axes

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\Option.dat			
Original line	BOOL \$ENDLESS=TRUE ;Endlos drehende Achsen			
Comments				

Options	Effects
TRUE	Infinitely rotating axes possible
FALSE	Infinitely rotating axes not possible

## \$ENERGY\_MON

### Nominal energy monitoring (kinetic energy)

Data type	Boolean	Value	min.	
Unit			max.	
In file	R1\Mada\Robcor.dat			
Original line	BOOL \$ENERGY_MON=FALSE ;Ueberwachung kinetische Energie bei Crash			
Comments				

Options	Effects
TRUE	Energy monitoring activated
FALSE	Energy monitoring deactivated

## \$ERROFFMASK

### Removal of individual error bits

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$ERROFFMASK[12] ;Abschaltung einzelner Fehlerbits			
Comments				



**\$ERSYSROOT**

**Offset and orientation of the robot when external axes are present, with reference to the world coordinate system**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	R1\Mada\machine.dat			
Original line	FRAME \$ERSYSROOT={x 0.0,y 0.0,z 0.0,a 0.0,b 0.0,c 0.0} ;Roboterfußpunktkinematik im Weltkoordinatensystem [mm,Grad]			
Comments	Only valid when external axes are present. If “\$ERSYSROOT” is valid, then “\$ROBROOT” will be ignored.			

**\$ET1\_AX**

...  
**\$ET6\_AX**

**Assignment of external axes to external axis kinematic system ET1 ... ET6**

Data type	Enum	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL ET_AX \$ET1_AX={TR_A1 #NONE,TR_A2 #NONE,TR_A3 #NONE} ... DECL ET_AX \$ET6_AX={TR_A1 #NONE,TR_A2 #NONE,TR_A3 #NONE} ;Externe Achsen #NONE, #E1, #E2, #E3, #E4, #E5, #E6			
Comments	List of external axes used in the 1st ... 6th external transformations ET1 ... ET6.			

Options	Effects
#NONE	
#E1 - #E6	

**\$ET1\_NAME**

...  
**\$ET6\_NAME**

**Name of external axis kinematic system ET1 ... ET6**

Data type	Character	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	CHAR \$ET1_NAME[20] ... CHAR \$ET6_NAME[20]			
Comments	The name can have a maximum length of 20 characters.			

**\$ET1\_TA1KR**

...

**\$ET6\_TA1KR**

**Offset between axis 1 and the root of the external axis kinematic system ET1 ... ET6**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	R1\Mada\machine.dat			
Original line	FRAME \$ET1_TA1KR={x 0.0,y 0.0,z 0.0,a 0.0,b 0.0,c 0.0} ... FRAME \$ET6_TA1KR={x 0.0,y 0.0,z 0.0,a 0.0,b 0.0,c 0.0}			
Comments	FRAME between A1 and root point of KIN in transformation ET1 ... ET6.			

**\$ET1\_TA2A1**

...

**\$ET6\_TA2A1**

**Offset between axis 2 and axis 1 of the external axis kinematic system ET1 ... ET6**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	R1\Mada\machine.dat			
Original line	FRAME \$ET1_TA2A1={x 0.0,y 0.0,z 0.0,a 0.0,b 0.0,c 0.0} ... FRAME \$ET6_TA2A1={x 0.0,y 0.0,z 0.0,a 0.0,b 0.0,c 0.0}			
Comments				

**\$ET1\_TA3A2**

...

**\$ET6\_TA3A2**

**Offset between axis 3 and axis 2 of the external axis kinematic system ET1 ... ET6**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	R1\Mada\machine.dat			
Original line	FRAME \$ET1_TA3A2={x 0.0,y 0.0,z 0.0,a 0.0,b 0.0,c 0.0} ... FRAME \$ET6_TA3A2={x 0.0,y 0.0,z 0.0,a 0.0,b 0.0,c 0.0}			
Comments				

**\$ET1\_TFLA3**

...

**\$ET6\_TFLA3****Offset between flange and axis 3 of the external axis kinematic system ET1 ... ET6**

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada,\$machine.dat			
Original line	FRAME \$ET1_TFLA3={x 0.0,y 0.0,z 0.0,a 0.0,b 0.0,c 0.0} ... FRAME \$ET6_TFLA3={x 0.0,y 0.0,z 0.0,a 0.0,b 0.0,c 0.0}			
Comments				

**\$ET1\_TPINFL**

...

**\$ET6\_TPINFL****Offset between reference point and flange of the external axis kinematic system ET1 ... ET6**

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	FRAME \$ET1_TPINFL={x 0.0,y 0.0,z 0.0,a 0.0,b 0.0,c 0.0} ... FRAME \$ET6_TPINFL={x 0.0,y 0.0,z 0.0,a 0.0,b 0.0,c 0.0}			
Comments				

**\$EX\_AX\_ASYNC****Switch external axes to asynchronous motion**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$EX_AX_ASYNC='B000000' ;Externe Achsen asynchron			
Comments				

Options	Effects
Bit = 1	Axis asynchronous, Bit 0 external axis E1 to Bit 5 external axis E6

### \$EX\_AX\_NUM Number of external axes

Data type	Integer	Value	min.	0
Unit			max.	6
In file	R1\Mada,\$machine.dat			
Original line	INT \$EX_AX_NUM=0 ;Anzahl externer Achsen (0-6)			
Comments				

### \$EX\_KIN Assignment of external base coordinate system to external axis kinematic system

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL EX_KIN \$EX_KIN={ET1 #NONE,ET2 #NONE,ET3 #NONE,ET4 #NONE,ET5 #NONE,ET6 #NONE} ;Externe Kinematiken #NONE,#EASYS,#EBSYS,#ECSYS,#ED- SYS,#EESYS,#EFSYS,#ERSYS			
Comments				

### \$EXCOUP\_COMP Coupling factors of axes 7 (index 1) to 12 (index 6)

Data type	Array	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL FRA \$EXCOUP_COMP[6,6] ;Kopplungsfaktoren Achse 7 (Index 1) bis Achse 12 (Index12), N = Zaehler, D =Nenner			
Comments	N = numerator; D = denominator			

**\$EXT****Signal declaration "External mode"**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$EXT \$OUT[996] ;Betriebsart extern			
Comments				

Options	Effects
TRUE	Operating mode EXTERNAL
FALSE	Other operating mode

**\$EXT\_AXIS****Display whether external axes are present**

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\option.dat			
Original line	BOOL \$EXT_AXIS=FALSE			
Comments				

Options	Effects
TRUE	External axes present
FALSE	No external axes present

**\$EXT\_START****Signal declaration "External start active"**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$EXT_START \$IN[1026] ;Externer Start			
Comments				

## \$EXTSTARTTYP

Flag for automatic mode without external signals

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$EXTSTARTTYP			
Comments				

Options	Effects
TRUE	Automatic mode possible
FALSE	Automatic mode not possible

## 7 F

**\$FAN\_FOLLOW\_UP\_TIME** Signal declaration "Fan monitoring"

Data type	Signal declaration	Value	min.	5.0
Unit			max.	1000.0
In file	Steu\Mada\machine.dat			
Original line	REAL \$FAN_FOLLOW_UP_TIME			
Comments	Follow-up time for fan control.  When a defined temperature is reached, the external fan is activated for a preset length of time. If the follow-up time is set to “1000.0”, the fan runs continuously.			

**\$FFC\_TORQ** Torque feed forward control

Data type	Boolean	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	BOOL \$FFC_TORQ=FALSE ;Momentenvorsteuerung EIN/AUS			
Comments				

Options	Effects
TRUE	Torque feed forward control activated
FALSE	Torque feed forward control not activated

**\$FFC\_VEL** Velocity feed forward control

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$FFC_VEL='B000000' ;Geschwindigkeitsvorsteuerung EIN/AUS			
Comments				

Options	Effects
0	Off, LSB: axis 1, MSB: axis 12
1	On

## \$FILTER

### Smooth ramp in advance run

Data type	Integer	Value	min.	0
Unit			max.	16
In file	---			
Original line	INT \$FILTER			
Comments	The filter prevents abrupt acceleration to the maximum acceleration value of 16 interpolation cycles.			

## \$FILTER\_C

### Smooth ramp in main run

Data type	Integer	Value	min.	0
Unit			max.	16
In file	---			
Original line	INT \$FILTER_C			
Comments	The current filter value is displayed.			

## \$FLAG[1]...[1024]

### Flags 1 to 1024 as global markers

Data type	Boolean	Value	min.	0
Unit			max.	
In file	---			
Original line	BOOL \$FLAG[1024]			
Comments	Are used as global markers and initialized with FALSE			

Options	Effects
TRUE	
FALSE	

## \$FOL\_ERR\_MA

### Factor for following error monitoring

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\Smachine.dat			
Original line	REAL \$FOL_ERR_MA[12] ;Faktor fuer Schleppfehlerueberwachung			
Comments				



**\$FOL\_ERROR[n]****Velocity-related axis following error**

Data type	Real	Value	min.	0
Unit	ms		max.	
In file	---			
Original line	REAL \$FOL_ERROR[n] ;Bezogener Schleppfehler			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

## 8 G

### **\$G\_COE\_CUR[n]** Proportional gain of the current controller

Data type	Integer	Value	min.	1
Unit	%		max.	100
In file	R1\Mada\machine.dat			
Original line	INT \$G_COE_CUR[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

### **\$G\_VEL\_CAL[n]** Velocity factor for speed controller gain

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\smachine.dat			
Original line	REAL \$G_VEL_CAL[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

### **\$G\_VEL\_CP[n]** Velocity factor for speed controller gain

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\smachine.dat			
Original line	REAL \$G_VEL_CP[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

### **\$G\_VEL\_PTP[n]** Proportional gain of the speed controller for PTP motion

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$G_VEL_PTP[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$GEARTORQ\_MON****Control of gear torque monitoring**

Data type	Boolean	Value	min.	
Unit			max.	
In file	R1\Mada\smachine.dat			
Original line	BOOL \$GEARTORQ_MON=FALSE			
Comments				

Options	Effects
TRUE	Activated using the limits (% of the maximum accelerating torques) defined in the data \$DYN_DAT[231] ... \$DYN_DAT[236] in \$robcor.dat
FALSE	Controller OFF

## 9 H

### \$H\_POS Home position of the robot

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	R1\Mada,\$machine.dat			
Original line	E6AXIS \$H_POS={a1 0.0,a2 -90.0,a3 90.0,a4 0.0,a5 0.0,a6 0.0,e1 0.0,e2 0.0,e3 0.0,e4 0.0,e5 0.0,e6 0.0}			
Comments				

### \$H\_POS\_TOL Permissible tolerance for “Robot in home position”

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	R1\Mada\machine.dat			
Original line	E6AXIS \$H_POS_TOL={a1 2.0,a2 2.0,a3 2.0,a4 2.0,a5 2.0,a6 2.0,e1 2.0,e2 2.0,e3 2.0,e4 2.0,e5 2.0,e6 2.0}			
Comments				

### \$HOME[3] HOME directory setting of the compiler

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$HOME[3] ;HOME-Einstellung (/ = Steuerungsspezifisch, /R1 = Rob.System 1, /R2 = Rob.System 2 )			
Comments				

Options	Effects
/R1	Robot system 1
/R2	Robot system 2

**\$HW\_WARNING****Signal declaration “Hardware warning”**

Data type	Signal declaration	Value	min.	FALSE, 1
Unit			max.	4096
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$HW_WARNING \$OUT[148] ;Projektierbare Systemvariable			
Comments	As soon as a hardware warning occurs, the configured output is set Reacts to 268: Warning: PC fan speed 284: Warning: battery voltage 1066: Warning: motherboard temperature			

Options	Effects
FALSE	No output is set
1 ... 4096	The relevant output is set

**\$HWEND****Signal declaration “Limit switch tripped”**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$HWEND \$IN[1002] ;HW-Endschalter für alle Achsen			
Comments				

## 10 I

### **\$I\_O\_ACT** Signal declaration "I/O interfaces active"

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$I_O_ACT \$IN[1025] ;E/A-Schnittstelle aktiv			
Comments				

### **\$I\_O\_ACTCONF** Signal declaration "External device active"

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$I_O_ACTCONF \$OUT[1009] ;E/A-Schnittstelle aktiv Quittung			
Comments				

### **\$I\_VEL\_CP[n]** Integral factor of the speed controller for CP motion

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$I_VEL_CP[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

### **\$I\_VEL\_PTP[n]** Integral factor of the speed controller for PTP motion

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$I_VEL_PTP[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$IBS\_SLAVEIN[10]****Controller input words assigned by the Interbus slave**

Data type	Integer	Value	min.	
Unit			max.	
In file	Steu\Mada\Scustom.dat			
Original line	INT \$IBS_SLAVEIN[10]			
Comments				

**\$IBUS\_OFF****Switches off alternative Interbus groups**

Data type	Integer	Value	min.	
Unit			max.	
In file	Steu\Mada\Scustom.dat			
Original line	INT \$IBUS_OFF			
Comments				

**\$IBUS\_ON****Switches on alternative Interbus groups**

Data type	Integer	Value	min.	
Unit			max.	
In file	Steu\Mada\Scustom.dat			
Original line	INT \$IBUS_ON			
Comments				

**\$IDENT\_OPT****Query whether load data determination can be carried out**

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\Sooption.dat			
Original line	BOOL \$IDENT_OPT=FALSE			
Comments				

Options	Effects
TRUE	Load data determination is possible
FALSE	Load data determination is not possible

## \$IDENT\_STARTP

### Start position for load data determination

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\operate.dat			
Original line	E6AXIS \$IDENT_STARTP			
Comments				

## \$IDENT\_STATE

### Status of load data determination

Data type	Enum	Value	min.	
Unit			max.	
In file	Steu\Mada\operate.dat			
Original line	DECL IDENT_STATE \$IDENT_STATE			
Comments				

Options	Effects
#I_END	Load data determination terminated
#I_READY	Ready for load data determination
#I_TEST	Test run is being carried out
#I_MEAS	Measurement is being carried out
#I_MEAS_OK	Measurement was error-free
#I_CALC	Calculation is being carried out

## \$IN[n]

### Inputs

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$IN[4096] ;Eingang [1 bis 4096]			
Comments	[n]=[1] ... [4096] The number of inputs can be increased to max. 4096 by setting \$SET_IO_SIZE accordingly.			



**\$IN\_HOME****Signal declaration "Robot in home position"**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.d			
Original line	SIGNAL \$IN_HOME \$OUT[1000]			
Comments				

**\$IN\_HOME1**

...

**\$IN\_HOME5****Signal declaration "Home position1 ... 5"**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$IN_HOME1 \$OUT[977] ... SIGNAL \$IN_HOME5 \$OUT[981]			
Comments				

**\$IN\_POS\_MA[n]****Positioning window for following error monitoring**

Data type	Real	Value	min.	
Unit	mm, °		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$IN_POS_MA[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$IN\_STILL\_MA****Factor for calculating the standstill window**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$IN_STILL_MA			
Comments	If all axes are in position and no new setpoint is defined, the axes are monitored to make sure they do not wander out of position.			

**\$INC\_AXIS[1]...[6]** Incremental dimension, axis-specific – for axes A1 ... A6

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\smachine.dat			
Original line	REAL \$INC_AXIS[6]			
Comments				

**\$INC\_CAR[1]...[6]** Incremental dimension, Cartesian, relative to the tool, for axes A1 ... A6

Data type	Real	Value	min.	
Unit	mm, °		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$INC_CAR[6]			
Comments				

**\$INC\_EXTAX** Incremental dimension (axis-specific) for external axes

Data type	Real	Value	min.	
Unit	mm, °		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$INC_EXTAX[6]			
Comments				

**\$INPOSITION** Bit array for “Axis in position” of all axes, A1 ... A6, E1 ... E6

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$INPOSITION			
Comments				

Options	Effects
Bit=0	Axis in motion
Bit=1	Axis in positioning window

**\$INTERPRETER****Selection of the Submit or robot interpreter**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$INTERPRETER			
Comments				

Options	Effects
0	Submit interpreter
1	Robot interpreter

**\$INTERRUPT****Program is processing an interrupt**

Data type	Boolean	Value	min.	
Unit			max.	
In file	R1\Mada\\$_operate.dat			
Original line	BOOL \$INTERRUPT ;Interruptbearbeitung			
Comments				

**\$IOSIM\_OPT****Simulation of inputs/outputs**

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$IOSIM_OPT			
Comments				

Options	Effects
TRUE	I/O simulation activated
FALSE	I/O simulation deactivated

## \$IPO\_MODE

### Advance run interpolation mode

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL IPO_MODE \$IPO_MODE ;Interpolationsart Vorlauf			
Comments				

Options	Effects
#BASE	
#TCP	

## \$IPO\_MODE\_C

### Main run interpolation mode

Data type	Enum	Value	min.	
Unit			max.	
In file				
Original line	DECL IPO_MODE \$IPO_MODE_C ;Interpolationsart Hauptlauf			
Comments				

Options	Effects
#BASE	
#TCP	

## \$ITER

### Number of iterations for path planning with activated acceleration adaptation and higher motion profile

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\\$_robcor.dat			
Original line	INT \$ITER ;Anzahl der Iterationen			
Comments				

11 J

11 J

**\$JUS\_TOOL\_NO**      **Number of the current tool for EMT mastering**

Data type	Integer	Value	min.	
Unit			max.	
In file	Steu\Mada\Soperate.dat			
Original line	INT \$JUS_TOOL_NO			
Comments				

## 12 K

### \$KCP\_CONNECT

Display whether the KCP is connected to the controller

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$KCP_CONNECT			
Comments				

Options	Effects
TRUE	KCP is connected
FALSE	KCP is not connected

### \$KEYMOVE

Assignment of jog keys to axes

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL KEYMOVE \$KEYMOVE			
Comments	These six fields (T1 to T6) are used to store which axis is moved using which of the corresponding plus-minus rockers.  Whether or not the jog keys are active depends on the state of the system variable \$KEYMOVE.			

### \$KEYMOVE.T1

...

### \$KEYMOVE.T6

Status of plus/minus key 1 ... 6 (from top on the KCP)

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	STRUC KEYMOVE INT T1,T2,T3,T4,T5,T6			
Comments				

**\$KINCLASS****Kinematic classes**

Data type	Enum	Value	min.	
Unit			max.	
In file	R1\Mada,\$machine.dat			
Original line	DECL KINCLASS \$KINCLASS=#STANDARD ;Kinematikklassen (STANDARD,SPECIAL,TEST,NONE)			
Comments				

Options	Effects
#STANDARD	
#SPECIAL	
#TEST	
#NONE	

**\$KPS\_CURR\_MAX[8]****Maximum current of a KPS over 1 second**

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$KPS_CURR_MAX[8] ;Maximalstrom eines KPS über 1 s			
Comments	KPS = KUKA Power Supply			

**\$KPS\_CURR\_RATED[8]****Rated current of KPS for a duration of 60 seconds**

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$KPS_CURR_RATED[8] ;Nennstrom eines KPS über 60 s			
Comments	KPS = KUKA Power Supply			

**\$KR\_SERIALNO** Serial number of the robot

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$KR_SERIALNO ;Roboter-Seriennummer			
Comments				

**\$KT\_MOT** KT factor of motors (relationship between current and torque)

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$KT_MOT[12] ;KT-Faktor der Motoren			
Comments				

**\$KT0\_MOT[n]** KT0 factor of servomotors  
(defined at working point with speed=0)

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$KT0_MOT[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			



## 13 L

**\$L\_EMT\_MAX[n]** Maximum length of EMT mastering travel

Data type	Real	Value min. max.	
Unit	mm, °		
In file	R1\Mada\machine.dat		
Original line	REAL \$L_EMT_MAX[n]		
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6 If the travel length is exceeded, an error message will be displayed.		

**\$LAST\_BUFFERING\_NOTOK** Signal declaration "Battery message"

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$LAST_BUFFERING_NOTOK \$OUT[1003] ;Ausgang signalisiert eine anstehende Akkumeldung			
Comments	If the variable "\$LAST_BUFFERING_NOTOK" has the value "TRUE", the battery voltage was too low the last time the system was shut down. Otherwise, the value is "FALSE".			

**\$LENGTH\_A** Main axis length A, eccentricity of axis 2 relative to axis 1

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$LENGTH_A ;Grundachslaenge A			
Comments				

### \$LENGTH\_B Main axis length B, link arm length

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\\${machine}.dat			
Original line	REAL \$LENGTH_B ;Grundachslaenge B			
Comments				

### \$LG\_CP Proportional gain of the position controller for CP motion

Data type	Real	Value	min.	
Unit	1/ms		max.	
In file	R1\Mada\\${machine}.dat			
Original line	REAL \$LG_CP[12] ;KV-Faktor Bahn-fahren [1/ms]			
Comments				

### \$LG\_PTP Proportional gain of the position controller for PTP motion

Data type	Real	Value	min.	
Unit	1/ms		max.	
In file	R1\Mada\\${machine}.dat			
Original line	REAL \$LG_PTP[12] ;KV-Faktor PTP Achse [I] (i=1:A1,i=7:E1) [1/ms]			
Comments				

### \$LINE\_SEL\_OK Display whether block selection was successful

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$LINE_SEL_OK			
Comments				

Options	Effects
TRUE	Block selection took place
FALSE	Block selection did not take place

**\$LINE\_SELECT****Editing with or without implicit block selection**

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$LINE_SELECT			
Comments				

Options	Effects
TRUE	Editing with block selection
FALSE	Editing without block selection

**\$LOOP\_CONT****Results of simulation for loop termination condition**

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$LOOP_CONT=FALSE			
Comments	Simulation result which can be used as loop termination condition. \$LOOP_CONT receives the value FALSE as soon as the simulation key is pressed. The value must be set to TRUE before using \$LOOP_MSG to start a simulation.			

Options	Effects
TRUE	Simulation key pressed
FALSE	Simulation key not pressed

**\$LOOP\_MSG****Start simulation if value not equal to blank string**

Data type	Character	Value	min.	
Unit			max.	
In file	Steu\Mada\Option.dat			
Original line	CHAR \$LOOP_MSG[128]			
Comments	Starts the simulation as soon as the value is not equal to blank string, and causes the text contained and the simulation key to be displayed. To end the simulation, the value must be reset to blank string.			



## 14 M

**\$MAIN\_AXIS** Main axis identification

Data type	Enum	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL MAIN_AXIS \$MAIN_AXIS=#NR ;Grundachsenkennung (SS = Portal, CC = Scara, NR = Gelenkroboter)			
Comments				

Options	Effect
#SS	Gantry robot
#CC	SCARA robot
#NR	Jointed-arm robot

**\$MAMES[n]** Offset between mechanical and mathematical zero of axis n

Data type	Real	Value	min.	
Unit	mm, °		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$MAMES[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$MEAS\_PULSE** Activate rapid gauging

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$MEAS_PULSE[5] ;Messpuls			
Comments				

## \$MODE\_MOVE Motion type in jog mode

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL MODE_MOVE \$MODE_MOVE			
Comments				

Options	Effect
#MM	Jogging
#MC	Manual referencing
#MI	Incremental motion

## \$MODE\_OP Display current operating mode

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL MODE_OP \$MODE_OP ;Betriebsart (T̄1, T2, AUT, EX̄)			
Comments				

Options	Effect
#T1	Test 1
#T2	Test 2
#AUT	Automatic
#EX	Automatic External

## \$MODEL\_NAME Robot type

Data type	Character	Value	min.	
Unit			max.	
In file	R1\Mada\\$_robcor.dat			
Original line	CHAR \$MODEL_NAME[32]			
Comments	Defines the robot type.			

**\$MOUSE\_ACT****Status of the Space Mouse**

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$MOUSE_ACT			
Comments				

Options	Effect
TRUE	Space Mouse active
FALSE	Space Mouse not active

**\$MOUSE\_DOM****Mode for Space Mouse  
Dominant coordinate / All coordinates**

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$MOUSE_DOM			
Comments				

Options	Effect
TRUE	Space Mouse in mode "Dominant coordinate active"
FALSE	Space Mouse in mode "All coordinates active"

**\$MOUSE\_ROT****Space Mouse – set rotational motions to active**

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$MOUSE_ROT			
Comments				

Options	Effect
TRUE	Space Mouse "rotational" motions switched on
FALSE	Space Mouse "rotational" motions switched off

## \$MOUSE\_TRA

### Space Mouse – set translational motions to active

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$MOUSE_TRA			
Comments				

Options	Effect
TRUE	Space Mouse “translational” motions switched on
FALSE	Space Mouse “translational” motions switched off

## \$MOVE\_BCO

### Block coincidence run (BCO)

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$MOVE_BCO ;Aktuelle Bewegung ist SAK-Fahrt			
Comments				

Options	Effect
TRUE	Current motion is BCO run
FALSE	No BCO run

## \$MOVE\_ENABLE

### Signal declaration “Move enable”

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\\$_machine.dat			
Original line	SIGNAL \$MOVE_ENABLE \$IN[1025] ;Fahrfreigabe gesamt			
Comments				



**\$MOVE\_ENA\_ACK****Move enable signal feedback signal**

Data type	Signal declaration	Value min. max.	
Unit			
In file	Steu\Mada\\$.machine.dat		
Original line	SIGNAL \$MOVE_ENA_ACK \$OUT[150] ;Rueckmeldung \$MOVE_ENABLE an PLC		
Comments			

**\$MOVE\_STATE****Current status of motion**

Data type	Enum	Value min. max.	
Unit			
In file	---		
Original line	DECL MOVE_STATE \$MOVE_STATE		
Comments	<p>\$MOVE_STATE is used in path planning to identify the individual motion path sections.</p> <p>In the case of RESET, CANCEL, block selection and no program selected, \$MOVE_STATE has the value #NONE.</p> <p>\$MOVE_STATE is composed of two parts. The first is the designation of the specific type of motion (PTP, LIN, CIRC), and the second is the identifier of the current section of the path.</p> <p>#xxx_SINGLE designates a motion outside an approximate positioning range;</p> <p>#xxx_APO1 designates a motion inside an approximate positioning range up to the middle of the block;</p> <p>#xxx_APO2 designates a motion inside an approximate positioning range after the middle of the block;</p> <p>#NONE designates the state with no program selected, in the case of RESET or CANCEL.</p>		

**\$MS\_DA[n]****Status of position control monitoring**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\\$.machine.dat			
Original line	INT \$MS_DA[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$MSG\_T**
**Structure for message display**

Data type	Structure	Value	min.	
Unit			max.	
In file	Steu\Mada\Option.dat			
Original line	DECL MSG_T \$MSG_T={VALID FALSE,RELEASE FALSE,TYP #NOTIFY,MÖDUL[] " ",KEY[] " ",PARAM_TYP #VALUE,PARAM[] " ",DLG_FORMAT[] " ",ANSWER 0}			
Comments				

**\$MSG\_T.ANSWER**
**Number of the softkey pressed**

Data type	Integer	Value	min.	
Unit			max.	

**\$MSG\_T.DLG\_FORMAT**
**Label of the softkeys**

Data type	Character	Value	min.	
Unit			max.	

**\$MSG\_T.KEY**
**Key to the message text in the data bank**
**\$MSG\_T.MODUL**
**Module identifier for access to database**
**\$MSG\_T.PARAM**
**Additional parameter displayed with the message text**
**\$MSG\_T.PARAM\_TYP**
**“PARAM” type definition**

Data type	Enum	Value	min.	
Unit			max.	

Options	Effect
#VALUE	
#WORDS	
#KEY	

**\$MSG\_T.RELEASE**
**Deletion of status message**

Data type	Boolean	Value	min.	
Unit			max.	

**\$MSG\_T.TYP****Definition of message type**

Data type	Enum	Value	min.	
Unit			max.	

Options	Effect
#NOTIFY	Notification message
#STATE	Status message
#QUIT	Acknowledgment message
#DIALOG	Dialog query

**\$MSG\_T.VALID****Output of message text**

Data type	Boolean	Value	min.	
Unit			max.	

## 15 N

**\$NEAR\_POSRET** Robot is within a sphere about “\$POS\_RET” (tolerance window)

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$NEAR_POSRET \$OUT[997] ;Roboter in Toleranzfenster			
Comments	Signal is set if the robot is positioned within a sphere about \$POS_RET. The radius of this sphere is defined in \$NEARPATHTOL.			

**\$NEARPATHTOL** Radius of the sphere about “\$POS\_RET”

Data type	Real	Value	min.	
Unit			max.	
In file	Steu\Mada\custom.dat			
Original line	REAL \$NEARPATHTOL ;Toleranz für die Abweichung von \$POS_RET			
Comments				

**\$NULLFRAME** Null frame

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	FRAME \$NULLFRAME			
Comments	All values for offset (X, Y, Z) and rotation (A, B, C) are set to zero.			

**\$NULLFRAME.A**      **Rotation about the Z axis**

Data type	Real	Value	min.	
Unit	mm, °		max.	

**\$NULLFRAME.B**      **Rotation about the Y axis****\$NULLFRAME.C**      **Rotation about the X axis****\$NULLFRAME.X**      **Offset in the X direction****\$NULLFRAME.Y**      **Offset in the Y direction****\$NULLFRAME.Z**      **Offset in the Z direction****\$NUM\_AX**      **Number of robot axes**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$NUM_AX=6 ;Achsen des Robotersystems			
Comments				

**\$NUM\_IN**      **Maximum number of digital inputs (\$IN)**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$NUM_IN ;Anzahl der Eingaenge			
Comments				

**\$NUM\_OUT**      **Maximum number of digital outputs (\$OUT)**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$NUM_OUT ;Anzahl der Ausgaenge			
Comments				

## \$NUMSTATE

### State of the Num Lock key

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$NUMSTATE			
Comments				

Options	Effect
TRUE	Num Lock key on
FALSE	Num Lock key off

## 16 O

**\$ON\_PATH**

**Signal declaration “Path check” – robot is on the programmed path**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$ON_PATH \$OUT[997]			
Comments				

**\$OPT\_MOVE**

**Activation of the higher motion profile**

Data type	Enum	Value	min.	
Unit			max.	
In file	R1\Mada\robcor.dat			
Original line	DECL ADAP_ACC \$OPT_MOVE=#NONE			
Comments				

Options	Effect
#NONE	Higher motion profile deactivated
#STEP1	Higher motion profile without energy planning activated
#STEP2	Higher motion profile with energy planning activated

**\$OPT\_VAR\_IDX**

**Index of selected correction variables from the list “\$OPT\_VAR[]”**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$OPT_VAR_IDX ;Index Korr.-Var. in der Var.-Liste \$OPT_VAR[]			
Comments				

## \$ORI\_CHECK

Orientation check at CP end points (only with five-axis robots)

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\\$_machine.dat			
Original line	INT \$ORI_CHECK			
Comments				

## \$ORI\_TYPE

Orientation control for CP instructions (LIN, CIRC) in the advance run

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL ORI_TYPE \$ORI_TYPE ;Orientierungsfuehrung bei CP-Saetzen (Vorlauf)			
Comments				

Options	Effect
#VAR	Variable orientation with possible reduction of velocity and acceleration
#CONSTANT	Constant orientation
#JOINT	Variable orientation without reduction of velocity and acceleration

## \$ORI\_TYPE\_C

Orientation control for CP instructions (LIN, CIRC) in the main run

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL ORI_TYPE \$ORI_TYPE_C ;Orientierungsfuehrung bei CP-Saetzen (Hauptlauf)			
Comments				

Options	Effect
#VAR	Variable orientation with possible reduction of velocity and acceleration
#CONSTANT	Constant orientation
#JOINT	Variable orientation without reduction of velocity and acceleration



**\$OUT[n]** Outputs

Data type	Boolean	Value	min.	1
Unit			max.	4096
In file	---			
Original line	BOOL \$OUT[4096] ;Ausgang [1 bis 4096] )*			
Comments	[n] = [1] ... [4096] )* 1024, 2048 or 4096 outputs can be set by setting the variable "\$SET_IO_SIZE" accordingly.			

**\$OUT\_C[n]** Outputs

Data type	Boolean	Value	min.	1
Unit			max.	4096
In file	---			
Original line	BOOL \$OUT_C[4096] ;Ausgang [1 bis 4096] )*			
Comments	[n] = [1] ... [4096]  For setting outputs at the end point for motions with exact positioning and at the vertex for approximate positioning motions.  )* 1024, 2048 or 4096 outputs can be set by setting the variable "\$SET_IO_SIZE" accordingly.			

**\$OV\_ASYNC** Override for asynchronous external axes

Data type	Integer	Value	min.	0
Unit	%		max.	100
In file	---			
Original line	INT \$OV_ASYNC ;OVERRIDE asynchrone Zusatzachsen			
Comments				

### \$OV\_JOG Jog override

Data type	Integer	Value	min.	0
Unit	%		max.	100
In file	---			
Original line	INT \$OV_JOG ;Einricht-OVERRIDE			
Comments				

### \$OV\_PRO Program override

Data type	Integer	Value	min.	0
Unit	%		max.	100
In file	---			
Original line	INT \$OV_PRO			
Comments				

### \$OV\_PRO1 Internal use in the controller

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$OV_PRO1			
Comments				

### \$OV\_ROB Robot override

Data type	Integer	Value	min.	
Unit	%		max.	
In file	---			
Original line	INT \$OV_ROB			
Comments				

**\$OV\_ROB1** Internal use in the controller

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$OV_ROB1			
Comments				

## 17 P

### \$PAL\_MODE Activate palletizing mode

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$PAL_MODE ;Achse A4 wird auf null Grad fixiert			
Comments	Axis 4 is fixed at 0°. \$PAL_MODE = \$DEF_A4FIX is set during loading and program reset. Palletizing mode is automatically activated for a 5-axis robot and not for a normal 6-axis robot.			

Options	Effect
TRUE	Palletizing mode on
FALSE	Palletizing mode off

### \$PERI\_RDY Signal declaration "Drives ON"

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\\${machine}.dat			
Original line	SIGNAL \$PERI_RDY \$OUT[1012]			
Comments				

### \$PHGBRIGHT Set display brightness

Data type	Integer	Value	min.	0
Unit			max.	15
In file	---			
Original line	INT \$PHGBRIGHT			
Comments	The value set is lost if the robot controller is switched off			

Options	Effect
0	Display is dark
15	Display is bright

**\$PHGCONT Set display contrast**

Data type	Integer	Value	min.	0
Unit			max.	15
In file	---			
Original line	INT \$PHGCONT			
Comments	The value set is lost if the robot controller is switched off			
Options	Effect			
0	Lower contrast, dark			
15	Higher contrast, bright			

**\$PHGINFO Serial number of the KCP CPU and software version**

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$PHGINFO[24]			
Comments				

**\$PHGTEMP Current temperature inside the KCP**

Data type	Integer	Value	min.	
Unit	°C		max.	
In file	---			
Original line	INT \$PHGTEMP			
Comments				

**\$PMCHANNEL[n] Assignment of the axes to the drive interfaces in the power module**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$PMCHANNEL[n] ;Antriebsschnittstellen-Nr. auf dem Powermodul			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$POS\_ACT**
**Current robot position, Cartesian**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	E6POS \$POS_ACT ;Aktuelle Roboterposition kartesisch [mm,Grad]			
Comments				

**\$POS\_ACT.A**
**Rotation about the Z axis**

Data type	Real	Value	min.	
Unit	mm, °		max.	

**\$POS\_ACT.B**
**Rotation about the Y axis**
**\$POS\_ACT.C**
**Rotation about the X axis**
**\$POS\_ACT.X**
**Offset in the X direction**
**\$POS\_ACT.Y**
**Offset in the Y direction**
**\$POS\_ACT.Z**
**Offset in the Z direction**
**\$POS\_ACT\_MES**
**Measured actual position, Cartesian**

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	E6POS \$POS_ACT_MES			
Comments				

**\$POS\_BACK****Start position of the current motion block, Cartesian**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	E6POS \$POS_BACK ;Anfangsposition des aktuellen Bewegungssatzes kartesisch [mm,Grad]			
Comments				

**\$POS\_BACK.A****Rotation about the Z axis**

Data type	Real	Value	min.	
Unit	°		max.	

**\$POS\_BACK.B****Rotation about the Y axis****\$POS\_BACK.C****Rotation about the X axis****\$POS\_BACK.X****Offset in the X direction**

Data type	Real	Value	min.	
Unit	mm		max.	

**\$POS\_BACK.Y****Offset in the Y direction****\$POS\_BACK.Z****Offset in the Z direction**

**\$POS\_FOR**
**Target position of the current motion block, Cartesian**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	E6POS \$POS_FOR ;Zielposition des aktuellen Bewegungssatzes kartesisch [mm,Grad]			
Comments				

**\$POS\_FOR.A**
**Rotation about the Z axis**

Data type	Real	Value	min.	
Unit	°		max.	

**\$POS\_FOR.B**
**Rotation about the Y axis**
**\$POS\_FOR.C**
**Rotation about the X axis**
**\$POS\_FOR.X**
**Offset in the X direction**
**\$POS\_FOR.Y**
**Offset in the Y direction**
**\$POS\_FOR.Z**
**Offset in the Z direction**



**\$POS\_INT****Position when interrupt is triggered, Cartesian**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	E6POS \$POS_INT ;Unterbrechungsposition kartesisch [mm,Grad]			
Comments				

**\$POS\_INT.A****Rotation about the Z axis**

Data type	Real	Value	min.	
Unit	°		max.	

**\$POS\_INT.B****Rotation about the Y axis****\$POS\_INT.C****Rotation about the X axis****\$POS\_INT.X****Offset in the X direction**

Data type	Real	Value	min.	
Unit	mm		max.	

**\$POS\_INT.Y****Offset in the Y direction****\$POS\_INT.Z****Offset in the Z direction**

**\$POS\_RET**
**Position when leaving the path, Cartesian**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	E6POS \$POS_RET ;Rückpositionieren kartesisch [mm,Grad]			
Comments				

**\$POS\_RET.A**
**Rotation about the Z axis**

Data type	Real	Value	min.	
Unit	°		max.	

**\$POS\_RET.B**
**Rotation about the Y axis**
**\$POS\_RET.C**
**Rotation about the X axis**
**\$POS\_RET.X**
**Offset in the X direction**

Data type	Real	Value	min.	
Unit	mm		max.	

**\$POS\_RET.Y**
**Offset in the Y direction**
**\$POS\_RET.Z**
**Offset in the Z direction**
**\$POWER\_FAIL**
**Display of power failure**

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$POWER_FAIL			
Comments				

Options	Effect
TRUE	Power failure
FALSE	No power failure



**\$POWERMODUL1**  
...  
**\$POWERMODUL4**

Internal register of power module 1 ... 4 for diagnostic purposes

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL POWERMODUL \$POWERMODUL1 ... DECL POWERMODUL \$POWERMODUL4			
Comments				

**\$POWERMODUL1.BUSVOLTAGE**  
...  
**\$POWERMODUL4.BUSVOLTAGE**

Intermediate circuit voltage, power module 1 ... 4

Data type	Integer	Value	min.	
Unit			max.	

**\$POWERMODUL1.CURRCAL**  
...  
**\$POWERMODUL4.CURRCAL**

Current calibration, power module 1 ... 4

**\$POWERMODUL1.CURRERROR**  
...  
**\$POWERMODUL4.CURRERROR**

Current error, power module 1 ... 4

**\$POWERMODUL1.PMERROR**  
...  
**\$POWERMODUL4.PMERROR**

Register for error messages, power module 1 ... 4

**\$POWERMODUL1.PMSTATE**  
...  
**\$POWERMODUL4.PMSTATE**

State of power module 1 ... 4

## \$POWEROFF\_DELAYTIME Wait time before shutting down the system

Data type	Real	Value	min.	0
Unit	s		max.	30000
In file	---			
Original line	INT \$POWEROFF_DELAYTIME			
Comments				

Options	Effect
0	The controller is shut down despite external power supply.
1...30000	Wait time in seconds before the system is shut down.



### NOTE

On controllers of type KR C3A, KR C3E or COBRA, the variable \$POWEROFF\_DELAYTIME may be set to no more than 180 s. Otherwise, there is a risk of data loss.

## \$PR\_MODE Signal declaration "Test mode"

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$PR_MODE \$OUT[998]			
Comments				

## \$PRO\_ACT Signal declaration "Program status"

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	SIGNAL \$PRO_ACT \$OUT[1021]			
Comments				

Options	Effect
TRUE	Process is active.
FALSE	Process is not active.


**\$PRO\_I\_O** External program for controller node

Data type	Character	Value	min.	
Unit			max.	
In file	Steu\Mada\Scustom.dat			
Original line	CHAR \$PRO_I_O[64]			
Comments	Determines which external program is automatically started for the controller node after download.			

**\$PRO\_IP** Process pointer to current KRL process

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL PRO_IP \$PRO_IP			
Comments	Name = block name in advance run and main run SNR = block number in advance run and main run			

**\$PRO\_IP.I\_EXECUTED** KRL instruction executed

Data type	Boolean	Value	min.	
Unit			max.	

Options	Effect
TRUE	KRL instruction executed
FALSE	KRL instruction not executed

**\$PRO\_IP.NAME[32]** Name of the block in the advance run

Data type	Character	Value	min.	
Unit			max.	

**\$PRO\_IP.NAME\_C[32]** Name of the block in the main run

**\$PRO\_IP.P\_ARRIVED** Path status for the programmed point

Data type	Integer	Value	min.	
Unit			max.	

**\$PRO\_IP.P\_NAME[24]** Name or aggregate of the end or auxiliary point

Data type	Character	Value	min.	
Unit			max.	

**\$PRO\_IP.SNR** Block number in the advance run

Data type	Integer	Value	min.	
Unit			max.	

**\$PRO\_IP.SNR\_C** Block number in the main run

**\$PRO\_MODE** Program run mode dependent on “\$INTERPRETER”

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL PRO_MODE \$PRO_MODE			
Comments	Program run modes: ISTEP, PSTEP, MSTEP, CSTEP, GO, BSTEP			

Options	Effect			
#ISTEP	Incremental Step:	Block-by-block processing with a stop after each instruction (without advance run processing).		
#PSTEP	Program Step:	Complete processing of subprograms (without advance run processing).		
#MSTEP	Motion Step:	Step-by-step processing with a stop after each motion instruction (without advance run processing).		
#CSTEP	Continuous Step:	Step-by-step processing with a stop after each motion instruction (with advance run processing).		
#GO		Continuous execution to the end of the program.		
#BSTEP	Back Step:	Continuous execution backwards to the start of the program.		

**\$PRO\_MODE0****Process run mode of the Submit interpreter**

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL PRO_MODE \$PRO_MODE0			
Comments	Internal use in the controller.			

Options	Effect
#ISTEP	
#PSTEP	
#MSTEP	
#CSTEP	
#GO	
#BSTEP	

**\$PRO\_MODE1****Process run mode of the robot interpreter**

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL PRO_MODE \$PRO_MODE1			
Comments	Internal use in the controller.			

Options	Effect
#ISTEP	
#PSTEP	
#MSTEP	
#CSTEP	
#GO	
#BSTEP	

**\$PRO\_MOVE****Signal declaration "Motion status"**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	SIGNAL \$PRO_MOVE \$OUT[1022] ;Programmbewegung aktiv			
Comments				

**\$PRO\_NAME[24]** Process name dependent on “\$INTERPRETER”

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$PRO_NAME[24]			
Comments				

**\$PRO\_NAME0[24]** Process name of the Submit interpreter

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$PRO_NAME0[24]			
Comments	Internal use in the controller.			

**\$PRO\_NAME1[24]** Process name of the robot interpreter

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$PRO_NAME1[24]			
Comments	Internal use in the controller.			

**\$PRO\_START** START program execution / command

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$PRO_START ;Start wirkt auf Programm			
Comments				

Options	Effect
TRUE	Program execution
FALSE	Command execution



**\$PRO\_STATE****Process state dependent on “\$INTERPRETER”**

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL PRO_STATE \$PRO_STATE			
Comments				

Options	Effect
#P_FREE	Program not selected
#P_RESET	Program reset
#P_ACTIVE	Program active
#P_STOP	Program stopped
#P_END	End of program reached

**\$PRO\_STATE0****Process state of the Submit interpreter**

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL PRO_STATE \$PRO_STATE0			
Comments	Internal use in the controller.			

**\$PRO\_STATE1****Process state of the robot interpreter**

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL PRO_STATE \$PRO_STATE1			
Comments	Internal use in the controller.			

## \$PROG\_EEPOT

### Programming EE potentiometers of DSE – specification of axis numbers

Data type	Integer	Value	min.	1
Unit			max.	12
In file	---			
Original line	INT \$PROG_EEPOT ;Programmierung der EEPOTIS DSE			
Comments	The EE potentiometers on the power module are programmed here; this requires entry of the axis numbers.			

## \$PROG\_TORQ\_MON

### Command torque monitoring

Data type	Boolean	Value	min.	
Unit			max.	
In file	R1\Mada\\$_robcor.dat			
Original line	BOOL \$PROG_TORQ_MON=FALSE ;Ueberwachung der Soll-Momente Motor und Getriebe			
Comments	If the operating mode is changed while the message is activated (TRUE), the following acknowledgeable message is generated: 1467 Attention! Maximum speed could be programmed.			

Options	Effect
TRUE	Command torque monitoring activated
FALSE	Command torque monitoring deactivated



## 18 R

**\$RAISE\_T\_MOT[n]** Motor run-up time without the axis being loaded, axes 1 ... 12

Data type	Real	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$RAISE_T_MOT[n]			
Comments	Time in which the motor accelerates to rated speed without the axis being loaded. [n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$RAISE\_TIME[n]** Axis run-up time, axes 1 ... 12

Data type	Real	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$RAISE_TIME[n]			
Comments	Time in which the axis can be accelerated to rated speed. [n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$RAT\_MOT\_AX[n]** Motor:axis transmission ratio, axes 1 ... 12

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL FRA \$RAT_MOT_AX[n] ;Uebersetzung Motor-Achse N = Zaehler, D = Nenner			
Comments	Format: N Motor, D Axis  [n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

### \$RAT\_MOT\_ENC[n]

**Motor:encoder transmission ratio of axes 1 ... 12**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL FRA \$RAT_MOT_ENC[n] ;Uebersetzung Motor-Geber N = Zaehler, D = Nenner			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

### \$SRC\_RDY1

**Signal declaration "Ready for Program Start"**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$RC_RDY1 \$OUT[1014] ;RC-Betriebsbereit 1			
Comments				

### \$RCV\_INFO

**Version of the kernel system**

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$RCV_INFO[128]			
Comments	String which designates the version of the kernel system. Example: "KS V5.46 (krc1adm@ks_build_01) #1 Tue Aug 13 12:59:31 WS 2002 RELEASE" Meaning: Kernel system version V5.46, compiled by KRC1ADM on the ks_build_01 computer on 13 August 2002 at 12:59 PM.			

**\$REBOOTDSE****Flag for re-initializing the digital servoelectronics (DSE)**

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$REBOOTDSE			
Comments	For software development only!			
Options	Effect			
TRUE	DSE is re-initialized			

**\$RED\_ACC\_AXC[n]****Reduction factor for axial acceleration in axis-specific jogging and command mode, axes 1 ... 12**

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$RED_ACC_AXC[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$RED\_ACC\_CPC****Reduction factor for CP and orientation acceleration in Cartesian jogging and command mode**

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$RED_ACC_CPC			
Comments				

**\$RED\_ACC\_DYN****Reduction factor for acceleration**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$RED_ACC_DYN			
Comments				

### \$RED\_ACC\_EMX

Reduction factor for path-maintaining EMERGENCY STOP ramp

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\smachine.dat			
Original line	INT \$RED_ACC_EMX[12]			
Comments				

### \$RED\_ACC\_OV[n]

Reduction of acceleration for override changes, axes 1 ... 12

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$RED_ACC_OV[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

### \$RED\_CAL\_SD

Reduction factor for velocity in referencing after reaching reference point cam

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$RED_CAL_SD			
Comments	Only required with incremental encoders			

### \$RED\_CAL\_SF

Reduction factor for velocity in referencing before reaching reference point cam

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$RED_CAL_SF			
Comments				

**\$RED\_JUS\_UEB****Reduction factor for sensor location run**

Data type	Real	Value	min.	
Unit	%		max.	
In file	R1\Mada\smachine.dat			
Original line	REAL \$RED_JUS_UEB			
Comments				

**\$RED\_T1****Reduction factor for T1 mode**

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$RED_T1			
Comments				

**\$RED\_T1\_OV\_CP****Type of reduction of CP velocity for CP motions in T1 mode**

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\custom.dat			
Original line	BOOL \$RED_T1_OV_CP=TRUE			
Comments				

Options	Effect
TRUE	The CP velocity is reduced by the percentage value set in \$RED_T1.
FALSE	The CP velocity is reduced to the value set in \$VEL_CP_T1.

**\$RED\_VEL****Reduction factor for program in the advance run**

Data type	Integer	Value	min.	1
Unit	%		max.	100
In file	---			
Original line	INT \$RED_VEL			
Comments				

### \$RED\_VEL\_AXC[n] Reduction factor for axial velocity in axis-specific jogging and command mode (PTP)

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$RED_VEL_AXC[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

### \$RED\_VEL\_C Reduction factor for program in the main run

Data type	Integer	Value	min.	1
Unit	%		max.	100
In file	R1\Mada\machine.dat			
Original line	INT \$RED_VEL_C			
Comments				

### \$RED\_VEL\_CPC Reduction factor for CP, swivel and rotational velocity in Cartesian jogging and command mode (CP)

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$RED_VEL_CPC			
Comments				

### \$REVO\_NUM[n] Revolution counter for endless axes

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$REVO_NUM[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			



**\$RINT\_LIST****List of interrupts at robot level**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	DECL INT_INFO \$RINT_LIST[32]			
Comments	This information is shown in the menu “Monitor – Diagnosis – Interrupts”.			

**\$ROB\_CAL****Signal declaration "Referencing status"**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	SIGNAL \$ROB_CAL \$OUT[1001] ;Roboter synchron			
Comments				

**\$ROB\_STOPPED****Signal declaration "Motion monitoring"**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	SIGNAL \$ROB_STOPPED \$OUT[1023] ;Roboter steht			
Comments				

**\$ROB\_TIMER****Clock generator**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$ROB_TIMER			
Comments	Serves as a clock generator if no exact time measurement is required			

## \$ROBROOT

Position of robot in world coordinate system

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	FRAME \$ROBROOT={x 0.0,y 0.0,z 0.0,a 0.0,b 0.0,c 0.0} ;Roboter im Weltkoordinatensystem [mm,Grad]			
Comments				

## \$ROBROOT\_C

Position of robot root point in world coordinate system in the main run

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	FRAME \$ROBROOT_C ;Roboterfusspunkt im Weltkoordinatensystem Hauptlauf			
Comments				

## \$ROBROOT\_KIN

Name of the external Robroot kinematic system

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$ROBROOT_KIN[29] ;Externe Kinematikachsen in ROBROOT			
Comments				

## \$ROBRUNTIME

Operating hours meter

Data type	Integer	Value	min.	
Unit	min		max.	
In file	---			
Original line	INT \$ROBRUNTIME			
Comments				

**\$ROBTRAFO****Robot name**

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$ROBTRAFO[32]			
Comments				

**\$ROTSYS****Rotational reference system for relative blocks in the advance run**

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL ROTSYS \$ROTSYS			
Comments				

Options	Effect
#AS_TRA	
#TCP	
#BASE	

**\$ROTSYS\_C****Rotational reference system for relative blocks in the main run**

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL ROTSYS \$ROTSYS_C			
Comments				

Options	Effect
#AS_TRA	
#TCP	
#BASE	

## 19 S

### \$SAFEGATE\_OP

**Activate path-maintaining braking in event of operator safety violation**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$SAFEGATE_OP \$IN[1025]			
Comments				

### \$SAFETY\_SW

**Status of enabling switch (valid KSS 6.0 onwards)**

Data type	Enum	Value	min.	
Unit			max.	
In file				
Original line	DECL SIG_STATE \$SAFETY_SW			
Comments				

Options	Effect
#RELEASED	No enabling switch pressed (default position) or switched fully pressed (panic position).
#PRESSED	One or more enabling switches pressed (enabling position).

### \$SEN\_DEL[n]

**Distance traveled during signal propagation time in EMT**

Data type	Integer	Value	min.	
Unit	Incr		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$SEN_DEL[n]			
Comments	Distance traveled during signal propagation time in EMT in increments due to the time delay between passing the mastering notch and generation of the signal.  [n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$SEN\_PINT[1]...[20]**

Exchange of integer values in advance run between the controller and the sensor interface program

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$SEN_PINT[20]			
Comments				

**\$SEN\_PINT\_C[1]...[20]**

Exchange of integer values in main run between the controller and the sensor interface program

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$SEN_PINT_C[20]			
Comments				

**\$SEN\_PREA[1]...[20]**

Exchange of real values in advance run between the controller and the sensor interface program

Data type	Real	Value	min.	
Unit			max.	
In file	---			
Original line	REAL \$SEN_PREA[20]			
Comments				

**\$SEN\_PREA\_C[1]...[20]**

Exchange of real values in main run between the controller and the sensor interface program

Data type	Real	Value	min.	
Unit			max.	
In file	---			
Original line	REAL \$SEN_PREA_C[20]			
Comments				

## \$SEQ\_CAL

Referencing sequence of the axes

Data type	Integer	Value	min.	
Unit	Bit sequence		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$SEQ_CAL[12]			
Comments				

Options	Effect
LSB	Axis 1
MSB	Axis 12

## \$SERV\_OFF\_TM[n]

Time during which axis servo and axis brake overlap in order to locate the axis securely

Data type	Integer	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$SERV_OFF_TM[n] ;Reglersperrzeit Achse[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

## \$SERVOFILE

...  
\$SERVOFILE12

Servo parameters 1 ... 12 for DSE when the controller is booted

Data type	Character	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	CHAR \$SERVOFILE1[16] ... CHAR \$SERVOFILE12[16]			
Comments	When the controller is booted, servo parameters for each axis can be sent to the DSE. These parameters must be available in a file “Filename” in the directory R1\Mada. The name of this file must be entered in the robot-specific machine data, for example: \$SERVOFILE1[]= “dumper.servo”. “DEFAULT” is not permissible as a parameter file name.			

**\$SERVOPARA****Online modification of servo parameters**

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL SERVOPARA \$SERVOPARA			
Comments				

**\$SET\_IO\_SIZE****Defines the maximum number of inputs/outputs that may be used**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$SET_IO_SIZE			
Comments	If the default 1024 inputs/outputs are not sufficient, the number of usable I/Os can be increased to 2048 or 4096 by setting the variable “\$SET_IO_SIZE” accordingly.			

Options	Effect
1	1024 inputs/outputs as standard
2	2048 inputs/outputs
4	4096 inputs/outputs

**\$SIMULATE****Simulate observer's point of view using the 6D mouse (AnySim)**

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$SIMULATE			
Comments	For offline programming with AnySim it is possible to change the observer's point of view using the 6D mouse. To do so, the system variable \$SIMULATE must be set. The mouse data are then no longer processed in the kernel system, but sent to Cross via the socket interface.			

Options	Effect
TRUE	Simulation active
FALSE	Simulation not active

**\$SINGUL\_ERR\_JOG** Maximum orientation error for singularity-free motion in jog mode

Data type	Structure	Value	min.	
Unit			max.	
In file	Steu\Mada\Scustom.dat			
Original line	FRAME \$SINGUL_ERR_JOG={a 5.0,b 5.0,c 5.0}			
Comments				

**\$SINGUL\_ERR\_PRO** Maximum orientation error for singularity-free motion in automatic mode

Data type	Structure	Value	min.	
Unit			max.	
In file	Steu\Mada\Scustom.dat			
Original line	FRAME \$SINGUL_ERR_PRO={a 0.0,b 0.0,c 0.0}			
Comments				

**\$SINGUL\_POS[1]** Response of axis 1 in the event of an overhead singularity ( $\alpha_1$  position)

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\Smachine.dat			
Original line	\$SINGUL_POS[1]			
Comments	Treatment of an undefined joint position			

Options	Effect
0	The angle for axis 1 is defined as "0" degrees
1	The angle for axis 1 remains the same from the start point to the end point



**\$SINGUL\_POS[2]****Response of axis 2 in the event of an extended position singularity ( $\alpha 2$  position)**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\smachine.dat			
Original line	\$SINGUL_POS[2]			
Comments	Treatment of an undefined joint position			

Options	Effect
0	The angle for axis 2 is defined as "0" degrees
1	The angle for axis 2 remains the same from the start point to the end point

**\$SINGUL\_POS[3]****Response of axis 4 in the event of a wrist axis singularity ( $\alpha 5$  position)**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	\$SINGUL_POS[3]			
Comments	Treatment of an undefined joint position			

Options	Effect
0	The angle for axis 4 is defined as "0" degrees
1	The angle for axis 4 remains the same from the start point to the end point

**\$SINGUL\_STRATEGY****Strategy for singularity-free motion**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$SINGUL_STRATEGY			
Comments				

Options	Effect
0	No strategy
1	Approximation strategy: moving through the singularity by means of changes in orientation

## \$SINT\_LIST

List of interrupts at Submit level

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL INT_INFO \$SINT_LIST[32]			
Comments	This information is shown in the menu Monitor → Diagnosis → Interrupts.			

## \$SLAVE\_AXIS\_INC

Actual position of master/slave axes in increments

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	DECL SLAVE_AXIS_INC \$SLAVE_AXIS_INC[12]			
Comments	M: Master    S1 - S5: Slaves e.g.: \$SLAVE_AXIS_INC[6].S2    --> 2nd slave of axis 6 \$SLAVE_AXIS_INC[1].M    --> master of axis 1			

## \$SOFTN\_END[n]

Position of the software limit switches at the negative end of the axis (axes 1 ... 12)

Data type	Real	Value	min.	
Unit	mm, °		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$SOFTN_END[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

## \$SOFTP\_END[n]

Position of the software limit switches at the positive end of the axis (axes 1 ... 12)

Data type	Real	Value	min.	
Unit	mm, °		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$SOFTP_END[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$SOFTPLCBOOL[n]****Data exchange between KRC and SoftPLC**

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$SOFTPLCBOOL[n]			
Comments	[n] = [1] ... [1024] Read value: single: T_INT16 RdPLC_BOOL(T_UINT16 Index, T_FLAG * Erg); several: T_INT16 RdPLC_BOOL_EX(T_FLAG * pBoolArray, T_UINT16 nIndex, T_UINT16 nAmount); Write value: single: T_INT16 WrPLC_BOOL(T_UINT16 Index, T_FLAG Wert); several: T_INT16 WrPLC_BOOL_EX(T_FLAG * pBoolArray, T_UINT16 nIndex, T_UINT16 nAmount); nIndex: Defined position beyond which data are read nAmount: Number of variables used The return value sent is either "0" (reading/writing OK) or "-1" (error reading or writing).			

Options	Effect
TRUE	None, because user variable
FALSE	None, because user variable

**\$SOFTPLCINT[n]****Data exchange between KRC and SoftPLC**

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$SOFTPLCINT[n]			
Comments	[n] = [1] ... [1024] Read value: single: T_INT16 RdPLC_INT(T_UINT16 Index, T_INT32 * Erg); several: T_INT16 RdPLC_INT_EX(T_INT32* pIntArray, T_UINT16 nIndex, T_UINT16 nAmount); Write value: single: T_INT16 WrPLC_INT(T_UINT16 Index, T_INT32 Wert); several: T_INT16 WrPLC_INT_EX(T_INT32* pIntArray, T_UINT16 nIndex, T_UINT16 nAmount); nIndex: Defined position beyond which data are read nAmount: Number of variables used The return value sent is either "0" (reading/writing OK) or "-1" (error reading or writing).			

Options	Effect
TRUE	None, because user variable
FALSE	None, because user variable

## \$SOFTPLCREAL[n] Data exchange between KRC and SoftPLC

Data type	Real	Value	min.	
Unit			max.	
In file	---			
Original line	REAL \$SOFTPLCREAL[n]			
Comments	[n] = [1] ... [1024] Read value: single: T_INT16 RdPLC_REAL(T_UINT16 Index, T_FLOAT * Erg); several: T_INT16 RdPLC_REAL_EX(T_FLOAT* pFloatArray, T_UINT16 nIndex, T_UINT16 nAmount); Write value: single: T_INT16 WrPLC_REAL(T_UINT16 Index, T_FLOAT Wert); several: T_INT16 WrPLC_REAL_EX(T_FLOAT* pRealArray, T_UINT16 nIndex, T_UINT16 nAmount); nIndex: Defined position beyond which data are read nAmount: Number of variables used The return value sent is either "0" (reading/writing OK) or "-1" (error reading or writing).			

Options	Effect
TRUE	None, because user variable
FALSE	None, because user variable

## \$SPC\_KIN Data for special kinematics

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$SPC_KIN[30] ;Sonderkinematiken			
Comments				

**\$SPIN\_A****Description of the spindle drive**

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL SPIN \$SPIN_A={SPIN_AXIS 0,SPIN_RAD_G 0.0,SPIN_RAD_H 0.0,SPIN_SG 0,SPIN_BETA 0.0}			
Comments				

**\$SPIN\_A.SPIN\_AXIS****Number of the axis on which the spindle acts**

Data type	Integer	Value	min.	
Unit			max.	

**\$SPIN\_A.SPIN\_BETA****Offset of the angle between sides “g” and “h” of the trapezoid in relation to initial angle**

Data type	Real	Value	min.	
Unit			max.	

**\$SPIN\_A.SPIN\_RAD\_G****Length of the static side “g” of the spindle****\$SPIN\_A.SPIN\_RAD\_H****Length of the moving side “h” of the spindle****\$SPIN\_A.SPIN\_SG****Sign for the direction of rotation**

Data type	Integer	Value	min.	
Unit			max.	

## \$SPIN\_B

Description of the spindle drive

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL SPIN \$SPIN_B={SPIN_AXIS 0,SPIN_RAD_G 0.0,SPIN_RAD_H 0.0,SPIN_SG 0,SPIN_BETA 0.0}			
Comments				

## \$SPIN\_B.SPIN\_AXIS

Number of the axis on which the spindle acts

Data type	Integer	Value	min.	
Unit			max.	

## \$SPIN\_B.SPIN\_BETA

Offset of the angle between sides “g” and “h” of the trapezoid in relation to initial angle

Data type	Real	Value	min.	
Unit			max.	

## \$SPIN\_B.SPIN\_RAD\_G

Length of the static side “g” of the spindle

## \$SPIN\_B.SPIN\_RAD\_H

Length of the moving side “h” of the spindle

## \$SPIN\_B.SPIN\_SG

Sign for the direction of rotation

**\$SPIN\_C****Description of the spindle drive**

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada,\$machine.dat			
Original line	DECL SPIN \$SPIN_C={SPIN_AXIS 0,SPIN_RAD_G 0.0,SPIN_RAD_H 0.0,SPIN_SG 0,SPIN_BETA 0.0}			
Comments				

**\$SPIN\_C.SPIN\_AXIS****Number of the axis on which the spindle acts**

Data type	Integer	Value	min.	
Unit			max.	

**\$SPIN\_C.SPIN\_BETA****Offset of the angle between sides “g” and “h” of the trapezoid in relation to initial angle**

Data type	Real	Value	min.	
Unit			max.	

**\$SPIN\_C.SPIN\_RAD\_G****Length of the static side “g” of the spindle****\$SPIN\_C.SPIN\_RAD\_H****Length of the moving side “h” of the spindle****\$SPIN\_C.SPIN\_SG****Sign for the direction of rotation**

Data type	Integer	Value	min.	
Unit			max.	

**\$SPINDLE****Spindles**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$SPINDLE			
Comments				

Options	Effect
0	No
1	Yes

## \$SS\_MODE

### Signal declaration "Single step mode"

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$SS_MODE \$OUT[999]			
Comments				

## \$ST\_TOL\_TIME

### Standstill detection time

Data type	Integer	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$ST_TOL_TIME			
Comments	Time in ms that the robot must remain in velocity band \$ST_TOL_VEL before a standstill will be detected.			

## \$ST\_TOL\_VEL[n]

### Velocity limit for standstill detection

Data type	Real	Value	min.	
Unit	1/min		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$ST_TOL_VEL[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

## \$STOPMB\_ID

### Identification of the mailbox for stop messages

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$STOPMB_ID			
Comments				



**\$STOPMESS****Signal declaration "Stop message"**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$STOPMESS \$OUT[1010]			
Comments				

Options	Effect
TRUE	Stop message; the assigned output is set to TRUE.
FALSE	No stop message; the assigned output is set to FALSE.

**\$STOPNOAPROX****Message "Approximation not possible", with or without acknowledgement**

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$STOPNOAPROX			
Comments	Defines whether in the event of "Approximation not possible" a notification message or an acknowledgment message is generated.			

Options	Effect
TRUE	T1/T2 mode: Acknowledgement message "Approximation not possible". The robot stops.
	AUT/EXT mode: Notification message "Approximation not possible".
FALSE	T1/T2 mode: Notification message "Approximation not possible".
	AUT/EXT mode: No message.

**\$STROBE1**...  
**\$STROBE6****Measured-value scan, strobe for digital input 1 ... 6**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$STROBE1 \$OUT[1015] ... SIGNAL \$STROBE6 \$OUT[1020]			
Comments	Strobe output for digital input 1 ... 6			

# \$STROBE1LEV

...

# \$STROBE6LEV

Strobe pulse digital input 1 ... 6 High or Low

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\\$_machine.dat			
Original line	BOOL \$STROBE1LEV ... BOOL \$STROBE6LEV			
Comments	Active flank of the strobe output for digital input 1 ... 6			

Options	Effect
TRUE	Strobe is a High pulse
FALSE	Strobe is a Low pulse

# \$SYNC

Generation of phase-synchronous profiles

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\\$_robcor.dat			
Original line	INT \$SYNC ;Phasen Anpassung (1 = synchron, 0 = nicht synchron)			
Comments	Generation of phase-synchronous profiles on/off. If acceleration adaptation is switched on and higher motion profile is deactivated, phase-synchronous profiles are generated for PTP individual blocks – if at the same time \$SYNC > 0. This means that all acceleration, constant travel and deceleration phases take place simultaneously for all axes. Thus the geometric path does not change if the motion parameters are changed. This is not the case if \$SYNC=0; in this case the axes merely start and end motion at the same time.			

Options	Effect
1	Profiles are phase-synchronous
0	Profiles are not phase-synchronous



## 20 T

**\$T1** Signal declaration "TEST 1 mode" – "T1"

Data type	Signal declaration	Value min. max.	
Unit			
In file	Steu\Mada\machine.dat		
Original line	SIGNAL \$T1 \$OUT[993]		
Comments			

**\$T2** Signal declaration "TEST 2 mode" – "T2"

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$T2 \$OUT[994]			
Comments				

**\$T2\_OUT\_WARNING** Warning in the event of mode change to "T2" or "AUT"

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\MaDa\soption.dat			
Original line	BOOL \$T2_OUT_WARNING=FALSE			
Comments				

Options	Effect
TRUE	Warning activated
FALSE	Warning deactivated

## \$T2\_OV\_REDUCE

### Reduction of the override when switching to "T2"

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\MaDa\option.dat			
Original line	BOOL \$T2_OV_REDUCE=FALSE			
Comments	<p>When the operating mode is switched to “T2”, the override is automatically reduced to 10%.</p> <p>The “T1” override setting is saved and is available once again when the mode is switched back to “T1” (customer version 1). The default value for “T1” (e.g. after a cold reboot) is 100%.</p>			

Options	Effect
TRUE	Override is reduced to 10% when switching to "T2" and the "T1" override setting is saved.
FALSE	Override is not reduced when switching to "T2". The "T1" override setting is not saved.

## \$TARGET\_STATUS

### Selection of status for motion from start point to end (target) point

Data type	Enum	Value	min.	
Unit			max.	
In file	Steu\MaDa\Scustom.dat			
Original line	DECL TARGET_STATUS \$TARGET_STATUS=#SOURCE			
Comments	Used by the KRL function INVERSE() if the transferred end (target) point does not have a valid STATUS value.			

Options	Effect
#SOURCE	Use Status of start point.
#BEST	All eight Status combinations are calculated; the one with the shortest path between the start point and end point in axis space is selected.

**\$TC\_SYM****Time-constant symmetry filters**

Data type	Real	Value	min.	
Unit			max.	
In file	R1\Mada,\$machine.dat			
Original line	REAL \$TC_SYM			
Comments	The axes are made symmetrical by means of the machine datum “\$TC_SYM”. For optimum CP motion, the value of the equivalent circuit constant of the slowest speed control loop should be entered here.			

**\$TCP\_IPO****Flag for "TCP-related interpolation" mode**

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\option.dat			
Original line	BOOL \$TCP_IPO=FALSE			
Comments				

Options	Effect
TRUE	"TCP-related interpolation" on
FALSE	"TCP-related interpolation" off

**\$TECH****Function parameters for function generator in the advance run**

Data type	Enum	Value	min.	
Unit			max.	
In file	R1\Mada\operate.dat			
Original line	DECL TECH \$TECH[6]			
Comments				

## \$TECH\_ANA\_FLT\_OFF[n] Deactivate analog output filter for Techval

Data type	Boolean	Value min. max.	
Unit			
In file	Steu\Mada\Scustom.dat		
Original line	BOOL \$TECH_ANA_FLT_OFF[n] ;Zykl. Analogausgabe des TECHVALS gefiltert		
Comments	<p>[n] = [1] ... [6]</p> <p>The value of the system variable “\$ANA_DEL_FLT” is ignored as soon as one of the variables “\$TECH_ANA_FLT_OFF[1] ... [6]” also has the value “TRUE”.</p> <p>If you wish to use “\$ANA_DEF_FLT”, the six variables “\$ANA_DEF_FLT_OFF[1] ... [6]” and “\$VEL_FLT_OFF” must be set to “FALSE”.</p>		

Options	Effect
TRUE	The signal is not filtered so the programmed amplitude is reached exactly and without phase shift.
FALSE	The signal is output through a filter, as previously, so the analog signal does not quite reach the programmed amplitude and is dependent on the velocity and the override.

## \$TECH\_C Function parameters for function generator in the main run

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL TECH \$TECH_C[6] ;Funktionsparameter Funktionsgenerator Hauptlauf			
Comments				

## \$TECH\_FUNC Functionality bits for the function generator

Data type	Integer	Value min. max.	
Unit			
In file	Steu\Mada\Scustom.dat		
Original line	INT \$TECH_FUNC='B0000'		
Comments			


**\$TECH\_MAX** Maximum number of function generators

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$TECH_MAX ;Max. Anzahl Funktionsgeneratoren			
Comments				

**\$TECH\_OPT** Option bit for the function generator

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\soption.dat			
Original line	BOOL \$TECH_OPT=FALSE ;Funktionsgenerator			
Comments				

Options	Effect
TRUE	Function generator on.
FALSE	Function generator off.

**\$TECHANGLE** Rotation of the TTS in the advance run

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL TECHANGLE \$TECHANGLE ;Verdrehung Technologiedreibein im Vorlauf			
Comments				

**\$TECHANGLE\_C** Rotation of the TTS in the main run

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL TECHANGLE \$TECHANGLE_C			
Comments				

## \$TECHIN

### Input value for function generator

Data type	Real	Value	min.	
Unit			max.	
In file	---			
Original line	REAL \$TECHIN[6] ;Eingangswert Funktionsgenarator			
Comments				

## \$TECHPAR

### Parameterization of the function generator in the advance run

Data type	Real	Value	min.	
Unit			max.	
In file	---			
Original line	REAL \$TECHPAR[6,10] ;Parameter Funktionsgenerator			
Comments				

## \$TECHPAR\_C

### Parameterization of the function generator in the main run

Data type	Real	Value	min.	
Unit			max.	
In file	---			
Original line	REAL \$TECHPAR_C[6,10] ;Parameter Funktionsgenerator			
Comments				

## \$TECHSYS

### TTS in the advance run

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL TECHSYS \$TECHSYS ;Technologiedreibein im Vorlauf			
Comments				




**\$TECHSYS\_C** TTS in the main run

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL TECHSYS \$TECHSYS ;Technologiedreibein im Hauptlauf			
Comments				

**\$TECHVAL** Function value for function generator

Data type	Real	Value	min.	
Unit			max.	
In file	---			
Original line	REAL \$TECHVAL[6] ;Funktionswert Funktionsgenerator			
Comments				

**\$TFLWP** Offset between flange point and wrist point coordinate system

Data type	Structure	Value	min.	
Unit	Frame		max.	
In file	R1\Mada\machine.dat			
Original line	FRAME \$TFLWP={x 0.0,y 0.0,z 210.0,a 0.0,b 0.0,c 0.0} ;Frame zwischen Flansch- und Handpunktkoordinatensystem			
Comments				

**\$TIME\_POS[n]** Axis positioning time

Data type	Integer	Value	min.	
Unit	ms		max.	
In file	R1\Mada\$machine.dat			
Original line	INT \$TIME_POS[n]			
Comments	Maximum time for positioning of the axis. [n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

### \$TIMER[n] Timer

Data type	Integer	Value	min.	
Unit	ms		max.	
In file	---			
Original line	INT \$TIMER[n]			
Comments	[n] = [1] ... [32] Value of timer[n] increases by 1 each millisecond if \$TIMER_STOP = FALSE.			

### \$TIMER\_FLAG[n] Display if timer greater than or equal to zero

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$TIMER_FLAG[n]			
Comments	[n] = [1] ... [36]			

Options	Effect
TRUE	Value for timer n is greater than zero.
FALSE	Value for timer n is equal to zero.

### \$TIMER\_STOP[n] Start and stop the timer

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$TIMER_STOP[n]			
Comments	[n]= [1] ... [32]			

Options	Effect
TRUE	Timer is stopped.
FALSE	Timer is started.

**\$TIRORO****Offset between internal and current robot coordinate systems**

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\smachine.dat			
Original line	FRAME \$TIRORO={x 0.0,y 0.0,z 865.0,a 0.0,b 0.0,c 0.0}			
Comments				

**\$TL\_COM\_VAL****Tolerance time after exceeding the command speed limitation**

Data type	Integer	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$TL_COM_VAL=50 ;Toleranzzeit Soll Drehzahlbegrenzung [ms]			
Comments				

**\$TM\_CON\_VEL****Definition of minimum constant travel phase**

Data type	Integer	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$TM_CON_VEL ;Minimale Konstantfahrphase [ms]			
Comments	To avoid sudden loading of the robot arm due to abrupt changes between acceleration and braking (when there are short distances between points).			

**\$TOOL** Tool coordinate system relative to the flange coordinate system in the advance run

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	FRAME \$TOOL ;Werkzeug im Flanschkoordinatensystem Vorlauf			
Comments				

**\$TOOL.A** Rotation about the Z axis

Data type	Real	Value	min.	
Unit	°		max.	

**\$TOOL.B** Rotation about the Y axis

**\$TOOL.C** Rotation about the X axis

**\$TOOL.X** Offset in the X direction

Data type	Real	Value	min.	
Unit	mm		max.	

**\$TOOL.Y** Offset in the Y direction

**\$TOOL.Z** Offset in the Z direction

**\$TOOL\_C****Tool coordinate system relative to the flange coordinate system in the main run**

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	FRAME \$TOOL_C ;Werkzeug im Flanschkoordinatensystem Hauptlauf			
Comments				

**\$TOOL\_C.A****Rotation about the Z axis**

Data type	Real	Value	min.	
Unit	°		max.	

**\$TOOL\_C.B****Rotation about the Y axis****\$TOOL\_C.C****Rotation about the X axis****\$TOOL\_C.X****Offset in the X direction**

Data type	Real	Value	min.	
Unit	mm		max.	

**\$TOOL\_C.Y****Offset in the Y direction****\$TOOL\_C.Z****Offset in the Z direction****\$TOOL\_KIN****Name of the external TOOL kinematic system**

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$TOOL_KIN[29] ;Externe Kinematikachsen in TOOL			
Comments				

# \$TORQ\_DIFF[n] Maximum torque deviation of the individual axes

Data type	Integer	Value	min.	
Unit	%		max.	
In file	---			
Original line	INT \$TORQ_DIFF[n]			
Comments	<p>[n] = [1] ... [6]</p> <p>Specifies the maximum torque deviation in %; the only value the user can set it to is zero.</p> <p>This system variable can be used to optimize the torque monitoring (collision detection).</p> <p>Before a motion path section, the variable is set to zero in the KRL program; at the end of a motion instruction or a motion path section, \$TORQ_DIFF[] can be read, and the monitoring tunnel \$TORQMON[] set to the value of \$TORQ_DIFF[] (+5...10% safety margin).</p>			

# \$TORQ\_VEL[n] Velocity limitation for monitoring the torque-driven axis

Data type	Real	Value	min.	
Unit	%		max.	
In file	---			
Original line	REAL \$TORQ_VEL[n]			
Comments	<p>[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6</p> <p>Velocity limit in % of the maximum velocity for monitoring the torque-driven axis [n].</p> <p>When an axis is in torque mode, all monitoring functions are disabled. Hardware defects or an axis “runaway” can nevertheless be detected by monitoring the velocity.</p> <p>The maximum permissible velocity in operating modes Automatic and T2 can be set in the program by means of \$TORQ_VEL. In mode T1, the velocity set in the machine data applies.</p> <p>If this velocity is exceeded, the drives are switched off and a corresponding error message is generated.</p>			


**\$TORQMON[6]** Torque monitoring tunnel in program mode

Data type	Integer	Value	min.	
Unit	%		max.	
In file	---			
Original line	INT \$TORQMON[6] ;Momentenueberwachungsschlauch im Programmbetrieb [%]			
Comments				

**\$TORQMON\_COM[6]** Torque monitoring tunnel in command mode

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$TORQMON_COM[6] ;Momentenueberwachungsschlauch im Kommandobetrieb [%]			
Comments				

**\$TORQMON\_COM\_DEF[6]** Default values for torque monitoring tunnel in command mode

Data type	Integer	Value	min.	
Unit	%		max.	
In file	Steu\Mada\Scustom.dat			
Original line	INT \$TORQMON_COM_DEF[6]			
Comments				

**\$TORQMON\_DEF[6]** Default values for torque monitoring tunnel in program mode

Data type	Integer	Value	min.	
Unit	%		max.	
In file	Steu\Mada\Scustom.dat			
Original line	INT \$TORQMON_DEF[6]			
Comments				

### \$TORQMON\_TIME

Response time of the motion torque monitoring function

Data type	Real	Value	min.	
Unit	ms		max.	
In file	Steu\Mada\Scustom.dat			
Original line	REAL \$TORQMON_TIME			
Comments	Response time of the motion torque monitoring function.			

### \$TORQUE\_AXIS

Axis in position when command value reached – A1 ... A6, E1 ... E6

Data type	Integer	Value	min.	
Unit			max.	
In file	---			
Original line	INT \$TORQUE_AXIS			
Comments	<p>Bit array for torque-driven axes A1 – A6, E1 – E6.</p> <p>If a bit for a given axis is set, then there will be no waiting at the end of the motion for the axis to reach its positioning window.</p> <p>As soon as the command value has reached the target position, the next block will be executed.</p> <p><b>The axis monitoring functions are switched off.</b></p> <p>Changing the value of this variable triggers an advance run stop.</p> <p><b>Example:</b></p> <p>Switch axis 1 to torque mode: \$TORQUE_AXIS = 'B000001'</p>			

### \$TOUCH\_ACC

Retract acceleration for touch sensor

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\Smachine.dat			
Original line	INT \$TOUCH_ACC			
Comments				




**\$TOUCH\_SVEL**      Start velocity for touch sensor

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\smachine.dat			
Original line	INT \$TOUCH_SVEL			
Comments	Start velocity of touch sensor as a percentage of the search velocity.			

**\$TOUCH\_VEL**      Maximum retract velocity of the touch sensor

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$TOUCH_VEL			
Comments				

**\$TRACE**      Parameters for the trace function

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL TRACE \$TRACE			
Comments				

**\$TRACE.MODE**      Trace function control

Data type	Enum	Value	min.	
Unit			max.	
Options	Effect			
#START	Start TRACE			

**\$TRACE.NAME**
**Name of the file in which the data are recorded**

Data type	Character	Value	min.	
Unit			max.	

**\$TRACE.STATE**
**State of the trace function**

Data type	Enum	Value	min.	
Unit			max.	

Options	Effect
#T_WAIT	
#TRIGGERED	
#T_END	

**\$TRAFO\_AXIS**
**Number of transformed axes**

Data type	Integer	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	INT \$TRAFO_AXIS=6 ;Anzahl der transformierten Achsen			
Comments				

**\$TRAFONAME**
**Name of coordinate transformation**

Data type	Character	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	CHAR \$TRAFONAME[32] ;Name der Koordinatentransformation			
Comments				


**\$TRANSSYS** Translation reference system

Data type	Enum	Value	min.	
Unit			max.	
In file	---			
Original line	DECL TRANSSYS \$TRANSSYS ;WORLD, BASE, ROBROOT, TCP			
Comments				

Options	Effect
#WORLD	
#BASE	
#ROBROOT	
#TCP	

**\$TRP\_A** Trapezoidal link of the axis drives

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL TRPSPIN \$TRP_A={TRPSP_AXIS 0,TRPSP_COP_AX 0,TRPSP_A 0.0,TRPSP_B 0.0,TRPSP_C 0.0,TRPSP_D 0.0}			
Comments	Describes a trapezoidal link of the axis drives. TRP_A.TRPSP_AXIS: driven axis. TRP_A.TRPSP_COP_AXIS: coupled axis. TRP_A.TRPSP_A, B, C and D: lengths of the four trapezoid sides.			

**\$TRP\_A.TRPSP\_A** Length of trapezoid side "A"

Data type	Real	Value	min.	
Unit			max.	

**\$TRP\_A.TRPSP\_AXIS** Driven axis

Data type	Integer	Value	min.	
Unit			max.	

**\$TRP\_A.TRPSP\_B** Length of trapezoid side “B”

Data type	Real	Value	min.	
Unit			max.	

**\$TRP\_A.TRPSP\_C** Length of trapezoid side “C”

**\$TRP\_A.TRPSP\_COP\_AX** Coupled axis

Data type	Integer	Value	min.	
Unit			max.	

**\$TRP\_A.TRPSP\_D** Length of trapezoid side “D”

Data type	Real	Value	min.	
Unit			max.	

**\$TSYS** Current TTS in relation to the base coordinate system

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	FRAME \$TSYS ;Aktuelles Technologie-Dreibein bezogen auf BASE			
Comments				

**\$TURN** Rotational adjustment active

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$TURN ;Drehjustage aktiv			
Comments				

Options	Effect
TRUE	Rotational adjustment active
FALSE	Rotational adjustment not active

**\$TX3P3** Offset of robot wrist, based on axis 3

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	FRAME \$TX3P3={x 1000.0,y 0.0,z 45.0,a 0.0,b 90.0,c 0.0}			
Comments				

## 21 U

**\$USER\_SAF**

**Signal declaration "Safety gate monitoring"**

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$USER_SAF \$OUT[1011]			
Comments				



## 22 V

**\$V\_CUSTOM** Version identifier of the file “\$Custom.dat”

Data type	Character	Value	min.	
Unit			max.	
In file	Steu\Mada\Scustom.dat			
Original line	CHAR \$V_CUSTOM[32]			
Comments				

**\$V\_OPTION** Version identifier of the file “\$Option.dat”

Data type	Character	Value	min.	
Unit			max.	
In file	Steu\Mada\Sooption.dat			
Original line	CHAR \$V_OPTION[32]			
Comments				

**\$V\_R1MADA** Version identifier of machine data in the directory R1

Data type	Character	Value	min.	
Unit			max.	
In file	R1\Mada\Smachine.dat			
Original line	CHAR \$V_R1MADA[32]			
Comments				

**\$V\_ROBCOR** Version identifier of the file “Robcor.dat”

Data type	Character	Value	min.	
Unit			max.	
In file	R1\Mada\Srobcor.dat			
Original line	CHAR \$V_ROBCOR[32]			
Comments				

## \$V\_STEUMADA

Version identifier of the file “\$machine.dat” in the directory \Steu

Data type	Character	Value	min.	
Unit			max.	
In file	Steu\Mada\Smachine.dat			
Original line	CHAR \$V_STEUMADA[32]			
Comments				

## \$VEL

Velocities in the advance run

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL CP \$VEL			
Comments	Velocities in the advance run CP = m/s, ORI1 = °/s, ORI2 = °/s			

## \$VEL.CP

CP velocity in the advance run

Data type	Real	Value	min.	> 0
Unit	m/s		max.	

## \$VEL.ORI1

Swivel velocity in the advance run

Data type	Real	Value	min.	
Unit	°/s		max.	

## \$VEL.ORI2

Rotational velocity in the advance run

## \$VEL\_ACT

Current CP velocity

Data type	Real	Value	min.	> 0
Unit	m/s		max.	\$VEL_MA.CP
In file	R1\Mada\machine.dat			
Original line	REAL \$VEL_ACT			
Comments				



**\$VEL\_ACT\_MA****Limit value of axial command velocity**

Data type	Integer	Value	min.	
Unit	%		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$VEL_ACT_MA ;Grenzwert Sollgeschwindigkeit [%]			
Comments	In jog mode and T1 mode, the limits are reduced by the value of the velocity reduction factor in T1. In PTP motions, the acceleration of the higher motion profile is calculated on the basis of a robot model.			

**\$VEL\_AX\_JUS[n]****Velocity of individual axes for EMT mastering**

Data type	Real	Value	min.	
Unit	°/s, mm/s		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$VEL_AX_JUS[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

**\$VEL\_AXIS[n]****Velocity of the axes in the advance run**

Data type	Integer	Value	min.	1
Unit	%		max.	100
In file	---			
Original line	INT \$VEL_AXIS[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6			

**\$VEL\_AXIS\_ACT[n]****Current axis velocity relative to the maximum velocity**

Data type	Real	Value	min.	-100
Unit	%		max.	100
In file	---			
Original line	REAL \$VEL_AXIS_ACT[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

### \$VEL\_AXIS\_C[n] Velocity of the axes in the main run

Data type	Integer	Value	min.	1
Unit	%		max.	100
In file	---			
Original line	INT \$VEL_AXIS_C[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6			

### \$VEL\_AXIS\_MA[n] Rated speed of the motors of the individual axes

Data type	Real	Value	min.	
Unit	1/min		max.	
In file	---			
Original line	REAL \$VEL_AXIS_MA[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

### \$VEL\_C Velocities in the main run

Data type	Structure	Value	min.	
Unit			max.	
In file	---			
Original line	DECL CP \$VEL_C			
Comments	Velocities in the main run CP = m/s, ORI1 = °/s, ORI2 = °/s			

### \$VEL\_C.CP CP velocity in the main run

Data type	Real	Value	min.	> 0
Unit	m/s		max.	

### \$VEL\_C.ORI1 Swivel velocity in the main run

Data type	Real	Value	min.	
Unit	°/s		max.	

### \$VEL\_C.ORI2 Rotational velocity in the main run

**\$VEL\_CP\_COM****Reduction factor for the flange velocity in reorientation motions of the tool**

Data type	Real	Value	min.	
Unit	m/s		max.	
In file	R1\Mada,\$machine.dat			
Original line	REAL \$VEL_CP_COM ;Reduzierung der Flanschgeschwindigkeit in [m/s]			
Comments				

**\$VEL\_CP\_T1****CP velocity in Test 1 mode**

Data type	Real	Value	min.	
Unit	m/s		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$VEL_CP_T1 ;Bahngeschwindigkeit in T1 [m/s]			
Comments				

**\$VEL\_ENC\_CO****Speed command value threshold for encoder monitoring**

Data type	Integer	Value	min.	
Unit	Inkr		max.	
In file	R1\Mada\machine.dat			
Original line	INT \$VEL_ENC_CO			
Comments				

**\$VEL\_EXTAX[n]****Axis velocity of the external axes in the advance run**

Data type	Integer	Value	min.	
Unit	%		max.	
Original line	INT \$VEL_EXTAX[n]			
Comments	[n]= [1] ... [6]: external axis E1 ... E6			

### \$VEL\_EXTAX\_C[n]

Axis velocity of the external axes in the main run

Data type	Integer	Value	min.	
Unit	%		max.	
In file				
Original line	INT \$VEL_EXTAX_C[n]			
Comments	[n]= [1] ... [6]: external axis E1 ... E6			

### \$VEL\_FILT[n]

Tacho filter

Data type	Real	Value	min.	
Unit	ms		max.	
In file	R1\Mada\machine.dat			
Original line	REAL \$VEL_FILT[n]			
Comments	[n] = [1] ... [6]: axis A1 ... A6 [n] = [7] ... [12]: external axis E1 ... E6			

### \$VEL\_FLT\_OFF

Calculation of velocity from filtered or unfiltered setpoints

Data type	Boolean	Value	min.	
Unit			max.	
In file	Steu\Mada\custom.dat			
Original line	BOOL \$VEL_FLT_OFF=TRUE			
Comments	If this variable is set to "TRUE", the value of the system variable "\$ANA_DEL_FLT" must first be set to "ON".			

Options	Effect
TRUE	Calculation of velocity from filtered setpoints. The velocity values need no longer be filtered.
FALSE	Calculation of velocity from unfiltered setpoints. The velocity values must be filtered.

**\$VEL\_MA****Data for maximum CP, swivel and rotational velocity**

Data type	Structure	Value	min.	
Unit			max.	
In file	R1\Mada\machine.dat			
Original line	DECL CP \$VEL_MA={CP 1.75,ORI1 400.0,ORI2 400.0}			
Comments	CP = Max. CP velocity [m/s], ORI1 = Max. swivel velocity [°/s], ORI2 = Max. rotational velocity [°/s]			

**\$VEL\_MA.CP****Maximum CP velocity**

Data type	Real	Value	min.	
Unit	m/s		max.	
Comments	Cartesian motions are carried out with the velocity \$RED_VEL_CPC*\$VEL_MA.CP			

**\$VEL\_MA.ORI1****Maximum swivel velocity**

Data type	Real	Value	min.	
Unit	°/s		max.	
Comments	Cartesian swivel motions are carried out with the velocity \$RED_VEL_CPC*\$VEL_MA.ORI1			

**\$VEL\_MA.ORI2****Maximum rotational velocity**

Comments	Rotational motions are carried out with the velocity RED_VEL_CPC*VEL_MA.ORI2			
----------	---	--	--	--

## 23 W

### \$WAIT\_FOR[470]

Interpreter waiting at a WAIT FOR statement

Data type	Character	Value	min.	
Unit			max.	
In file	---			
Original line	CHAR \$WAIT_FOR[470]			
Comments				

### \$WAIT\_FOR\_ON

Interpreter waiting at a condition

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$WAIT_FOR_ON			
Comments				

Options	Effect
TRUE	Interpreter is waiting at a condition
FALSE	Interpreter is not waiting at a condition

### \$WBOXDISABLE

Workspace monitoring on or off

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$WBOXDISABLE			
Comments				

Options	Effect
TRUE	Working envelope monitoring is switched on
FALSE	Working envelope monitoring is switched off

**\$WORKSPACE[n]****Definition of workspace monitoring**

Data type	Structure	Value	min.	
Unit			max.	
In file	Steu\Mada\Scustom.dat			
Original line	DECL BOX \$WORKSPACE[n]			
Comments	[n] = [1] ... [8]			

**\$WORKSPACE[n].MODE****Functional principle of the workspace monitoring function**

Data type	Enum	Value	min.	
Unit			max.	
Options	Effect			
#OFF	Workspace monitoring deactivated			
#INSIDE	The output is set if the TCP is located inside the workspace			
#OUTSIDE	The output is set if the TCP is located outside the workspace			
#INSIDE_STOP	The output is set and the robot stopped if the TCP is located inside the workspace			
#OUTSIDE_STOP	The output is set and the robot stopped if the TCP is located outside the workspace			

**\$WORKSPACE[n].STATE****Violation of the workspace**

Data type	Boolean	Value	min.	
Unit			max.	
Options	Effect			
TRUE	The workspace has been violated			
FALSE	The workspace has not been violated			

**\$WORKSPACE\_NAME[n][24]****Name of the particular workspace**

Data type	Character	Value	min.	
Unit			max.	
In file	Steu\Mada\Scustom.dat			
Original line	CHAR \$WORKSPACE_NAME1[24] \$WORKSPACE_NAME1[]="WORKSPACE 1"			
Comments	n = 1 ... 8			

## \$WORKSTATE1

...  
\$WORKSTATE8

Signal declaration "Violation of workspace"

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$WORKSTATE1 \$OUT[984] ... SIGNAL \$WORKSTATE8 \$OUT[991]			
Comments				

Options	Effect
\$OUT[n]	Output no. 1 ... 4096
FALSE	Outputs that are not required can be set to "FALSE", e.g. SIGNAL \$WORKSTATE1 FALSE

## \$WORLD

World coordinate system relative to the initial coordinate system

Data type	Structure	Value	min.	
Unit	mm, °		max.	
In file	---			
Original line	FRAME \$WORLD			
Comments	Initial coordinate system: So-called origin coordinate system that is identical to the World coordinate system in the KRC controller.			

## \$WORLD.A

Rotation about the Z axis

Data type	Real	Value	min.	
Unit	°		max.	

## \$WORLD.B

Rotation about the Y axis

## \$WORLD.C

Rotation about the X axis

## \$WORLD.X

Offset in the X direction

Data type	Real	Value	min.	
Unit	mm		max.	

## \$WORLD.Y

Offset in the Y direction

## \$WORLD.Z

Offset in the Z direction



**\$WRIST\_AXIS****Wrist axis identification**

Data type	Enum	Value	min.	
Unit			max.	
In file	R1\Mada\Smachine.dat			
Original line	DECL WRIST_AXIS \$WRIST_AXIS=#ZEH			
Comments				

Options	Effect
#NOH	No wrist
#ZEH	In-line wrist
#SRH	Oblique wrist
#DSH	Triple-roll wrist
#WIH	Offset wrist
#WSH	Oblique offset wrist

## 24 Z

### \$ZERO\_MOVE

#### Execution of a zero motion block

Data type	Boolean	Value	min.	
Unit			max.	
In file	---			
Original line	BOOL \$ZERO_MOVE			
Comments	The value TRUE is valid for only one interpolation cycle. Interpolation of zero blocks only during a single interpolation cycle.			

Options	Effect
TRUE	Zero motion block is executed
FALSE	No zero motion block is executed

### \$ZUST\_ASYNC

#### Enable asynchronous external axes

Data type	Signal declaration	Value	min.	
Unit			max.	
In file	Steu\Mada\machine.dat			
Original line	SIGNAL \$ZUST_ASYNC \$IN[1026]			
Comments				

Options	Effect
TRUE	Asynchronous external axes enabled
FALSE	Asynchronous external axes not enabled



## Zahlen

6D mouse, 127

## A

Absolutely accurate robot model, 7, 8  
Acceleration adaptation, 13  
Acceleration of the axes in the advance run, 8  
Acceleration of the axes in the main run, 9  
Acceleration of the external axes, 11  
Access to database, 90  
Activate palletizing mode, 100  
Activation of the higher motion profile, 95  
Actual current of axes, 38  
Actual position, Cartesian, 102  
Aggregate of the end or auxiliary point, 110  
Alarm Stop, 14  
Alpha1 position, 128  
Alpha2 position, 129  
Alpha5 position, 129  
Analog inputs, 14  
Analog output filter, 14  
Analog outputs, 15  
Approximation distance, 15  
Approximation not possible, 137  
Assignment of axes, 51  
Assignment of external axes to external axis kinematic system, 57  
Assignment of jog keys, 78  
Assignment of the jog keys, 19  
Automatic, 19  
Axis 4, 7  
Axis angle, 20  
Axis brake, 126  
Axis brakes, 31, 32  
Axis coupling factors, 37  
Axis identification, 26  
Axis in position, 152  
Axis positioning time, 145  
Axis run-up time, 115  
Axis servo, 126  
Axis velocity of the external axes, 163

## B

Base coordinate system, 29  
BASE system, 12  
Battery message, 81  
BCO, 88  
Bit array for axis brakes, 31  
Block coincidence run, 88  
Block number, 110  
Block selection, 82  
Bounce time for EMT signals, 30  
Brake control mode, 32  
Brake delay time for external axes, 31

## C

Cartesian coordinates, 50  
Cartesian robot motion, 50  
Center of mass frame for the default load, 43  
Clock generator, 121  
Command acceleration, 8  
Command execution, 112  
Command torque monitoring, 114  
Command velocity, 161  
Constant travel phase, 147  
Conversion of point coordinates, 7  
Coordinate system for jogging, 37  
Coordinate transformation, 154  
Correction variables, 95  
Coupled axis, 156  
Coupling factors of axes, 60  
CP motion, 50  
CP velocity, 160, 162  
CP velocity in Test 1 mode, 163  
CP velocity in the advance run, 160  
Current asynchronous motion execution state, 18  
Current axis-specific robot position, 20  
Current calibration in the power module, 39  
Current calibration, power module, 107  
Current CP velocity, 160  
Current error, power module, 107  
Current limitation for external axes, 39  
Current limitation of axes, 40  
Current limitation on axis, 39  
Current temperature inside the KCP, 101  
Curve length, CP motion, 50  
Cyclical flag, 40  
Cyclical flags, 40

**D**

- Data for acceleration with changes of override, 12
- Data for special kinematics, 132
- Deceleration time during maximum braking, 42
- Default center of mass, 44
- Default filter for CP motion, 43
- Default filter for PTP motion, 43
- Default mass of the load on the flange, 44
- Default moment of inertia of the load, 44
- Default values for torque monitoring, 151
- Definition of message type, 91
- Denavit-Hartenberg parameters, 46
- Description of the spindle drive, 133, 134, 135
- Diagnosis, 107
- Digital input, 47
- Direction of rotation of the axis, 22
- Direction of the start key, 48
- Display axis mastered, 24
- Display brightness, 100
- Display contrast, 101
- Display of axis angle, 20
- Display of power failure, 106
- Distance to the next exact positioning point, 49
- Distance traveled during signal propagation time in EMT, 124
- Drive interfaces, 101
- Drives OFF, 51
- Drives ON, 51, 100
- DSE, 51

**E**

- Editing, 83
- EMERGENCY STOP ramp, 118
- EMT, 124
- EMT mastering, 55, 77, 81, 161
- Enable asynchronous external axes, 170
- Enabling switch, 124
- Encoder actual values, 13
- Endless axes, 120
- Error messages, 107
- Execution of a zero motion block, 170
- Extended position singularity, 129
- External axes, 16, 97
- External axis kinematic system, 57
- External device active, 70
- External kinematic, 30

- External mode, 61
- External power supply, 19
- External program for controller node, 109
- External Robroot kinematic system, 122
- External start active, 61

**F**

- Fan monitoring, 63
- Five-axis robots, 96
- Fixing of axis 4 when palletizing, 42
- Flag for automatic mode, 62
- Flag for infinitely rotating axes, 56
- Flag for re-initializing the DSE, 117
- Flags 1 to 1024 as global markers, 64
- Following error monitoring, 64, 73
- Function generator, 141
- Function parameters for function generator, 141
- Function value for function generator, 145

**G**

- Gear torque monitoring, 67

**H**

- Higher motion profile, 51, 76, 95
- HOME directory setting of the compiler, 68
- Home position, 23, 68

**I**

- I/O interface active, 70
- Incremental actual values, 23
- Incremental dimension for external axes, 74
- Incremental dimension, axis-specific, 74
- Incremental dimension, Cartesian, relative to the tool, 74
- Infinitely rotating axes, 56
- Input value for function generator, 144
- Inputs, 72
- Inputs/outputs, 75
- Integer variables, 37
- Integral factor of the speed controller, 70
- Interbus groups, 71
- Interbus slave, 71
- Intermediate circuit voltage, power module, 107
- Interpolation mode, 76
- Interpreter waiting, 166



Interrupt, 105  
Interrupts at robot level, 121  
Interrupts at Submit level, 130  
Iterations for path planning, 76

## J

Jog keys, 19, 78  
Jog mode, 86  
Jog override, 98  
Jogging, 31

## K

Kernel system, 116  
Kernel system version, 116  
Key to the message text in the data bank, 90  
Kinematic classes, 79  
Kinetic energy, 56  
KRL instruction executed, 109  
KT factor of motors, 80  
KT0 factor of servomotors, 80

## L

Length of EMT mastering travel, 81  
Limit switch tripped, 69  
Limit value of axial command acceleration, 8  
Limit value of axial command velocity, 161  
Limitation of command speed, 36  
Load data determination, 71

## M

Main axis identification, 85  
Master/slave axes, 130  
Mastering difference for EMT mastering, 34  
Maximum approximation distance, 15  
Maximum braking, 42  
Maximum CP velocity, 165  
Maximum current of a KPS, 79  
Maximum deceleration time for path-maintaining Emergency Stop, 32  
Maximum effective current on power module output, 39  
Maximum number of digital inputs, 93  
Maximum number of digital outputs, 93  
Maximum number of function generators, 143

Maximum orientation error for singularity-free motion, 128  
Maximum rotational velocity, 165  
Maximum swivel velocity, 165  
Maximum torque deviation, 150  
Maximum values for path acceleration, 12  
Measured-value scan, strobe, 137  
Message display, 90  
Message type, 91  
Method for EMT mastering, 55  
Mode, 19  
Mode for asynchronous external axes, 17  
Mode for Space Mouse, 87  
Model data of the robot, 51  
Module identifier for access to database, 90  
Motion monitoring, 121  
Motion status, 111  
Motion torque monitoring, 152  
Motion type in jog mode, 86  
Motor run-up time without the axis being loaded, 115  
Move enable, 88  
Move enable signal, 89

## N

Name for the variable, 49  
Name of coordinate transformation, 154  
Name of the block, 109  
Name of the end or auxiliary point, 110  
Name of the external Robroot kinematic system, 122  
Name of the external TOOL kinematic system, 149  
Name of the particular workspace, 27, 167  
Nominal energy monitoring, 56  
Null frame, 92  
Number of external axes, 60  
Number of robot axes, 93  
Number of the softkey pressed, 90  
Number of transformed axes, 154

## O

Observable variables, 49  
Offset, 57  
Offset between flange point and wrist point coordinate system, 145

Offset between mechanical and mathematical zero, 85  
 Offset of robot wrist, 157  
 Online modification of servo parameters, 127  
 Operating hours meter, 122  
 Operator control device status, 45  
 Option bit for the function generator, 143  
 Orientation, 57  
 Orientation check, 96  
 Orientation control with CIRC blocks, 35  
 Orientation error, 128  
 Output of message text, 91  
 Outputs, 97  
 Overhead singularity, 128  
 Override, 98  
 Override for asynchronous external axes, 97  
 Override in jog mode, 45

## P

Palletizing, 42  
 Parameterization of the function generator, 144  
 Parameters for the trace function, 153  
 Path acceleration, 8, 9, 12  
 Path check, 95  
 Path status for the programmed point, 110  
 Path-maintaining braking in event of operator safety violation, 124  
 Path-maintaining Emergency Stop, 54  
 Permissible rated current, 40  
 Plus/minus key, 78  
 Position control monitoring, 89  
 Position of robot in world coordinate system, 122  
 Position of robot root point in world coordinate system, 122  
 Position when interrupt is triggered, 105  
 Position when leaving the path, Cartesian, 106  
 Power failure, 106  
 Power module, 101, 107  
 Process name, 112  
 Process name of the robot interpreter, 112  
 Process name of the Submit interpreter, 112  
 Process pointer to current KRL process, 109  
 Process run mode of the robot interpreter, 111  
 Process run mode of the Submit interpreter, 111  
 Process state, 113  
 Program execution, 112

Program is processing an interrupt, 75  
 Program override, 98  
 Program run mode, 110  
 Program status, 108  
 Programming the EE potentiometer of DSE, 114  
 Proportional gain of the current controller, 66  
 Proportional gain of the position controller, 82  
 PTP points with Cartesian coordinates, 50

## R

Rapid gauging, 85  
 Rated current, 40  
 Rated current of KPS, 79  
 Rated speed of the motors, 162  
 Re-initializing the digital servoelectronics (DSE), 117  
 Ready for Program Start, 116  
 Reduction factor for acceleration, 117  
 Reduction factor for axial acceleration, 117  
 Reduction factor for axial velocity, 120  
 Reduction factor for CP and orientation acceleration, 117  
 Reduction factor for path-maintaining Emergency Stop ramp, 118  
 Reduction factor for program in the advance run, 119  
 Reduction factor for sensor location run, 119  
 Reduction factor for T1 mode, 119  
 Reduction factor for velocity in referencing (reference point cam), 118  
 Reduction of acceleration, 118  
 Reduction of the CP path velocity, 38  
 Reference point offset, 34  
 Referencing direction, 47  
 Referencing sequence of the axes, 126  
 Referencing status, 121  
 Register for error messages, 107  
 Relative blocks, 123  
 Reorientation, 163  
 Reset acknowledgement messages, 36  
 Resolution of the position sensing system, 24  
 Response time of the motion torque monitoring function, 152  
 Results of simulation for loop termination condition, 83  
 Retract acceleration for touch sensor, 152  
 Retract velocity of the touch sensor, 153  
 Revolution counter for endless axes, 120



- Robot in home position, 73
- Robot interpreter, 75
- Robot name, 123
- Robot override, 98
- Robot position, 20
- Robot position at the time of an interrupt, 23
- Robot position, Cartesian, 102
- Robot type, 86
- Robot wrist, 157
- Rotation of the base coordinate system, 30
- Rotation of the TTS, 143
- Rotational acceleration, 8, 9, 12
- Rotational adjustment active, 156
- Rotational reference system for relative blocks, 123
- Rotational velocity, 160
- Rotational velocity in the main run, 162

## S

- Safety gate monitoring, 158
- Sensor interface, 125
- Serial number of the KCP CPU and software version, 101
- Serial number of the robot, 80
- Servo parameters for DSE, 126
- Signal propagation time in EMT, 124
- Simulate observer's point of view using the 6D mouse (AnySim), 127
- Simulation of inputs/outputs, 75
- Single step mode, 136
- Singularity, 48
- Singularity-free motion, 128, 129
- Smooth ramp, 64
- Softkey, 90
- SoftPLC, 131, 132
- Software limit switches, 130
- Space Mouse, 87
- Special kinematics, 132
- Speed command value threshold for encoder monitoring, 163
- Speed control loop, 20
- Speed controller gain, 66
- Spindle drive, 133, 134, 135
- Standstill detection time, 136
- Standstill window, 73
- START, 112
- Start key, 48

- Start position of motion block, Cartesian, 103
- Start position of the current motion block, 21
- Start simulation, 83
- Start velocity for touch sensor, 153
- State of power module, 107
- State of the Num Lock key, 94
- Status for motion from start point to target point, 140
- Status of motion, 89
- Status of plus/minus key, 78
- Status of position control monitoring, 89
- Status of the Space Mouse, 87
- Stop messages, 136
- Strategy for singularity-free motion, 129
- Structure for message display, 90
- Submit interpreter, 75
- Supplementary load on axis 3, 45
- Switching external axes to asynchronous motion, 59
- Swivel acceleration, 8, 9, 12
- Swivel velocity, 160, 162
- Symmetry filters, 141
- System time and system date, 42

## T

- Tacho filter, 164
- Target position of the current motion block, 22
- Target position of the motion block, Cartesian, 104
- TCP-related interpolation, 141
- Test mode, 108
- Test1 mode, 18
- Time-constant symmetry filters, 141
- Timer, 146
- Timer display, 146
- Tolerance time, 147
- Tolerance window, 92
- Tool coordinate system, 13
- Tool coordinate system relative to the flange coordinate system, 148, 149
- Tool-based technological system (TTS), 143, 144
- Torque deviation, 150
- Torque feed forward control, 63
- Torque monitoring tunnel in command mode, 151
- Torque monitoring tunnel in program mode, 151
- Touch sensor, 152

Trace function, 153  
Trace function control, 153  
Transformed axes, 154  
Translation reference system, 155  
Transmission ratio, 115  
Trapezoidal link, 155  
TTS in relation to the base coordinate system,  
156

## V

Velocity feed forward control, 63  
Velocity limitation for monitoring the torque-driven  
axis, 150  
Velocity of the axes, 161  
Velocity reduction factor in Test1 mode, 18  
Violation of the axis-specific workspace, 27  
Violation of the workspace, 28, 167, 168

## W

WAIT FOR statement, 166  
Workspace monitoring, 166  
World coordinate system, 29, 122  
World coordinate system relative to the initial  
coordinate system, 168  
Wrist axis identification, 169  
Wrist axis singularity, 129

## Z

Zero motion block, 170