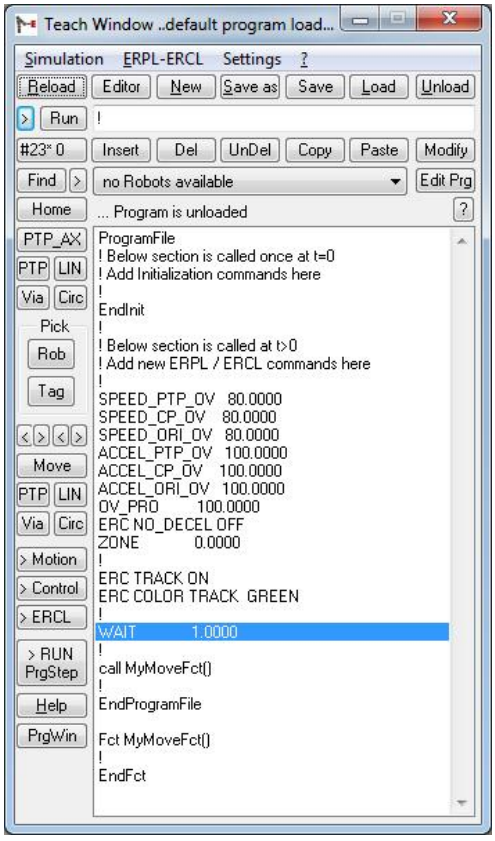
ERPL- / ERCL- Program Language

EASY-ROB™ V7.6



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EASY-ROB™

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EASY-ROB™

ERPL - EASY-ROB Program Language

The below table gives an overview about the EASY-ROB program structure and available robot motion commands.

Principle syntax definition:

- Units (length) are meter [m], degree [deg] or percentage [%]
- Speed units are in length unit per seconds e.g. [m/s]
- A cartesian position consists of a position with X, Y and Z values and an orientation with A, B and C angles.
  The orientation definition for ABC angles is:
  Rot (A,B,C) = Rot(X,A) * Rot(Y,B) * Rot(Z,C)
- A Tag name is for example 'T_1'. To use a tag name with a motion command, the Tag must exist in the work cell.

General Program Structure

Command and Syntax	**Description**
PROGRAMFILE	Begin of Program Executing this command as single step command will reset some status data, such as BASE, BASE_PRG, etc.
ENDPROGRAMFILE or END	End of Program Program executing stops
CALL fct_name()	Internal Function Call fct_name() - name of function **Note**: The function must exist in the current program file
FCT fct_name()	Begin function definition fct_name() - name of function
ENDFCT	end of function
! some text and comments	The '!' sign will comment out the complete command line
EndInit	End of the area for the initialization (for initialization of the „not-time-consuming“ commands)

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Robot Motion Commands

Command and Syntax	Description
! some text and comments	The '!' sign will comment out the complete command line
OV_PRO x [%]	Programmable Override x - percentage value
SPEED_CP dx dxe [m/s]	Speed for continuous path motion dx - cartesian speed [dxe] – cartesian speed at target
SPEED_ORI dx_ori dxe_ori [deg/s]	Orientation Speed for continuous path motion dx_ori - orientation speed [dxe_ori] - orientation speed at target
SPEED_PTP v ve [m/s, deg/s]	Speed for PTP motion v - joint speed [ve] - joint speed at target *Remark: command obsolete – use SPEED_PTP_AX instead*
ACCEL_CP ax axe [m/s²]	Acceleration for continuous path motion ax - cartesian acceleration [axe] - cartesian acceleration at target
ACCEL_ORI ax_ori axe_ori [deg/s²]	Orientation Acceleration for continuous path motion ax_ori - orientation acceleration axe_ori] - orientation acceleration at target
ACCEL_PTP aq aq_end [m/s², deg/s²]	Acceleration for PTP motion aq - joint acceleration [aqe] - joint acceleration at target *Remark: command obsolete – use ACCEL_PTP_AX instead*
SPEED_PTP_AX v1 .. vn [m/s, deg/s]	Speed for PTP motion for every axis v1 - Joint(1) - joint speed [vn] – Joint(n) - joint speed
ACCEL_PTP_AX a1 .. an [m/s², deg/s²]	Acceleration for PTP motion for every axis a1 - Joint(1) acceleration [an] - Joint(n) acceleration
SPEED_PTP_OV x [%]	Percentage speed (for PTP motion) of the maximum speed values (for every axis) x – value in percent
ACCEL_PTP_OV x [%]	Percentage acceleration (for PTP motion) of the maximum acceleration values (for every axis) x - value in percent
SPEED_CP_OV x [%]	Percentage speed (for continuous path motion) of the maximum speed values (for every axis) x - value in percent
ACCEL_CP_OV x [%]	Percentage acceleration (for continuous path motion) of the maximum acceleration values (for every axis) x - value in percent
SPEED_ORI_CP_OV x [%]	Percentage orientation-speed (for continuous path motion) of the maximum speed values (for every axis) x - value in percent
ACCEL_ORI_CP_OV x [%]	Percentage orientation-acceleration (for continuous path motion) of the maximum acceleration values (for every axis) x - value in percent

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Command and Syntax	Description
CONFIG n	Robot Configuration n - configuration number
TOOL X Y Z A B C [m,deg]	Tool data from tip to TCP XYZ - Position ABC - Orientation
TOOL tagname	Tool data from tip to TCP tagname - name of Tag
TOOL DEVICE robname	Sets the TCP for the current Robot to the TCP data of the robot 'robname'. This command is useful after another robot is grabbed.
TOOL toolname	Sets the tool / the TCP to the tool with name ‚toolname'
TOOL DEVICE tool_dev_name toolname	Sets the TCP for the current Robot to the tool data of the tool ‚toolname' of the selected devices 'tool_dev_name'. This command is useful after another robot is grabbed
EXT_TCP X Y Z A B C [m,deg]	Extern TCP XYZ - Position ABC - Orientation
EXT_TCP tagname	Extern TCP tagname - name of Tag
BASE X Y Z A B C [m,deg]	Shift Targets by BASE frame The goal of all BASE commands is to shift program commands. The BASE command is always with respect to the robots base. (see also ERC BASE ...) i.e. All following motion commands are transformed by the current base frame. XYZ - Position ABC - Orientation **Note**: see also ERC BASE BODY bodyname ERC BASE TCP
BASE tagname	Program BASE tagname - name of Tag
BASE_REL dX dY dZ dA dB dC [m,deg]	Relative Program BASE Shift the current base frame by the relative location dXdYdZ - delta Position, dAdBdC - delta Orientation
BASE_PRG X Y Z A B C [m,deg]	The BASE_PRG command operates with respect to the current BASE frame. The final reference for all motion and position commands with respect to the robots base is calculated as: T_base_final = T_base_prg * T_base (T - homogeneous 4x4 matrix) XYZ – Position, ABC - Orientation
BASE_PRG_REL dX dY dZ dA dB dC [m,deg]	Relative Program BASE_PRG dXdYdZ - delta Position, dAdBdC - delta Orientation

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LEADING_POSITION x	Leading Position for continuous path motion ON - Position has priority, keeps speed on a path OFF - Orientation has priority VAR - slowest profile has priority
LEADING_ORIENTATION x	Leading Orientation for continuous path motion (Opposite form LEADING_POSITION) ON - Orientation has priority OFF - Position has priority, keeps speed on a path VAR - slowest profile has priority
HOME n	Home position n - number of home position
HOME homepositionname	Home position homepositionname - name of home position
HOME $NAME_N	Homeposition $NAME_N Name of the home position defined by the command ERC SET_PARAMETER $NAME_1 'name'
SLEW X Y Z A B C [m,deg] [Extax1 Extax2 …]	SLEW (PTP), each Joint reaches its target at different time XYZ – Position, ABC – Orientation, Extax – external axis values
SLEW _REL dX dY dZ dA dB dC [m,deg]	Relative SLEW dXdYdZ - delta Position, dAdBdC - delta Orientation
SLEW tagname	SLEW (PTP), each Joint reaches its target at different time tagname - name of Tag
SLEW _AX q1 .. qn [m,deg]	Joint specific SLEW q1..qn - target Joint/Axis
SLEW _AX_REL dq1..dqn [m,deg]	Relative Joint specific SLEW dq1..dqn - delta Joint/Axis
PTP X Y Z A B C [m,deg] [Extax1 Extax2 …]	Full-Synchro PTP XYZ – Position, ABC – Orientation, Extax – external axis values
PTP_REL dX dY dZ dA dB dC [m,deg]	Relative Full-Synchro PTP dXdYdZ - delta Position, dAdBdC - delta Orientation
PTP tagname	Full-Synchro PTP tagname - name of Tag
PTP_AX q1 .. qn [m,deg]	Joint specific Full-Synchro PTP q1..qn - target Joint/Axis
PTP_AX_REL dq1..dqn [m,deg]	Relative Joint specific Full-Synchro PTP dq1..dqn - delta Joint/Axis
LIN X Y Z A B C [m,deg]] [Extax1 Extax2 …]	Linear CP motion XYZ – Position, ABC – Orientation Extax - external axis values
LIN_REL dX dY dZ dA dB dC [m,deg]	Relative Linear CP motion dXdYdZ - delta Position, dAdBdC - delta Orientation
LIN TagName	Linear CP motion Tag name - name of Tag
LIN_ORI ori_type	Orientation Interpolation type for Linear CP motion ori_type - VARIABLE, FIX, TANGENTIAL, AUX, VARIABLE2, QUATERNION

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MOVE TagNames[] MOVE TagIdx[]	Moves to one or more Tagpoints in tag motion type. Example: Path with 4 tag points { T1, T2, T3, T4}, T1 has PTP motype T2 has LIN motype T3 has CIRC motype T4 has VIA motype MOVE T1 T4 T3 T2 moves to T1 in ptp, to T3 in circ via T4 and to T2 in lin motion type. Using Tagindex, MOVE 1 4 3 2 causes the same motion.
Along path TagNameStrt TagNameEnd	Move along a path path : Path name to move along TagNameStrt - first Tag to move to TagNameEnd - last Tag to move to TagNameStrt, TagNameEnd are identified by names “T_1” or by Idx Examples: along path01 T_1 T_5, moves from Tag “T_1” to “T_5” along path01 T_1 -1, moves from Tag “T_1” to last Tag in cPath along path01 2 6, moves from 2nd Tag to 6th Tag in Path “path01” Note: The motion type, speeds, etc. depending on Tag attributes when ”ERC USE_TAG_ATTRIBUTES ON” is set.
CIRC X Y Z A B C [X2 Y2 Z2] [m,deg]	Circular CP motion XYZ – Position, ABC - Orientation [X2 Y2 Z2] – Via Point Pose
CIRC_REL dX dY dZ dA dB dC [dX2 dY2 dZ2] [m,deg]	Relative Circular CP motion dXdYdZ - delta Position, dAdBdC - delta Orientation [dX2 dY2 dZ2] - delta Via Point position
CIRC tagname [TagName2]	Circular CP motion tagname - name of target Tag [tagname2] - name of via point tag position
CIRC_ORI ori_type	Orientation Interpolation type for Circular CP motion ori_type - VARIABLE, FIX, TANGENTIAL, AUX, VARIABLE2, QUATERNION
CIRC_ORI_QUAT_IPO ori_quat_type START_VIA_END [START_END, START_VIAORI_END, TANGENTIAL, FIX]	Orientation Interpolation type for Circular CP motion when CIRC_ORI = QUATERNION START_VIA_END – The x axis alignment in the via point determine the orientation interpolation START_END – The orientation interpolation is determined by the orientation of start and target location. START_VIAORI_END – During CIRC-Interpolation the via point orientation in is reached in the via point. TANGENTIAL – The x axis is guided tangential at the circular segment FIX – The orientation is kept unchanged, hereby the orientation in the target is ignored.

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VIA_POS X Y Z A B C [m,deg]	Via Position for Circular CP motion XYZ – Position, ABC - Orientation
VIA_POS_REL dX dY dZ dA dB dC [m,deg]	Relative Via Position for Circular CP motion dXdYdZ - delta Position, dAdBdC - delta Orientation
VIA_POS tagname	Via Position for Circular CP motion tagname - name of via point Tag pose
JUMP_TO X Y Z A B C [m,deg]	Jump to target location XYZ – Position, ABC - Orientation
JUMP_TO tagname	Jump to target location tagname - name of target Tag
JUMP_TO_AX q1 .. qn [m,deg]	Jump to target joint axis q1..qn - target Joint/Axis
WAIT x [sec]	Wait Statement x - time in seconds
ZONE	Rounding parameter. The command „Zone = 0“ forces the robot to move to the exact position
AUTO_ACCEL ON [OFF/AX/POS/ORI]	Automatic calculation of acceleration dependent on programmed speed. AX – Calculation for PTP motions POS – Calculation for CP motions for Position ORI – Calculation for CP motions for Orientation ON – Calculation for PTP, POS and ORI OFF – Calculation deactivated
ACCSET Acc Ramp	Lagging of accelerations. The arguments Acc and Ramp are given in percentage values in the range 20% to 100%. Acc – Acceleration and Deceleration as percentage value of normal values Ramp – Change of Acceleration and Deceleration as percentage value of normal values
PTP_CALC_MODE SHORTEST_ANGLE [TURN, MATH, IN_TRAVEL_RANGE, VAR_CONFIG]	Calculation specification for PTP motion. SHORTEST_ANGLE – shortest angle TURN – use TURN parameter MATH – mathematical within [-180°,180°] IN_TRAVEL_RANGE – within valid travel ranges if possible VAR_CONFIG – variable Configuration, calculation of shortest angle could result in new configuration.
TURN Turn_Ax1 ... Turn_Axn	TURN-Values for each axis Ax1…Axn, for the following PTP or SLEW Target, if TURN-Intervals are defined
MSG text	‘Text’ will be shown in the program window
NATIVE command	The native command can be used 1 by 1 in the post processor API. It has no effect in the simulation

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IF, While and Goto Statements

Command and Syntax	Description

IF *condition*
 	
! enter ERPL,ERCL here
 	
ELSEIF *condition2*
 	
! enter ERPL,ERCL here
 	
ELSEIF *condition3*
 	
! enter ERPL,ERCL here
 	
ELSE
 	
! enter ERPL,ERCL here
 	
ENDIF
	IF Statement (checking condition for true and false)
	
	The condition is a mathematical expression and will be checked for “True” and “False”. The condition is true when greater zero.
	
	Example: xx > yy, thus the robot will move to Tag ‘T_1’
	xx=3; yy=1
	IF gt(xx,yy)
	LIN T_1
	ELSEIF lt(xx,yy)
	LIN T_2
	ELSEIF eq(xx,yy)
	LIN T_3
	ELSE
	! enter ERPL,ERCL here
	ENDIF

WHILE *condition* *! enter ERPL,ERCL here* ENDWHILE	While-loop (checking condition for true and false) The condition is a mathematical expression and will be checked for “True” and “False”. The condition is true when greater zero. Example: The robot will move along path ‘path01’ three times xx=4; yy=1 WHILE gt(xx,yy) xx = xx-1 ALONG PATH01 T_1 T_5 ENDWHILE
GOTO LABEL *label_name* LABEL *label_name*	GOTO Statement (to jump to another program line) Example: GOTO LABEL my_label … *! skip all these program lines* … LABEL my_label Tipps: - use labels only if necessary - a label can be placed everywhere, but only once in a program file - never use labels to exit an if-else-endif or a while-endwhile statement

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Commands for I/O Signals

Kommando und Syntax	Beschreibung
WAIT_UNTIL_SIGNAL_SET *my_signal*	Will wait until the signal is set. The command is checking a condition on „True“ and „False“. The condition is a mathematical expression, which is true if greater than 0.5. WAIT_UNTIL_SIGNAL_SET my_signal ! continues when the signal „my_signal“ is set ! will wait as long as the signal „my_signal“ is not set
WAIT_UNTIL_SIGNAL_UNSET *my_signal*	Will wait until the signal is **not** set anymore. Das Kommando prüft eine Bedingung auf „True“ und „False“. Dabei ist die Bedingung ein mathematischer Ausdruck und ist wahr, wenn größer 0.5 WAIT_UNTIL_SIGNAL_UNSET my_signal ! continues when the signal „my_signal“ is not set anymore ! will wait as long as the signal „my_signal“ is set
WAIT_FOR_CONDITION *condition*	Will check a given condition. WAIT_FOR_CONDITION gt(my_signal ,0) ! continues if condition is true ! will wait if condition is false

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Math Parser Constants

Command and Syntax	Description	Example
PI	Circle number 3.1415926	U = 2*pi*radius
e	Exponential value 2.718282	e = exp(1)
RAD	Convert degree → radiant	RAD = PI / 180° = 0.017453
DEG	Convert radiant → degree	DEG = 180° / PI = 57.295778
m2mm	Convert m → mm	m2mm = 1000
mm2m	Convert mm → m	m2mm = 0.001
m2inch	Convert m → inch	m2inch = 39.37
inch2m	Convert inch → m	inch2m = 0.0254
mm2inch	Convert mm → inch	mm2inch = 0.03937
inch2mm	Convert inch → mm	inch2mm = 25.4
mps2mmpmin	Convert mps → mmpmin	mps2mmpmin = 60000
mmpmin2mps	Convert mmpmin → mps	mmpmin2mps = 1/60000
TRUE	1	WHILE TRUE ENDWHILE
FALSE	0	done = FALSE
unit2m	Convert userunit → m	scale = unit2m
m2unit	Convert m → userunit	scale = m2unit
ans	Answer, last result	
DIM	3	
DOF6	6	

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Math Parser Functions

Command and Syntax	Description	Example
abs (x)	Absolute value	abs (-6) = 6.000000
asin (x)*DEG	Inverse Sine	asin (0.5)*DEG = 30
acos (x)*DEG	Inverse Cosine	acos (0.5)*DEG = 60
atan (x)*DEG	Inverse Tangent	atan (1)*DEG = 45
atan2 (y,x)*DEG	Arcuskotangens	atan2 (2,-1)*DEG = -116.56501
cos (x*RAD)	Cosine	cos (45*RAD) = 0.707107
cosh (x)	Cosine-hyperbola	cosh (0) = 1.000000
ceil (x)	Ceiling	ceil (2.83) = 3.000000
exp (x)	Exponential	exp (0) = 1.000000
eq (x,y)	Equal to	eq (5,5) = 1.000000
fact (x)	Factorial	fact (6) = 720.000000
floor (x)	Floor	floor (2.83) = 2.000000
gt (x,y)	Greater than	gt (5,3) = 1.000000
ge (x,y)	Greater equal	ge (5,5) = 1.000000
int (x)	Integer	int (2.83) = 2.000000
ln (x)	Natural logarithm	ln (2) = 0.693147
Log (x)	Logarithm	log (2) = 0.301030
lt (x,y)	Less than	lt (3,5) = 1.000000
le (x,y)	Less equal	le (5,5) = 1.000000
min(1,2)	Minimum of two arguments	min(1,2) = 1.000000
max(1,2)	Maximum of two arguments	max(1,2) = 2.000000
ne (x,y)	Not equal	ne (3,5) = 1.000000
pow (x,y)	Power	pow (2,3) = 8.000000
rnd (x)	Random	Rnd (10)-5 = 3.772546
Sqrt (x)	Square root	sqrt (2) = 1.414214
sin (x*RAD)	Sine	sin (45*RAD) = 0.707107
sinh (x)	Sine-hyperbola	sinh (1) = 1.175201
sign (x)	Sign	sign (-2.83) = -1.000000
tan (x*RAD)	Tangent	tan (45*RAD) = 1.000000
tanh (x)	Tangent-hyperbola	tanh (1) = 0.761594
trunk (x)	Truncate	Trunk (-2.83) = -2.000000

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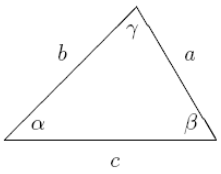
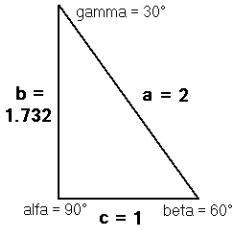
Triangle Parser Functions

Command and Syntax	Description	Example
beta = tr_assa (alfa, c, a) angle side side > angle	Triangle calculation:  In: alfa, c, a Out: beta	 tr_assa (90*RAD, 1, 2) * DEG = 60° = beta
gamma = tr_assa2 (alfa, c, a) angle side side > angle2	In: alfa, c, a Out: gamma	tr_assa2 (90*RAD, 1, 2) * DEG = 30°= gamma
b = tr_asss (alfa, c, a) angle side side > side	In: alfa, c, a Out: b	tr_asss (90*RAD, 1, 2) = 1.732051 = b = sqrt (2^2-1^2)
b = tr_sass (c, beta, a) side angle side > side	In: c, beta, a Out: b	tr_sass (1, 60*RAD, 2) = 1.732051 = b = sqrt (2^2-1^2)
gamma = tr_sasa (c, beta, a) side angle side > angle	In: c, beta, a Out: gamma	tr_sasa (1, 60*RAD, 2)*DEG = 30° = gamma
alfa = tr_sssa (a, b, c) side side side > angle	In: a, b, c Out: alfa	tr_sssa (2,sqrt(3),1)*DEG = 90° = alfa
gamma = tr_sasssa (d, beta, a, b, c) side angle side side side > angle	4 - angle calculation In: d, beta, a, b, c Out: gamma beta is between <d,a> gamma is between <a,b>	tr_sasssa (1,90*RAD,2,1,3) * DEG = 158.6955° = gamma
delta = tr_sasssa2 (d, beta, a, b, c) side angle side side side > angle	In: d, beta, a, b, c Out: delta beta is between <d,a> delta is between <b,c>	tr_sasssa2 (1,90*RAD,2,1,3)*DEG = 33.55731° = delta

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Robot related Parser Functions

Command and Syntax	Description	Example
num_dof()	Number of active Joints	num_dof() = 6
num_pdof()	Number of passive Joints	num_pdof() = 1
dof(aJnt _number)	Robot joint value with 'aJnt_number' [1..ndof] in radiant [rad] or meter [m]	dof(1) * DEG = -0.132455
pdof(pJnt_number)	Passive robot joint value 'pJnt_number' [1..npdof] in radiant or meter	pdof(1) * DEG = -0.132455
dofoffsign(aJnt _number)	Consider joint offset and sign = dof(jn) * jntsign(jn) - jntoff(jn)	dofoffsign(1) = -0.132455
jntoff(aJnt _number)	Joint offset for robot	jntoff(2) = 0.174533
jntsign(aJnt _number)	Sign of joint	jntsign(1) = 1.000000
mtounit()	Meter-to-Unit	mtounit() = 1000.000000
robb(direction)	Robotbase w.r.t. Reference system in [m,rad] direction = [1..6] with 1=x, 5=Ry	robb(1)*m2mm = 0.000000 robb(5)*deg = 45. 000000
swen(aJnt)	Negative travel range limit [rad,m]	swen(1) = -3.141593
swep(aJnt)	Positive travel range limit [rad,m]	swep(1) = 3.141593
swen_calc(aJnt)	Negative calculated travel range limit [rad,m]	swen_calc(1) = -3.141593
swep_calc(aJnt)	Positive calculated travel range limit [rad,m]	swep_calc(1) = 3.141593
tcp (direction)	TCP w.r.t. Robot base in [m,rad] direction = [1..6] with 1=x, 5=Ry	tcp(1)*m2mm = 1798.858523 tcp(5)* DEG = 95.000000
tcpi (direction)	TCP w.r.t. World 'i' in [m,rad] direction = [1..6] with 1=x, 5=Ry	tcpi(1)*m2mm = 1798.858523 tcpi(5)* DEG = 95.000000
ctool (direction)	current Tool data [m,rad] direction = [1..6] mit 1=x, 5=Ry	ctool(3)*m2mm = 150.000000 ctool(5)* DEG = 30.000000
tool(tool_number,direction)	Tool data [m,rad] tool_number – number of tool direction = [1..6] mit 1=x, 5=Ry	tool(1,3)*m2mm = 150.000000 tool(1,5)* DEG = 30.000000
la (aJnt , direction)	Transformation to next active Joint aJnt – Number active Joint [0..ndof] direction = [1..6] mit 1=x, 5=Ry Note: aJnt = 0 → Rbase to 1st Joint	la(0,1)*m2mm = 0.000000 la(1,1)*m2mm = 0.000000 la(6,5)* DEG = 90.000000

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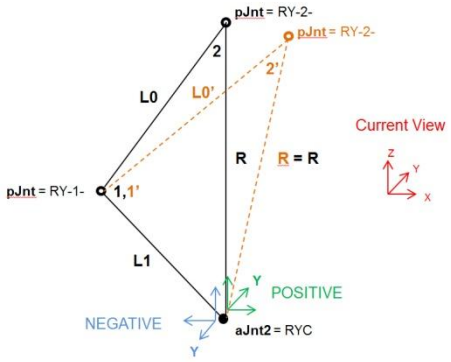
Command and Syntax	Description	Example
lp (pJnt , direction)	Transformation to next passive Joint pJnt - Number passive Joint [1..npdof] direction = [1..6] mit 1=x, 5=Ry	lp(1,1)*m2mm = 0.000000 lp(1,5)* DEG = 0.000000
lp0 (pJnt , direction)	Transformation from last passive Joint pJnt - Number passive Joint [1..npdof] direction = [1..6] mit 1=x, 5=Ry	lp0(1,1)*m2mm = 0.000000 lp0(1,5)* DEG = 0.000000
JNTDAMP_TRI(L0, L1, R, position, aJ2_ori, pjnt_angle)	Angular variation of the pJnt-axis in dependency of aJnt2 [rad]  Note: consider initial (Start-)postition of robot L0 = Distance pJnt to pJnt in [mm] L1 = Distance aJnt2 RYC to pJnt RY-1- in [mm] R = Distance aJnt2 RYC to pJnt RY-2- in [mm] position – position of pJnt RY-2- to aJnt2 RYC [DAMP_BELOW, DAMP_ABOVE] with DAMP_BELOW = 0: below aJnt2 with DAMP_ABOVE = 1: above aJnt2 aJ2_ori – Orientation of y-axis (rotation) of aJnt2 RYC in relation to Current View [POSITIVE, NEGATIVE] with POSITIVE = 1: pos. direction (weg) with NEGATIVE = -1: neg. direction (hin) pjnt_angle = [1..2] with 1 = Function returns angular variation of the angle between L0 and L1 with 2 = Function returns angular variation of the angle between L0 and R	L0=400.000 L1=300.000 R=500.000 **Example 1:** dof(2)*DEG=0.000° JNTDAMP_TRI(L0,L1,R, DAMP_ABOVE,POSITIVE,1)*DEG = 0.000° JNTDAMP_TRI(L0,L1,R, DAMP_ABOVE,POSITIVE,2)*DEG = 0.000° **Example 2:** dof(2)*DEG=10.000° JNTDAMP_TRI(L0,L1,R, DAMP_ABOVE,POSITIVE,1)*DEG = 9.42° JNTDAMP_TRI(L0,L1,R, DAMP_ABOVE,POSITIVE,2)*DEG = - 0.58°

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Command and Syntax	Description	Example
unittom()	Unit-to-Meter	unittom() = 0.001000
collision()	Return 1 if collision detected, else 0	coll = collision()
collision_devices_idx (dev_idx1, dev_idx2)	Checks whether the 1st device with the device idx dev_idx1 collides with the 2nd device dev_idx2. The parameters dev_idx1 and dev_idx2 can be set flexible, so that e.g. the 1st device is checked against all other devices dev_idx2 = 0 in the work cell for collision. Return 1 if collision detected, else 0	coll = collision_devices_idx(1,2) coll = collision_devices_idx(3,2) coll = collision_devices_idx(1,0) coll = collision_devices_idx(0,2)
collision_devices_name ("DeviceName1", "DeviceName2")	Checks whether the 1st device with the device name "DeviceName1" collides with the 2nd device "DeviceName2". The parameters "DeviceName1" and "DeviceName2" can be set flexible, so that e.g. the 1st device is checked against all other devices "DeviceName2" = "0" in the work cell for collision. Return 1 if collision detected, else 0	coll = collision_devices_name ("dev1","dev2") coll = collision_devices_name (dev1,dev2) coll = collision_devices_name ("dev1","0") coll = collision_devices_name (dev2,0)
get_device_idx ("DeviceName")	Returns the device idx in the range [1 to n = number of devices] of the device named "DeviceName". The parameter "DeviceName" can be chosen flexibly, so that e.g. "" or () returns the device idx of the current device. If an error occurs, 0 is returned.	dev_idx = get_devices_idx ("dev1") dev_idx = get_devices_idx (dev1) cdev_idx = get_devices_idx ("") cdev_idx = get_devices_idx ()
sim_time()	global simulation time in sec	simtime = sim_time()
sim_realtime()	real simulation time in sec	simrealtime = sim_realtime()
sim_step()	simulation step size in sec	simstep = sim_step()

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EASY-ROB™

ERCL - EASY-ROB™ Command Language

ERCL is an extension of ERPL, to automate nearly all user interactions inside a robot program. Examples are: Switch ON/OFF the TCP trace, collision, TCP coorsys, load another view, render bodies to flat, wire or invisible, set a new color, change the simulation step size or the motion planner step size, move bodies, define and move body lists, move the robots base, etc.. This feature is useful to create more advanced and effective simulations

Command and Syntax	Description
ERC SET_DEFAULTS	Set default values: Enables the robot, tool and environment bodies. Disables the robot joint coorsys.
ERC SIM_STEP x [sec]	Set Simulation step size x - simulation step size **Note**: This command switches “Realtime OFF” automatically
ERC CNTRL_STEP x [sec]	Set Controller sample rate x - controller sample rate
ERC SYSTEM_STEP x [sec]	Set robot modell sample rate x - model sample rate
ERC IPO_STEP x [sec]	Set Interpolation sample rate x - ipo sample rate
ERC IPO_LEAD_TIME x [sec]	Set IPO Lead time, the motion will start after this time. x - ipo lead time
ERC IPO_LAG_TIME x [sec]	Set IPO Lag time, at the end of motion, the robot will rest in that pose for this time before moving to the next target pose. x - ipo lag time

ERCL - ON / OFF Commands

Command and Syntax	Description
ERC TRACK ON,OFF	Enables / Disables the TCP trace
ERC DYNAMICS ON,OFF	Enables / Disables Dynamics
ERC STOP_SWE ON,OFF	Enables / Disables monitoring of software end switches
ERC STOP_SPEED ON,OFF	Enables / Disables monitoring of joint/axis speed
ERC STOP_ACCEL ON,OFF	Enables / Disables monitoring of joint/axis acceleration
ERC STOP_CART_SPACE ON/OFF	Enables / Disables monitoring of cartesian space limits
ERC COLLISION ON,OFF	Enables / Disables monitoring of collision
ERC STOP_COLLISION ON,OFF	Enables / Disables the STOP motion on collision
ERC RED_BLUE_ COLLISION ON,OFF	Enables / Disables red blue collision

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ERC ROBOT_JOINTS * ERC ROBOT_POSITION * ERC ROBOT_MOTIONDATA * ERC ROBOT_PARSERVARS * * = ON,OFF	Enables / Disables the Robots Online Output Data Dialog ROBOT_JOINTS: robot desired joint values ROBOT_POSITION robot desired cartesian pose ROBOT_MOTIONDATA robot motion data ROBOT_PARSERVARS robot parser vars
ERC FLOOR ON,OFF	Enables / Disables the Floor
ERC FLOOR_RENDER ON,OFF	Enables / Disables the flat shaded floor (flat or wire)
ERC EXT_TCP ON,OFF	Enables / Disables external TCP mode
ERC ORTHOGRAFIC ON,OFF	Enables / Disables Orthographic view
ERC DISPLAY DEVICE 'device_name' ON,OFF	Enables / Disables the visualization of the device with device name 'DeviceName'
ERC DISPLAY_ROBOTS ON,OFF	Enables / Disables the visualization of geometries in all Robot groups
ERC DISPLAY_ROBOT_COORSYS ON,OFF	Enables / Disables the visualization of yellow/green colored Robot Joint/Axis Coorsys
ERC DISPLAY_TOOLS ON,OFF	Enables / Disables the visualization of geometries in all Tool groups
ERC DISPLAY_BODIES ON,OFF	Enables / Disables the visualization of geometries in Body / Environment group
ERC TCP_COORSYS ON,OFF	Enables / Disables the visualization of blue colored Tool/TCP Coorsys
ERC IPO_COORSYS ON,OFF	Enables / Disables the visualization of red colored IPO Coorsys
ERC BASE_COORSYS ON/OFF	Enables / Disables the visualization of green colored Base Coorsys
ERC CREATE_TARGET_TAGS ON/OFF	Enables / Disables creating Tag at target location
ERC RESET_ALL_POSITIONS_JOINTS ON/OFF	Enables / Disables resets all positions and robot joints
ERC NO_DECEL ON/OFF	Enables / Disables the Speed deceleration at target pose NO_DECEL=ON : will set ZONE=0.1 if ZONE<> 0 NO_DECEL=OFF : will set ZONE=0
ERC GRAFIC_UPDATE ON/OFF	Enables / Disables the visualization of the Render Scene during program Execution. This command is useful to hide background command
ERC DISPLAY_TAGS ON/OFF	Enables / Disables the visualization of all Pathes with its Tag poses
ERC VIEW_CHOREOGRAPHY ON,OFF	activates / deactivates View Choreography, thus “ERC LOAD View …” commands are skipped
ERC DISPLAY_ROBOT_COORSYS ON, OFF	activates / deactivates visualization of the robots joint coorsys for all active and passive joints
ERC DISPLAY_ROBOT_NAME ON, OFF	activates / deactivates visualization of the robots name

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ERC SHOW_CART_SPACE ON/OFF	activates / deactivates visualization of the cartesian space limits
ERC STATUS_OUTPUT ON/OFF [1-at simstep,2-at target pose] [flnname] [fct# 0-12]	Enables / Disables the Status Output during program execution. Using this feature allows you to save the complete simulation status in an own defined format. Typical values are joint/axis data and also cartesian TCP location. Parameter: 1st : 1 - save status data every simstep 2 - save status data at target location 2nd : filename, e.g. "out.dat" 3rd : Function number -1 - default output inside EASY-ROB™ for matlab visualization 0 - default output inside EASY-ROB™ 1..12 - user defined output, see example API-DYN status_output_user_1() defined in file *dyn_user.cpp* **Example**: in folder ./proj/proj/ Status_Output.cel and Status_Output.prg
ERC INTERPOLATION ON/OFF	Disables continuous interpolation, robot jumps to target location
ERC REALTIME_SIM ON/OFF	Real time Simulation causes program execution in real time. This mode will calculate the simulation step size permanently.
ERC BACKFACES ON/OFF	Enables / Disables visualization of back faces
ERC CAMERA ON/OFF	Enables / Disables the Camera.
ERCUSE_TAG_ ATTRIBUTES ON/OFF	Enables / Disables the use of tag attributes, such as motion type, speed, acceleration, etc.
ERC MSG_WIN ON/OFF	Enables / Disables the message window
ERC PRG_WIN ON/OFF	Enables / Disables the program window
ERC DISPLAY_CROBOT ON,OFF	Enables / Disables the visualization of the current robot
ERC DISPLAY_CTOOL ON,OFF	Enables / Disables the visualization of the current tool
ERC COLLISION_CROBOT ON/OFF	Enables / Disables the collision check of the current robot
ERC COLLISION_CTOOL ON/OFF	Enables / Disables the collision check of the current tool
ERC COLLISION_CROBOT_ REF ON/OFF	Enables / Disables the reference collision check of the current robot
ERC WORLD_COORSYS ON/OFF	Enables / Disables the world coordinate system
ERC ALL_COORSYS ON/OFF	Enables / Disables all coordinate system in the workcell
ERC HISTORY_DEVICE ON/OFF	Enables / Disables the recording of data (for one device) for the History-Diagram
ERC HISTORY_DEVICE ALL_ON / ALL_OFF	Enables / Disables the recording of data (for all devices) for the History-Diagram
ERC HISTORY_OUTPUT ON / ALL_ON [flnname]	Start of History-Diagram recording flnname – file name to store the data
ERC HISTORY_OUTPUT OFF	Stops the History-Diagram recording
ERC CELL_INFO_SHOW ON/OFF	Enables / Disables the Cell Information line

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ERCL - Post Processor Commands

Command and Syntax	Description
ERC POST_PROCESS KEY filename	Starts Post Processor. Parameter: KEY Language Key, defined in er_post.dll z. B. ABB, KUKA, FANUC_RJ or COMAU_C5G filename Name of created robot program file
ERC POST_PROCESS OFF	Terminate Post Processing

ERCL - Render Commands

Command and Syntax	Description
ERC RENDER SMOOTH ERC RENDER FLAT	Sets the complete Render Scene FLAT or SMOOTH shaded, same as icon 
ERC RENDER WIRE	Sets the complete Render Scene in WIRE frame, same as icon 
ERC RENDER POINT	Sets the complete Render Scene as POINTS, same as icon 
ERC RENDER BBOX ON,OFF	Sets the complete Render Scene as Bbox (bounded boxes), same as icon 
ERC RENDER group bodyname render	Sets/modifies the render of an unique body group - BODY, ROBOT, TOOL bodyname - name of unique body render - WIRE, FLAT, BBOXWIRE, BBOXFLAT, INVISIBLE, POINT, SMOOTH **Example**: erc render ROBOT 'body_name' WIRE erc render ROBOT 'body_name' FLAT
ERC RENDER group render	Sets/modifies the render of all parts in the group group - BODY_GRP, ROBOT_GRP, TOOL_GRP render - WIRE, FLAT, BBOXWIRE, BBOXFLAT, INVISIBLE, POINT, SMOOTH **Example**: erc render TOOL_GRP WIRE erc render TOOL_GRP FLAT
ERC DISPLAY DEVICE 'device_name' ON,OFF	Enables / Disables the visualization of the device with device name 'DeviceName'

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ERCL - Camera Commands

Command and Syntax	Description
ERC CAMERA ON/OFF	Enables / Disables the Camera.
ERC CAMERA FOCUS focus [mm]	Set Camera focus focus – focus length Range [12.25 mm to 240 mm], default. 50 mm (middle Mouse)
ERC CAMERA Z_OFFSET z_offset [mm]	Set Camera Offset in Z direction z_offset – Z - Offset Range [-200 mm to +500 mm], default. 0 mm (left Mouse) - value zoomes out + value zoomes in
ERC CAMERA BODY [ROBOT,TOOL] bodyname	Attaches the Camera to the origin of CAD geometry
ERC CAMERA POSITION XYZ ABC [m,deg]	Offset position w.r.t. the origin of the CAD geometry where the camera is attached to Note: per default, the camera looks in –Z direction (see also OpenGL™) A 180° rotation about y axis turns the camera in many cases into the right direction.

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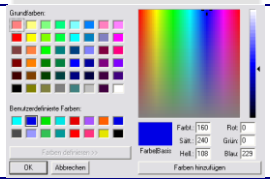
ERCL - Color Commands

Predefined COLOR values

	1 BLUE 2 GREEN 3 CYAN 4 RED 5 MAGENTA 6 BROWN 7 LIGHTGRAY 8 DARKGRAY 9 LIGHTBLUE 10 LIGHTGREEN 11 LIGHTCYAN 12 LIGHTRED 13 LIGHTMAGENTA 14 YELLOW 15 WHITE
	32 Bit RGB Color

Command and Syntax	**Description**
ERC COLOR group name color	Sets/modifies the color for an unique body group - BODY, ROBOT, TOOL name - name of body color predefined color **Example**: erc color TOOL 'tool' RED
ERC COLOR group color	Sets/modifies the color of all parts in the group group BODY_GRP, ROBOT_GRP, TOOL_GRP color predefined color **Example**: erc color TOOL_GRP RED
ERC COLOR track color	Sets/modifies the color the robots TCP trace track TRACK, TRACK_DYN color predefined color **Example**: erc color TRACK RED erc color TRACK -1, for alternating color
ERC COLOR tag color	Sets the predefined TAG color color predefined color **Note**: When creating a new Tag, the tag will have this color

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ERCL - Transparency- Commands

Kommando und Syntax	Beschreibung
ERC TRANSPARENCY group name alpha	Set transparency for each single part or body group - BODY, ROBOT, TOOL name - name of body alpha alpha blend value [0,1] **Example**: erc transparency TOOL 'tool' 0.5
ERC TRANSPARENCY group alpha	Set transparency for each for all parts in a group group BODY_GRP, ROBOT_GRP, TOOL_GRP alpha alpha blend wert [0,1] **Example**: erc transparency TOOL_GRP 0.5

ERCL - Reset and Save Commands

Command and Syntax	Description
ERC RESET JOINTPOSITION	Reset the joint/axis position to start condition
ERC SAVE JOINTPOSITION	Saves the joint/axis position as start condition

ERCL - Load Commands

This feature gives the user the ability to load a file, e.g. a robot tool or a view file during program execution.

Command and Syntax	Description
ERC LOAD TOOL filename	Loads a Tool file (*.tol)
ERC LOAD VIEW filename	Loads a View file (*.vie) **Note**: The Render Scene interpolates to the new view with the number of 'view steps' ERC VIEW steps n
ERC LOAD ROBOT filename	Loads a Robot file (*.rob)
ERC LOAD BODY filename	Loads a Body file (*.bod)
ERC LOAD TAGS filename	Loads a Tag file (*.tag)
ERC LOAD MIMIC filename	Loads a Mimic file (*.mmc) ! Mimic = Machine Interface file
ERC LOAD CAMERA filename	Loads a Camera file (*.cam)
ERC LOAD ENVIRONMENT [filename]	Loads an Environment file (*.env)

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ERCL - Move Commands

Command and Syntax	Description
ERC MOVE BODY bodyname XYZ ABC [m,deg]	Moves a unique part from the BODY group to a new location bodyname - name of body XYZ - Position. ABC - Orientation
ERC MOVE BODY bodyname TagName	Moves a unique part from the BODY group to a new tag point pose. bodyname - name of body TagName - name of Tag
ERC MOVE TOOL bodyname XYZ ABC [m,deg]	Moves a unique part from the TOOL group to a new location. bodyname - name of body XYZ - Position ABC - Orientation
ERC MOVE TOOL bodyname TagName	Moves a unique part from the TOOL group to a new tag point pose. bodyname - name of body TagName - name of Tag
ERC MOVE ROBOT bodyname XYZ ABC [m,deg]	Moves a unique part from the ROBOT group to a new location. bodyname - name of body XYZ - Position ABC - Orientation
ERC MOVE ROBOT bodyname TagName	Moves a unique part from the ROBOT group to a new tag point pose. bodyname - name of body TagName - name of Tag
ERC MOVE_REL BODY bodyname dXdYdZ dAdBdC [m,deg]	Relative movement of a unique part from the BODY group. bodyname - name of body dXdYdZ - delta Position. dAdBdC - delta Orientation
ERC MOVE_REL TOOL bodyname dXdYdZ dAdBdC [m,deg]	Relative movement of a unique part from the TOOL group. bodyname - name of body dXdYdZ - delta Position. dAdBdC - delta Orientation
ERC MOVE_REL ROBOT bodyname dXdYdZ dAdBdC [m,deg]	Relative movement of a unique part from the ROBOT group. bodyname - name of body dXdYdZ - delta Position. dAdBdC - delta Orientation
ERC MOVE_REL BODY_GRP bodyname dXdYdZ dAdBdC [m,deg]	Relative movement of the complete BODY goup, with respect to the reference body. bodyname - name of reference body dXdYdZ - delta Position. dAdBdC - delta Orientation
ERC MOVE_REL TOOL_GRP bodyname dXdYdZ dAdBdC [m,deg]	Relative movement of the complete TOOL goup, with respect to the reference body. bodyname - name of reference body dXdYdZ - delta Position. dAdBdC - delta Orientation

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ERC MOVE_REL ROBOT_GRP bodyname dXdYdZ dAdBdC [m,deg]	Relative movement of the complete ROBOT goup, with respect to the reference body. bodyname - name of reference body dXdYdZ - delta Position. dAdBdC - delta Orientation
ERC MOVE_REL LIST listname dXdYdZ dAdBdC [m,deg]	Relative movement of all parts defined in a LIST listname - name of List dXdYdZ - delta Position. dAdBdC - delta Orientation

ERCL - Grab and Release Commands

Command and Syntax	**Description**
ERC GRAB BODY 'bodyname'	Grab a body Bodyname - name of body
ERC GRAB BODY_GRP	Grab all parts in the BODY_GRP
ERC RELEASE BODY 'bodyname'	Release a body Bodyname - name of body
ERC RELEASE BODY_GRP	Release all parts in the BODY_GRP
ERC GRAB DEVICE devname	The current robot grabs the robot/device with name ‘devname’
ERC GRAB_TO DEVICE devname targetdevname	The device with name ‘devname’ will be grabbed by a target device with the name ‘targetdevname’
ERC RELEASE DEVICE devname	The device with the name ‘devname’ will be released

ERCL – Robot / Device Commands

Command and Syntax	**Description**
ERC CURRENT_DEVICE SET 'robotname’	Activates the robots with name ’robotname’ Note: All following ERPL- und ERCL-commands refer to the current activated robot. This robot is current ‘cRobot’
ERC CURRENT_DEVICE UNSET	Disables the current robot and makes the robot before as current. Example: When writing a function to close a spot weld gun do as follows: We suppose that the cRobot is ‘MyRobot’ erc current_device set SpotWeldGun ptp_ax 0 0 ! move joint 1 and 2 to 0 erc current_device unset ! disables ‘SpotWeldGun’, enables ‘MyRobot’
ERC CURRENT_DEVICE CLEAR	Clears the complete device stack
ERC CURRENT_DEVICE SHOW	Shows the complete device stack in ‘message Window’
TOOL DEVICE robotname	Sets the TCP for the current Robot to the TCP data of the robot ‘robotname’. This command is useful after another robot is grabbed.

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ERC ROBOT_BASE XYZ ABC [m,deg]	Move the cRobot base to a new location. XYZ - Position ABC - Orientation
ERC ROBOT_BASE tagname	Move the cRobot base to a new Tag location. Tagname - name of TAG
ERC ROBOT_BASE_REL XYZ ABC [m,deg]	Relative movement of the cRobot base. dXdYdZ - delta Position. dAdBdC - delta Orientation

ERCL - TAG Commands

Command and Syntax	**Description**
ERC CREATE_TARGET_TAGS ON/OFF	Enables / Disables creating Tag at target location.
ERC TAGS PREFIX prefixname	Sets the Prefix for Tags Prefixname - name of prefix **Note**: When creating a new Tag, the tag will have this prefixname
ERC TAGS DELETE tagname	Delete a Tag pose from the render scene Tagname - name of Tag
ERC TAGS DELETE ALL	Delete all tags from the render Scene

ERCL - View Commands

Command and Syntax	**Description**
ERC VIEW steps n	Sets the number of view steps, important when loading a (*.vie) file
ERC VIEW hither x	Sets value for the hither plane
ERC VIEW yonder x	Sets value for the yonder Plane
ERC VIEW zoom x	Zoom the render scene by the value x
ERC VIEW zoom_in x	Zoom In the render scene by the value x
ERC VIEW zoom_out x	Zoom Out the render scene by the value x
ERC VIEW tcp_rot_tcp ABC	Rotate the render scene about the current robots TCP with respect to the TCP orientation ABC - relative Rotations
ERC VIEW tcp_rot_world ABC	Rotate the render scene about the current robots TCP with respect to the world frame orientation ABC - relative Rotations
ERC VIEW world_rot_base ABC	Rotate the render scene about the world coorsys frame with respect to the robot base frame orientation ABC - relative Rotations
ERC VIEW TOP [BOTTOM, LEFT, RIGHT, FRONT, REAR, ZOOM_WORLD]	Zooms the scene in a predefined perspective (Top, Bottom, Left, etc.). ZOOM_WORLD zooms the scene in a visible range

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ERC VIEW world_rot_world ABC	Rotate the render scene about the world coorsys frame with respect to the world frame orientation ABC - relative Rotations
ERC LOAD VIEW filename	Loads a View file (*.vie) **Note**: The Render Scene interpolates to the new view with the number of 'view steps'

ERCL - TCP Trace Commands

Command and Syntax	**Description**
ERC TRACK_TYPE type [size]	Sets the trace type and style type POINT LINE LINE_Z_DIRECTION, Z_DIRECTION X_DIRECTION Y_DIRECTION [size] length of direction **Examples**: erc track_type line erc track_type line_z_direction 0.2 erc track_type line_z_direction -0.2
ERC TRACK ON,OFF	Enables / Disables the TCP trace for current robot 'cRobot'
ERC COLOR track color	Sets/modifies the color the robotsTCP trace track TRACK, TRACK_DYN color predef. color **Example**: erc color TRACK RED erc color TRACK -1, for alternating standard colors [1..15]

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ERCL - Collision Commands

Command and Syntax	Description
ERC Collision ON/OFF	Enables / disables the collision detection Note: In case collision is enabled, all geometries belonging to one robot/tool are checked vs. other robots and tools automatically. This is the default collision queue.
ERC RED_BLUE_COLLISION ON, OFF	Enables / disables red blue collision In case collision is checked and detected, all colliding geometries are displayed in red color, non colliding geometries displayed in light blue color.
ERC COLLISION BODY [ROBOT, TOOL] bodyname OFF, ON=CONCAVE, CONVEX, BBOX	Enables / disables the collision attribute of a Body to OFF, ! Collision for the geometry is disabled ON = CONCAVE ! Collision is checked concave CONVEX ! Collision is checked with convex huel BBOX ! Collision is checked with bounded box huel
ERC COLLISION BODY_GRP [ROBOT_GRP, TOOL_GRP] OFF, ON= CONCAVE, CONVEX, BBOX	Enables / disables the collision attribute for a complete Group to off, on=concave, convex or bbox Note: Robot_Grp and Tool_Grp have effect to the geometries belonging to the current selected robot 'cRobot'
ERC COLLISION QUEUE BODY_ROBOT [BODY_TOOL, ROBOT_TOOL, GRABBODY_ROBOT, GRABBODY_BODY, ROBOT_ROBOT BODY_BODY ALL] ON,OFF	Enables / disables a predefined collision queues BODY_ROBOT – checks collision between body vs. robot BODY_TOOL – checks collision between body vs. tool ROBOT_TOOL – checks collision between robot vs. tool GRABBODY_ROBOT – checks collision between grabbed bodies' vs. robot GRABBODY_ BODY – checks collision between grabbed bodies' vs. and not grabbed bodies ROBOT_ROBOT – checks collision between all geometries belonging to the same Robot_Grp BODY_BODY – checks collision between all geometries belonging to the same Body_Grp ALL – enable/disable all predefined queues
ERC COLLISION_TOL BODY [ROBOT, TOOL] bodyname tolerance [mm]	Tolerance value for body ,bodyname' from Body-, Robot or Tool- group with concave collision check in [mm]
ERC COLLISION_TOL BODY_GRP [ROBOT_GRP, TOOL_GRP] tolerance [mm]	Tolerance value for complete group with concave collision check in [mm]
ERC COLLISION DISTANCE tolerance [mm]	Sets global collision threshold 'tolerance' in mm. Collision is detected if the minimal distance between two tested geometries is less then this collision threshold value 'tolerance'.

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ERCL - Attach Commands

ERC ATTACH ROBOT 'bodyname' to_ROBOT ['bodyname2']	Reattaches a body (geometry) to another robot joint inside a Robot_Grp, defined by 'bodyname2' Note: the body is attached to the robot base if no 2nd body is specified
ERC ATTACH ROBOT 'bodyname' to_TOOL	Reattaches a body to the tip of the cRobot

ERCL - Unit Commands

ERC UNIT M	Sets the unit to meter [m] for all following ERPL & ERCL commands Example: speed_cp 0.1 is 100 mm/s
ERC UNIT MM	Sets the unit to millimeter [mm] for all following ERPL & ERCL commands Example: speed_cp 100 is 100 mm/s
ERC UNIT INCH	Sets the unit to inch [inch] for all following ERPL & ERCL commands Example: speed_cp 1 is 25.4 mm/s
ERC UNIT DEG	Sets the rotation unit to degree [°] Example: speed_ori 20 is 20°/s
ERC UNIT RAD	Sets the rotation unit to radiant [rad] Example: speed_ori 3.1415 is 180°/s
ERC UNIT TRANS_SCAL x	Scales the internal unit [m] by the user defined value x Example: x=10 speed_cp 0.1 is 1 m/s = 1000 mm/s
ERC UNIT ROT_SCAL x	Scales the internal unit [°] by the user defined value x Example: x= 10 speed_ori 2 is 20°/s

CALC - Math Commands

CALC 'math expression'	Example: calc a=0.5 calc b = a * sin (45.0*RAD) LIN_REL 0 0 0.1*a 0 0 0
CALC SHOW_VARS	Shows all global variables in the message window
CALC SHOW_USER_VARS	Shows all user defined global variables (without prefix '$') in the message window
CALC CLEAR_VARS	Deletes all global variables
CALC CLEAR_USER_VARS	Deletes all user defined global variables (without prefix '$')
= msg('math expression')	Data output in the message window. Example: = msg(a)
= 'math expression'	Result output in the program window. Example: = a

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ERCL - PARAMETER Commands

ERC SET_PARAMETER $NAME_1 'name'	Copy name into the first of 100 possible global string parameter $NAME_1 = 'name' Usage: ERC SET_PARAMETER $NAME_1 T_1 ! Tag point ERC SET_PARAMETER $NAME_2 MYROB ! a device name … ERC CURRENT DEVICE SET $NAME_2 ! set 'MYROB' as current LIN $NAME_1 ! move to tag 'T_1'
ERC SET_PARAMETER $NAME_1 text_word [value]	Copy the text word plus a value name into the first of 100 possible global string parameter $NAME_1 = text_word [value] Usage: ii=1 ERC SET_PARAMETER $NAME T_ ii ! Tag point "T_1"
ERC SET_PARAMETER $NAME_RESET	Deletes all global string parameter
ERC SET_PARAMETER $NAME_INFO	shows all global string parameter in the message window

ERCL - KUD Commands

ERC KUD row column x	Sets value 'x' for the Kinematics User Data for current robot given by row [1..12] column [1..12] Example: ERC KUD 1 1 1 ERC KUD 12 12 144
ERC KUD name x	Sets value 'x' for the Kinematics User Data for current robot given by a name. Valid names are: KUD_1_1 …. KUD_12_12 Note: The user can change the KUD name. Example: ERC KUD_1_1 1 ERC KUD_12_12 144

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ERCL - Additional Commands

Command and Syntax	Description
ERC STOP	Stops program execution
ERC PAUSE	Halts program execution
ERC ESSI ON,OFF [speed scale value] [size scale value]	Enables / Disables the Interpetation of ESSI NC-Code (Option “NC-Simulation” is required) Optional parameter Speed scale value will scale the programmed speed. Size scale value will scale the target location (program scale) **Note**: This feature requires a licensed NC-Option
ERC EIA ON,OFF [speed scale value] [size scale value]	Enables / Disables the Interpetation of EIA NC-Code, DIN 66025 (Option “NC-Simulation” is required) Optional parameter Speed scale value will scale the programmed speed. Size scale value will scale the target location (program scale) **Note**: This feature requires a licensed NC-Option
ERC BASE BODY bodyname	Sets the BASE to the bodyname
ERC BASE TCP	Sets the BASE to the current robots TCP
ERC SWE_NEG swe1 ... swen	Sets the **negative** travel range values for each joint [m,deg] The number of values should coincide with the number of joints/axis
ERC SWE_POS swe1 ... swen	Sets the **positive** travel range values for each joint [m,deg] The number of values should coincide with the number of joints/axis
ERC CART_LIMITS_MIN X Y Z	Sets the **minimum** cartesian space limits [m] for the X, Y und Z coordinate direction
ERC CART_LIMITS_MAX X Y Z	Sets the **maximum** cartesian space limits [m] for the X, Y und Z coordinate direction
ERC TURN_INTERVAL Ax1 ...Axn [deg]	TURN -Interval for each axis Ax1…Axn, within [0°, ∞°[
ERC TURN_ OFFSET Ax1 ...Axn [deg]	TURN -Offset for each axis Ax1…Axn, within] -∞°, ∞°[
ERC JOINT_WEIGHT 0 or 1 for number of joints	Sets the joint weight vector, to influence the result of the numerical solution The number of values should coincide with the number of joints/axis
ERC MASK_VECTOR [0,1] for X Y Z A B C	Sets the mask vector, to influence the result of the numerical solution
ERC CELL_INFO text	String for cell Information line

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ERCL - 3D-PDF-Export Commands

Below commands require the licensed 3D PDF Export option.

Command and Syntax	Description
ERC _3D_PDF_EXPORT SCREENSHOT [flnname]	Creates a 3D-PDF-document of the current scene (without animation), this means an image with all joint values at the time of the command. If no [flnname] is set, the name of the workcell will be used for the 3D-PDF-document per default. filename: name of the created 3D-PDF-document
ERC _3D_PDF_EXPORT ON / OFF [flnname]	Enables/ Disables recording of the 3D-PDF-document. If no [flnname] is set, the name of the workcell will be used for the 3D-PDF-document per default. When you finish recording the 3D-PDF-document will be generated automatically and stored under the specified name. **Important:** If a 3D-PDF-document has been opened previously, it must be closed first, so that the recording can be finished and the new document can be saved again.
ERC _3D_PDF_EXPORT SET_FILE flnname	The 3D-PDF-document will be generated with the specified name used under „flnname“. Previously, the _3D_PDF_EXPORT ON command must be set. filename: name of the created 3D-PDF-document
ERC _3D_PDF_EXPORT SET_LABEL labelname	Sets a label with the name specified in "label name". The name of the label is displayed in the open 3D-PDF-document next to the real process-time and is used for individual identification of single process sections. Previously, the _3D_PDF_EXPORT ON command must be set. labelname: name of the label
ERC _3D_PDF_EXPORT SET_PASSWORD passwordname	The 3D-PDF-document is protected with the password specified in "password name". This passphrase must be entered when the document is opened. Previously, the _3D_PDF_EXPORT ON command must be set. passwordname: name of password
ERC _3D_PDF_EXPORT PAUSE	Pauses the recording of the 3D-PDF-document. If the command is set again, the recording will be continued. Previously, the _3D_PDF_EXPORT ON command must be set.
ERC _3D_PDF_EXPORT DEACTIVATE	The recording of the 3D-PDF-document will be canceled and the document is discarded.

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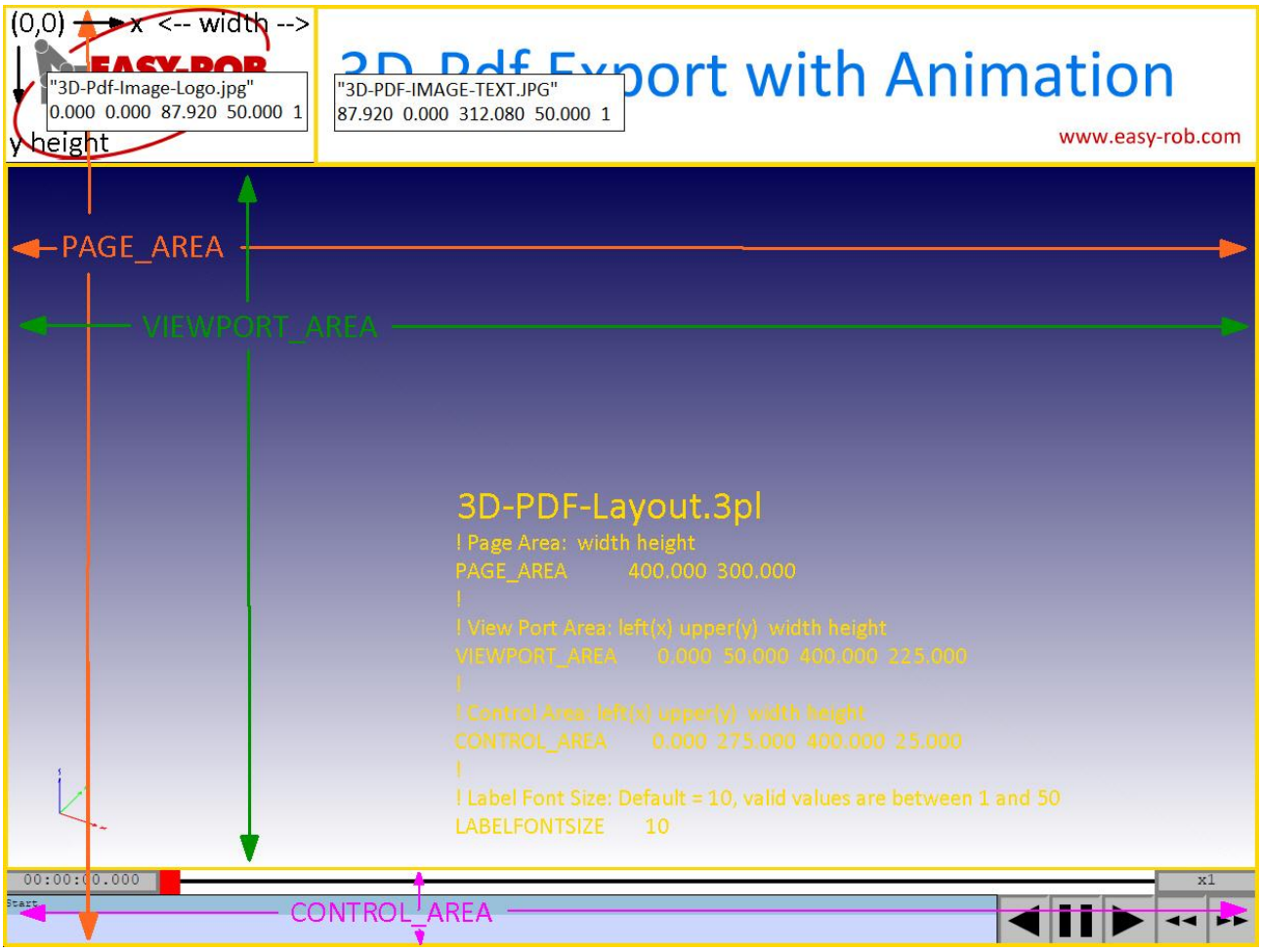
ERCL - 3D-PDF-Export Layout Definition Commands

Below commands require the licensed 3D PDF export option.

The 3D-PDF Layout can be loaded by an 3D-Pdf Layout file (.3pl) or dynamically and individually during the simulation run.

The size for an 3D-Pdf Layouts are determined by the parameter PAGE_AREA, VIEWPORT_AREA and CONTROL_AREA. The position for the images should be defined outside from the PAGE_AREA. In case of overlapping they will be shifted to the background.

Example for a 3D-Pdf Layout



3D-Pdf Layouts with size 400mm x 300mm and two images

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Kommando und Syntax	Beschreibung
ERC _3D_PDF_EXPORT RESET_LAYOUT	3D-Pdf Layout reset to default values
ERC _3D_PDF_EXPORT LOAD_LAYOUT filename.3pl	Load 3D-Pdf Layout from .3pl Datei "filename.3pl"
ERC _3D_PDF_EXPORT SAVE_LAYOUT filename.3pl	Save 3D-Pdf Layout to .3pl Datei "filename.3pl"
ERC _3D_PDF_EXPORT PAGE_AREA width height	Set Page Area for 3D-Pdf Layout Parameter: width height, see image above
ERC _3D_PDF_EXPORT VIEWPORT_AREA left(x) upper(y) width height	Set Viewport Area des 3D-Pdf Layout Parameter: left(x) upper(y) width height, see image above
ERC _3D_PDF_EXPORT CONTROL_AREA left(x) upper(y) width height	Set Control Area des 3D-Pdf Layout Parameter: left(x) upper(y) width height, see image above
ERC _3D_PDF_EXPORT LABEL_FONT_SIZE size	Set Label Font Size for Control Area des 3D-Pdf Layout Parameter: size in range [1-50], Default-Value: size = 10

Add Images to 3D-PDF Layout.

The folder must be predefined by the command IMAGE_PATH. Folder and images names must be defined in quotes "".

ERC _3D_PDF_EXPORT IMAGE_PATH "path"	Set folder to load images by ADD_IMAGE command.
ERC _3D_PDF_EXPORT IMAGE_PATH USERPROFILE	The Key "USERPROFILE" determines the path from which the images are loaded with ADD IMAGE z. B: c:\Users\MyLoginName
ERC _3D_PDF_EXPORT IMAGE_PATH WORKING_DIRECTORY	The Key "WORKING_DIRECTORY", current working directory determines the path from which the images are loaded with ADD IMAGE
ERC _3D_PDF_EXPORT IMAGE_PATH ""	Same as Key "WORKING_DIRECTORY" current working directory
ERC _3D_PDF_EXPORT IMAGE_PATH 3PL_FILE_FOLDER	Key "3PL_FILE_FOLDER " The path defined in the loaded 3D-Pdf Layout file .3pl determines the path from which the images are loaded with ADD IMAGE
ERC _3D_PDF_EXPORT ADD_IMAGE "filename.jpg" left(x) upper(y) width height Scaling	Adds a .jpg Image to a defined position Parameter 1: "Image file name" Parameter 2-5: left(x) upper(y) width height Parameter 6: Scaling is one of ISO_Stretch = 0 or ISO_CenterFit = 1

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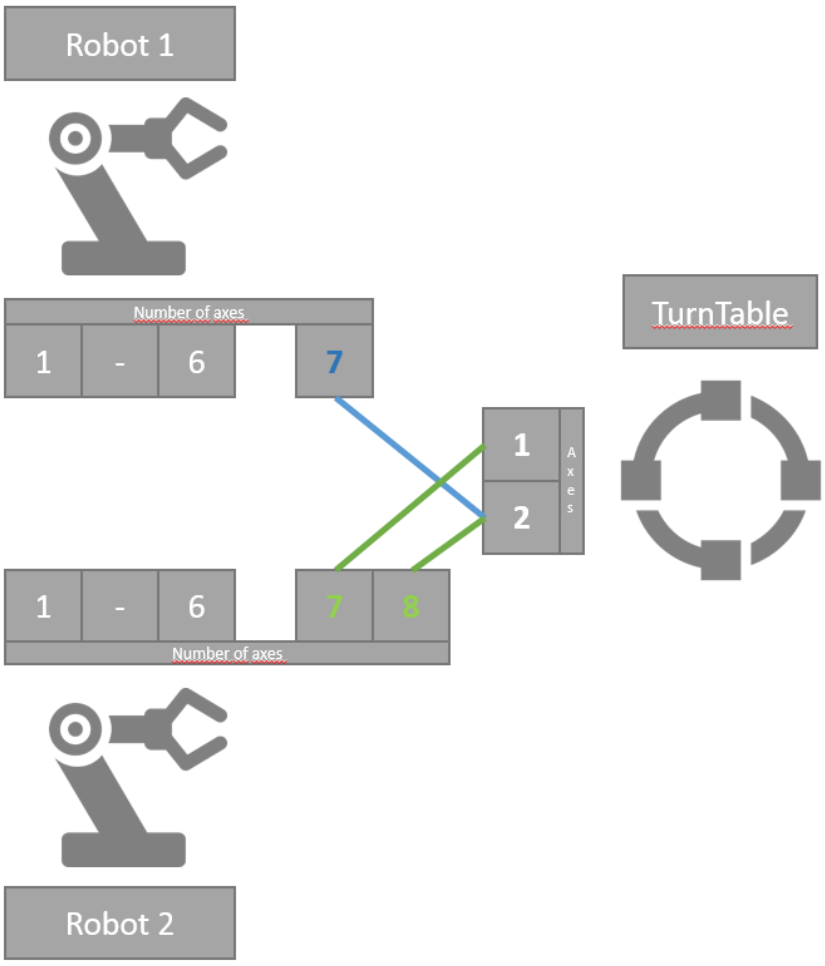
ERCL - Linkage Commands

Coupling of devices via ERC commands with the possibility of mappings of axes. Thus, inter alia, an elegant master - slave switch can be realized during the simulation run.

ERC LINKAGE DEVICE SET ['DeviceName'] [AxIdx(1)] .. [AxIdx(n)]	Creates the coupling of the current device to the simulation run DeviceName = Name of the device to be coupled with AxIdx(1) = first axes index AxIdx(n) = n-th axes index
ERC LINKAGE DEVICE UNSET ['DeviceName']	Cancelation of the coupling DeviceName = Name of the device with which coupling should be canceled

Schematic representation of the axis mappings



blau = ERC LINKAGE DEVICE SET TurnTable 0 7
grün = ERC LINKAGE DEVICE SET TurnTable 7 8

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EASY-ROB customer area

Content: Program updates and robot libraries

Web: http://www.easy-rob.com/en/special/customer-area/

Log in data:

User name: customer
Password: **********

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ERCL - Notes

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