

**DANGER**  
⚡  
≤ 780 VDC  
180 s

**KUKA**  
KSD1-48  
Ser. Nr. 0011678  
Liefer. Nr. 0011678  
Art. Nr. 0011678

**SBM**  
Ser. Nr. 20  
Liefer. Nr. 00  
Art. Nr. 00  
Version: 0

**SBM2**  
**KUKA**  
Ser. Nr. 0011678  
Liefer. Nr. 0011678  
Art. Nr. 0011678  
Version: 0

**KUKA**  
KSD1-32  
Ser. Nr. 0011678  
Liefer. Nr. 0011678  
Art. Nr. 0011678  
Version: 0

**DANGER**  
⚡  
≤ 780 VDC  
180 s

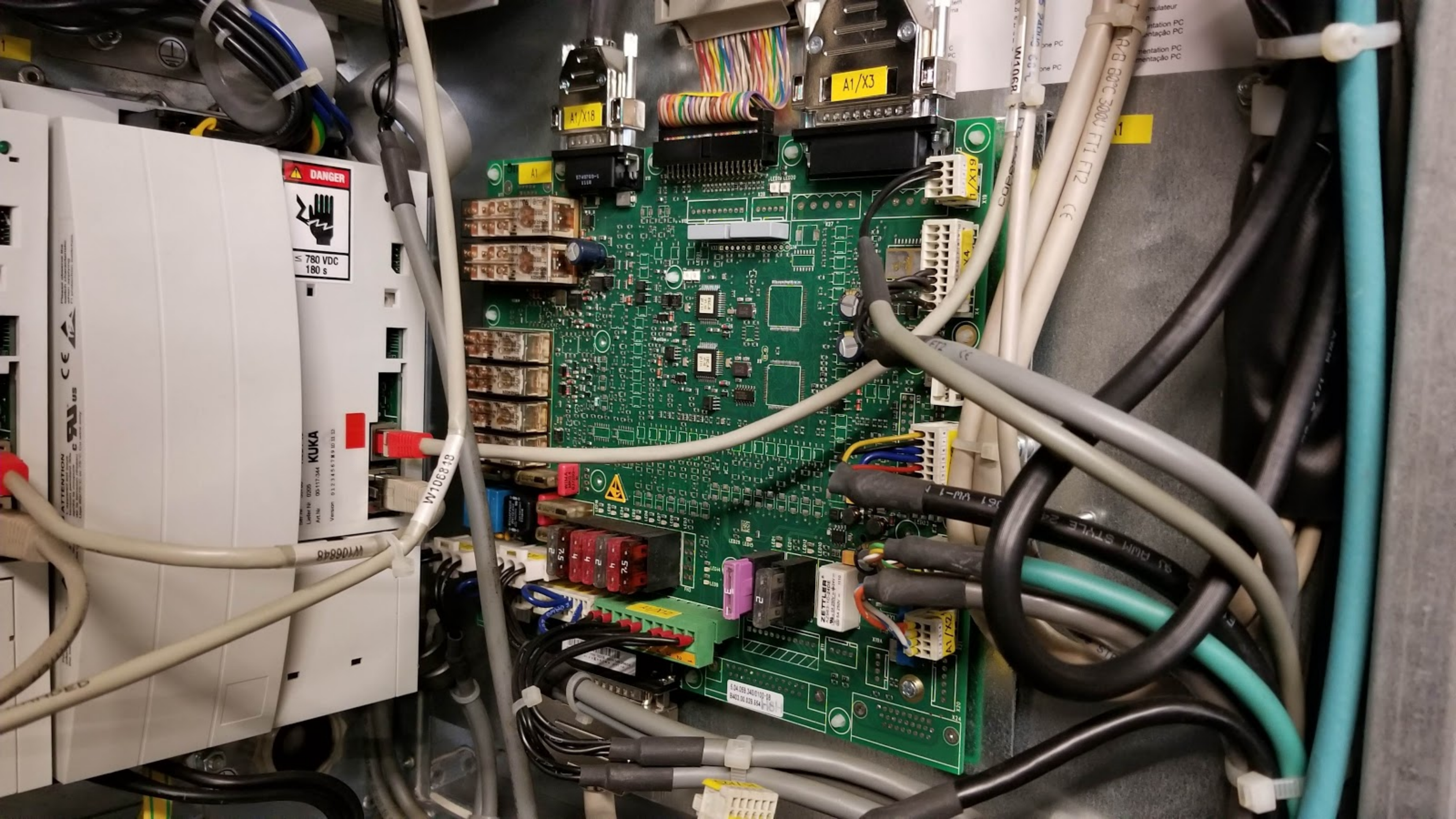
**KUKA**  
KSD1-16  
Ser. Nr. 0011678  
Liefer. Nr. 0011678  
Art. Nr. 0011678  
Version: 0

**DANGER**  
⚡  
≤ 780 VDC  
180 s

**KUKA**  
KSD1-16  
Ser. Nr. 0011678  
Liefer. Nr. 0011678  
Art. Nr. 0011678  
Version: 0

G1/X10





**DANGER**  
⚡  
780 VDC  
180 s

**KUKA**  
Liefer Nr. 02005  
Art. Nr. 005-117-344  
Version: 01.2.3.4.5.6.7.8.9.10.11.12

A1/X18

A1/X3

A1

A1/X19

A1/X4

W106818

W106848

6.04.059.340.0100-08  
8401.00.019.154

ZETTLER  
10-24008  
10-24008  
10-24008

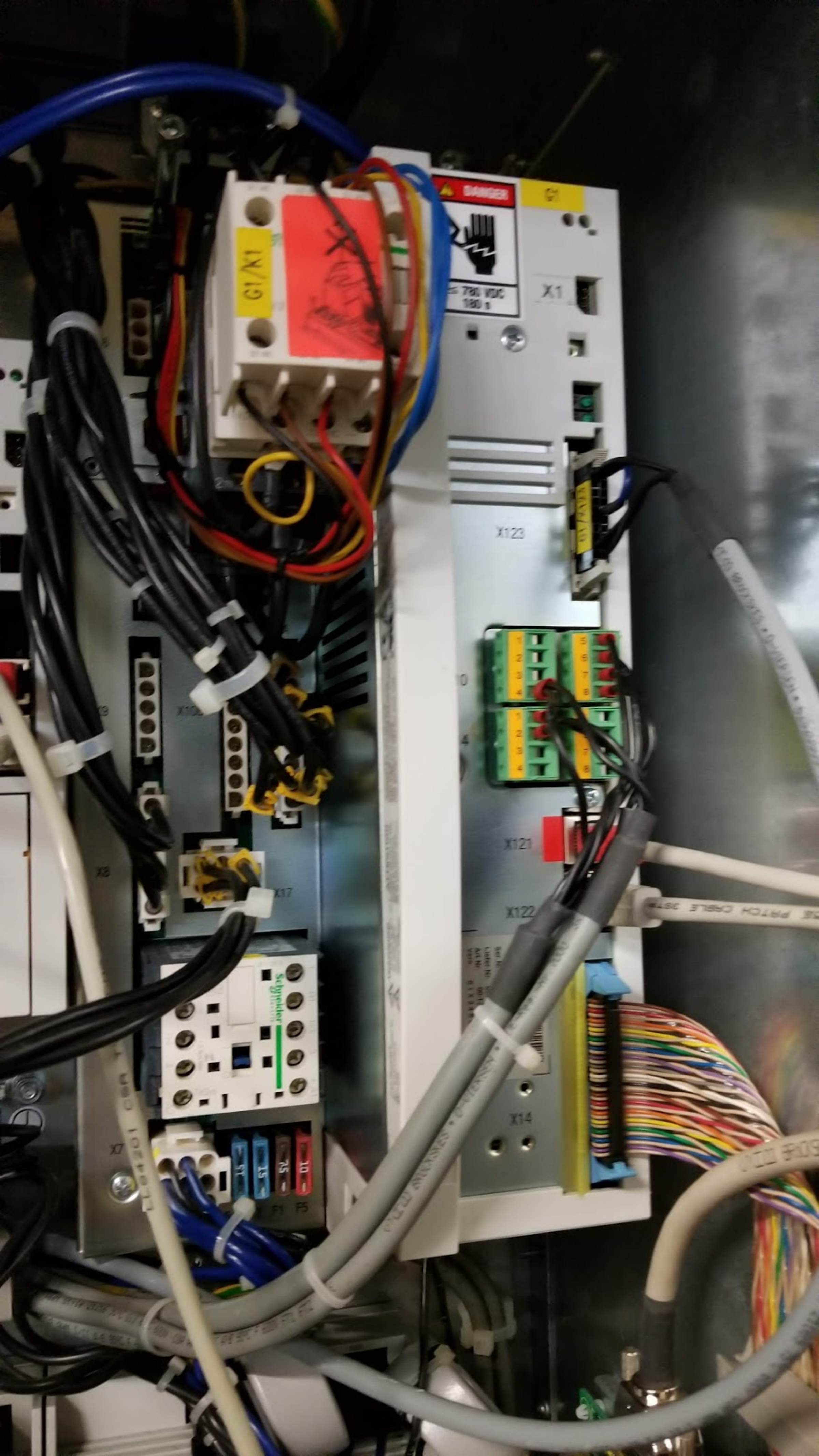
W1-1

91 RUM STYLE 24

A/B 800C 3000 FT1 FT2

Simulation PC  
Simulation PC  
Simulation PC  
Simulation PC



















1.77 kW 9.50 A U<sub>nom</sub> 100 V  
Frequency 50/60 Hz  
M 85 IP 65 TA CL F KTY 84  
Rev. - Nr. 82 EN 60034  
K 4 - Nr. 88 - 225 - 463



LITECO



Roboter GmbH  
Augsburg / Germany



**KUKA**

3 - Brushless - Servomotor

1FK6100-8AF91-1ZZ9-Z S49

Nr. YF N450 1698 38 017

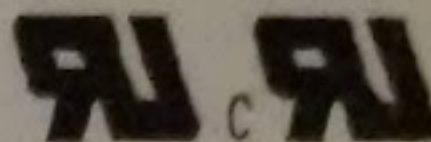
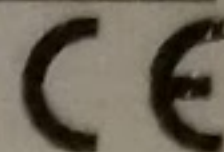
3,77 kW 9,50 A  $U_{\text{istr}}$  156 V

$n_{\text{N/max}}$  3000/4200 min<sup>-1</sup>

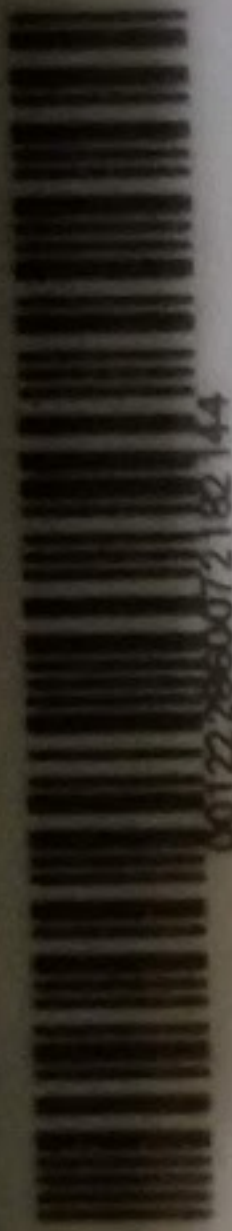
IM B5 IP 65 Th. Cl. F KTY 84

Rev. - Nr. 03 EN 60034

Art. - Nr.: 69-225-463







001222860072182144

**KSD1-32**

Ser.Nr. 18214

Liefer.Nr. 0072

Art.Nr. 00-122-286

**KUKA**

Version 0 1 2 ~~X~~ 4 5 6 7 8 9 10 11 12





```

1 CHAR $U_OPTION[32]
2 $U_OPTION[]="U3.8.1/KUKA5.6" ;VERSIONSKENNUNG
3 BOOL $DRIVE_CP=TRUE ;BAHNFAHREN
4 BOOL $DRIVE_CART=TRUE ;PTP MIT KARTESISCHEN KOORDINATEN
5 BOOL $IMPROVEDMIXEDBLENDING=TRUE ;verbessertes gemischtes
  ↳ Ueberschleifen
6 BOOL $IMPROVEDCPBLENDING=TRUE
7 BOOL $EXT_AXIS=TRUE ;EXTERNE ACHSEN VORHANDEN
8 BOOL $TECH_OPT=TRUE ;FUNKTIONSGENERATOR
9 BOOL $ENDLESS=TRUE ;ENDLOS DREHENDE ACHSEN
10 BOOL $TCP_IPD=TRUE ;GREIFERBEZOGENE INTERPOLATION
11 BOOL $ASYNC_OPT=FALSE
12 BOOL $SEP_ASYNC_OV=FALSE ;Schalter fuer asynchrone
  ↳ Hand-Overrides
13 DECL MSG_T $MSG_T={VALID FALSE,RELEASE FALSE,TYP #NOTIFY,
  ↳ MODUL[] " ",KEY[] " ",PARAM_TYP #VALUE,PARAM[] " ",
  ↳ DLG_FORMAT[] " ",ANSWER 0}
14 BOOL $LOOP_CONT=FALSE
15 CHAR $LOOP_MSG[128]
16 BOOL $ABS_ACCUR=TRUE ;ABSOLUTGENAUES ROBOTERMODELL
  
```

KRC:\STEU\MADA\OPTION.DAT

Ln 1, Col 0

Up	C...	Time	no.	Source	Message
		1:34:50 PM	284		Accu voltage at PM1 below 22 volts during last buffering
		1:35:20 PM	200	KS	Drives contactor off
		1:37:00 PM	120	LOS	Log-On user changed from Operator to Expert.



100%



1

10

10

10

1

1

1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 26

[illegible]



7

1



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From



1

 $\nabla \cdot \mathbf{u} = 0$ 

Ln 20, Col 0

Message

Accu voltage at PM1 below 22 volts during last buffering

Log-On user changed from Operator to Expert.

Drives contactor off, intermediate circuit loaded

1:42 PM

NAVIGATOR

↕

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+

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+

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⊥

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+

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+

—

+



The screenshot displays the SIMATIC Manager software interface. The top menu bar includes File, Program, Configure, Monitor, Setup, Commands, Technology, and Help. The main workspace shows a ladder logic program with the following code:

```
126 $DSECHANNEL[4]=4
127 $DSECHANNEL[5]=5
128 $DSECHANNEL[6]=6
129 $DSECHANNEL[7]=7
130 $DSECHANNEL[8]=0
131 $DSECHANNEL[9]=0
132 $DSECHANNEL[10]=0
133 $DSECHANNEL[11]=0
134 $DSECHANNEL[12]=0
135 INT $PMCHANNEL[12] ;ZUORDNUNG DER ACHSE ZU DSE, KPS,
    ↳ BREMSENKANAL UND SBM
136 $PMCHANNEL[1]=20
137 $PMCHANNEL[2]=20
138 $PMCHANNEL[3]=20
139 $PMCHANNEL[4]=20
140 $PMCHANNEL[5]=20
141 $PMCHANNEL[6]=20
142 $PMCHANNEL[7]=20
143 $PMCHANNEL[8]=0
144 $PMCHANNEL[9]=0
```

The status bar at the bottom indicates the current file is KRC:\R1\MADA\MACHINE.DAT, and the cursor is at line 141, column 0. Below the main workspace, a message log is visible, showing the following entries:

Icon	Time	no.	Source	Message
i	1:34:50 PM	284		Accu voltage at PM1 below 22 volts during last buffering
!	1:37:00 PM	120	LOS	Log-On user changed from Operator to Expert.
i	1:41:46 PM	220	KS	Drives contactor off, intermediate circuit loaded

The bottom status bar shows the following information: Num, Cap, S, I, R, T1, POV 100%, r924800, 1:42 PM, Close, and NAVIGATOR.



FileViewServo-FileInfo

General DataMain AxesExternal AxesExt. KinematicsServo-File

System informations

KUKA control type: (V)KR C2

KUKA robot type: "#KR2150\_2 S C2 FLR ZH150"

Machinedata Version: "V3.8.1/KUKA5.6"

Main AxesExternal Axes

Variable	Value
\$NUM_AX	6
\$BRK_MODE_BIT0	1
\$BRK_MODE_BIT1	0
\$BRK_MODE_BIT2	1

Variable	Value
\$EX_AX_NUM	1
\$BRK_MODE_BIT3	0

Number of external axes [ ] Type [INT]

"\$EX\_AX\_NUM" defines the number of external axes that are connected to the robot system.

Def.:

Fix:

Min: 0

Max: 6

NUM

Change

Save

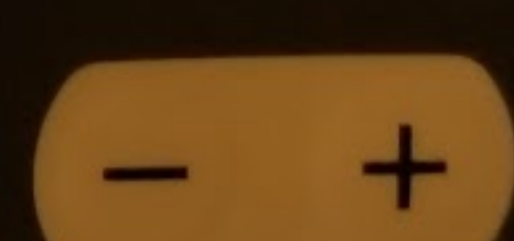
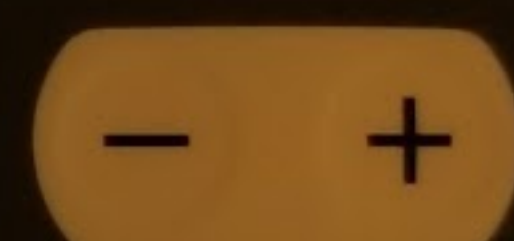
Exit

13:56



+TAB

-TAB





File	View	Servo-File				Info
General Data		Main Axes	External Axes	Ext. Kinematics	Servo-File	
Variable		Axis 7				
\$AXIS_TYPE		3				
MOTORTYPE		69-225-463. B				
\$KT_MOT		1.17				
\$KTO_MOT		1.41				
\$RAISE_T_MOT		5.0				
\$RAT_MOT_ENC		{N 1,D 4}				
\$BRK_ENERGY_MAX		4600				
\$BRK_COOL_OFF_COEFF		36.0				
\$BRK_TORQUE		20.0				
\$SERVOFILE		"KSD_32_MB_S"				
\$CURR_MAX		32.0				
\$CURR_LIM		100				
Axis identifier [ ]		Type [INT]				
Definition of the axis type.		Def.: [ ]				
1 = LINEAR (e.g. linear units)		Fix: [ ]				
2 = SPINDLE (special kinematics and spindle drives)		Min: [ ]				
3 = ROTATIONAL (standard case: rotational axes; turning range from -358° to 358°)		Max: [ ]				
4 = Finitely rotating		1				
5 = Infinitely rotating (e.g. robot axis 4 or 6)		5				
NUM [CAPS]		13:56				
Change		Save Exit				



File

View

Servo-File

Info

General Data

Main Axes

External Axes

Ext. Kinematics

Servo-File

Variable	Axis 7
\$CURR_CAL	1.0
\$CURR_COM_EX	100.0
\$DSECHANNEL	7
\$PMCHANNEL	20
\$AXIS_RESO	4096
\$IN_POS_MA	0.5
\$RED_VEL_AXC	50
\$RED_ACC_AXC	50
\$RED_ACC_OV	100
\$VEL_AXIS_MA	3000.0
\$G_VEL_PTP	10.0
\$G_VEL_CP	10.0

Proportional gain of the speed controller for CP motion [ ] Type [REAL]

The setting of the proportional gain of the speed controller for CP motion is made in "\$G\_VEL\_CP". The P value determines whether the reaction to the predefined position controller setting is fast or slow (influence on the constant motion phase). The value depends on the motor type and mechanic.

Def.: Fix: Min: Max: 

+TAB

-TAB

NUM [CAPS]

13:57

Change

Save

Exit

ESC



STOP

HOME  
7LDEL  
8PG UP  
9



ESC

KUKA

File

View

Servo-File

Info

General Data

Main Axes

External Axes

Ext. Kinematics

Servo-File

Variable	Axis 7
\$I_VEL_PTP	500.0
\$I_VEL_CP	500.0
\$LG_PTP	0.100000009
\$LG_CP	0.100000009
\$G_COE_CUR	85
\$APO_DIS_PTP	90.0
\$SOFTN_END	-355.0
\$SOFTP_END	355.0
\$RAT_MOT_AX	{N 180,D 1}
\$AX_ENERGY_MAX	3005
\$MAMES	0.0
\$VEL_AX_JUS	0.100000001

Velocity for EMT mastering [mm/s,\*/s] Type [REAL]

This entry defines the velocity at which a particular axis moves during EMT mastering. The user can thus set the velocity in such a way that the EMT can detect the reference notch reliably.  
The vertical velocity required by the EMT should be +/- 250 µm/s.

Def.: 0.1

Fix:

Min:

Max:

+TAB

-TAB

NUM [CAPS]

Change

Save

Exit

13:57

LDEL



File		View		Servo-File								Info	
General Data				Main Axes		External Axes		Ext. Kinematics		Servo-File			
		Variable		Axis 7									
		\$MAMES		0.0									
		\$VEL_AX_JUS		0.100000001									
		\$L_EMT_MAX		5.0									
		\$RAISE_TIME		300.0									
		\$RED_ACC_EMX		100									
		\$DECEL_MB		1000.0									
		\$AXIS_DIR		1									
		\$ASYNC_T1_FAST		0									
		\$EX_AX_ASYNC		0									
		\$ASYNC_EX_AX_DECOUPLE		0									
		\$JERK_MA		1000.0									
		\$AXIS_JERK		1.00000002E+20									
allow axisjerk for the Spline(Axis and ext. Axis) [DEG/S^3] / [M/S^3] — [deg./s^3(r),m/s^3(l)]													
allow axisjerk for the Spline(Axis and ext. Axis) [DEG/S^3] / [M/S^3]												Def.: <input type="text"/>	
												Fix: <input type="text"/>	
												Min: <input type="text" value="1.0"/>	
												Max: <input type="text" value="999999.9"/>	
		NUM		CAPS									
		Change								Save		Exit	

— +

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— +

— +

— +



File

Edit

Configure

Monitor

Setup

Commands

Technology

Help

Filter: Module

Contents of: Mada

KUKA-SEW004 (KRC:\)

R1

Mada

Program

System

TP

STEU

Mada

(A:\)

KUKA\_DISK (C:\)

KUKA\_DATA (D:\)

(E:\)

(ARCHIVE:\)

Attributes	Size:	#	Changed	Created:
---			20/01/2012 02:...	20/01/2012 02:...
---			20/01/2012 02:...	20/01/2012 02:...
---			20/01/2012 02:...	20/01/2012 02:...
---			28/02/2012 02:...	28/02/2012 02:...
---			14/05/2012 04:...	14/05/2012 04:...
---			05/07/2012 09:...	05/07/2012 09:...
---			05/03/2012 23:...	05/03/2012 23:...
---			01/07/2012 13:...	05/07/2012 09:...
---			01/07/2012 13:...	05/07/2012 09:...
---RV\$---	54 KB	57	09/01/2000 08:...	24/08/2011 24:...
---RV\$---	20 KB		09/01/2000 08:...	24/08/2011 24:...
---	4 KB		09/01/2000 08:...	20/01/2012 02:...

1 Object(s) selected

55044 Bytes

C...	Time	no.	Source	Message
i	1:34:50 PM	284		Accu voltage at PM1 below 22 volts during last buffering
!	1:37:00 PM	120	LDS	Log-On user changed from Operator to Expert.
i	1:59:09 PM	310	KS	Safety circuit for drives not ready
i	1:59:09 PM	200	KS	Drives contactor off
	1:59:09 PM	1146		Ackn. motor blocked E1

Num

Cap

S

I

R

T1

HOV 10%

r924800

1:59 PM

Online help

Ackn.

Ackn. All