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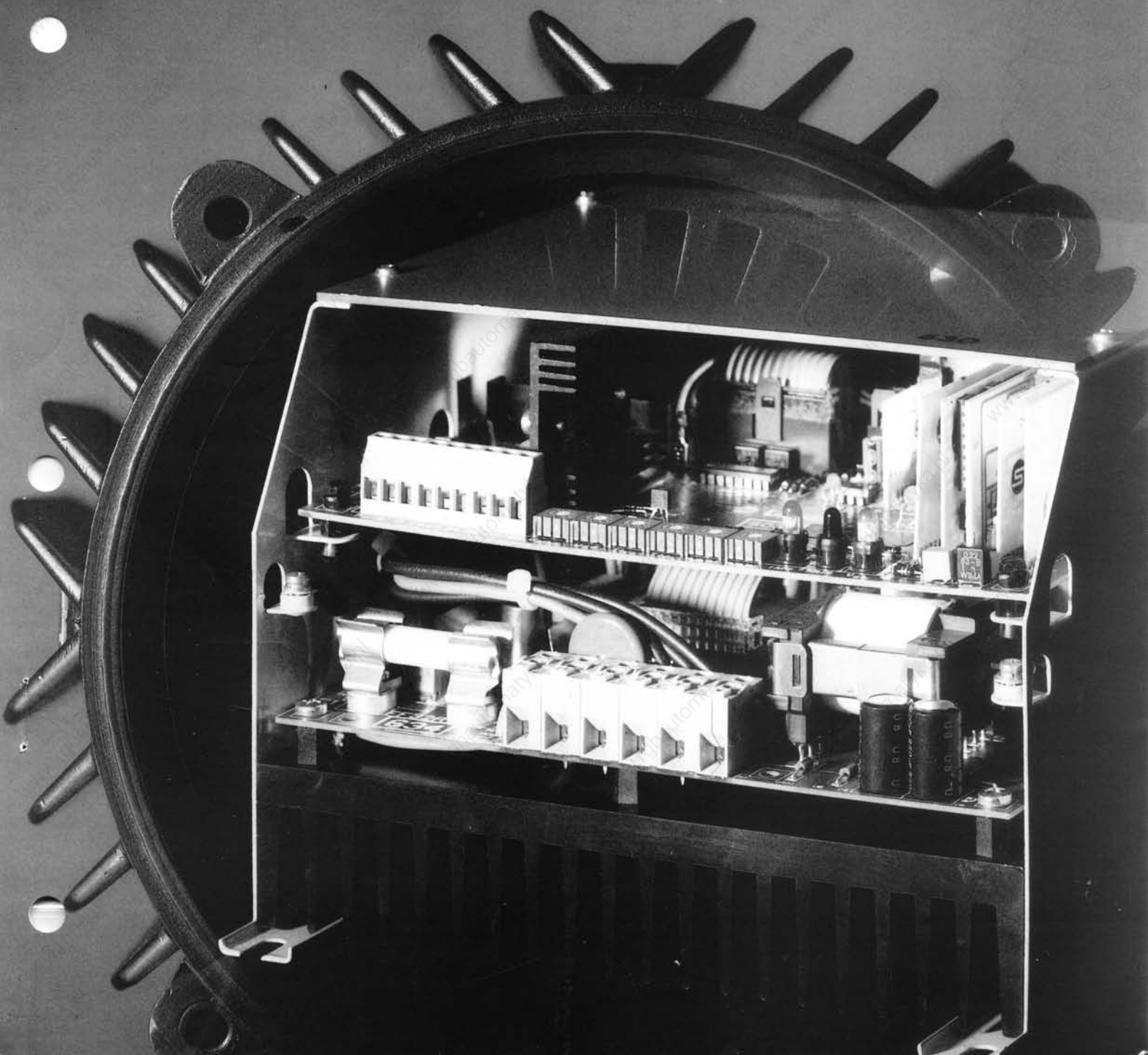
Service instructions

Inverter drives
Range 630



26.10.1989

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1. General information

Caution: The modules are fitted with C-MOS and MOS components which are sensitive against electrostatic influences

Please note the following information, when the controller is handled and checked; otherwise these circuits may be destroyed.

- Make sure that there is a potential compensation (charge accumulation between controller, tools, measuring instruments, and personnel before servicing.
- The modules must be touched at the edges, never at the components and their connections.
- Caution: Controller is carriying mains potential up to 20s after switching-off
- The phase current should be measured with a moving iron instrument and the voltage with a moving coil instrument.

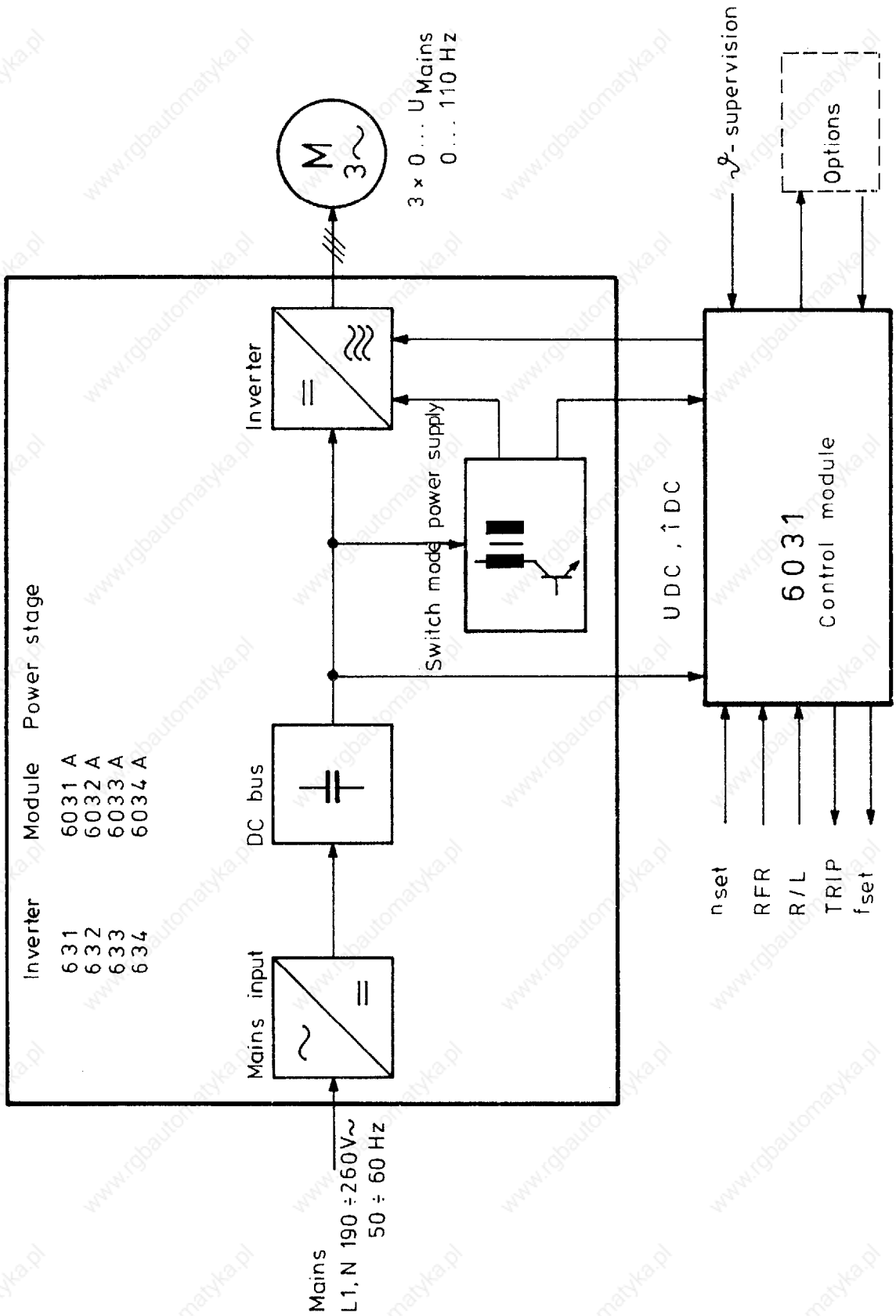
2. Technical data

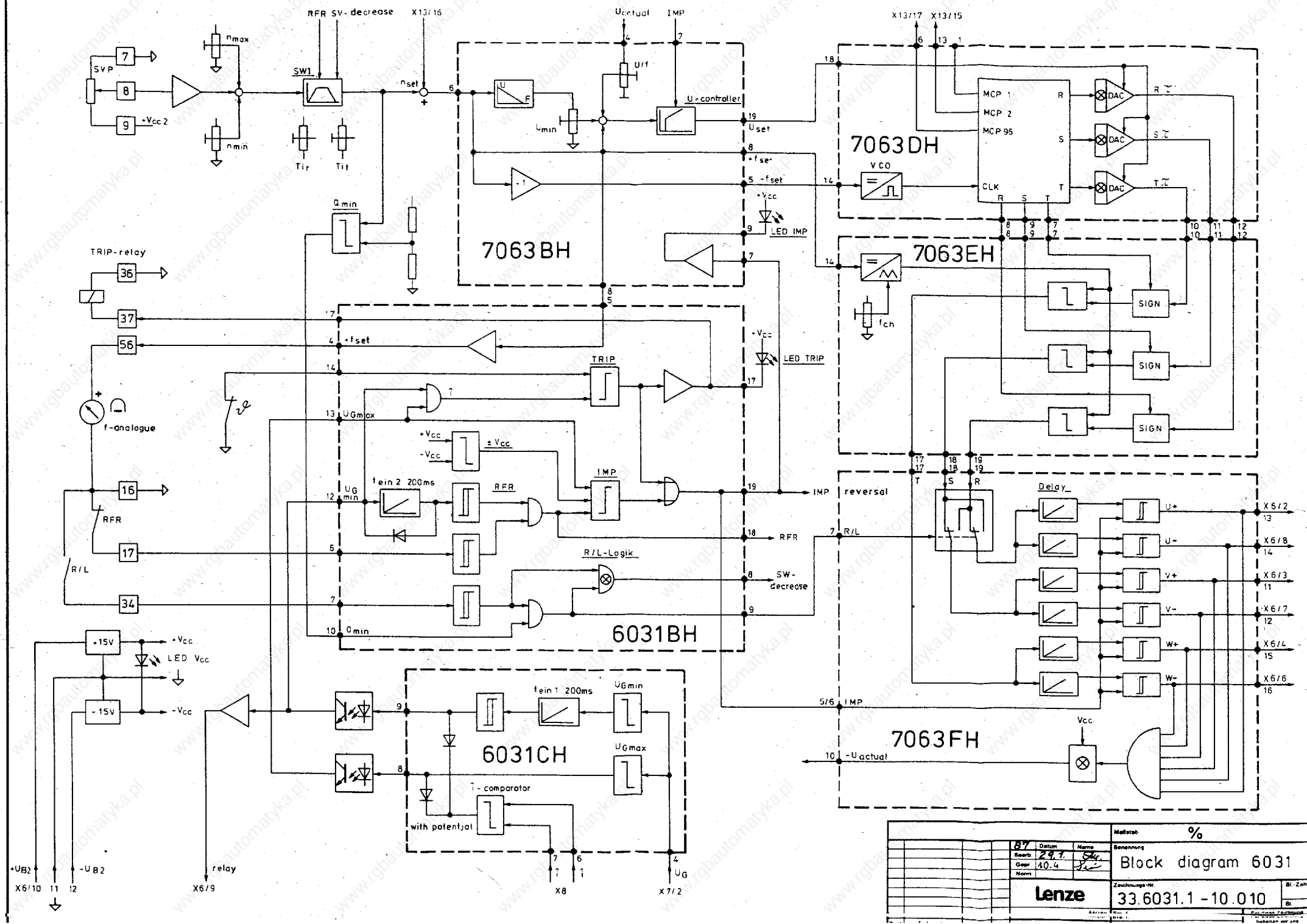
Type		631	632	633	634
Output power	S/kVA	1.3	1.5	2.6	3.6
Rated motor power	P/kW	0.55	0.75	1.5	2.2
Mains voltage	U_{mains}/V	L_1N 190 - 260 ± 0% 50 - 60			
Rated mains current	I_{mains}/A	7.0	9.0	15.0	17.0
Output voltage	U_{phase}/V	3 x 0 ...U_{mains}			
Rated output current	I_N/A	3.4	4.0	7.0	9.5
Max. unit current	I_{max}/A	5.4	6.4	11.2	15.0
Power loss f_d=50Hz, I=I_N	P_v/W	50	70	90	150
Output frequency	f_d/Hz	0 ...110			
Master voltage	U_{LN}/V	0 ...10			
Master current	I_{LN}/mA	0 .. 20 or 4 ... 20			
Ambient temperature	T_u/°C	0 ... 45			
Dimensions	HxBxD mm	155 x 202 x 230			
Weight	kg	2.2	2.9	4.0	4.0

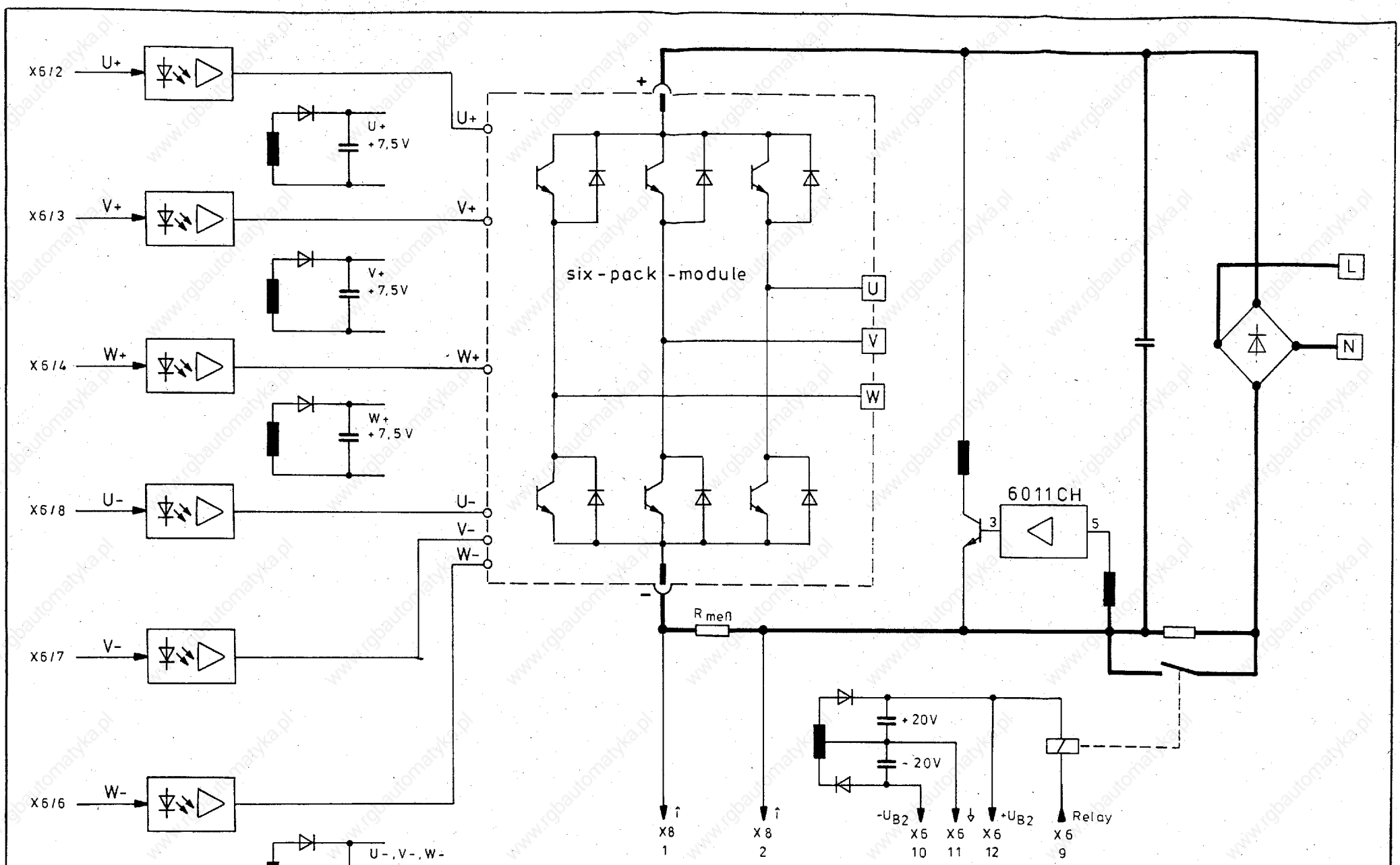
Fuses, mains chokes

	631	632	633	634
Mains fuses F1 Part no.	FF12.5A 6.3x32 324 808	FF16A 6.3x32 305 725	FF25A 10x38 307 308	FF30A 10x38 321 554
Control fuse F2 Part no.	F1A 5x20 321 660			
Mains chokes Part no.	5mH, 9A 323 330	5mH, 9A 323 330	3.5mH,14A 323 331	1.6mH,17A 323 361
Controller part no.	326 442	326 443	326 444	326 445

3. Block diagram 631 - 634




RFR SV-decrease
X13/16
Uactual
IMP
X13/17
X13/15
SVP
+Vcc 2
nmax
nmin
SW1
nset
Tir
Tif
U/f
U-controller
Umin
Uset
+fset
-fset
+Vcc
LED IMP
7063BH
7063DH
MCP 1
MCP 2
MCP 95
CLK
DAC
VCO
7063EH
SIGN
fch
Qmin
TRIP-relay
f-analogue
TRIP
LED TRIP
UGmax
UG min
fein 2 200ms
RFR
IMP
R/L
R/L-Logik
SW-decrease
6031BH
+15V
-15V
LED Vcc
fein 1 200ms
UGmin
UGmax
6031CH
Ī-comparator
with potential
relay
reversal
Delay
7063FH
Vcc
-Uactual
+UB2
-UB2
X6/10
X6/9
X8
X7/2
X6/2
X6/8
X6/3
X6/7
X6/4
X6/6
Maßstab
%
Benennung
Block diagram 6031
Datum
Name
Bearb.
29.1.
Gepr.
10.4.
Norm
Lenze
Zeichnungs-Nr.
33.6031.1 -10.010



				87	Datum	Name	Maßstab
				Bearb.	3.4.		Benennung: Block diagram Power stage 630
				Gepr.	10.4.		
				Norm			
				Lenze			Zeichnungs-Nr. 33.630.31 - 10.011
							Bl.-Zahl / Bl.
Zust.	Änderung	Datum	Name	Urspr.	Aerzen	Ers. f. / Ers. d.	Für diese Zeichnung behalten wir uns alle Rechte vor

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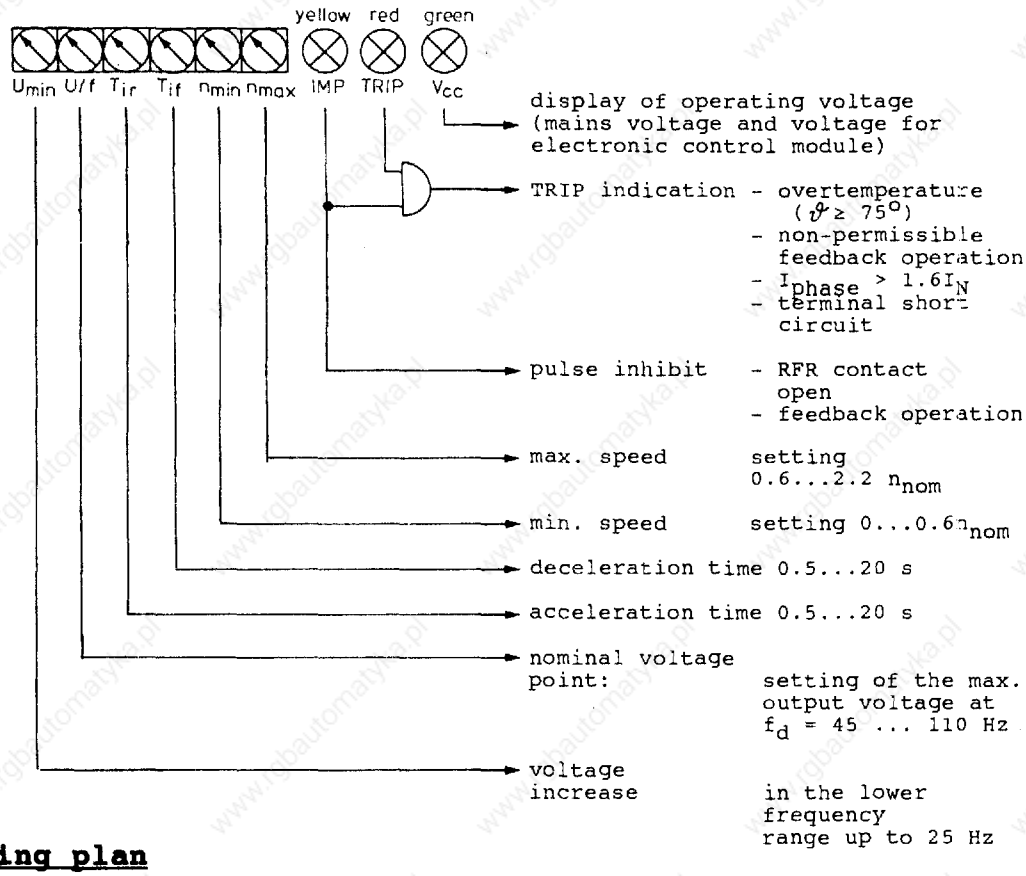
4. Trimmers, display of operational status

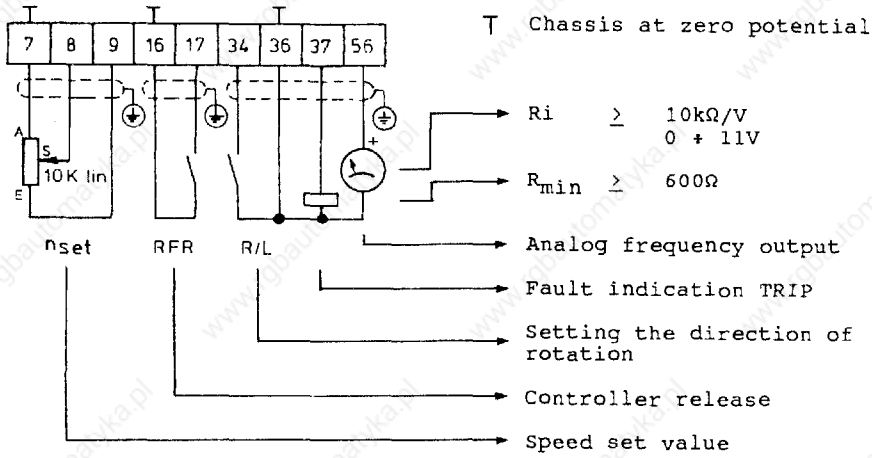
Fig. 21



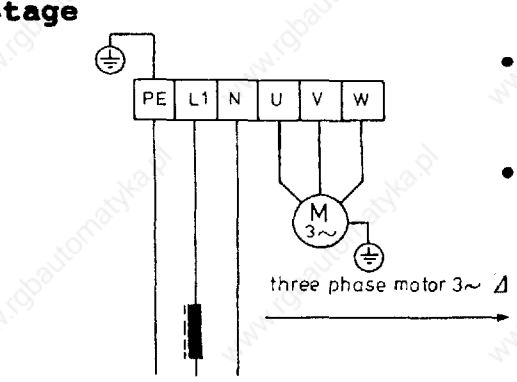
5. Connecting plan

Control module 6031

All control terminals are free of mains potential. Screen control cables. Apply screen on one side of the inverter to PE.



Power stage



Caution:

- Terminals carry mains potential up to 20 s after switching off
- Do not switch in the motor phases (if necessary, please consult manufacturer)
- Operate unit 634 only with allocated mains choke 1.6mH/17 A, part no: 323 361

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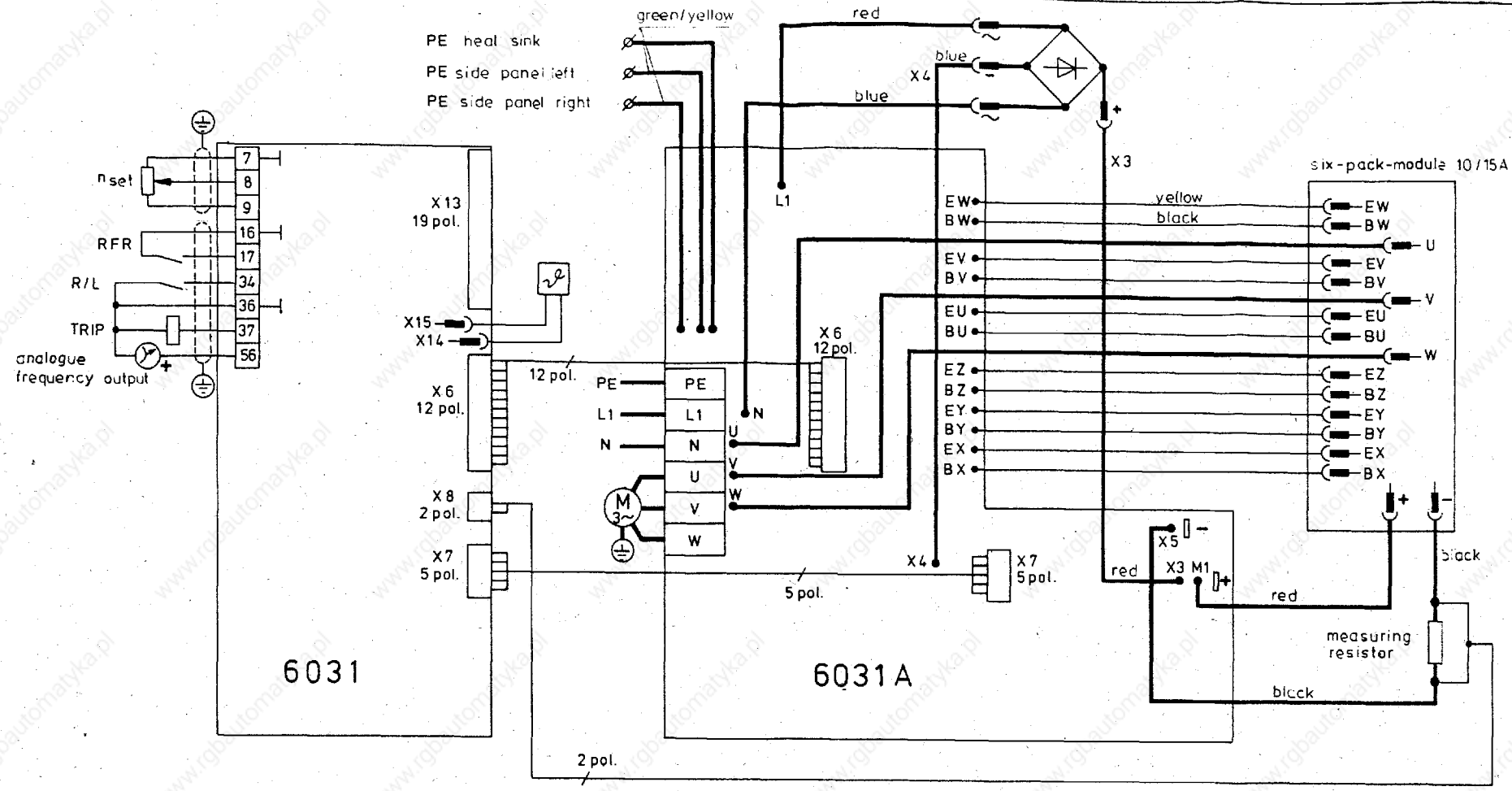
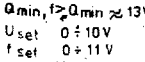
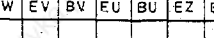
U_{mains}: 190 - 260 V ± 0%



pin	X 13
1	$+U_{B2} \approx 20V$ } total charge 50 mA
2	$+Vcc2 = 15V$
3	GND 2 ⊥
4	$-Vcc2 = -15V$
5	$Q_{min}, f \geq Q_{min} \approx 13V, f < Q_{min} \approx -13V$
6	U_{set} 0 ÷ 10V
7	f_{set} 0 ÷ 11V
8	n_{set}, U_{Leit} 0 ÷ 11V
9	RFR : L=0V=ON, H=+15V=OFF
10	IMP : L=0V=ON, H= 15V=OFF
11	R/L : R=H=15V, L=L=0V
12	TRIP : L=0V=OFF, H=15V=ON
13	ϑ : L=0V=ON, H=15V=OFF
14	$f_{ch} \approx 350Hz \div 4KHz$  + 6,5V − 6,5V
15	n_{set} ; U_{Leit} 0÷11V

pin	X 13
16	summation for n_{set}
17	$96 \times f_d$: 0÷10,5 KHz 
18	comp. for SWI +12V acceleration −12V deceleration
19	active L= 0V → WR inhibited H=15V → WR released

pin	X 6
1	opto coupler current U+,V+,W+
2	triggering U+
3	" V+
4	" W+
5	opto coupler current U-,V-,W-
6	triggering U-
7	" V-
8	" W-
9	relay ON = 0V OFF ≈ 20V
10	$+U_{B2} \approx 20V$
11	GND 2 ⊥
12	$-U_{B2} \approx -20V$

pin	X 8
1	I_Z DC link current
2	GND 1 ⊥

	ϑ
X 14	OFF ≈ 15V = TRIP ON ≈ 0V
X 15	GND 2 ⊥

pin	X 7
1	GND1 ⊥
2	$U_Z \approx 8,4V$
3	$+U_{B1} \approx 7V$
4	GND 1 for 6011CH
5	$-U_{B1} \approx -7,5V$

Connections of the modules

name of the connectors on print			EW	BW	EV	BV	EU	BU	EZ	BZ	EY	BY	EX	BX
name on module of Mitsubishi	10A	part no. 326530	EwP	BwP	EvP	BvP	EuP	BuP	EwN	BwN	EvN	BvN	EuN	BuN
Toshiba	15A	" " 326538	EW	BW	EV	BV	EU	BU	–	BZ	E-	BY	–	BX
Fuji	15A	" " 326537	EW	BW	EV	BV	EU	BU	–	BZ	EC	BY	–	BX

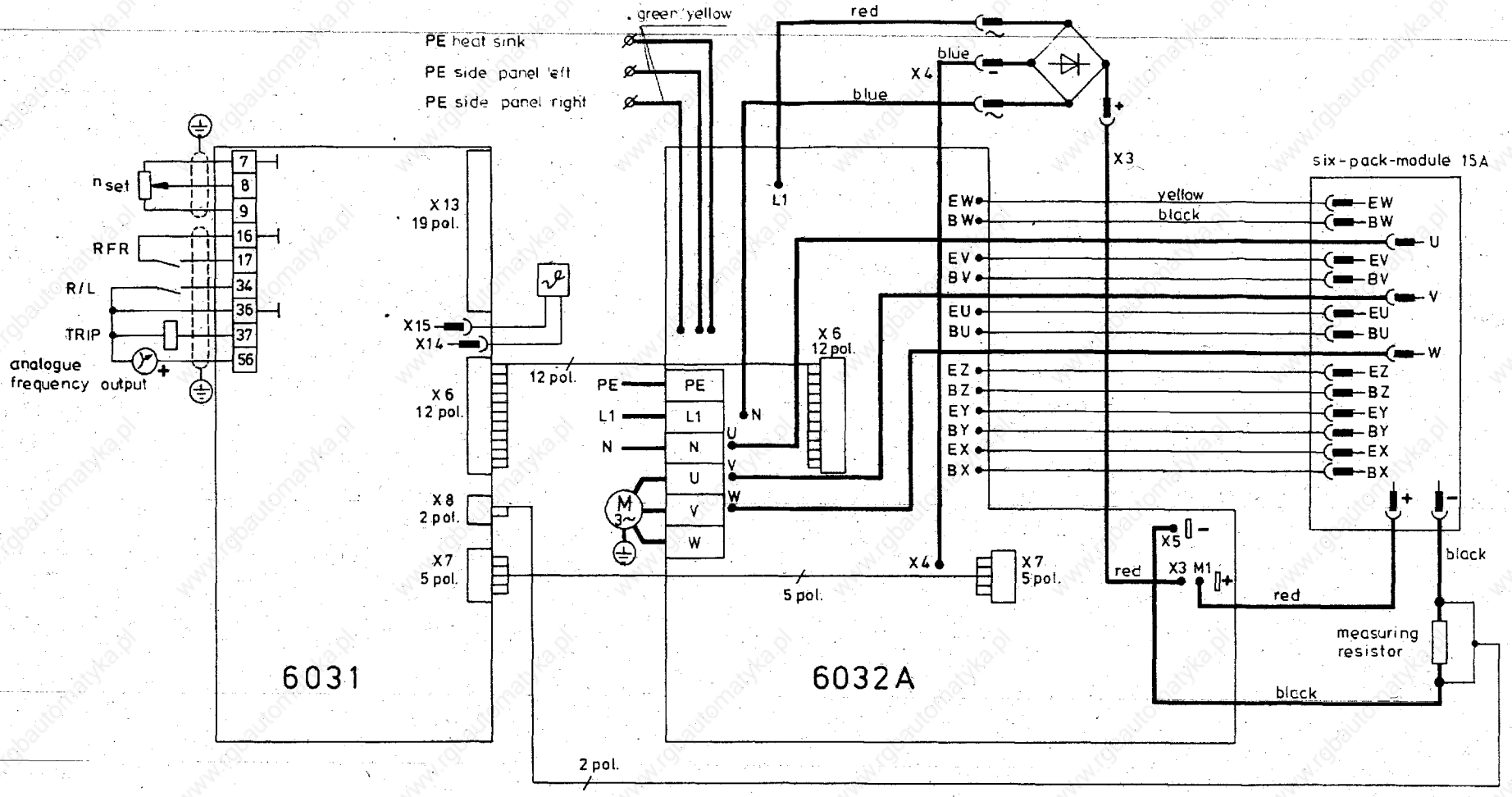
1. connect spade connectors U, V, W, + and − according to drawing
2. spade connectors existing on the module, but not indicated in the drawing are not connected

basic connections

U+	BU → EU	ON ≈	+ 2,0V
		OFF ≈	− 1,4V
V+	BV → EV	ON ≈	+ 2,0V
		OFF ≈	− 1,4V
W+	BW → EW	ON ≈	+ 2,0V
		OFF ≈	− 1,4V
U−	EX → EX	ON ≈	+ 2,0V
		OFF ≈	− 1,4V
V−	BY → EY	ON ≈	+ 2,0V
		OFF ≈	− 1,4V
W−	BZ → EZ	ON ≈	+ 2,0V
		OFF ≈	− 1,4V

Maßstab	%		
Benennung	Overall connecting plan 631		
Zeichnungs-Nr.	33.631.33 - 00.001	Bl.-Zahl	Bl.

Lenze



pin	X 13
1	$+U_{B2} \approx 20V$
2	$+V_{cc2} = 15V$
3	GND 2 ⊥
4	$-V_{cc2} = -15V$
	total charge 50 mA
5	Q_{min}, $f > Q_{min} \approx 13V$, $f < Q_{min} \approx -13V$
6	U_{set} 0 ÷ 10V
7	f_{set} 0 ÷ 11 V
8	nset, U_{Leit} 0 ÷ 11 V
9	RFR : L = 0V = ON, H = +15V = OFF
10	INP : L = 0V = ON, H = 15V = OFF
11	R/L : R = H = 15V, L = L = 0V
12	TRIP : L = 0V = OFF, H = 15V = ON
13	ϑ : L = 0V = ON, H = 15V = OFF
14	$f_{ch} \approx 350Hz \div 4KHz$; +6,5V ; -6,5V
15	nset ; U_{Leit} 0÷11V

pin	X 13
16	summation for n_{set}
17	$96 \times f_d$: 0 ÷ 10,5 KHz
18	comp. for SWI +12 V acceleration -12V deceleration
19	active L = 0V → WR inhibited H = 15V → WR released

pin	X 6
1	opto coupler current U+,V+,W+
2	triggering U+
3	" V+
4	" W+
5	opto coupler current U-,V-,W-
6	triggering U-
7	" V-
8	" W-
9	relay ON = 0V OFF ≈ 20V
10	$+U_{B2} \approx 20V$
11	GND 2 ⊥
12	$-U_{B2} \approx -20V$

pin	X 8
1	I_Z DC link current
2	GND 1 ⊥

	ϑ
X14	OFF ≈ 15V = TRIP ON ≈ 0V
X15	GND 2 ⊥

pin	X 7
1	GND1 ⊥
2	$U_Z \approx 8,4V$
3	$+U_{B1} \approx 7V$
4	GND 1 for 6011CH
5	$-U_{B1} \approx -7,5V$

Connections of the modules

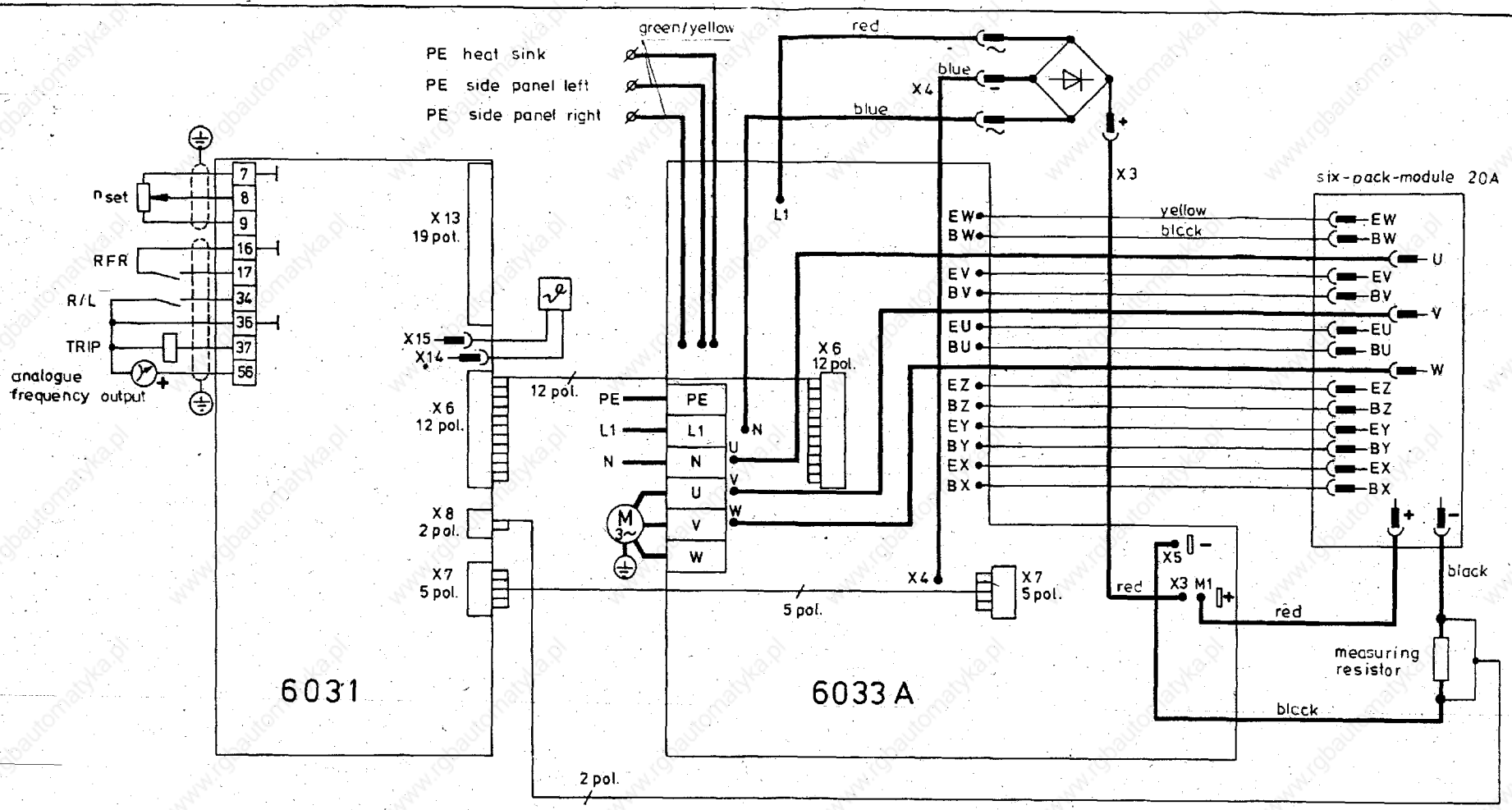
name of the connectors on print	EW	BW	EV	BV	EU	BU	EZ	BZ	EY	BY	EX	BX
name on module of												
Mitsubishi 15A part no. 326531	EwP	BwP	EvP	EvP	EuP	BuP	EwN	BwN	EvN	BvN	EuN	BuN
Toshiba 15A " " 326538	EW	BW	EV	BV	EU	BU.	-	BZ	E-	BY	-	BX
Fuji 15A " " 326537	EW	BW	EV	BV	EU	BU	-	BZ	EC	BY	-	BX

1 connect spade connectors U, V, W, + and − according to drawing
2 spade connectors existing on the module, but not indicated in the drawing are not connected.

basic connections

U+	BU → EU	ON ≈ + 2,0V OFF ≈ - 1,4V	
V+	BV → EV	ON ≈ + 2,0V OFF ≈ - 1,4V	
W+	BW → EW	ON ≈ + 2,0V OFF ≈ - 1,4V	
U-	BX → EX	ON ≈ + 2,0V OFF ≈ - 1,4V	
V-	BY → EY	ON ≈ + 2,0V OFF ≈ - 1,4V	
W-	BZ → EZ	ON ≈ + 2,0V OFF ≈ - 1,4V	

		Maßstab	%
		Benennung	Overall connecting plan 632
Bearb.	Datum 30.7.	Name	
Geprüft	11.4.		
Norm			
Lenze		Zeichnungs-Nr.	33.632.33 - 00.001



pin	X 13
1	$+U_{B2} \approx 20V$
2	$+V_{cc}2 = 15V$
3	GND 2 ⊥
4	$-V_{cc}2 = -15V$
	total charge 50 mA
5	$Q_{min}, f > Q_{min} \approx 13V, f < Q_{min} \approx -13V$
6	U_{set} 0 ÷ 10V
7	f_{set} 0 ÷ 11V
8	n_{set}, U_{Leit} 0 ÷ 11V
9	RFR: L = 0V = ON, H = +15V = OFF
10	IMP : L = 0V = ON, H = 15V = OFF
11	R/L : R = H = 15V, L = L = 0V
12	TRIP : L = 0V = OFF, H = 15V = ON
13	ϑ : L = 0V = ON, H = 15V = OFF
14	$f_{ch} \approx 350Hz \div 4 KHz$ + 6,5V / - 6,5V
15	n_{set} ; U_{Leit} 0 ÷ 11V

pin	X 13
16	summation for n_{set}
17	$96 \times f_d$ 0 ÷ 10,5 KHz
18	comp. for SWI +12V acceleration -12V deceleration
19	active L = 0V → WR inhibited H = 15V → WR released

pin	X 6
1	opto coupler current U+,V+,W+
2	triggering U+
3	" V+
4	" W+
5	opto coupler current U-,V-,W-
6	triggering U-
7	" V-
8	" W-
9	relay ON = 0V OFF ≈ 20V
10	$+U_{B2} \approx 20V$
11	GND 2 ⊥
12	$-U_{B2} \approx -20V$

pin	X 8
1	I_Z DC link current
2	GND 1 ⊥

	ϑ
X14	OFF ≈ 15V = TRIP ON ≈ 0V
X15	GND 2 ⊥

pin	X 7
1	GND1 ⊥
2	$U_Z \approx 8,4V$
3	$+U_{B1} \approx 7V$
4	GND 1 for 6011CH
5	$-U_{B1} \approx -7,5V$

Connections of the modules

name of the connectors on print		EW	BW	EV	BV	EU	BU	EZ	BZ	EY	BY	EX	BX
name on module of Mitsubishi	20A part no. 326 532	EwP	BwP	EvP	BvP	EuP	BuP	EwN	B N	EvN	BvN	EuN	BuN
Toshiba	20A " " 326 533	EW	BW	EV	BV	EU	BU	–	BZ	E–	BY	–	BX
Fuji	20A " " 326 540	EW	BW	EV	BV	EU	BU	EZ	BZ	EY	BY	EX	BX
Fuji	20A " " 326 539	EW	BW	EV	BV	EU	BU	–	BZ	EC	BY	–	BX

1. connect spade connectors U, V, W, + and – according to drawing
2. spade connectors existing on the module, but not indicated in the drawing are not connected.

basic connections

U+	BU → EU	ON ≈ + 2,0V	
		OFF ≈ - 1,4V	
V+	BV → EV	ON ≈ + 2,0V	
		OFF ≈ - 1,4V	
W+	BW → EW	ON ≈ + 2,0V	
		OFF ≈ - 1,4V	
U-	BX → EX	ON ≈ + 2,0V	
		OFF ≈ - 1,4V	
V-	BY → EY	ON ≈ + 2,0V	
		OFF ≈ - 1,4V	
W-	BZ → EZ	ON ≈ + 2,0V	
		OFF ≈ - 1,4V	

			Maßstab %
			Benennung: Overall connecting plan 633
	Datum	Name	
Bearb.	30.7.		
Gezr.	18.4.		
Norm			
Lenze			Zeichnungs-Nr. 33.633.33 - 00.001

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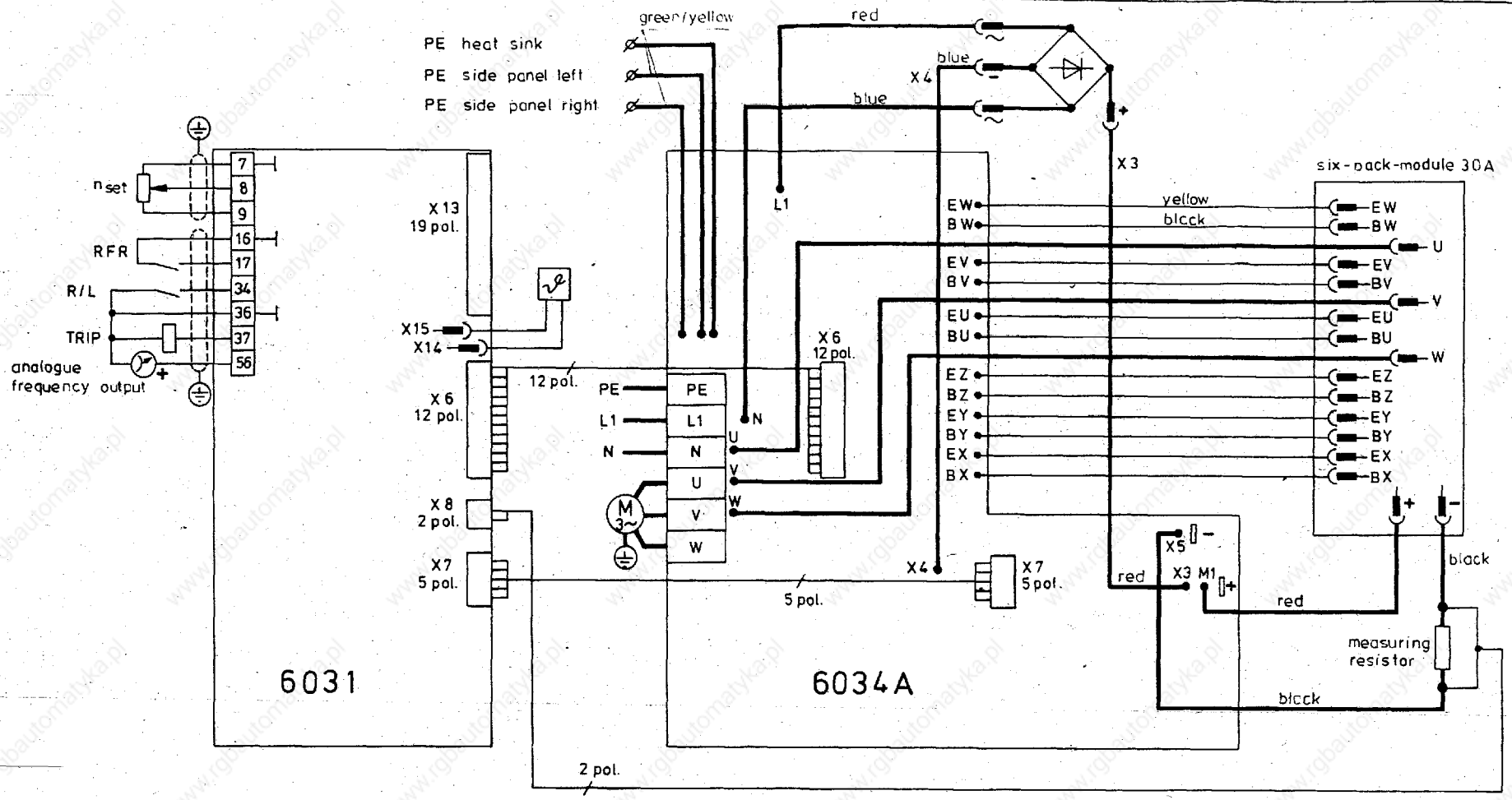
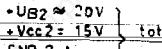


pin	X 13
1	$+U_{B2} \approx 20V$
2	$+Vcc2 = 15V$ } total charge
3	GND 2 ⊥ } 50mA
4	$-Vcc2 = -15V$
5	$a_{min}, f > a_{min} \approx 13V, f < a_{min} \approx -13V$
6	U_{set} 0 ÷ 10V
7	f_{set} 0 ÷ 11V
8	n_{set}, U_{Leit} 0 ÷ 11V
9	RFR : L = 0V = ON, H = +15V = OFF
10	IMP : L = 0V = ON, H = 15V = OFF
11	R/L : R = H = 15V, L = L = 0V
12	TRIP : L = 0V = OFF, H = 15V = ON
13	ϑ : L = 0V = ON, H = 15V = OFF
14	$f_{ch} \approx 350Hz \div 4KHz$  + 6,5V ~ 6,5V
15	n_{set} ; U_{Leit} 0 ÷ 11V

pin	X 13
16	summation for nset
17	$96 \times f_d$: 0 ÷ 10,5 KHz
18	comp. for SWI +12V acceleration -12V deceleration
19	active L = 0V → WR inhibited H = 15V → WR released

pin	X 6
1	opto coupler current U+,V+,W+
2	triggering U+
3	" V+
4	" W+
5	opto coupler current U-,V-,W-
6	triggering U-
7	" V-
8	" W-
9	relay ON = 0V OFF ≈ 20V
10	$+U_{B2} \approx 20V$
11	GND 2 ⊥
12	$-U_{B2} \approx -20V$

pin	X 8
1	I_Z DC link current
2	GND 1 ⊥

	ϑ
X14	OFF ≈ 15V = TRIP ON ≈ 0V
X15	GND 2 ⊥

pin	X 7
1	GND1 ⊥
2	$U_Z \approx 8,4V$
3	$+U_{B1} \approx 7V$
4	GND1 for 6011CH
5	$-U_{B1} \approx -7,5V$

Connections of the modules

name of the connectors on print —		EW	BW	EV	BV	EU	BU	EZ	BZ	EY	BY	EX	BX
name on module of													
Toshiba	30A part-no. 326 534	EW	BW	EV	BV	EU	BU	EZ	BZ	EY	BY	EX	BX
Fuji	30A " " 326541	EW	BW	EV	BV	EU	BU	EZ	BZ	EY	BY	EX	BX

1. connect spade connectors U, V, W, + and − according to drawing

basic connections

U+	BU → EU	ON ≈	+ 2,0V
		OFF ≈	- 1,4V
V+	BV → EV	ON ≈	+ 2,0V
		OFF ≈	- 1,4V
W+	BW → EW	ON ≈	+ 2,0V
		OFF ≈	- 1,4V
U-	BX → EX	ON ≈	+ 2,0V
		OFF ≈	- 1,4V
V-	BY → EY	ON ≈	+ 2,0V
		OFF ≈	- 1,4V
W-	BZ → EZ	ON ≈	+ 2,0V
		OFF ≈	- 1,4V

Maßstab	%		
Benennung	Overall connecting plan 634		
Bearb.	30.7.		
Geprüft	18.4.		
Norm			
Lenze	Zeichnungs-Nr. 33.634.33 - 00.001		

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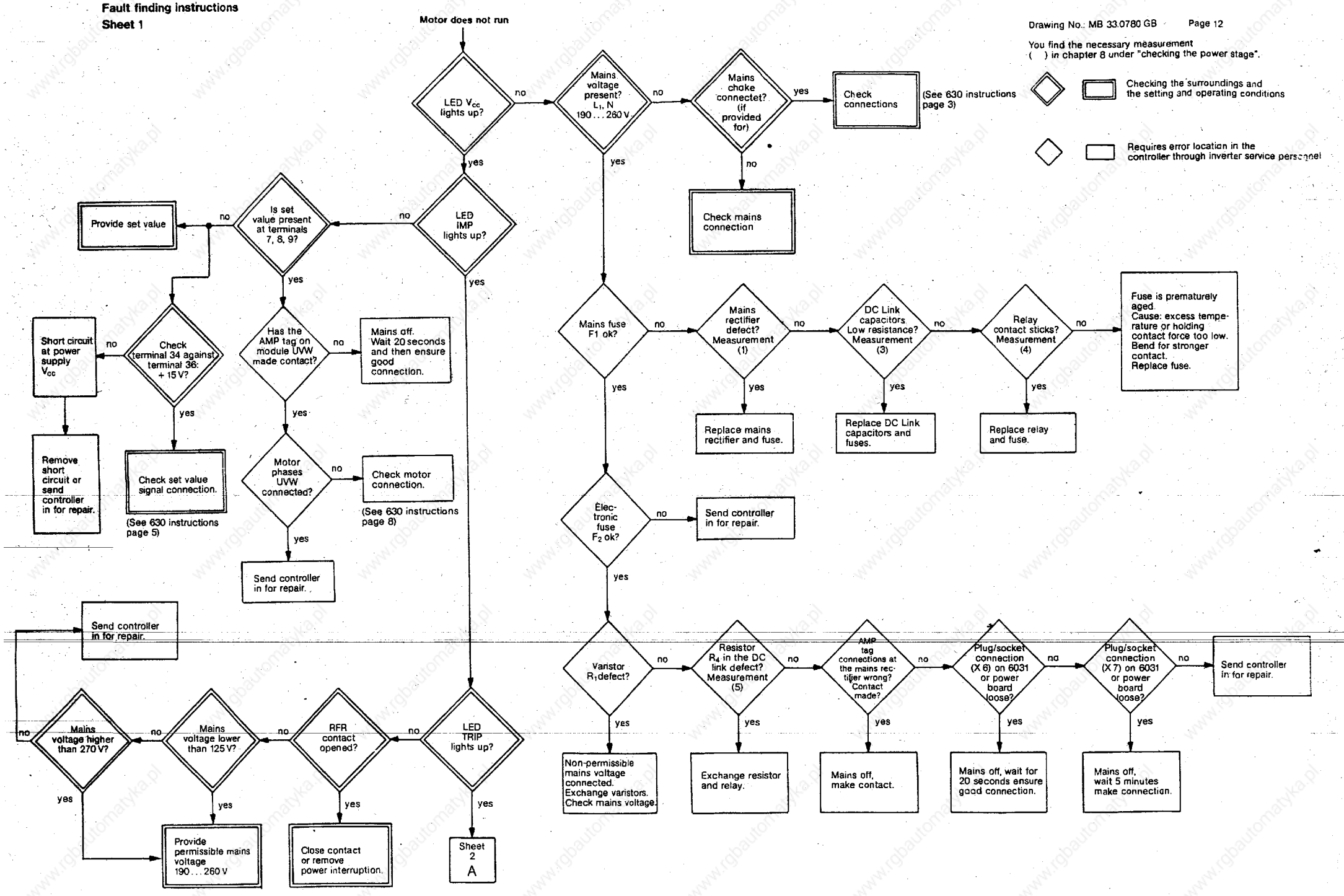
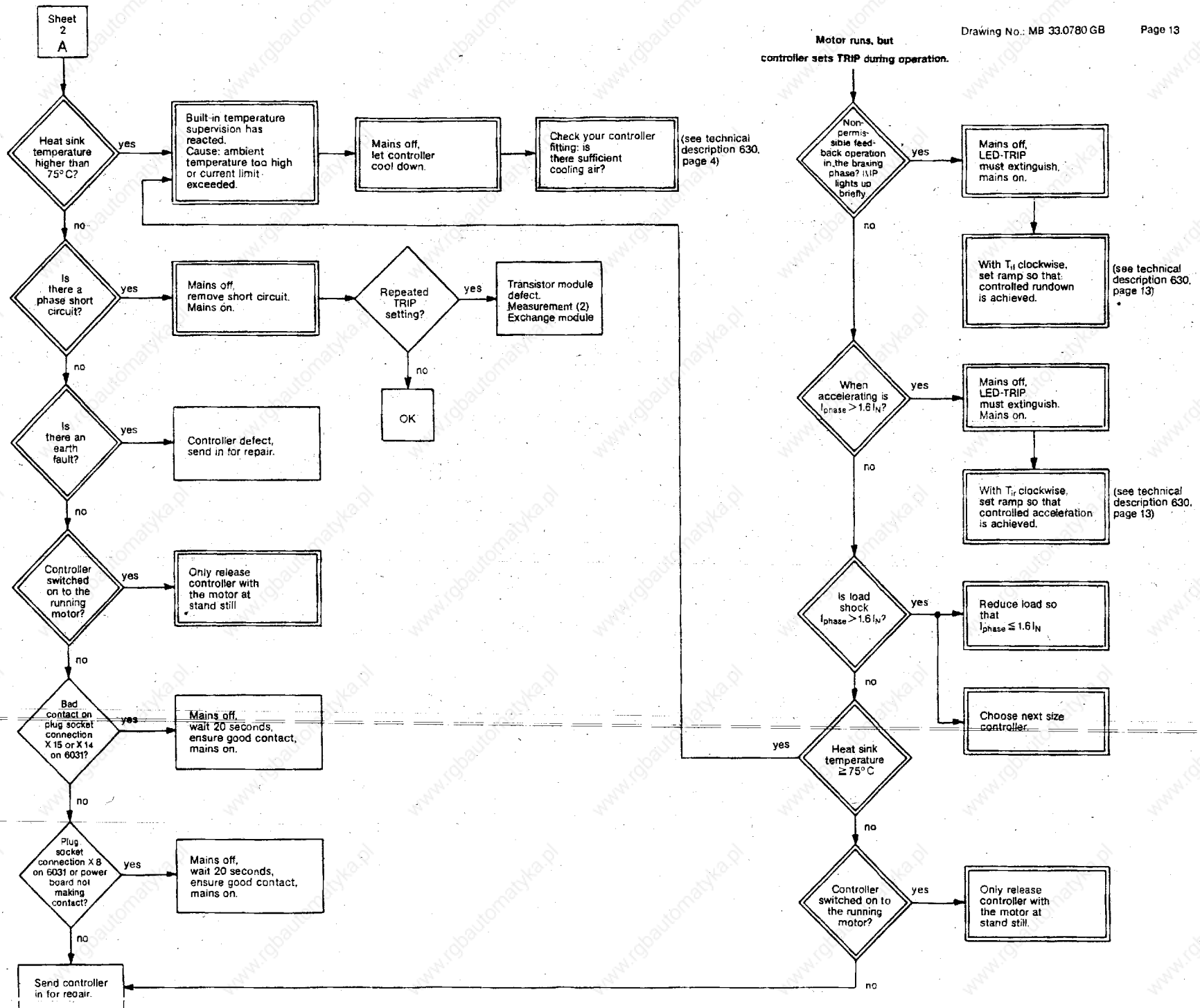
Fault finding instructions
Sheet 1

You find the necessary measurement ( ) in chapter 8 under "checking the power stage".

Checking the surroundings and the setting and operating conditions

Requires error location in the controller through inverter service personnel




Sheet 2 A
Heat sink temperature higher than 75° C?
yes
Built-in temperature supervision has reacted. Cause: ambient temperature too high or current limit exceeded.
Mains off, let controller cool down.
Check your controller fitting: is there sufficient cooling air?
(see technical description 630, page 4)
no
Is there a phase short circuit?
yes
Mains off, remove short circuit. Mains on.
Repeated TRIP setting?
yes
Transistor module defect. Measurement (2) Exchange module
no
OK
no
Is there an earth fault?
yes
Controller defect, send in for repair.
no
Controller switched on to the running motor?
yes
Only release controller with the motor at stand still
no
Bad contact on plug socket connection X 15 or X 14 on 6031?
yes
Mains off, wait 20 seconds, ensure good contact, mains on.
no
Plug socket connection X 8 on 6031 or power board not making contact?
yes
Mains off, wait 20 seconds, ensure good contact, mains on.
no
Send controller in for repair.
Motor runs, but controller sets TRIP during operation.
Non-permissible feed-back operation in the brasing phase? TRIP lights up briefly
yes
Mains off, LED-TRIP must extinguish, mains on.
With T_H clockwise, set ramp so that controlled rundown is achieved.
(see technical description 630, page 13)
no
When accelerating is $I_{phase} > 1.6\,I_N$?
yes
Mains off, LED-TRIP must extinguish. Mains on.
With T_r clockwise, set ramp so that controlled acceleration is achieved.
(see technical description 630, page 13)
no
Is load shock $I_{phase} > 1.6\,I_N$?
yes
Reduce load so that $I_{phase} \leq 1.6\,I_N$
Choose next size controller.
no
Heat sink temperature ≧ 75° C
yes
no
Controller switched on to the running motor?
yes
Only release controller with the motor at stand still.
no

8. Checking the power stage

The power stage was measured with an ohmmeter (analog multiple measuring instrument e.g. type Metavo 3 of Metrawatt) or with a digital multimeter (e.g. Fluke 77) when no voltage is applied at the controller).

Power supply cable and motor cable must be disconnected. The listed resistances stand for the nominal state. When they vary, there is a fault.

Operate digital multimeter in the measuring range ⊣▶| .

For the values marked with * the measuring instrument shows a small resistance at first, but then the stated final values are attained after a short time (approx. 1-2 s, depending on the measuring current.

+ and - refer to the two AMP plugs on the power board in the area of the DC link capacitors.

Caution: The positive pole of the internal accumulator of the used analog instrument is applied at the negative measuring terminal. Instruments of other manufacturers may be different (positive pole of the internal accumulator at the positive measuring terminal).

8. Measurement (1) Mains rectifier

positive connection of the ohmmeter at controller terminal	negative connection of the ohmmeter at controller terminal	displayed analog value	displayed voltage
L_1	+ AMP plug	R > 10 kΩ*	0.4-0.6V
N	+ AMP plug	R > 10 kΩ*	0.4-0.6V
+ AMP plug	L_1	R < 1 kΩ	OL
+ AMP plug	N	R < 1 kΩ	OL
- AMP plug	L_1	R > 10 kΩ*	0.4-0.6V
- AMP plug	N	R > 10 kΩ*	0.4-0.6V
L_1	- AMP plug	R < 1 kΩ	OL
N	- AMP plug	R → 1 kΩ	OL
L_1	PE	R → ∞	OL
N	PE	R → ∞	OL
PE	L_1	R → ∞	OL
PE	N	R → ∞	OL

8.2 Measurement (2) Inverter

positive connection of the ohmmeter at controller terminal	negative connection of the ohmmeter at controller terminal	displayed analog value	displayed voltage
U	+ AMP plug	R > 10 kΩ*	0.4-0.6V
V	+ AMP plug	R > 10 kΩ*	0.4-0.6V
W	+ AMP plug	R > 10 kΩ*	0.4-0.6V
+ AMP plug	U	R < 1 kΩ	OL
+ AMP plug	V	R < 1 kΩ	OL
+ AMP plug	W	R < 1 kΩ	OL
- AMP plug	U	R > 10 kΩ*	0.4-0.6V
- AMP plug	V	R > 10 kΩ*	0.4-0.6V
- AMP plug	W	R > 10 kΩ*	0.4-0.6V
U	-U AMP plug	R < 1 kΩ	OL
V	-U AMP plug	R < 1 kΩ	OL
W	-U AMP plug	R < 1 kΩ	OL
PE	U	R → ∞	OL
PE	V	R → ∞	OL
PE	W	R → ∞	OL
U	PE	R → ∞	OL
V	PE	R → ∞	OL
W	PE	R → ∞	OL

8.3 Measurement (3) DC link capacitors

positive connection of the ohmmeter at controller terminal	negative connection of the ohmmeter at controller terminal	displayed analog value	displayed voltage
+ AMP plug	- AMP plug	R < 1 kΩ*	0.6-1.2V
- AMP plug	+ AMP plug	R > 10 kΩ*	OL

8.4 Measurement (4) (5)
Relay, switch-on resistor

Operate digital multimeter in the Ω measuring range

positive connection of the ohmmeter at controller terminal	negative connection of the ohmmeter at controller terminal	displayed analog value	displayed digital value
- rectifier	- AMP plug	631, 632 } ≈4.5Ω 633, 634 } ≈7.5Ω	631, 632 } ≈4.5Ω 633, 634 } ≈7.5Ω

When the display shows 0Ω the relay contact sticks or the protective switch-on resistor R4 is of low resistance.

When the display shows ∞ or > 1 MΩ the protective switch-on resistor R4 is of high resistance.

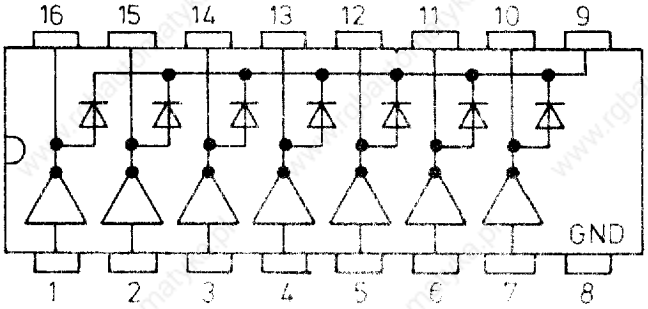
9. List of units, components, hybrids

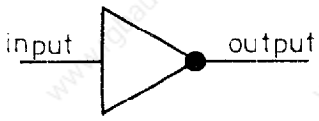
Integrated product	part.no	Description	Parts to be used 631	632	633	634	mother boards, mother units
631	326 442	frequency inverter 631					
632	326 443	frequency inverter 632					
633	326 444	frequency inverter 633					
634	326 445	frequency inverter 634					
6031	326 446	control board 631-634	1x	1x	1x	1x	631,632,633,634
6031A	326 447	power board for 631	1x				631
6032A	326 448	power board for 632		1x			632
6033A	326 449	power board for 633			1x		633
6034A	326 450	power board for 634				1x	634
6031BH	326 433	CW/CCW switching thick layer hybrid	1x	1x	1x	1x	6031
6031CH	326 435	I and U supervision thick layer hybrid	1x	1x	1x	1x	6031 6031
6011CH	326 431	switch mode power supply thick layer hybrid	1x	1x	1x	1x	6031A, 6032A 6033A, 6034A
7063BH	326 087	U controller thick layer hybrid	1x	1x	1x	1x	6031
70630H	326 089	sinus 1 thick layer hybrid	1x	1x	1x	1x	6031
7063EH	326 090	sinus 2 thick layer hybrid	1x	1x	1x	1x	6031
7063FH	326 091	sinus 3 thick layer hybrid	1x	1x	1x	1x	6031
Options							
6035A	326 624	PLC option	1x	1x	1x	1x	631,632,633,634
60310H	328 590	clamp hybrid	1x	1x	1x	1x	6031
6031C	328 935	clamp option	1x	1x	1x	1x	631,632,633,634
6030	328 894	hand held terminal for diagnosis	1x	1x	1x	1x	631,632,633,634
6030	328 897	current transformer	1x	1x	1x	1x	631,632,633,634

10. Fitted components

10.1 Analog integrated circuits

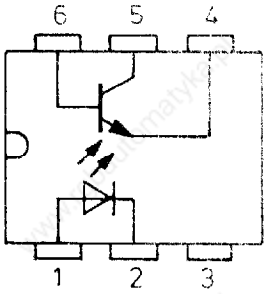
Darlington array
ULN 2004 part no. 321 044





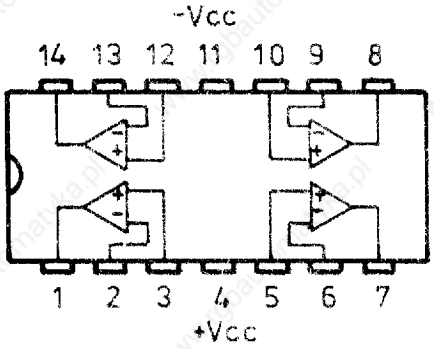
opto coupler part no. 324 517

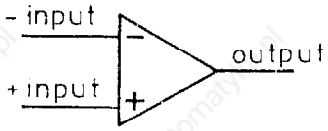
CNY17-III



x operational amplifier

LM 348 N part no. 307 900

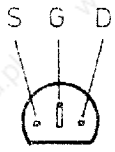


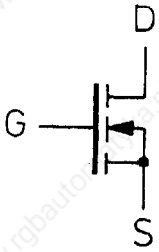


10.2 Discrete small power semiconductors

MOS-FET transistor n-channel

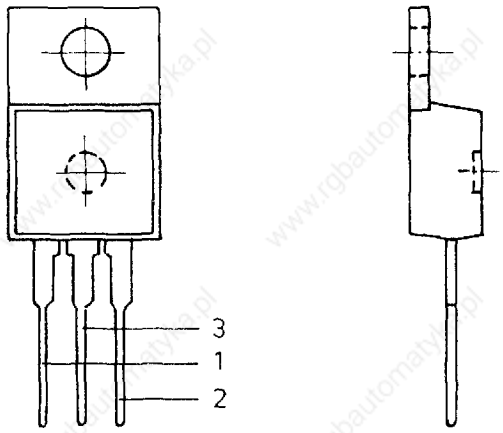
BS 170 part no. 321 940





Positive fixed voltage controller +15V
78 M 15 CKC

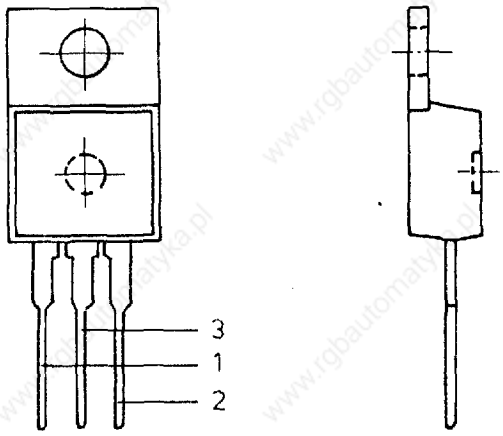
part no. 307 168



1 = input
2 = output
3 = GND

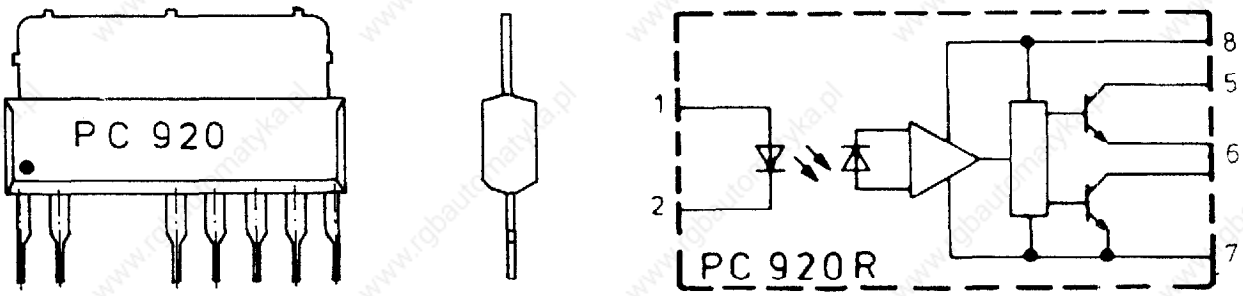
Negative fixed voltage controller -15V
79 M 15 AUC

part no. 307 899



1 = GND
2 = output
3 = input

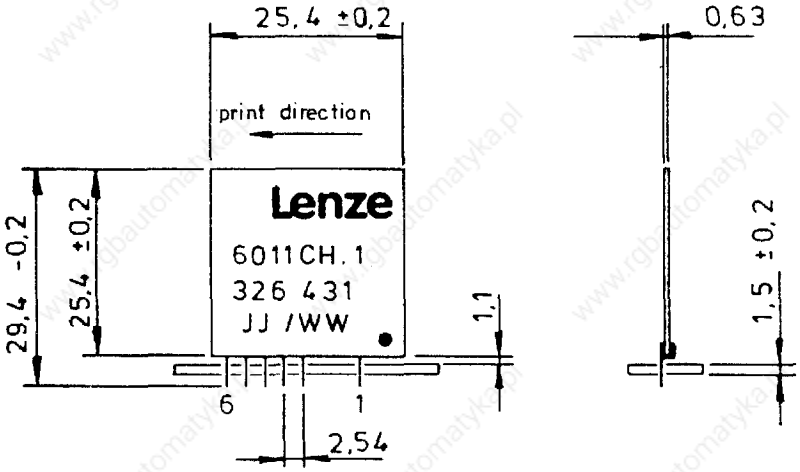
Driver components PC 920 part no. 326 412



10.3 Hybrids

Hybrid 6011CH switch mode power supply control

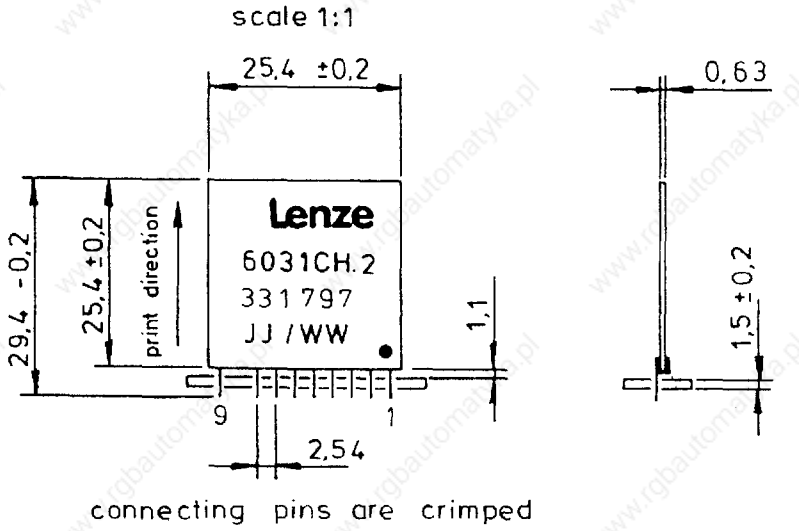
scale 1:1



connecting pins are crimped **part no. 326 431**

pin	
1	+ U_G (0-385V)
2	switch-on lock ⊥ — switch mode power supply on +0.7V — switch mode power supply off
3	basis of the switch mode power supply transistor 0,7 V / -1,4 V — 20 kHz ≤ f ≤ 30 kHz
4	GND1 DC link ground ⊥
5	control winding — U / -7,5 V
6	$-U_B$ = 7.5 V ± 2%

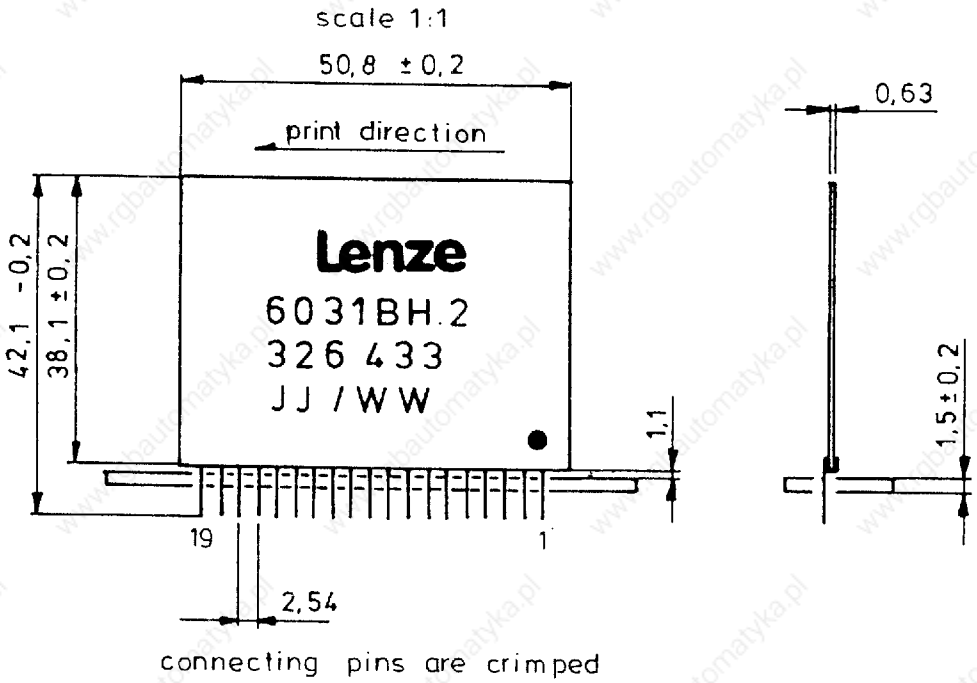
Hybrid 6031CH Supervision power stage



part no. 331 797

pin	
1	$+U_{B1}$ = +6.5V ± 5%
2	GND1 ⊥
3	$-U_{B1}$ = -7.5V ± 2%
4	U_Z, 8V at 310V DC
5	capacitor for mains switch-on time t_1 ≈ 350 ms
6	I_Z DC link current
7	GND1 ⊥
8	U_{Gmax}: -7.5V = OFF, +6.5V = ON
9	U_{Gmin}: -7.5V = OFF, +6.5V = ON

hybrid 6031BH supervision logic

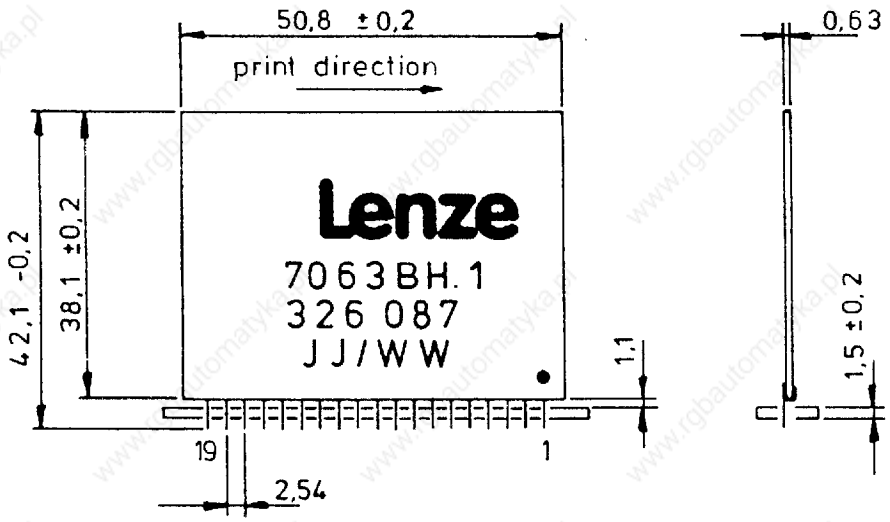


part no. 326 433

pin	
1	$+V_{cc2}$ = 15V ± 5%
2	GND2 ⊥
3	$-V_{cc2}$ = -15V ± 5%
4	f_{set}: 0 ÷ 11V
5	f_{set}: 0 ÷ 11V
6	RFR: L = 0V = ON, H = 15V = OFF
7	CW/CCW: CW = H = 15V, CCW = L =0V
8	set value decrease: 0V = active
9	CW/CCW: CW = H = 15V, CCW = L = 0V
10	Q_{min}: f < Q_{min} ≈ 13V, f > Q_{min} = 0V
11	RFR: L = 0V = ON, H = 15V = OFF
12	U_{Gmin}: L = 0V, H = 12V = OFF
13	U_{Gmax}: L = 0V, H = 12V = OFF
14	ϑ : L = 0V, H = 12V = OFF
15	capacitor for mains switch-on time t_2 ≈ 150ms
16	TRIP memory = 15V
17	TRIP indication: L = 0V = OFF, H = 15V = ON
18	IMP: L = 0V = OFF, H = 15V = ON
19	IMP: L = 0V = ON, H = 15V = OFF

hybrid 7063BH voltage controller

scale 1:1

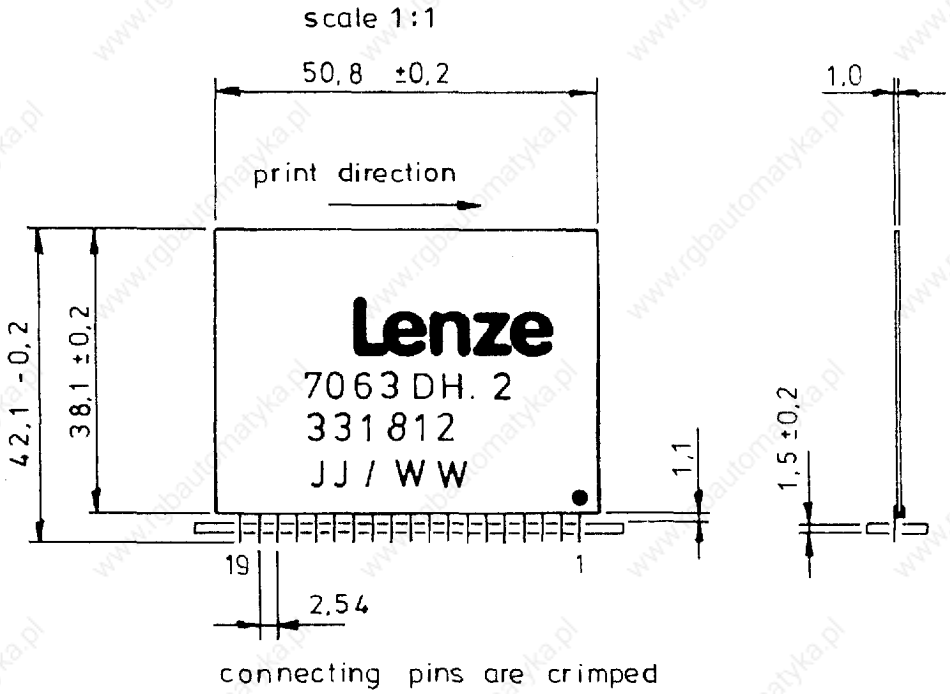


connecting pins are crimped

part no. 326 087

pin	
1	$+V_{cc2}$ = 15V ± 5%
2	GND2 ⊥
3	$-V_{cc2}$ = -15V ± 5%
4	$-U_{actual}$: 0 ÷ -7.5V
5	$-n_{nominal}$: 0 ÷ -11V
6	summation point: 0V
7	IMP: L = 0V = ON, H = 15V = OFF
8	$+n_{nominal}$: 0 ÷ 11V
9	IMP: -13V = OFF, +13V = ON
10	n.c.
11	U_{min}: 0 ÷ 0.8V
12	U_{min}: 0 ÷ 0.8V
13	n.c.
14	n.c.
15	$-V_{cc2}$ = -15V
16	n.c.
17	PI connection U controller
18	n.c.
19	$U_{nominal}$: 0 - 10V

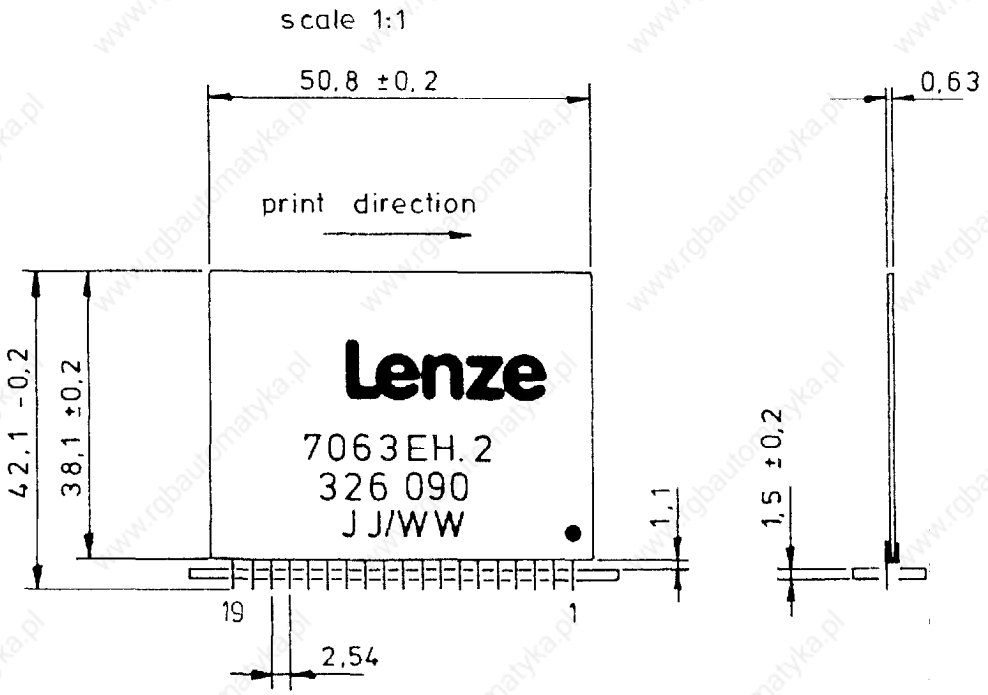
hybrid 7063DH sinus 1



part no. 331 812

pin	
1	$+V_{cc}$ = 15V ± 5%
2	GND2 ⊥
3	$-V_{cc}$ = -15V ± 5%
4	$+V_{cc}$ = 15V
5	96 fd 0 ÷ 10.5 kHz
6	96 fd 0 ÷ 10.5 kHz
7	phase T:
8	phase R:
9	phase S:
10	phase T:
11	phase S: } $\hat{U}$ 0 ÷ 10V ⊥
12	phase R:
13	6xfd: 0 ÷ 660 Hz
14	$-n_{nominal}$: 0 ÷ -11V
15	saw tooth: 96 fd ⊥ - 10V
16	0V
17	one shot: 96 fd ⊥ 10V
18	$U_{nominal}$: 0 ÷ 10V
19	1xfd: 0 ÷ 110 Hz

hybrid 7063EH.2 sinus 2

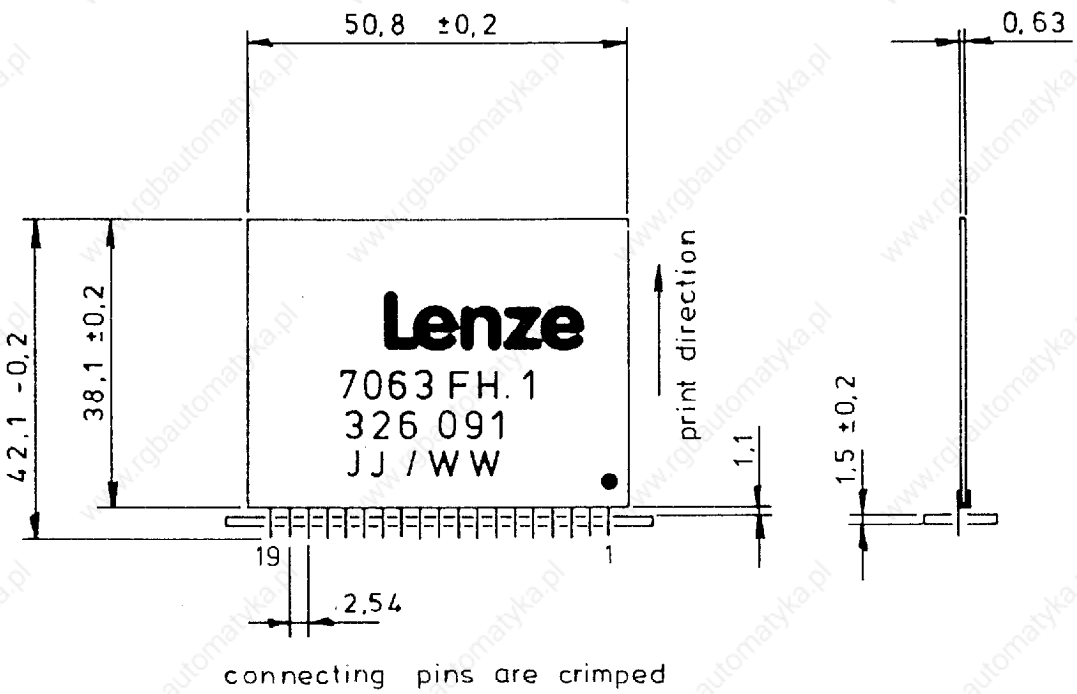


part no. 326 090

pin	
1	$+V_{CC}$ = 15V ± 5%
2	GND2 ⊥
3	$-V_{CC}$ = -15V ± 5%
4	square wave: 350 Hz ÷ 4 kHz, ± (2V÷8V) ⊥
5	0V
6	fch ≈ 350 Hz ÷ 4 kHz + 6,5 V / - 6,5 V ⊥
7	phase T:
8	phase R:
9	phase S:
10	phase T:
11	phase S: U 0 ÷ -10V ⊥
12	phase R:
13	fcmin: -1.95V
14	$+n_{nominal}$: 0 ÷ +5.5V
15	n.c.
16	fch: 350 Hz ÷ 4 kHz + 4,5 V / - 4,5 V ⊥
17	phase T:
18	phase S:
19	phase R:

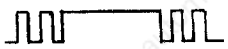
hybrid 7063FH sinus 3

scale 1:1



part no. 326 091

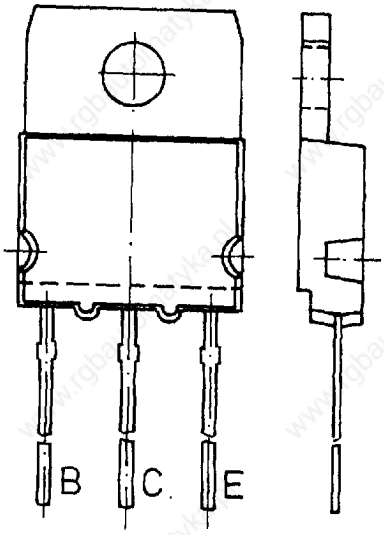
pin	
1	$+V_{CC}$ = 15V ± 5%
2	GND2 ⊥
3	$-V_{CC}$ = -15V ± 5%
4	$-V_{CC}$ = -15V
5	IMP: L = 0V = ON, H = 15V = OFF
6	IMP: L = 0V = ON, H = 15V = OFF
7	CW/CCW: CW = H = 15V, CCW = L = 0V
8	0V
9	n.c.
10	$-U_{actual}$: 0 ÷ -7.5V
11	phase V+
12	phase V-
13	phase U+
14	phase U-
15	phase W+
16	phase W-
17	phase T
18	phase S
19	phase R

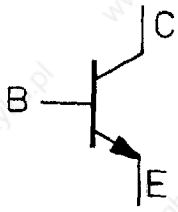


10.4 Power semiconductors

Switch mode power supply transistor S911T (BU908)

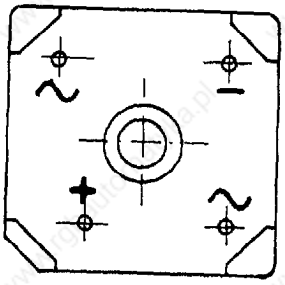
part no. 328 635

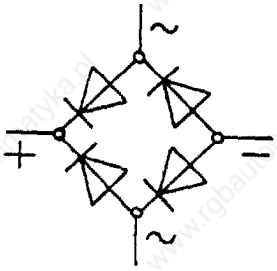




mains rectifier 36MB80A

part no. 308 302



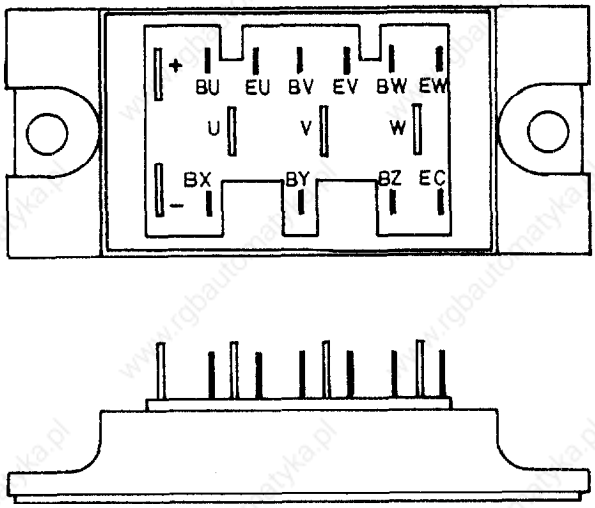


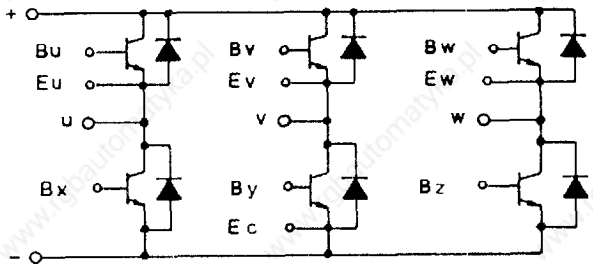
Transistor modules (only use modules according to Lenze specification with Lenze part no.)

Transistor module 631

Fuji 6DI15A-050

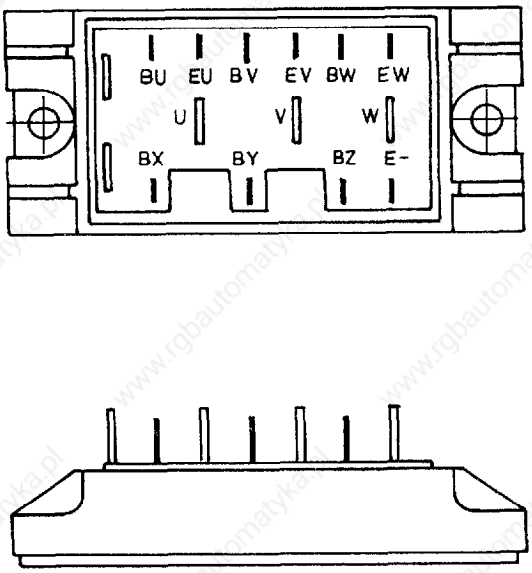
part no. 326 537

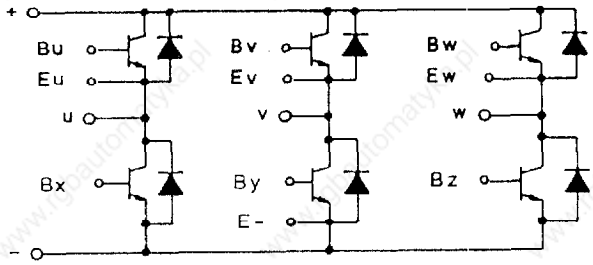




Toshiba: MG15G6EL1

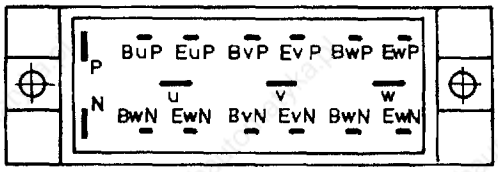
part no. 326 538

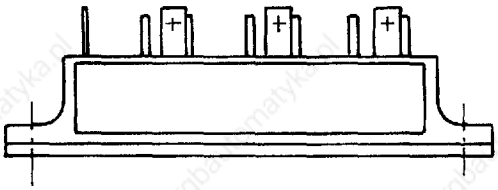


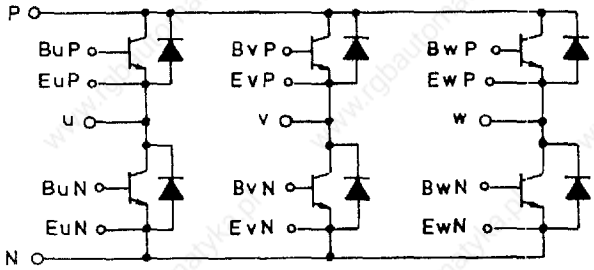


Mitsubishi: QM10TB-H

part no. 326 530



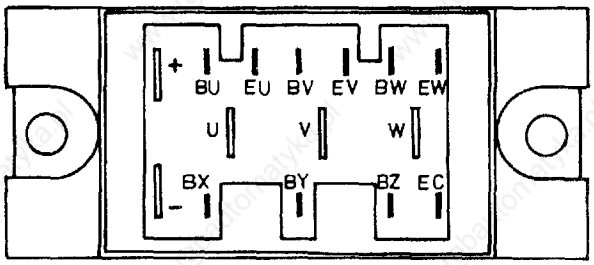


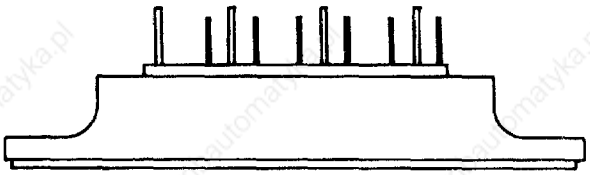


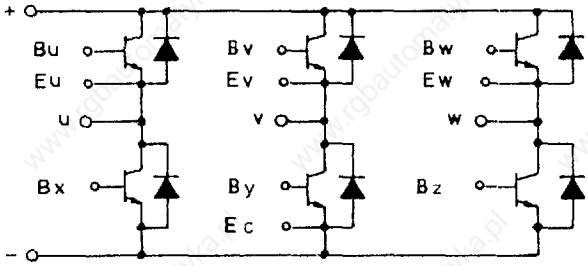
Transistor modules 632

Fuji 6DI15A-050

part no. 326 537

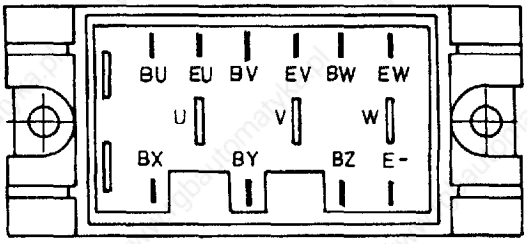


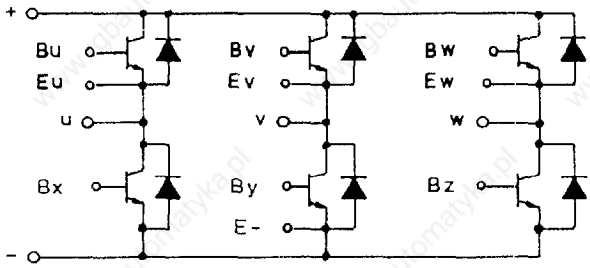


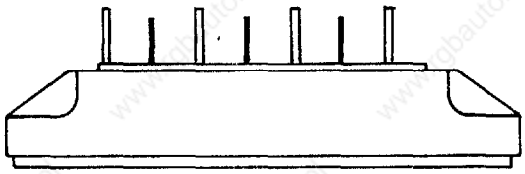


Toshiba: MG15G6EL1

part no. 326 538

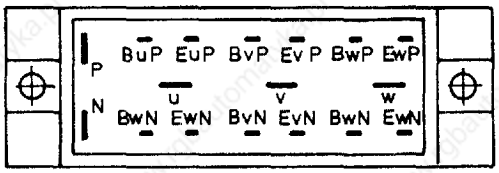


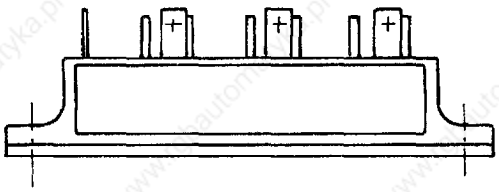


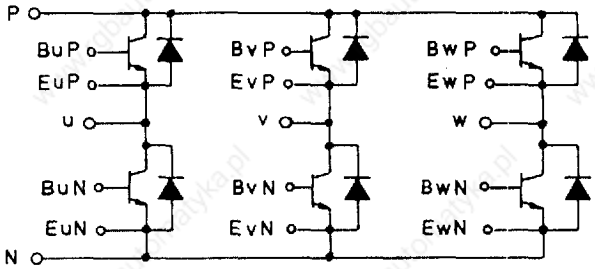


Mitsubishi: QM15TB-H

part no. 326 531



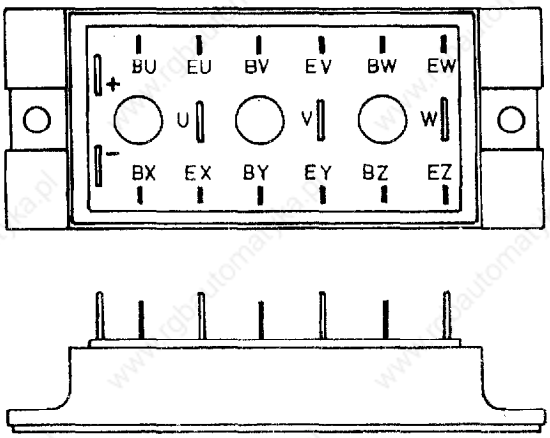


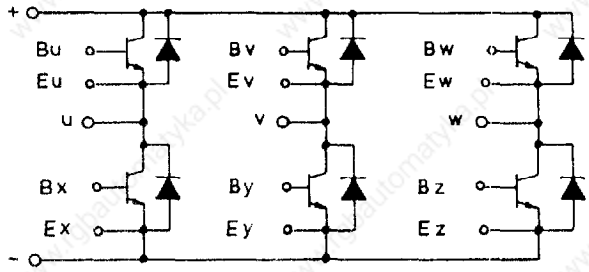


Transistor modules 633

Fuji: 6DI20B-050

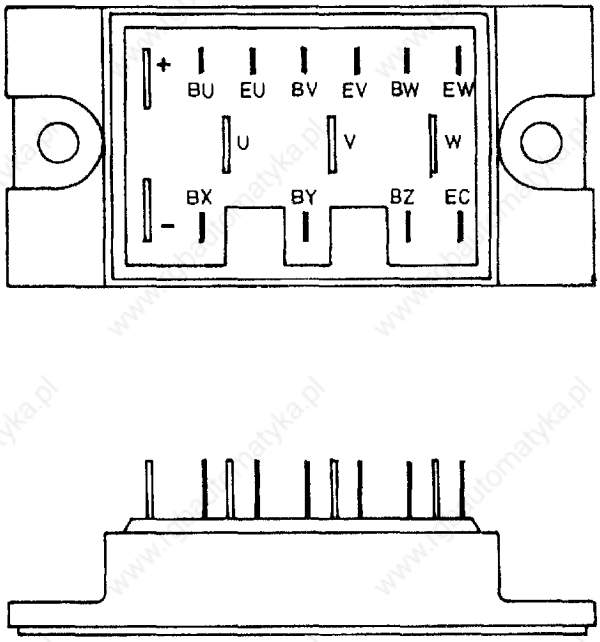
part no. 326 539

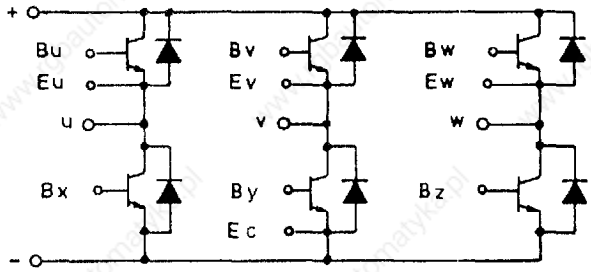




Fuji: 6DI20C-050

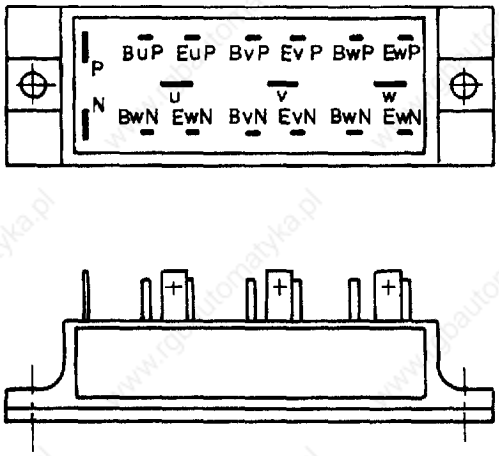
part no. 326 540





Transistor modules 633

Mitsubishi: QM20TB-H



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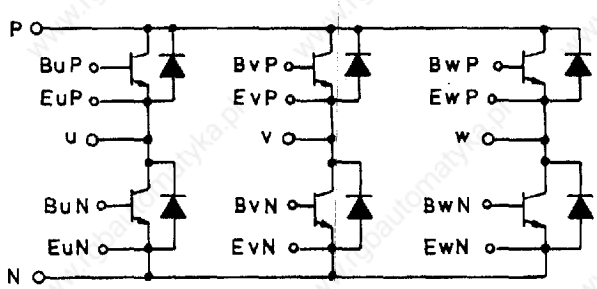
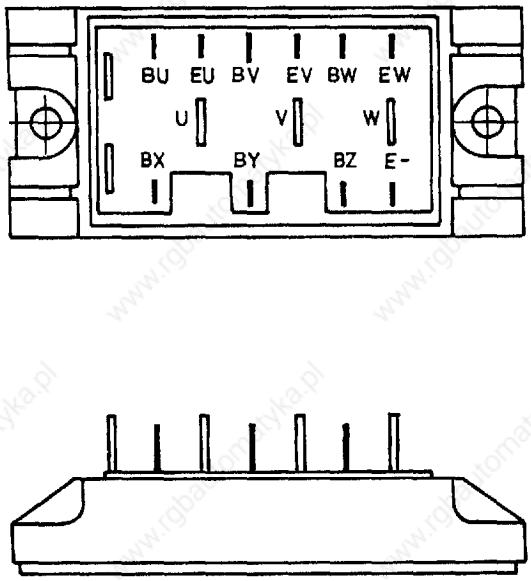


Toshiba: MG20G6EL1



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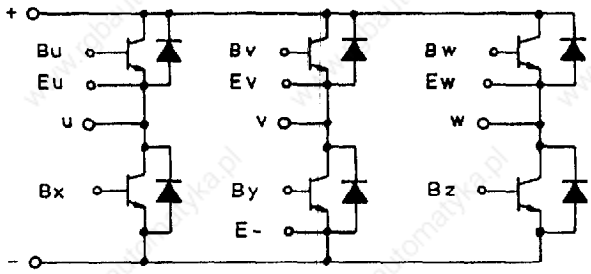
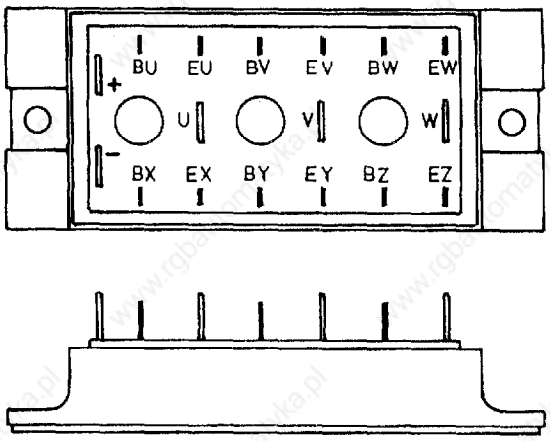
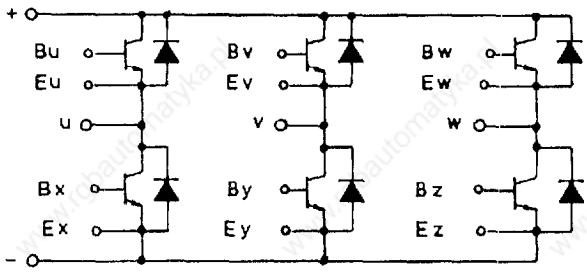


Transistor modules 634

Fuji: 6DI30B-050

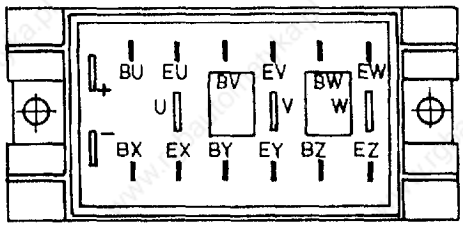
part no. 326 541

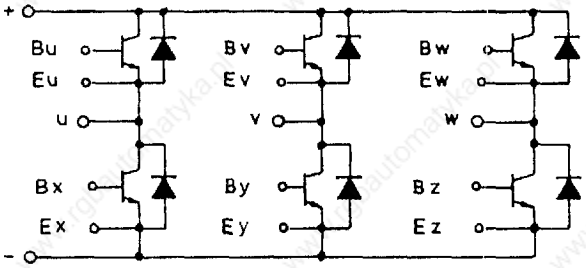


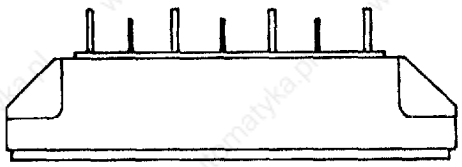


Toshiba: MG30G6EL2

part no. 326 534







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