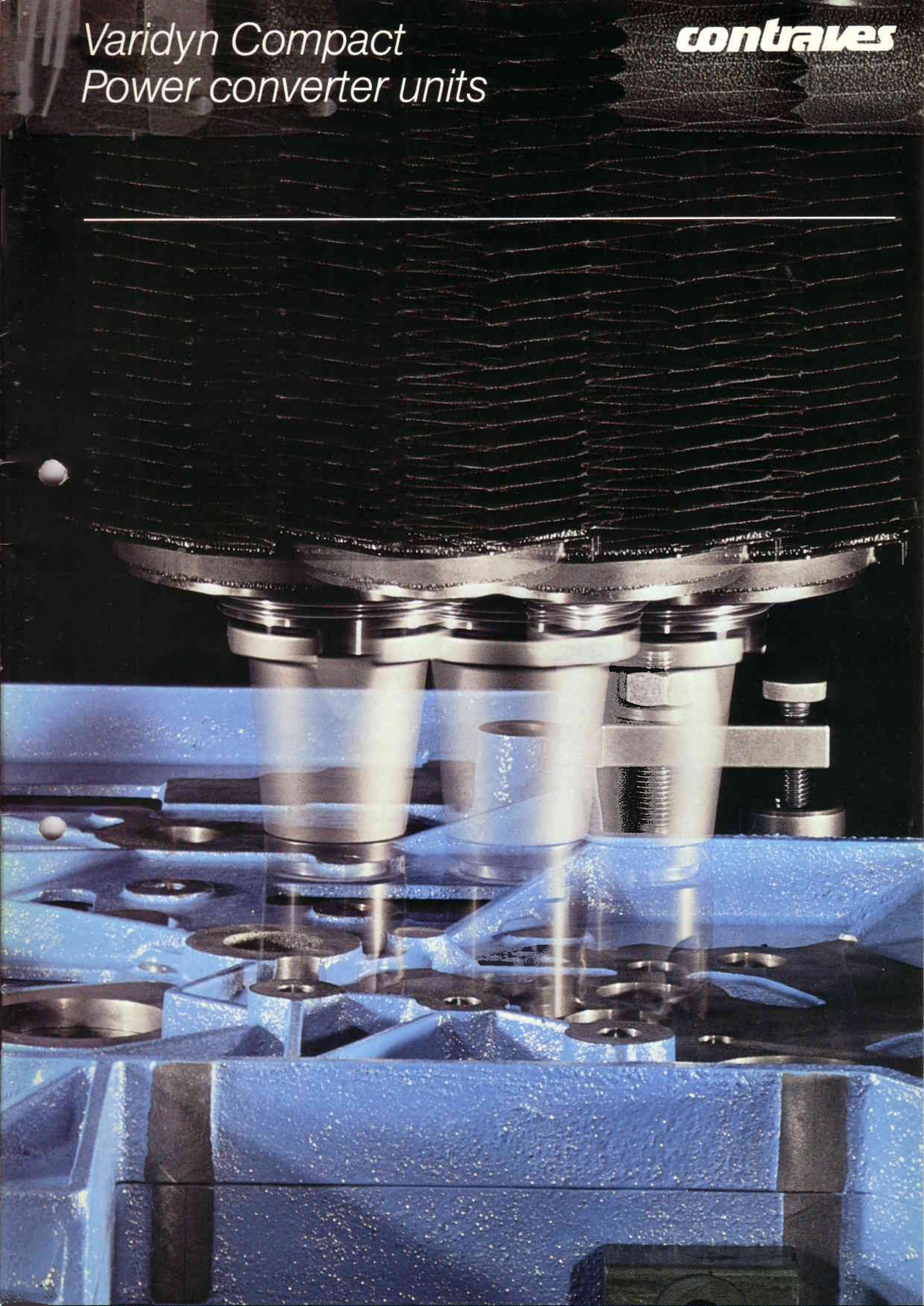


*Varidyn Compact
Power converter units*

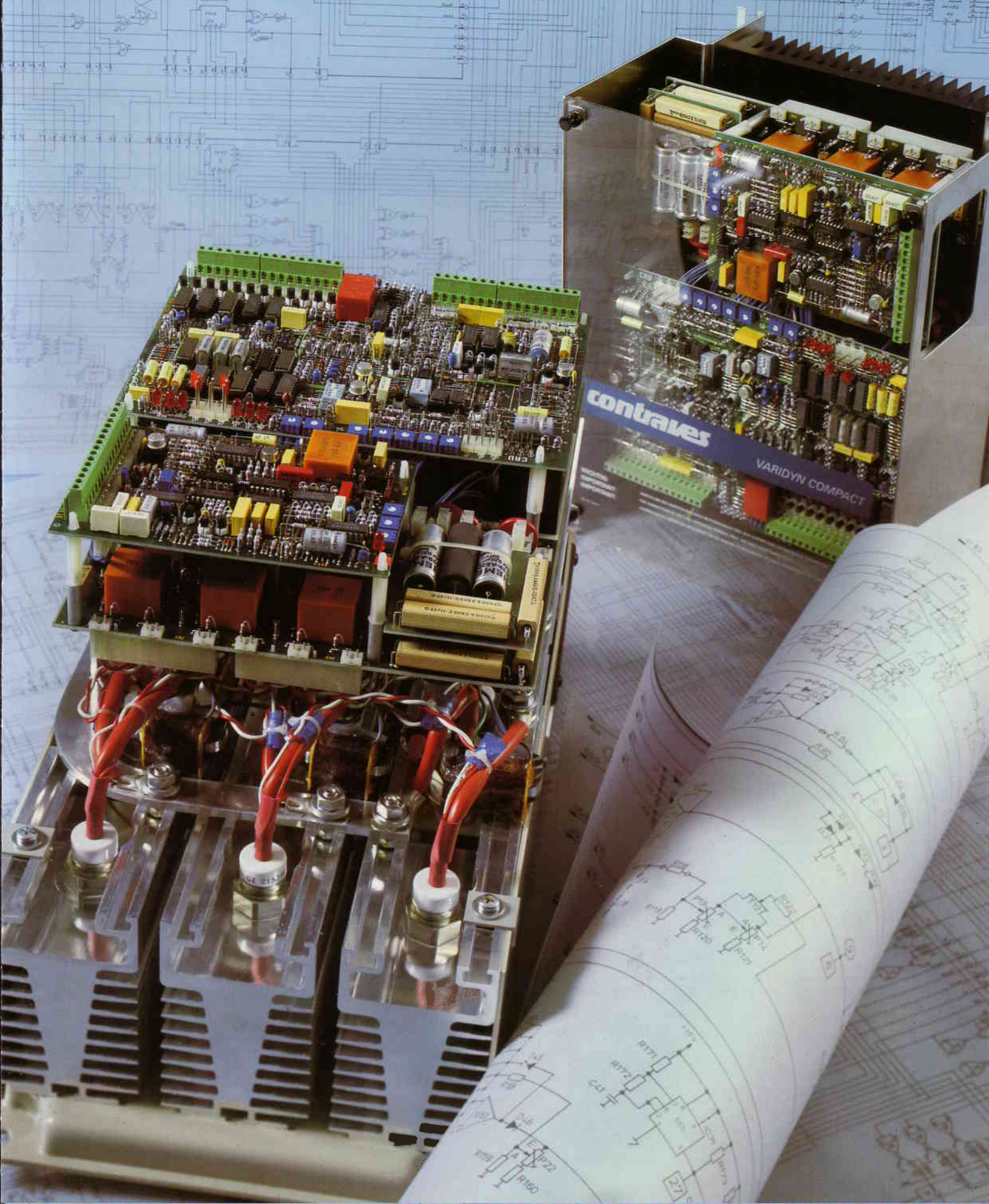
contraves



Varidyn Compact

contraives

3-Phasen-Stromrichter ADB für 4-Quadrant-Antrieb von 30 bis 1100 A



Introduction

With the Varidyn Compact static converters, the speed and armature current of DC motors with separate and permanent excitation can be controlled. The speed can be varied over a wide range, and the adjusted speed is held constant under load changes or supply voltage variations.

These converters are obtainable for single-phase supply up to about 10 kW and for 3-phase supply up to about 500 kW. In both power classes there are Varidyn Compact types for single and four-quadrant operation. With single-quadrant drives the armature current and hence the torque can act in one direction only, i.e. the motor can drive in only one sense of rotation, and cannot brake. Four-quadrant drives are able to drive and brake in both senses of rotation.

The four-quadrant drives of the Varidyn Compact series operate without circulating current. The two thyristor bridges are connected in an anti-parallel configuration having one Bridge firing. Reversing is achieved by logic circuitry, and for 3 phase bridges, the speed of operation matches systems using circulating current.

Design features include an inherent current loop which ensures good control throughout the speed range. Adjustable current limit facilities are included to utilise the maximum rating of the converters.

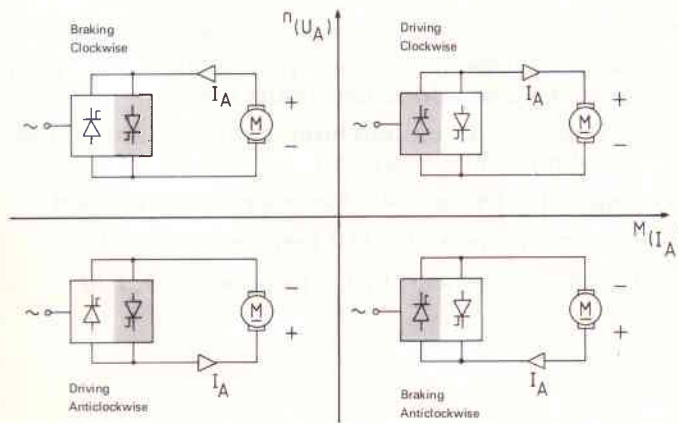
Except for the special feed drive controllers, all Varidyn Compact static converters are equipped with adjustable ramp references.

All three-phase converters have fully controlled three-phase bridges. The DC current pulsates at 6 times the supply frequency. This brings the following advantages:

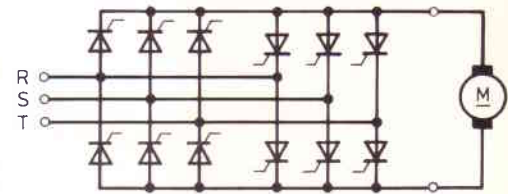
- lower thermal loading of the motor
- smoother running, therefore less stressing of the mechanical parts
- better form factor
- better control dynamics
- better commutation

With the Varidyn Compact series, special emphasis has been placed on high flexibility for adapting to the various applications, and on simple commissioning. The controllers are provided with additional circuits serving to indicate various operating states, thereby enhancing the reliability of complex systems.

Varidyn Compact static converters are put through the most stringent quality controls during manufacture. After artificial ageing in a hot room, the values of all electronic components and the functions of the individual circuits on the printed circuit boards are tested with an up-to-date computer-controlled testing facility. Maximum reliability is thus assured in these controllers.



**Three-phase static converters from 30 to 1100 A
without circulating current, for DC reversing drives**



Brief description

The speed controllers of the ADB type for the power range from 12 to approx. 500 kW with 380 V mains supply are operated with tacho feedback. Together with CONTRAVES motors, high-technology drives with outstanding dynamic characteristics are obtained.

Already the basic unit versions are equipped with additional functions which can be activated via

terminals, plugs or PCB switches (e.g. motor stalling monitor, regulator enabling with Hi instead of Lo, speed-dependent maximum current switchover, torque control with speed limitation etc.).

These units also feature wide control range, high control accuracy and high sensitivity. Moreover numerous possible interconnections and adaptations allow extremely versatile application.

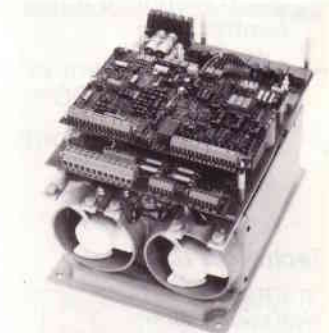
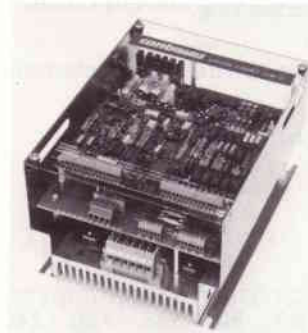
Layout

«Top mounting version»

The PCB with the control electronics is mounted on the power part. In addition there is space for fixing an optional PCB: E1 on units ≤ 90 A, E2 on units > 90 A, additional E1 on units > 240 A.

30 A

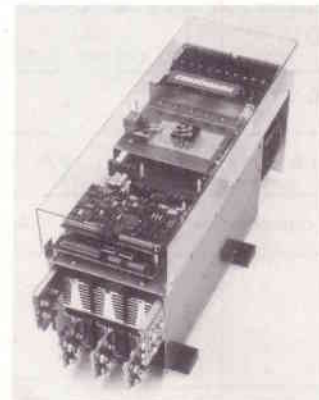
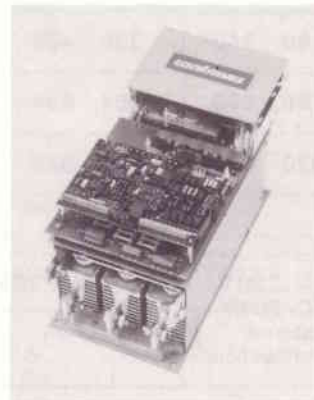
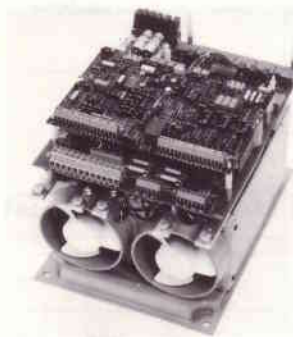
60/90 A
60 A without fans



145...240 A

375/500 A

700...1100 A



«Rack version»

If the regulating and control electronics comprise several PCBs (optional PCBs), these may be accommodated in a rack beside the power part.



Special features

- Any connecting sequence of supply phases
- 50/60 Hz preselection by PCB switch
- Isolated electronics
- Pulse band triggering
- Power supply spare capacity (+ 24 V/300 mA, ± 15 V/100 mA), for external circuits
- Short-circuit-proof control inputs
- Supplementary input to speed regulator (without ramp)
- Speed regulator available for PI or PID functions
- Short response times provided by inherent current control loop
- Maximum current externally controllable between about 15 and 100%
- Can be used as torque controller
- Additional operational amplifier with analogue and relay driver outputs (for use in either single ended or differential mode)
- Automatic disabling for overloaded and stalled motor (adjustable response time)
- Automatic disabling if a power phase fails
- Analog output signals available:
 - speed-proportional signal 0 to ± 8.5 V
 - actual current signal 0 to abt. ± 3.2 V
 - speed reference ramp 0 to ± 10 V
- Relay driver outputs for following signals:
 - ready to operate
 - operating
 - operating with limiting current (overload)
 - stopped

Technical data

Type current (A=)	30	60	90	145	180	240	375	500	700	950	1100	Nominal DC voltage*	
Nominal power (kW)	$V_{sup} = 380 V$	12	24	36	58	72	96	150	200	280	380	440	400 V =
	$V_{sup} = 415 V$	13	26	39	63	78	104	163	217	304	413	478	435 V =
	$V_{sup} = 440 V^{**}$	14	27	41	66	83	110	172	230	322	437	506	460 V =
	$V_{sup} = 460 V^{**}$	-	-	-	69	86	115	180	240	336	456	528	480 V =
	$V_{sup} = 500 V^{**}$	-	-	-	75	93	124	195	260	364	494	572	520 V =
Max. input current A~	26	52	77	125	154	206	320	430	600	820	950		
Available exciting current	4 A						20 A						
Fan	— —		1~, fed internally				1~, 220 V, 50/60 Hz external connection		3~, 380 V 50 Hz external connection				

* Valid with -10% supply voltage tolerance; with -15% choose $V_{sup} : V_{nom}^{dc} = 1 : 1$

** Supply voltage 440–500 V to order

Available exciting voltage	$0.9 \times V_{sup}$	Reference voltage (standard)	± 15 V
Mains supply frequency	50 or 60 Hz	Reference potentiometer	4.7–5 kOhm
Ambient temperature	0 to 45°C	Static control accuracy	< 1% n_{max}
Supply voltage tolerance	+ 10% / -15%	Control range with DC tachometer	> 1:1000

For unit dimensions see pages 26 to 28

The above data refer to installation at a maximum altitude of 1000 m above sea level.

Field controller unit FRU

Brief description

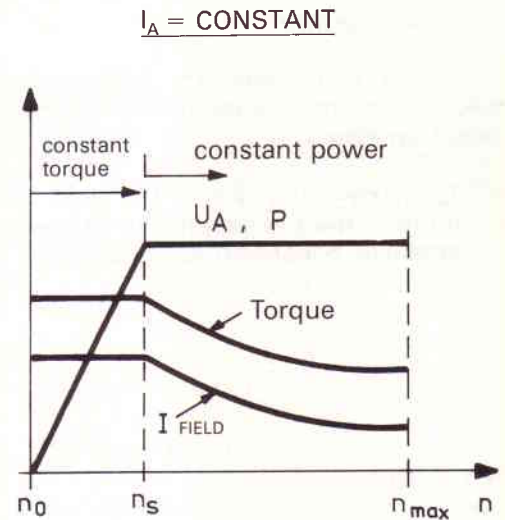
Euro PCB E2

FRU-100 with connecting terminals

FRU-101 with two 32-pin plugs and front plate

For DC drives with constant power over a given speed range (see diagram on right), standard ADB units are extended with a field control unit (optional board FRU). This allows savings on unit power and hence on the installation (connected load, copper cross section).

The field controller board FRU consists of the power part (single-phase thyristor bridge) and the control and regulating electronics.



Special features

- Internal acceleration control corrects the acceleration and deceleration of the drive optimally according to the available power and the load torque.
- Automatic compensation of the speed control gain drop due to diminishing torque constant with weakened field - hence better speed control behaviour.

- Information "speed attained" at relay driver output.
- Field current monitoring with LED display and relay driver output.
- Protection against overvoltage peaks on AC and DC sides of the power section.

Variant FRU-102 and 103

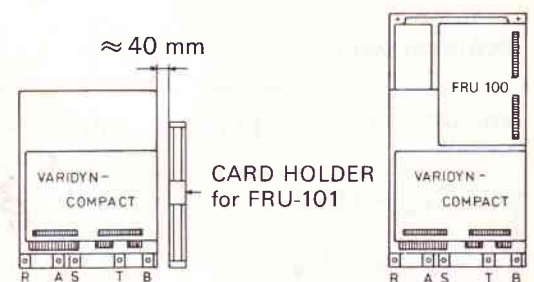
- With additional tacho failure monitoring.

Technical data of the field controllers

I_{nom} speed regulator	≤ 240 A	> 240 A
Max. output current	10 A	20 A*
recommended field voltage	270 V = with 415 V supply	
Fuses required	super rapid max. 16 A	super rapid max. 32 A

* Special variant with separate thyristor bridge

The above data refer to a installation at a maximum altitude of 1000 m above sea level.



FRU board:
Unit < 145 A

Unit ≥ 145 A

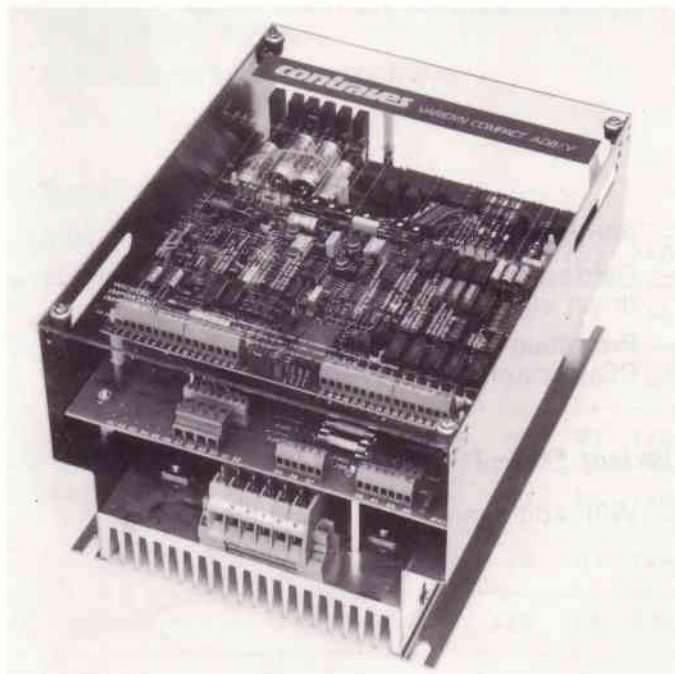
Brief description

The feed controllers are ADB units with control electronics incorporating the following two additional functions:

- To make better use of the feed motor the maximum current is adapted to its commutation characteristic according to the speed.

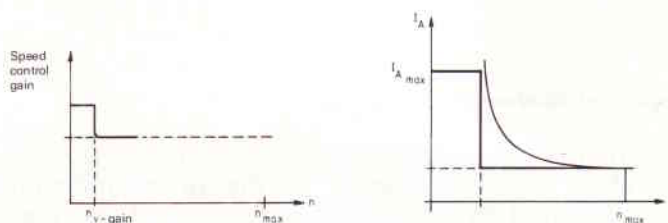
- The speed control gain is increased automatically at low speeds. A better speed gain factor is obtained in this way, with commensurately improved positioning behaviour.

30...60 A



The following two variants are available:

a) Standard version



b) Variant with optional board ASU



Technical data

Type disconnect current	(A=)	30	45	60	90	145	Mains supply needed
Nominal power kW	$V_{dc} = 115\text{ V}$	3.4	5.2	6.9	10.3	16.7	115 V
	$V_{dc} = 150\text{ V}$	4.5	6.7	9.0	13.5	21.7	150 V
	$V_{dc} = 190\text{ V}$	5.7	8.5	11.4	17.1	27.5	190 V

Short-time current = $2 \times I_{nom}$

Other technical data for ADB

Supply and armature fuses

(nominal ratings in A)

Make/Type	Feed controllers								Standard controllers** 30 to 240 A (380 to 440 V mains supply voltage)											
	ADB/V		ADB/V		ADB/V		ADB/V		ADB.VDB		ADB.VDB		ADB.VDB		ADB.VDB					
	190.30M	190.30M	190.60M	190.60M	190.90	190.90	190.145	190.145	380.30M	380.30M	380.60	380.60	380.90	380.90	380.145	380.145	380.180	380.180	380.240	380.240
N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	
Siba UR ... 500 V			80	80	80	100	125	160			63	63	80	100	125	160	160	200	200	250
Ferraz URE/URF 600 V	40	40	80	80	80	100			32	40	63	63	80	100						
Ferraz URG 600 V					80	100	125	160					80	100	125	160	160	200	200	250
Siemens Siziled 500 V	35	35	80	80	80	100	125	160	35	35	63	63	80	100	125	160				
Knudsen Typ 170 E 660 V					80	100	125	160					80	100	125	160	160	200	200	250
Jean Müller NH 500 V					80	100	125	160			63	63	80	100	125	160	160	200	200	250
Semikron	40	40							40	40										

N = Mains supply / A = armature (ADB only)

Ratings in A

** 415 V for U.K. companies

Standard controller 375 to 1100 A

(nominal ratings in A)

Make/Type		ADB, VDB 375 A	ADB, VDB 500 A	ADB, VDB 700 A	ADB, VDB 950 A	ADB, VDB 1100 A
Supply	Ferraz URG 600 V	315	450	630	800	1000
	Ferraz URH 500 V	350	—	700	—	—
	Ferraz URN 600 V	—	—	—	900	1000
Arma- ture	Ferraz SRC 600 V	400	500	2×400 parallel	2×500 parallel	2×600 parallel

Valid for mains supply voltages 380–500 V or armature voltages 400–520 V

* for ADB only