

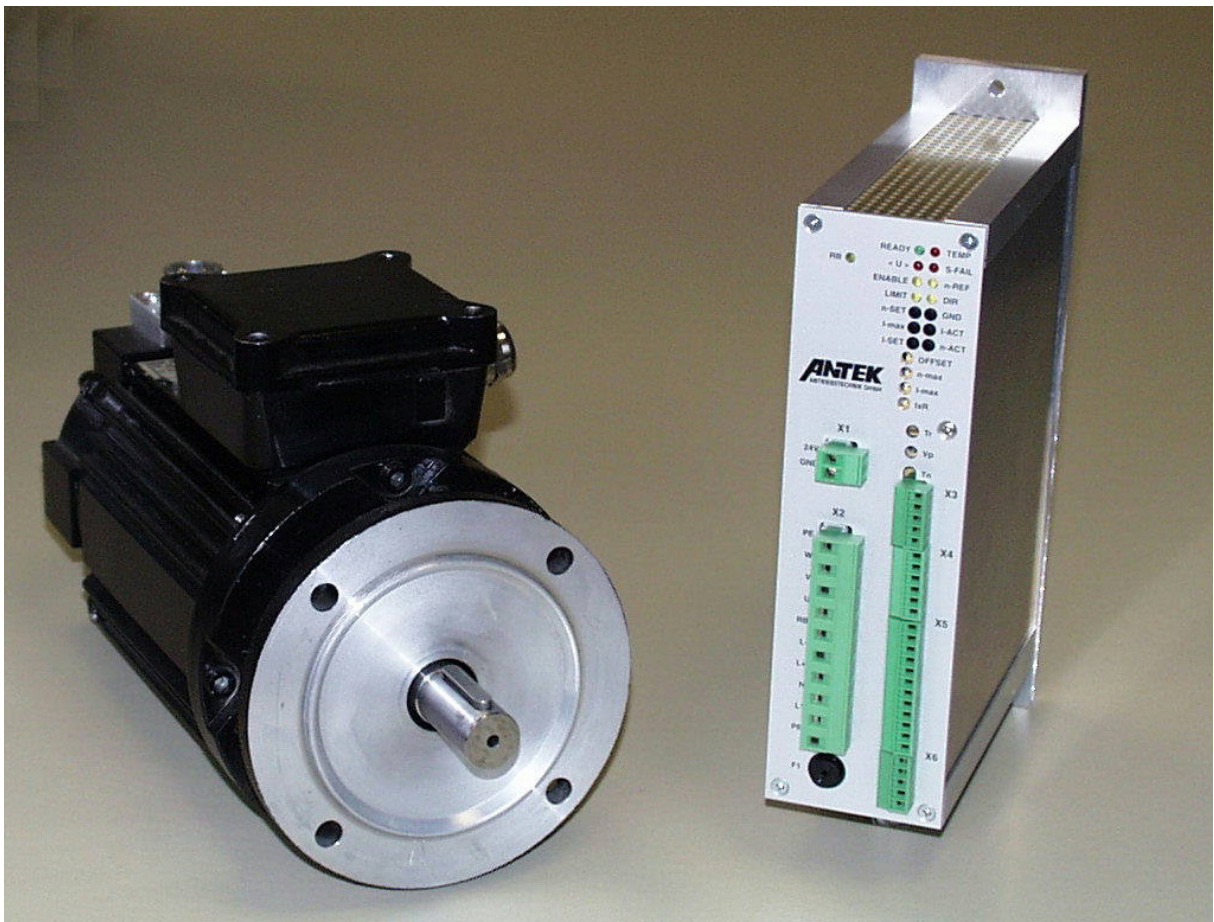
# Technical Documentation

for

4Q- Drive regulator

## ECE10CM-xx and DC10CM-xx

for permanent-excited Three-phase Synchronous Motors resp.  
permanent-excited Direct-current motors up to 1,4 kVA



Technical Documentation	4Q- Drive regulator ECE10CM and DC10CM
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errors and revisions are reserved

The text at hand is a translation which, before use, is to be examined by a professional engineer of the company using it for its technical accuracy and agreement.

## 1. General Information

### 1.1 Manufacturer

ANTEK GmbH  
Im Köchersgrund 1  
71717 Beilstein

 +49 7062 94060  
 +49 7062 940620  
 info@antek-online.de  
 www.antek-online.de

### 1.2 Shipping Contents

The following are shipped with the unit:

- ◆ 1 Drive Regulator ECE10CM-xx resp. DC10CM-xx
- ◆ 1 Operating Manual
- ◆ all necessary connectors

Upon receipt, examine the contents for completeness. The manufacturer, ANTEK – Antriebstechnik GmbH, assumes no liability for later shortage claims.

### 1.3 Universal Small Converter

The Universal Small Converter (UNIKUM) is a 4 quadrant drive control. It is specifically designed to fulfil the demands of quiet running and dynamics. The converter is built for direct connection to the 230 V~ mains. The intermediate circuit voltage connections are to plug-in terminals and there can be a free exchange of energy with several converters in interconnected operation.

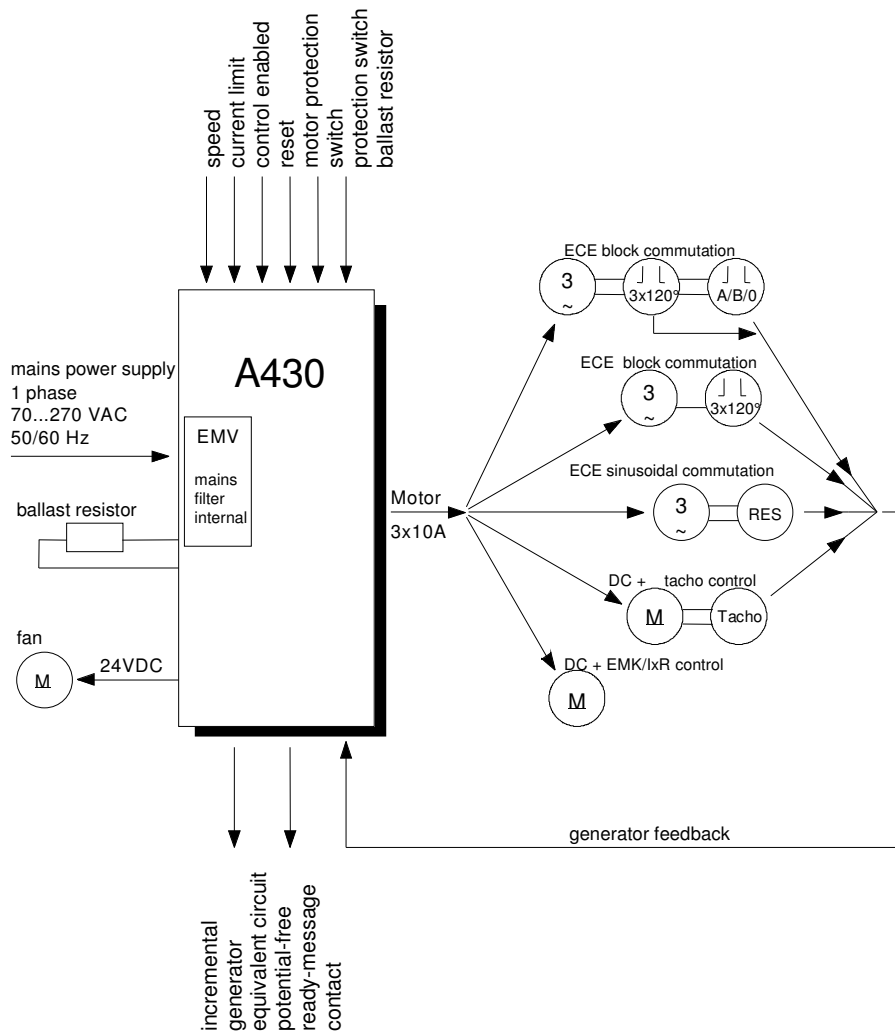
The converter can be adapted to different types of motors by using different component variants. The details on the rating plate will vary depending on the component variant of the converter:

- ◆ ECE10CM-xx      Converter for permanently excited three-phase synchronous motors
- ◆ DC10CM-xx      Converter for permanently excited DC motors

Thanks to a large variety of feedback systems it is possible to produce the optimum design of converter with regard to control accuracy and using the necessary technical expertise to solve the problems of a variable-speed drive.

### 1.3.1 Short description

- ◆ Power range: 1.4 kVA
  - ◆ Wide-area voltage input
  - ◆ 4Q drive control
  - ◆ Compliance with existing EMC Standard to EN 50011-A without additional external filters
  - ◆ All internal auxiliary voltages are generated from the intermediate circuit
  - ◆ Integrated ballast circuit
  - ◆ Integrated intermediate charging circuit
  - ◆ Provision of an external fan voltage supply
  - ◆ Different drive controls and motor types can be selected using component variants
- Single axle in slim compact design



### 1.3.2 Recommended Utilisation

- ◆ The Series ECE10CM & DC10CM converters are electrical operating equipment for use in power plants.
- ◆ The Series ECE10CM & DC10CM converters are electronic drive controls for the control and regulation of variable-speed
  - permanently excited three-phase synchronous motors
  - permanently excited DC motors
- ◆ The drive regulator ECE10CM und DC10CM are electrical devices for use in industrial systems. The drive is intended for installation in switching cupboards or cabinets for drive systems. Voltage-converters meet the EG safety standards for low-voltage.
- ◆ Drive systems incorporating the regulator ECE10CM resp. DC10CM, comply with EG-standards for EMI when installed per the directives for CE-typical drive systems.
- ◆ The CE-typical drive systems with these voltage changers are intended for
  - operation on public and non-public networks.
  - use in the industrial area as well as in residential and business areas.
- ◆ CE-typical drive systems are not compatible with IT-networks (networks without reference to earth-ground) due to the earth-ground reference of the radio-interference filter.
- ◆ The converters may not be operated on networks with a grounded phase.
- ◆ The converters are not household devices, they are intended for the construction of drive systems for commercial use.
- ◆ The converters are not machines according to the EG-directives for machines.

The converter is only to be operated under the operating conditions stated in this operation manual. Before installing the device, read this manual from beginning to end and follow the directions stated herein:  
Store this manual near the converter for future reference.

### 1.3.3 Disclaimer

#### Liability

The information, data and instructions stated in this operating manual were up-to-date as of the date of print. No claims can be made against previously delivered converters based upon statements, illustrations/photos or descriptions contained in this operating manual.

The process-specific instructions and circuit extracts contained in this manual are recommendations. Their applicability for the task at hand must first be verified. The firm ANTEK – Antriebstechnik GmbH assumes no liability for the suitability of the described processes and circuit suggestions contained herein.

No liability will be assumed for damages or malfunctions caused by:

- ◆ disregard of this operating manual
- ◆ unauthorized modifications made to the converter
- ◆ operator errors
- ◆ improper working on and with the converter

### **Guarantee**

Guarantee claims are to be made to the manufacturer as soon as a fault / defect is discovered. The guarantee will be voided by:

- ◆ improper use of the converter
- ◆ improper working on and with the converter

### **1.3.4 Definitions**

#### **Qualified Personnel**

Qualified personnel are persons who, due to their training, experience and instructions, as well as their knowledge of relevant standards and directives, safety-regulations, company policies, and entitled by those responsible for the safety of the system, are justified to carry out necessary tasks and recognize and avoid possible dangers.

(Definition for qualified employees per IEC 364)

#### **Operator**

An operator is any natural person or legal entity who operates the regulator, or in whose name the converter is operated.

#### **Drive regulator**

The term drive regulator will be used in the following to describe the regulator ECE10CM bzw. DC10CM



## 2. Safety

### 2.1 General Safety Information

The drive regulator was state-of-the-art at the time of delivery and is considered principally safe to operate. The drive regulator may present certain dangers to personnel, the drive regulator or other assets of the operator when

- ◆ non-qualified personnel work on or with the drive regulator,
- ◆ Operation of the regulator in other mountings or connections, other than described in this manual.

Then exists danger for:

- ◆ Persons
- ◆ The drive regulator
- ◆ Other real value of the operator

The drive regulator must be considered in the planning to ensure that the devices safely fulfill their intended purpose when correctly installed and operated. This also applies in combination with the complete system.

Take precautions to ensure that no damage may occur in the event of a malfunction of the drive regulator through the use of:

- ◆ additional devices to override the function of the regulator
- ◆ electrical or mechanical safety devices
- ◆ complete system measures

Ensure that no material damages may occur in the event of a regulator fault by implementing the proper safety measures.

### 2.2 Operating Manual

This operating manual contains safety instructions for correct operation on and of the drive regulator, they are to be followed.

In addition to the general safety instructions contained in this chapter, the instructions contained in the manual text must also be followed.

No claim is made that the safety instructions are complete. Please contact the manufacturer in the event of questions or problems.

This manual must be available to all persons who work on or with the drive regulator and must remain in good, readable condition.

## 2.3 Operator Responsibilities

Responsibilities of the operator or safety officer:

- ◆ to ensure adherence to all relevant directives, instructions and laws,
- ◆ to ensure that only qualified personnel operate on or with the drive regulator,
- ◆ to ensure that the operating manual is available to all personnel.

## 2.4 Personnel

Only qualified personnel may work on or with the regulator.

## 2.5 Drive Regulator

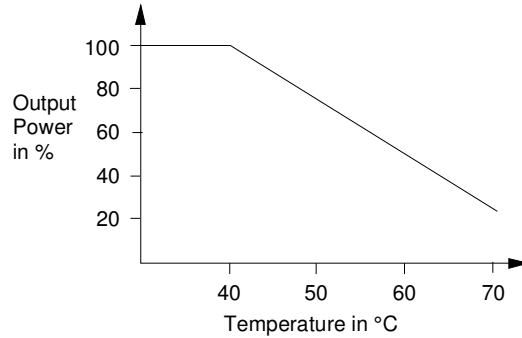
Only operate the drive regulator in faultless condition. The authorized operating conditions and power limits are to be adhered to.

Retrofitting, modification or conversion of the drive regulator is prohibited. Any of these must first be discussed with the manufacturer. The drive regulator is a device for use in industrial, high-voltage systems. All covers must be in place during operation to prevent the possibility of electrical shock.

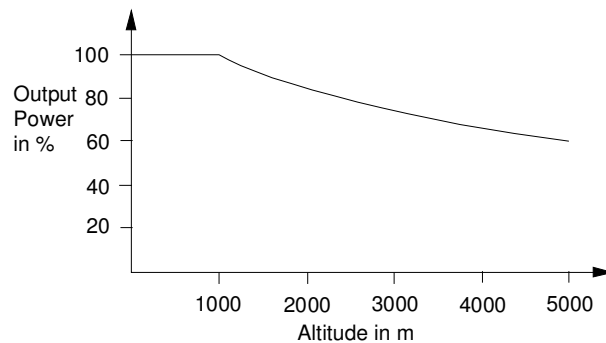
### 3. Technical Data

#### 3.1 General Data / Operating Conditions

Temperature range: 0°C ... +40°C without power-loss  
40°C ... +70°C with power-loss



Altitude tolerance: under 1000m without power-loss



over 1000m with power-loss

Humidity tolerance: Humidity class F without condensation  
(average relative humidity 85%)

Degree of soiling: VDE 0110 Part 2 level 2

Interference emission: EN 50081-2, EN 50082-1 requirements  
Class B limits per EN 55011 (residential)

Interference immunity: Meets standards without mains filter.  
Requirements per EN 50082-2

<i>Requirement</i>	<i>Norm</i>	<i>Intensity</i>
Burst	EN 61000-4-4	4kV
ESD	EN 61000-4-2	Enclosure 8KV Connectors 4kV
Voltage drops	EN 61000-4-11	
High frequency	EN 50141	10V/m
Voltage surge	EN 61000-4-5	Class 1

Insulation: Over-voltage category II per VDE 0100

Protection class: IP 00

Mounting position: vertical

### 3.2 ECE10CM, DC10CM Rating Data

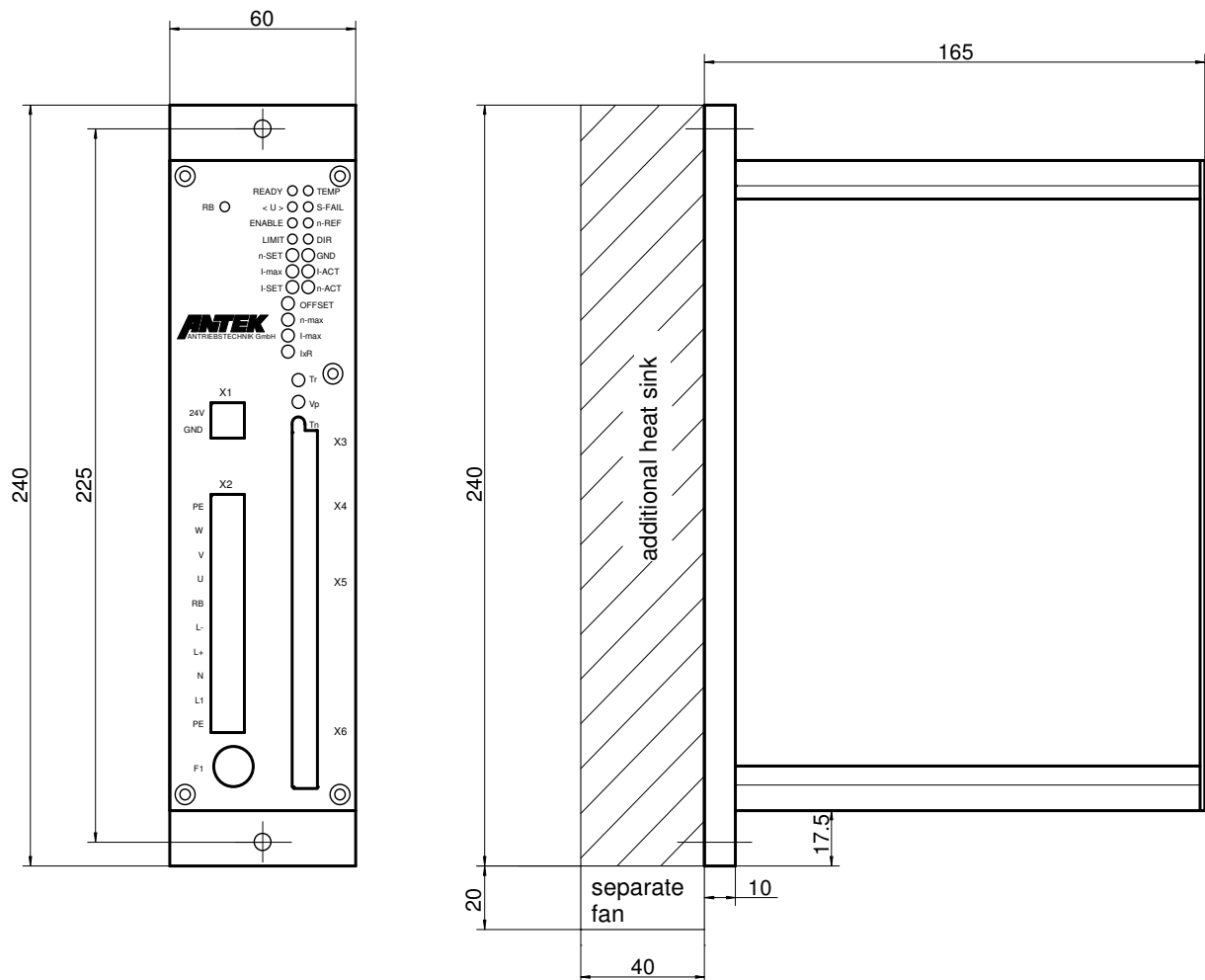
Mains input voltage:	$U_N$	70 ... 270 VAC, 45 ... 64 Hz
Alternative DC power supply:	$U_G$	80 VDC ... 350 VDC
Max. input current:	$I_{Nmax}$	6.3 AAC
Internal fuse <sup>1</sup> :		6.3 AT
Output voltage:	$U_M$	0 ... 90% UZK
Max. Output current:	$I_{Mmax}$	10 A / Phase
Continuous current:	$I_M$	in accordance of cooling
Nominal output power <sup>2</sup> :	$S_N$	1,4 kVA
Efficiency:	$\eta$	approx. 95%
Amplifier frequency:	$f_M$	10 kHz
Power dissipation no-load <sup>3</sup> :	$P_{V0}$	ca. 25 W
Power dissipation full-load:	$P_V$	ca. 150 W
Max. heat-sink temperature:	$\vartheta$	ca. 80 °C
Ballast resistor	$R_B$	min. 30 $\Omega$
Pulse capacity $R_B^4$	$P_{imp}$	$(U_{Ballast\ threshold})^2 / R_B$
Control range	1 : 40	(permanently excited three-phase synchronous motors Block commutation with integrated commutation sensors)
	1 : 500	(permanently excited three-phase synchronous motors. Block commutation with incremental generator feedback > 500pulse/rev.)
	1 : 1000	(permanently excited three-phase-synchronous motors. Sinusoidal commutation with resolver)
	1 : 100	(permanently excited DC motors with EMF regulation and IxR-compensation)
	1 : 1000	(permanently excited DC motors with DC tacho generator)
Weight:		1,4 kg

<sup>1</sup> Only with mains power supply

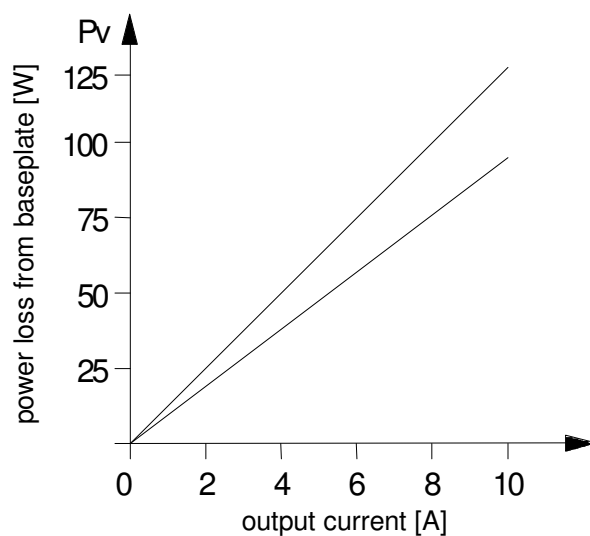
<sup>2</sup> Based on mains voltage of 230 VAC

<sup>3</sup> Dissipation at 3A phase-current and 16 kHz oscillator frequency

### 3.3 Dimensions



### 3.4 Heat Sink Dimensions



- Drive Control
- stand-alone 1.5 K/W
- with heat sink SK111 0.9 K/W
- with heat sink SK111 and separate fan type: 414 0.3 K/W

## 4. Installation

### 4.1 Mechanical Installation

- ◆ Only install the converter in the vertical position.
- ◆ Allow a distance of 50 mm above and below the drive regulator for air-circulation
- ◆ Ensure the unobstructed circulation of exhaust air
- ◆ When the cooling air is contaminated by dust, lint, aggressive gases and greases, which could impair the functioning of the drive regulator, sufficient countermeasures must be taken, e.g. separate air ducts, installation of filters, regular cleaning etc.
- ◆ Do not exceed the permitted operating temperature range.
- ◆ If the drive regulator is exposed to vibrations or tremors, vibration damping is required.

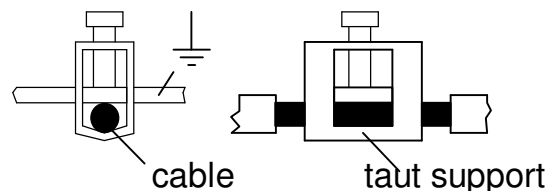
### 4.2 Electrical Installation

- ◆ The regulator contains components sensitive to electrostatics. Before installation and service work in the terminal clamp area, the staff must free itself of electrostatic electricity. The discharging can be achieved by touching a grounded metal surface beforehand.
- ◆ Due to the discharge currents of the drive regulator ( $>3,5$  mA) via the protective conductor (PE), the input diameter of the protective conductor must be at least  $10 \text{ mm}^2$  Cu according to DIN VDE 0160, or a second protective conductor must be laid, electrically parallel. With greater connection powers, the minimum diameter of the protective conductor must correspond to the diameter of the external conductors. (see DIN 57100 Part 540)
- ◆ The regulations for the minimum diameter of PE conductors must be observed. The diameter of the PE conductors must be at least as large as the diameter of the conductor connections.
- ◆ The drive regulator can only be safely switched using a mains contactor in the input.
- ◆ To protect the power supply cables, the recommended cable protection fuse is required
- ◆ We recommended conducting the temperature monitoring of the motor using a thermal protection switch and the monitor switching, which is integrated in the converter.
- ◆ Control wiring and power cables must always be spatially separated from each other.
- ◆ Set-value inputs, analogue control inputs and measurement outputs must be shielded.
- ◆ Conductor diameters for power supply and motor wiring must be at least  $1,5 \text{ mm}^2$ !
- ◆ Observe the current local safety regulations.

### 4.3 Information on EMC

In order to guarantee electromagnetic compatibility (EMC) in your switch cabinets in an electrically raw environment, the following EMC rules are to be observed during construction and set-up:

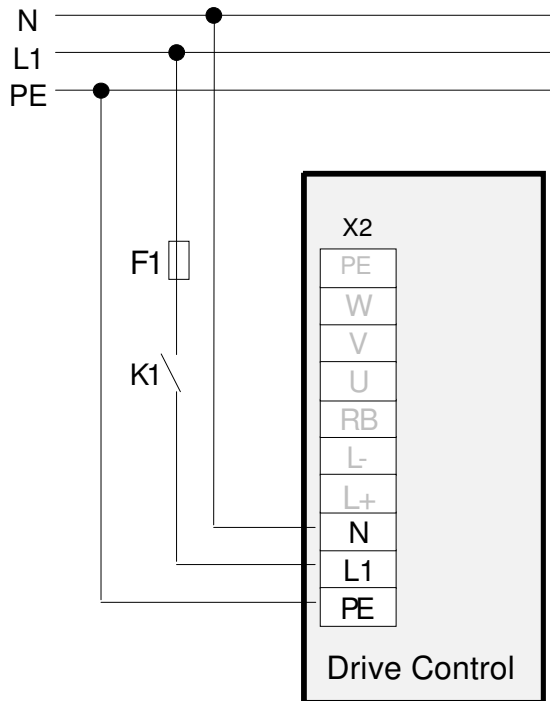
- ◆ All metallic parts of the switch cabinet are to be connected flatly and in a well-conducting manner (not lacquer on lacquer!). If necessary, use contact or scraper wafers. The cabinet door is to be connected with as short a circuit as possible via the metal powder tapes (upper, middle, lower).
- ◆ Signal lines and power cables are to be laid separated from each other in order to avoid coupling intervals. Minimum distance: 20 cm:
- ◆ Signal lines should be led to the cabinet from only one level, if possible. Unshielded lines from the same electrical circuit (outgoing and return circuit) are to be transposed, if possible.
- ◆ Contactors, relays and magnetic valves in the switch cabinet, if necessary in the adjacent cabinets, are to be wired with suppressor combinations, e.g. with RC elements, varistors or diodes.
- ◆ The braiding from signal lines are to be laid two-way (source and target), large-area and well-conducting to a ground<sup>1</sup>. In case of poor potential equalization between shielded connections, an additional balancing network of at least 10 mm<sup>2</sup> must be laid parallel to the braiding to reduce the current.
- ◆ Wiring is not to be laid freely in the cabinet, but should rather lead as tightly as possible to the cabinet frame or to installation plates. This also applies to reserve cables. At least one end of them must lie grounded, but preferably both (additional shield effect).
- ◆ Unnecessary wire lengths are to be avoided. Coupling capacities and coupling inductance's are thereby kept small.
- ◆ The braiding from leads, such as resolver or incremental tachometer cables, must be laid to the frame grounding. Approximately 2 cm of the insulation is to be removed in the area where the cable is to be led into the frame in order to expose the braided cable. The braided cable may not be damaged while removing the insulation. The cable is to be led at the position where the insulation has been removed by grounded terminals or taut supports.



<sup>1</sup>Generally all metallic conducting parts which can be connected to a protective conductor, such as cabinet frames, motor frames, foundation grounding, etc. are designated as a ground.

## 4.4 Connection

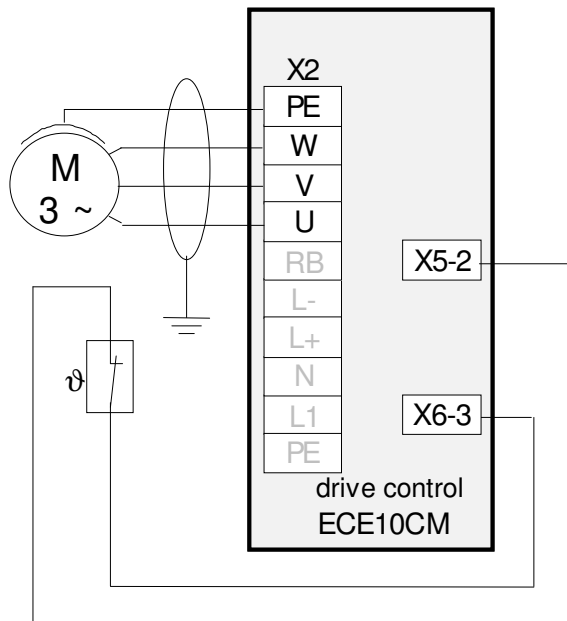
### 4.4.1 Mains



- ◆ Min. cable cross-section 1.5 mm<sup>2</sup>
- ◆ Connect mains cable to plug-in terminals N, L1, PE  
(Starting torque: 0.5 - 0.6 Nm)

### 4.4.2 Motor Connection

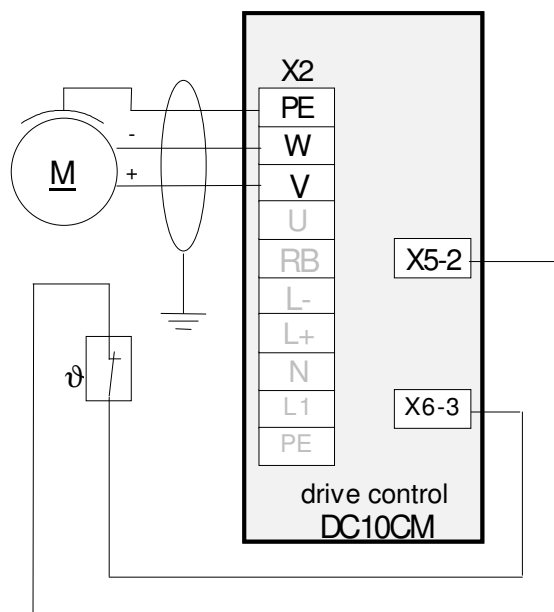
#### Permanently Excited Three-Phase-Synchronous Motor (ECE)



- ◆ Min. cable cross-section 1.5 mm<sup>2</sup>
- ◆ Connect motor cable to plug-in terminals PE, W, V, U  
(Starting torque: 0.5 - 0.6 Nm)
- ◆ Insert screen correctly in accordance with EMC wiring.
- ◆ For feedback system and sensor wire connections see Chapter 4.4.8
- ◆ Monitoring the motor temperature by means of a thermal protection contact is recommended.  
If no thermal protection contact is used, input X5-2 must be bridged to HIGH potential e.g. +15V X6-3.



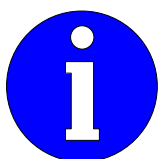
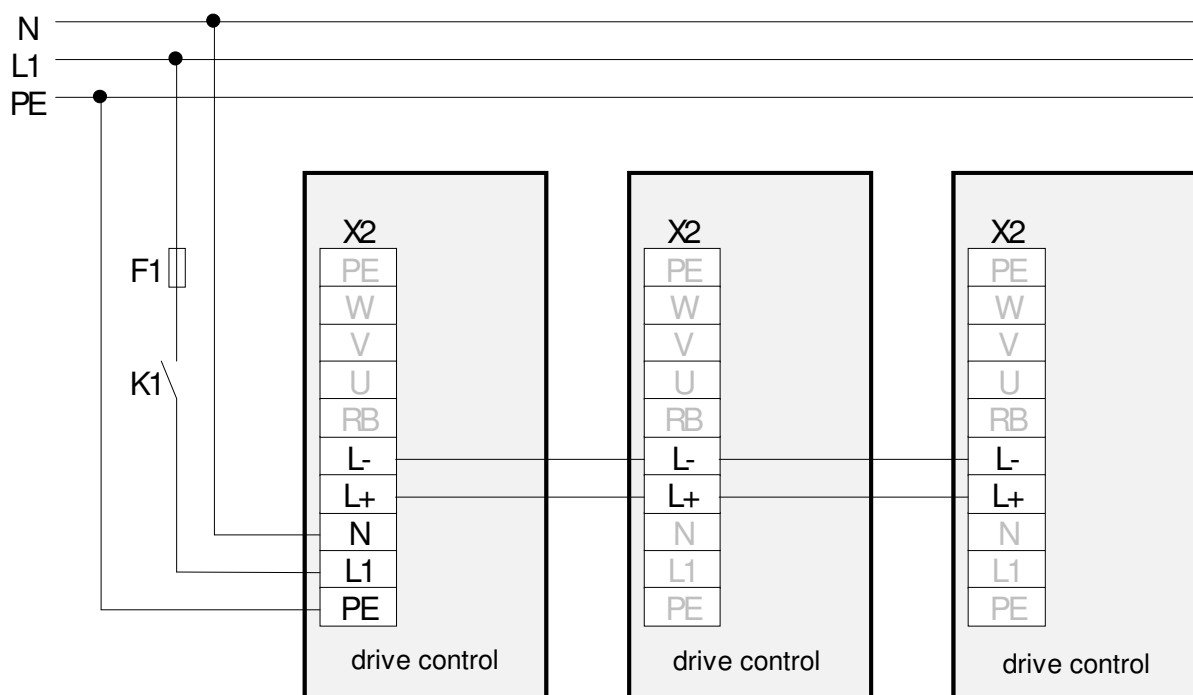
## Permanently Excited DC Motor



- ◆ Min. cable cross-section 1.5 mm<sup>2</sup>
- ◆ Connect motor cable to plug-in terminals PE, W, V  
(Starting torque: 0.5 - 0.6 Nm).  
Clockwise rotation for polarity illustrated.
- ◆ Insert screen correctly in accordance with EMC For feedback system and sensor wire connections see Chapter 4.4.8
- ◆ Monitoring the motor temperature by means of a thermal protection contact is recommended.  
If no thermal protection contact is used, input X5-2 must be bridged to HIGH potential e.g. +15V X6-3.

### 4.4.3 Interconnected Operation of Several

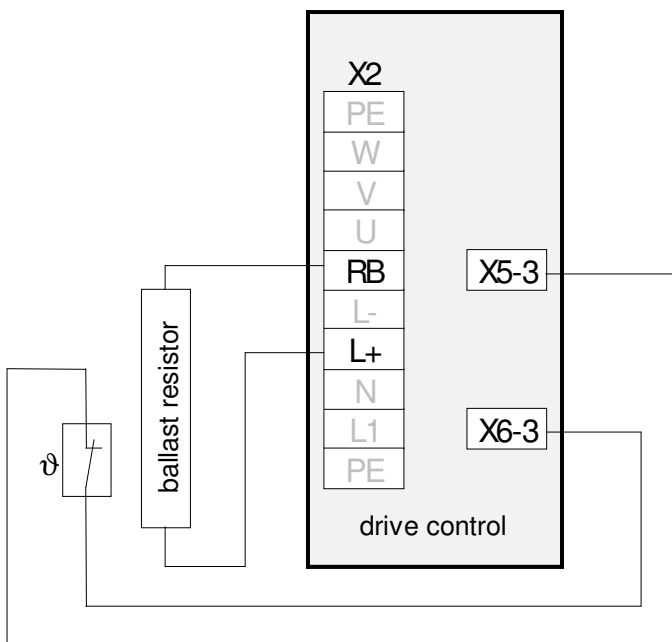
#### Drive Controls



The total connected load may not exceed 1.4 kVA in interconnected operation, otherwise

- ◆ every drive control must be supplied with mains power. Nevertheless, an energy exchange can take place on the intermediate circuit.
- ◆ or a separate supply module must be used.

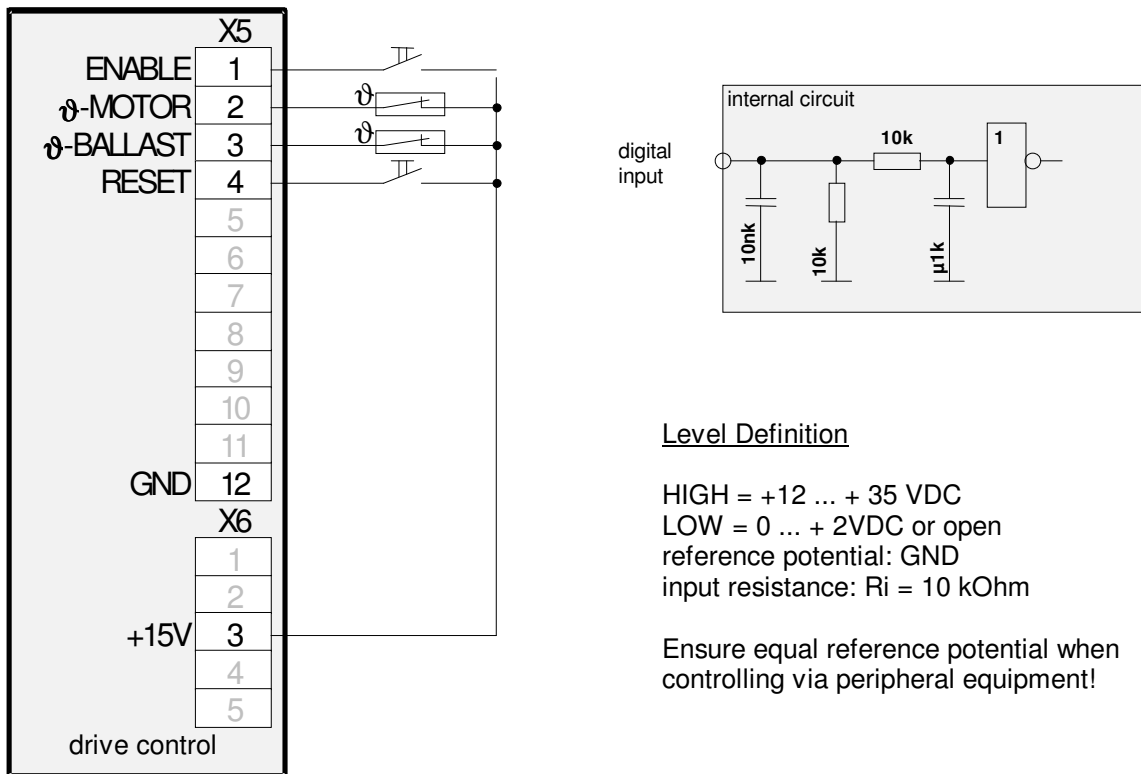
#### 4.4.4 Ballast Resistor Connection



- ◆ The size of the ballast resistor should be agreed with the manufacturer.
- ◆ Monitoring the ballast resistor by means of a thermal protection contact is recommended.  
If no thermal protection contact is used, input X5-3 must be bridged to HIGH potential e.g. +15V X6-3.

## 4.4.5 Control Connections

### 4.4.5.1 Digital Signal Connection



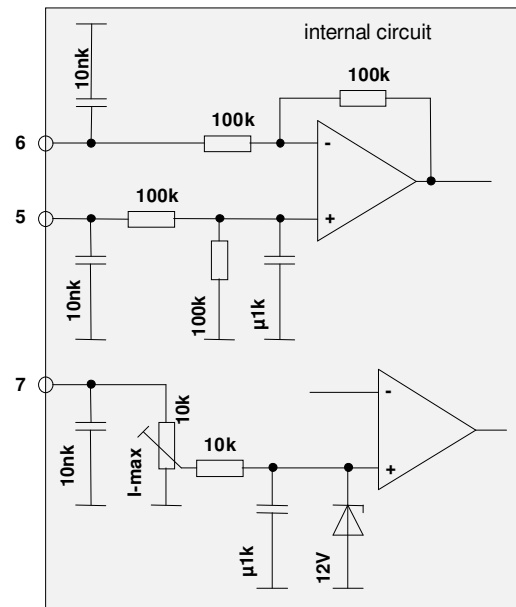
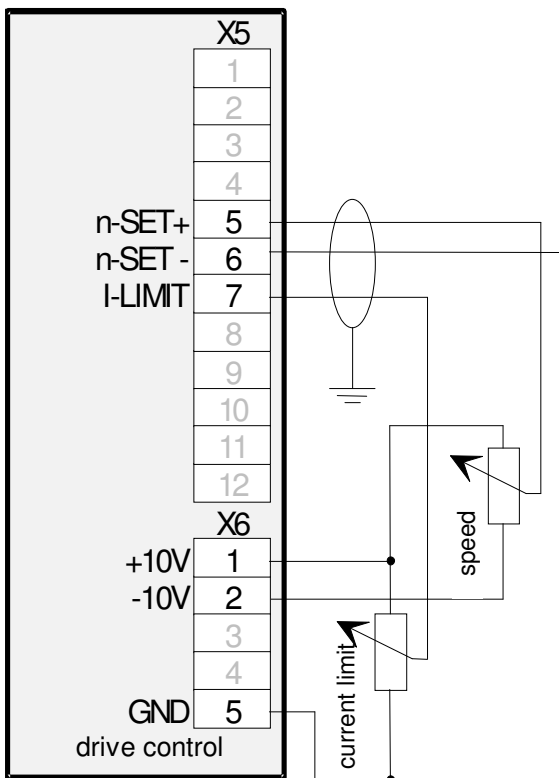
#### Level Definition

HIGH = +12 ... + 35 VDC  
 LOW = 0 ... + 2VDC or open  
 reference potential: GND  
 input resistance:  $R_i = 10 \text{ k}\Omega$

Ensure equal reference potential when controlling via peripheral equipment!

- ENABLE (X5-1)** HIGH = control enabled, the direction of rotation is dependent on the set point input X5-5/6  
 LOW = output stage disabled
- ∅-MOTOR (X5-2)** Connection for motor protection contact (NC contact)  
 HIGH = motor temperature in working range  
 LOW = motor overheating, cut-out (output stage disabled) after approx. 45 s time delay.  
*If no motor protection contact is used, terminal X5-2 must be connected to HIGH potential e.g. +15 V X6-3.*
- ∅-BALLAST (X5-3)** Connection for thermal protection contact (NC contact)  
 HIGH = Ballast resistor in working range  
 LOW = Ballast resistor overheating, cut-out (output stage disabled) occurs directly.  
*If no ballast resistor is used, terminal X5-3 must be connected to HIGH potential e.g. +15 V X6-3.*
- RESET (X5-4)** LOW-HIGH flank causes a resetting of the internal fault flip-flop (This input can be switched in parallel to another control input in order to minimise the wiring complexity)  
 A reset is carried out automatically with a time delay (approx. 1 s) when applying the supply voltage to the control unit.

### 4.4.5.2 Analogue Signal Connection



Analogue set point cables should be screened in general!

**n-SET+** (X5-5)  
**n-SET -** (X5-6)

Differential input to manual speed set point default  
 Tip: With unipolar signals connect " n-SET -" input to GND.  
 Input voltage: -10 VDC ... +10 VDC  
 Input resistance:  $R_i = 100\text{ k}\Omega$   
 Reference potential: GND

Positive differential input voltage produces

- ◆ a clockwise rotating field with ECE motors (See Chapter 4.4.8.1)
- ◆ a positive motor voltage with DC motors

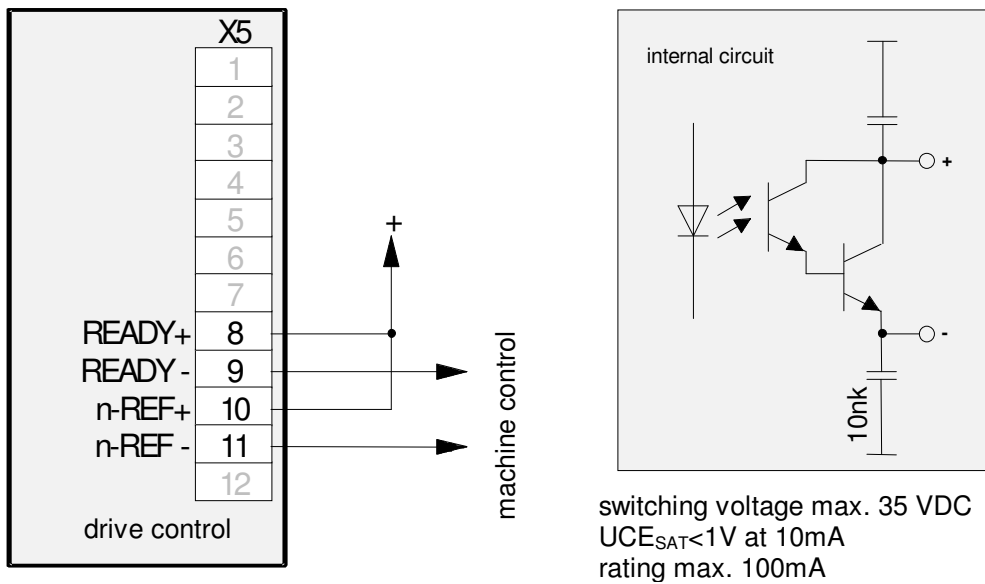
**I-LIMIT** (X5-7)

Input to external current limiting default  
 Input voltage: 0 ... +10 VDC  
 Input resistance:  $R_i = 10\text{ k}\Omega$   
 Reference potential: GND

0VDC = 0%  
 10VDC = 100% of internally set peak current

*If this function is not required, this input must be connected to  $\geq 10\text{VDC}$  e.g. X6-1.*

#### 4.4.6 Signalling Outputs

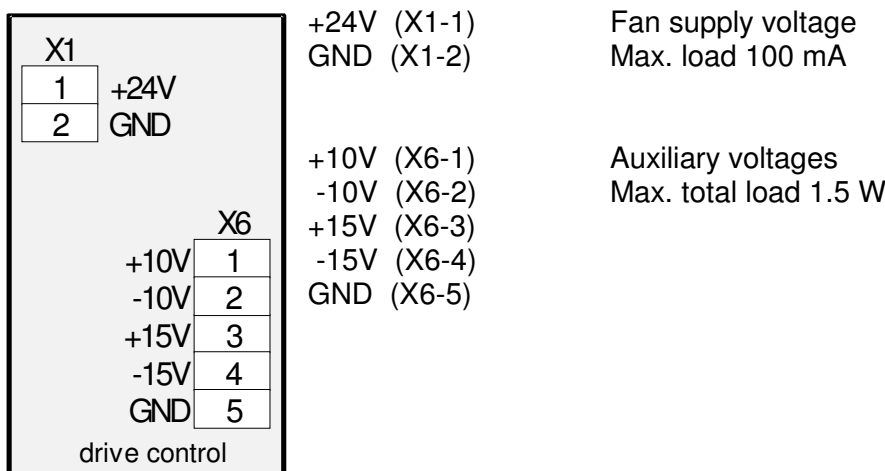


**READY** (X5-8/9) Transmitting when ready.  
Display by „READY“LED on front panel.

The following faults are displayed:  
(See Displays Chapter □)  
Each display corresponds to an LED on the front panel  
A fault is stored until it has been reset.  
For resetting of fault display see Chapter Ω

**n-REF** (X5-10/11) Nominal / Actual Function  
Transmitting, if the speed regulator does not show any deviation. The signal has a time delay in order to suppress dynamic control deviations during acceleration or braking.  
n < REF Function  
Transmitting, if the actual speed is < 2% of the maximum speed  
(For LED display see 5.1; for setting see 5.4)

#### 4.4.7 Auxiliary Voltages



#### 4.4.8 Feedback Systems

The Series ECE10CM & DC10CM drive controls can be fitted with various types of feedback systems. This results in different component variants for the converter:

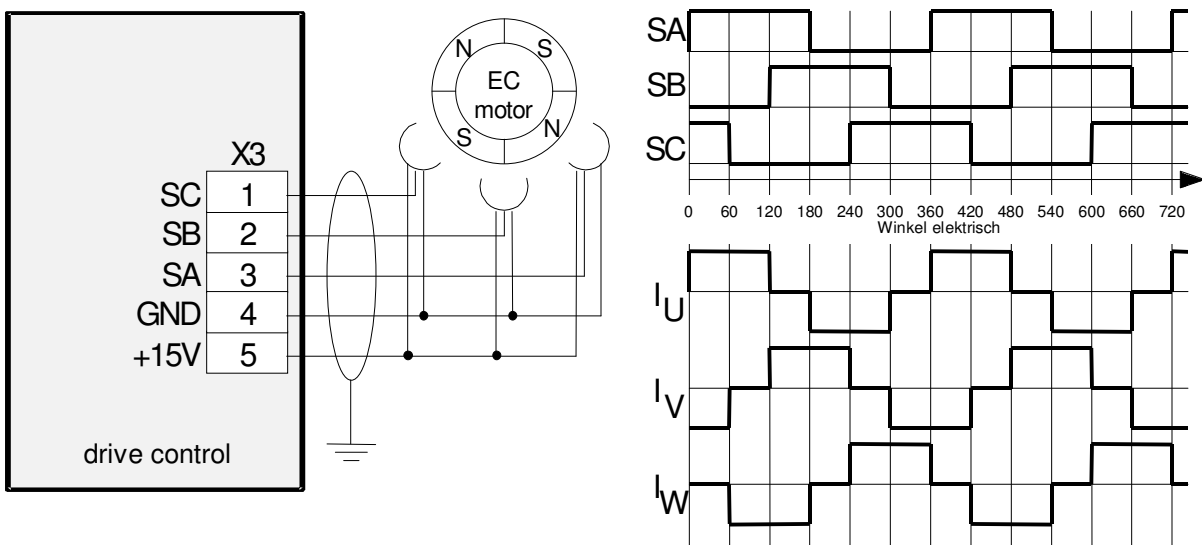
- ◆ **ECE10CM-00:** Converter for permanently excited three-phase synchronous motors with block commutation. Speed feedback via commutation sensors.
- ◆ **ECE10CM-01:** Converter for permanently excited three-phase synchronous motors with block commutation. Speed feedback via incremental generator.
- ◆ **ECE10CM-02:** Converter for permanently excited three-phase synchronous motors with sinusoidal commutation. Feedback with resolver.
- ◆ **DC10CM-00** Converter for permanently excited DC motors without feedback. Speed is controlled via EMF regulation with  $I_xR$  compensation
- ◆ **DC10CM-01** Converter for permanently excited DC motors Feedback by means of DC tachogenerators

##### 4.4.8.1 Commutation Sensors (ECE10CM-00)

If a permanently excited three-phase synchronous motor (ECE) with  $3 \times 120^\circ$  offset commutation sensors is connected, a control range of 1:40 can be achieved.

The commutation sensors shall be connected to the drive control in accordance with the following sketch. The sensor cables must be screened.

<b>SC</b> (X3-1)	Commutation sensor inputs with internal
<b>SB</b> (X3-2)	Pull-Up resistors 1 k $\Omega$ , 15 V reference voltage
<b>SA</b> (X3-3)	HIGH with input signal > 12 V
	LOW with input signal < 1 V
<b>GND</b> (X3-4)	Reference potential
<b>+15V</b> (X3-5)	Sensor supply



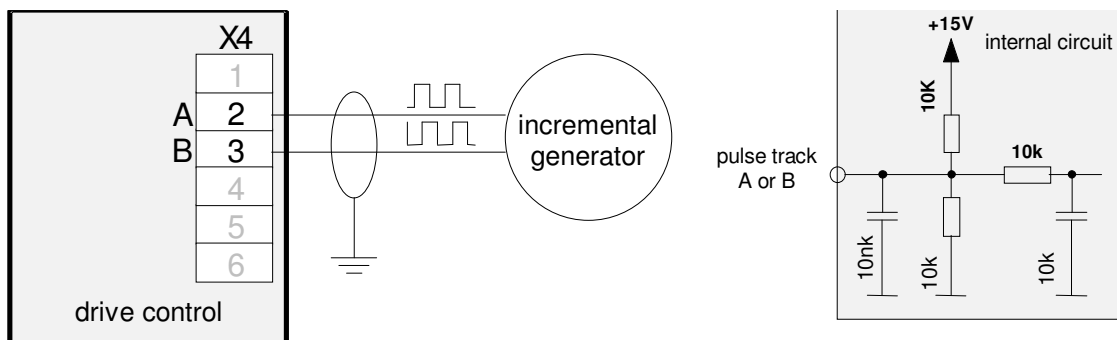
#### 4.4.8.2 Incremental Generator (ECE10CM-01)

If a permanently excited three-phase synchronous motor (ECE) with 3x120° offset commutation sensors and additional incremental generator with more than 500 pulse/rev. is connected, a control range of 1:500 can be achieved.

The power supply is controlled by evaluation of the rotor position by the commutation sensors. Greater control accuracy is achieved by the speed actual value being fed back as control value by means of incremental generator pulses.

Screened sensor cables must be used.

- A** (X4-2)                      Pulse track A
- B** (X4-3)                      Pulse track B



#### Level Definition

HIGH = +3.5 ... 35 VDC

LOW = 0 ... +2 VDC or open

reference potential: GND

input resistance:  $R_i = 10\text{k}\Omega$

other levels available upon request

### 4.4.8.3 Resolver Connection (ECE10CM-02)

If a permanently excited three-phase synchronous motor (ECE) with resolver is used, the motor is supplied with sinusoidal commutation and a control range of 1:1000 can be achieved.

The drive control is synchronised to the TAMAGAWA resolver Type TS2630N321E64.

Resolver key data:

- ◆ Model: 2 pole
- ◆ Exciter voltage: AC 7Vrms, 10kHz

Substitution of a different resolver must be approved by the Manufacturer.

A 6 pole cable, stranded and screened in pairs, with a wire cross-section of at least 0.25 mm<sup>2</sup> must be used for resolver cables.

The length of the resolver cable should be kept as short as possible and may not exceed 100m. The resolver cable may not be run from the control to the motor via additional plug connectors or terminals as otherwise malfunctions may occur.

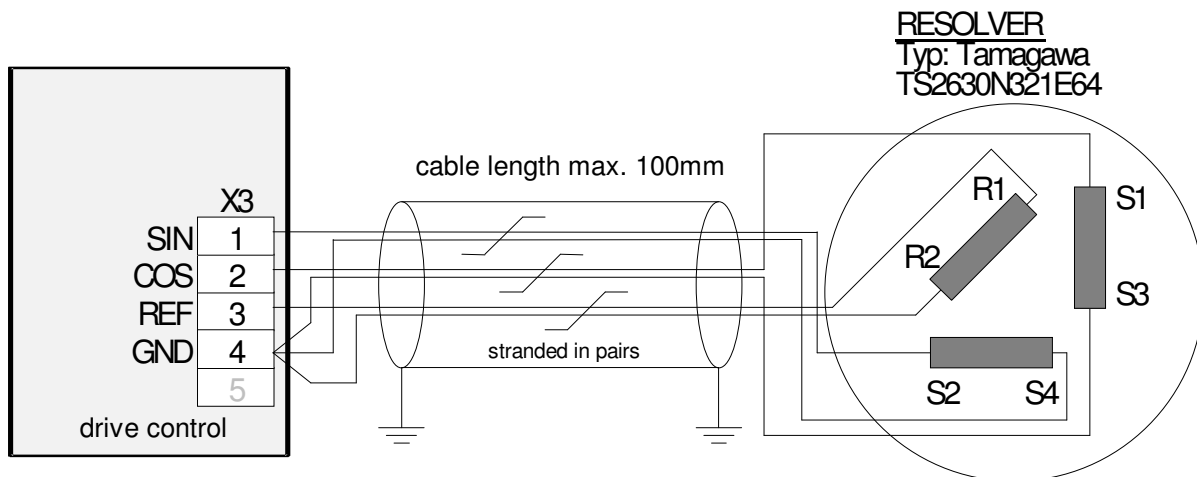
Cable drag capability shall be clarified with the cable manufacturer in each individual case.



#### Earth resolver cable on both sides over a large area!

- SIN** (X3-1)            Sensor inputs from resolver
- COS** (X3-2)
- REF** (X3-3)
- GND** (X3-4)            Reference potential

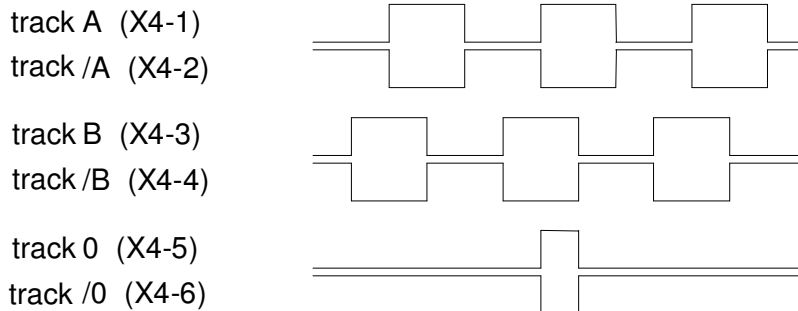
The resolver cables shall be connected to the drive control in accordance with the following sketch.





## Generator Equivalent Circuit

The generator equivalent circuit derives from the resolver signal a pulse sequence which corresponds to the pulse sequence of an incremental generator. The length of the zero pulse is set at 90°. 1024 pulses equal 1 motor revolution. The levels of all outputs are RS485 compatible. Min. 100 Ω must be provided as terminating resistance?.



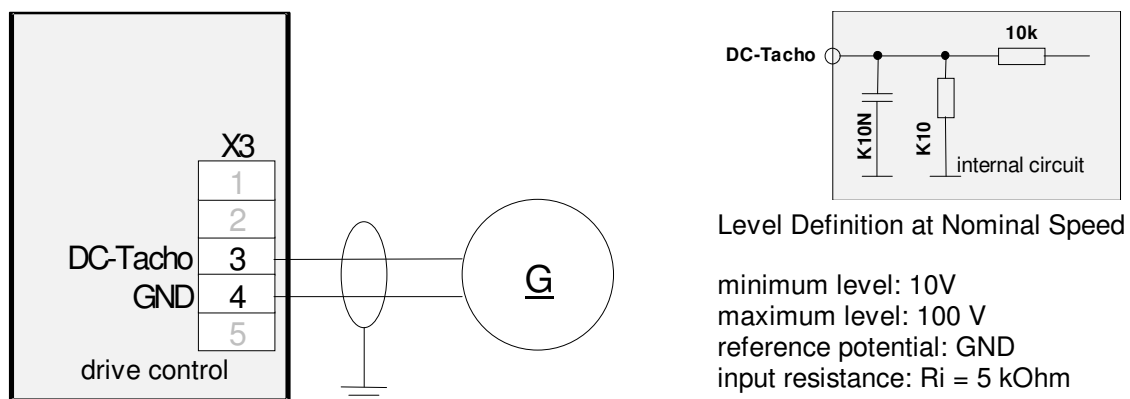
### 4.4.8.4 EMF Regulation + IxR Compensation (DC10CM-00)

If a permanently excited DC motor is used, operation is possible without additional feedback. The speed is then regulated via EMF regulation with IxR compensation. A control range of 1:100 can also be achieved with optimum settings without feedback.

### 4.4.8.5 DC Tachogenerator (DC10CM-01)

If a permanently excited DC motor is used with DC tachogenerator attached, a control range of 1:1000 can be achieved.

The tachocables must be screened. Minimum cable cross-section 0.25 mm<sup>2</sup>.



For level adjustment see Chapter 5.4

## 5. Service - Information

Ready: green (GN)  
 Fault indication: red (RD)  
 Status message: yellow (YE)

### 5.1 Displays

READY	●	●	TEMP
RB	●	●	< U >
ENABLE	●	●	S-FAIL
LIMIT	●	●	n-REF
n-SET	○	○	DIR
I-max	○	○	GND
I-SET	○	○	I-ACT
	○	○	n-ACT
	⊗		OFFSET
	⊗		n-max
	⊗		I-max
	⊗		I x R
	⊗		Tr
	⊗		Vp
	⊗		Tn
drive control			

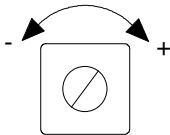
<b>READY</b> (GN)	ON = control unit ready for operation OFF= collective fault on control unit one of the following individual faults was triggered and remains stored until reset (See Chapter 7). The drive control is disabled.
<b>TEMP</b> (RD)	Overheating
<b>&lt; U &gt;</b> (RD)	Intermediate circuit voltage outside operating range
<b>S-FAIL</b> (RD)	Fault in feedback system
<b>RB</b> (YE)	Ballast threshold exceeded Standard: 380 VDC
<b>ENABLE</b> (YE)	ON = drive control enabled OFF= drive control disabled
<b>n-REF</b> (YE)	ON = no faults OFF= operating fault (For message output see Chapter 4.4.6) (For setting see Chapter 5.4)
<b>LIMIT</b> (YE)	Speed regulator works at the modulation limit (current limit, BDV too low)
<b>DIR</b> (YE)	Direction of rotation of motor with motor connection in accordance with this Operating Manual ON = clockwise OFF = anticlockwise

## 5.2 Measuring Points

<b>n-SET</b>	Speed set point in accordance with set point integrator Scaling: $\frac{100\%}{10V}$	
<b>GND</b>	Reference potential of all test jacks	
<b>I-max</b>	Maximum peak current $I_{max}$ Scaling: $1 \frac{A}{V}$	
<b>I-SET</b>	Current set point (Speed regulator output) Scaling: $1 \frac{A}{V}$	
<b>I-ACT</b>	Current actual value (Phase current in Phase V) Scaling: $2,5 \frac{A}{V}$	
<b>n-ACT</b>	Speed actual value in accordance with internal f/U transformer Scaling: $\frac{1500}{p} \cdot \frac{1}{min \cdot V}$	p .. number of pole pairs (ECE10CM-02: p=3)
	Speed actual value with variant DC10CM-01 (DC tachogenerator)	

## 5.3 Trimmer

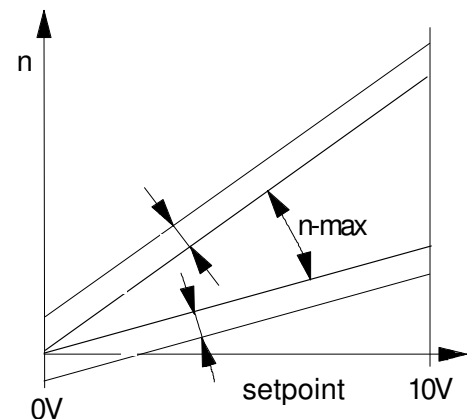
All of the trimmers required for the adjustment of the drive regulator to the respective application are located on the unit boards. All of the trimmers are pre-set to the standard parameters and/or the customer commissions so that the customer normally does not have to re-adjust the trimmers.



**Adjustment right** = value increases  
**Adjustment left** = value decreases

### OFFSET

Speed offset balancing  
Put set point input to "0".  
Enable drive control,  
i.e. set ENABLE to HIGH potential.  
Set motor at standstill with "OFFSET" trimmer.



**n-max**

Maximum speed setting

1. Rough adjustment via S1-1, S1-2 & R161  
(See Chapter 5.4)
2. Specify maximum set point voltage (10V).
3. Set max. required speed on "n-max" trimmer  
(See sketch for trimmer OFFSET).
4. Check at "n-ACT" test jack.

**I-max**

Equipment peak current setting

External current default "I-LIMIT (X5-7)" at analogue input

Apply potential  $\geq 10$  V. Set required peak current at I-max. trimmer

Check at "I-max" test jack.

**IxR**

IxR compensation setting with EMF regulation of DC motors (Component variant DC10CM-00)

- 1) Turn "IxR" trimmer to lefthand stop
- 2) Let motor idle at max. default speed (10V)
- 3) Set motor at required maximum speed with "n-max" trimmer.
- 4) Specify low speed (e.g. 20% of n-max)
- 5) Idling speed  $n_0$ , i.e. Measure motor without load.
- 6) Load motor close to nominal load.
- 7) Tighten "IxR" trimmer until speed measured under Point 5 is reached again.  
**"LIMIT" LED should not illuminate with balancing!**
- 8) Repeat balancing procedure from Point 2 until compensation is set at an adequate level.
- 9) Check IxR compensation at different speeds if possible.



If IxR compensation is set too high, the motor will run faster under load. This setting shall be avoided, as control fluctuations may occur.

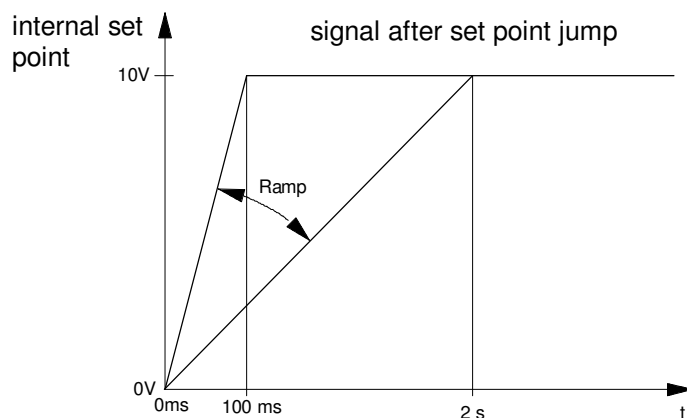
**Tr**

Set point ramp setting

Specify set point jump (0 → 10 V) at set point input and set required speed ramp with "Tr" trimmer.

Setting range: 100 ms ... 2 sec.

Other ramp times upon request.



The following simple setting of the drive control performance can only be carried out in certain applications. At high speeds and with large centrifugal masses (large mass moment of inertia), oscillation of the drive may destroy the system.

The Manufacturer is not liable for damage caused by incorrect parameter settings.

**Vp**

Drive control proportional amplification setting

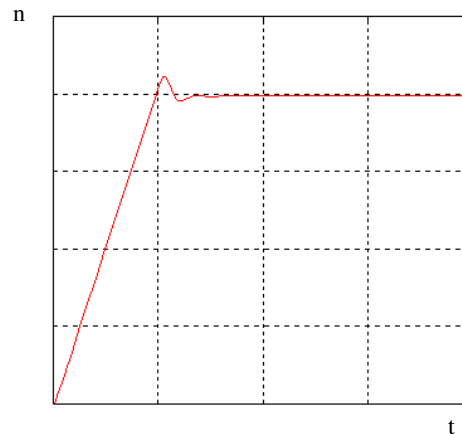
1. "Tn" trimmer to right-hand stop
2. Specify set point jump
3. Increase the potential amplification with "Vp" trimmer until the drive becomes unstable (observe jump response).
4. Reduce proportional amplification until the drive runs in a stable condition again.

**Tn**

Drive control reset time setting (Integration time)

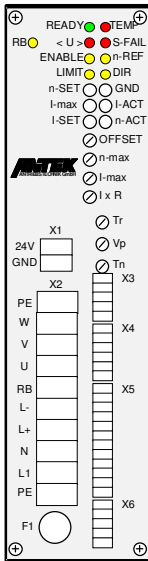
1. "Tn" trimmer to righthand stop.
2. Specify set point jump
3. Reduce reset time until drive becomes unstable.
4. Increase reset time until drive runs in a stable condition again

Example of a jump response after optimum setting of the control performance with a small speed overshoot.

**R97, C5**

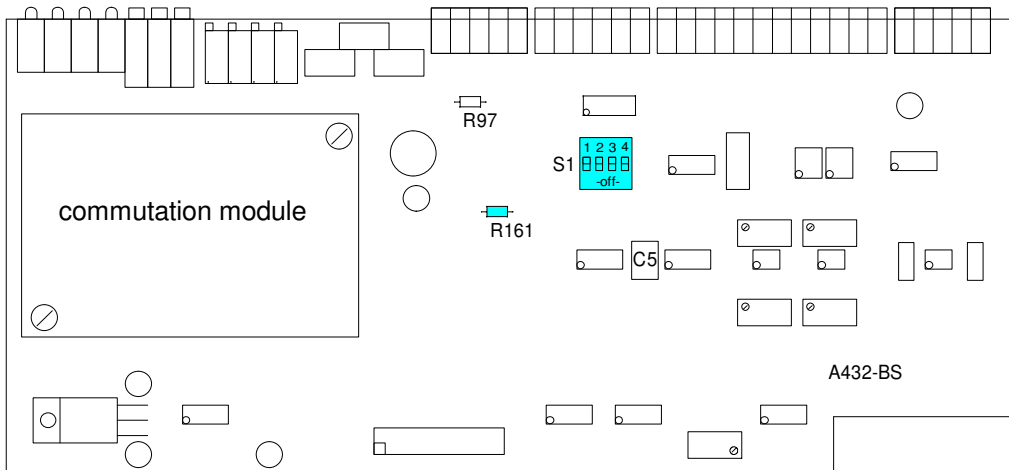
The rough adjustment of the control performance can be adapted to the application with resistor R97 and condenser C5. The Manufacturer is responsible for the sizing of these components. (For sketch of control card see Chapter 5.4)

## 5.4 Encoding



The drive control must be open for encoding. Disconnect drive control from mains voltage for this purpose.

Loosen the 4 screws on the front panel corners and remove the front panel together with control card. Set the required encoding and re-assemble the drive control in reverse order.



### S1-1, S1-2

Speed adjustment "n-max" for

- ◆ permanently excited three-phase synchronous motors and
- ◆ permanently excited DC motors with EMF regulation

S1-1	S1-2	f-Out [Hz]	ECE 4poleMotor [min-1]	ECE 6poleMotor [min-1]	DC Motor- voltage [V]
ON	ON	33 - 64	1000 - 1920	1280 - 1260	65 - 130
OFF	ON	62 - 115	1860 - 3450	1240 - 2300	125 - 240
ON	OFF	90 - 170	2700 - 5100	1800 - 3400	185 - 330
OFF	OFF	135 - 250	4050 - 7500	2700 - 5000	250 - 450

The column for 6 pole motors applies to resolver feedback ECE10CM-02.

$$\text{motor frequency} = f - \text{Out} = \frac{n \cdot p}{60}$$

n ... Speed in rpm  
p ... Number of pole pairs

**R161**

◆ permanently excited DC motors with DC tachogenerator

R161	Tacho voltage [VDC]
10 kΩ	11 - 20
22 kΩ	20 - 35
33 kΩ	25 - 45
47 kΩ	35 - 60
56 kΩ	40 - 70
68 kΩ	45 - 85
82 kΩ	55 - 100

S1-1 = OFF

S1-2 = OFF

**S1-3**

ON = Speed regulator cutout  
with nominal and actual speed < 2% of maximum speed  
(Setting is recommended for ECE block commutation)

OFF = no speed regulator cutout at low speeds.

**S1-4**

ON = Function "reference / actual value deviation"  
OFF = Function "n < REF"



## 6. Initiation

### 6.1 Initial Start-up



The open drive control may not be connected to the mains voltage while these settings are being made.

Select speed range (See Chapter 5.4)

Check the wiring for completeness, short or earth circuits prior to initial start-up of the drive control:

#### Power Connection:

- ◆ Incoming supply via terminals N, L1 (direct mains connection) or alternatively via terminals L+ and L- (DC incoming supply).
- ◆ Protective conductor connection

#### Motor Connection:

- ◆ In-phase connection to motor
- ◆ Feedback system (commutation sensors, incremental generator, resolver connection, DC tachogenerator).
- ◆ Protective conductor connection

#### Control Connections:

- ◆ Connection of motor protection contact and thermal protection contact to ballast resistor or an appropriate bridge at HIGH potential for applicatiions without protection contact.
- ◆ Reference potential for digital and analogue control inputs.
- ◆ Specification of current limit or bridge at HIGH potential.

#### **Switch-on Sequence**

1. Input ENABLE (X5-1) must be connected to LOW potential.
2. Switch on mains  
Drive control is ready for operation after approx. 2 s.
3. Enable drive control, connect input ENABLE (X5-1) to HIGH potential.

## 7. Troubleshooting & Elimination of Errors

### 7.1 Error Messages

See Chapter 5.1

### 7.2 Trouble Shooting

LED	Cause of fault	Elimination of errors
TEMP	Heat sink overheating (cutout at 80 °C)	- Allow module to cool down - Reduce maximum current - Clean heat sink, fan
	Motor protection contact has triggered	- Allow module to cool down - Reduce maximum current - With EMF control with IxR compensation reverse IxR trimmer - Clean heat sink, fan
	Protection contact on ballast resistor has triggered	- Allow ballast resistor to cool down - Avoid frequent or heavy braking - Try a different size of ballast resistor - Use mains module capable of energy recovery
< U >	Intermediate circuit voltage too low (BDV < 70 VDC)	- Check the supply voltage
	Intermediate circuit voltage too high BDV > Ballast threshold + 10% Default setting BDV > 420 VDC	- Check the supply voltage - Avoid frequent or heavy braking - Use mains module capable of energy recovery - Check ballast resistor
S-FAIL	Fault in feedback system	- Check sensors and wiring
LIMIT	Speed regulator working at modulation limit Maximum phase current reached	- Extend ramps - Check current limiter - Check motor and wiring
	Speed regulator working at modulation limit. Intermediate circuit voltage too low for momentarily required motor voltage	- Check motor - Check motor supply line - Check mains voltage
	Drive control oscillating	- Adjust control performance to application
	Motor running out of true	- Link up reference mass for analogue and digital inputs - Screening of analogue and digital inputs, sensor signals and motor cable large-area earthing - Check commutation
	Motor does not start	- Check commutation - Check motor phases
	Motor racing	- Check commutation - Check motor phases

If you send in your equipment for testing or repair, please quote the following:

- ◆ Type of fault
- ◆ Attendant circumstances
- ◆ Your own thoughts as to the cause of the fault
- ◆ Preceding unusual occurrences

### 7.3 Resetting of Error Messages

- ◆ Supply voltage OFF / ON
- ◆ LOW / HIGH flank on control input "RESET" (X5-4)

## 8. Maintenance

- ◆ The drive control is maintenance-free if the specified utilisation conditions are observed (See Chapter **3.1**).
- ◆ The air vents on the drive control can become blocked if the ambient air is polluted. Therefore, check and clean the air vents regularly depending on the degree of contamination.

## 9. Manufacturer's declaration

The manufacturer, ANTEK Antriebstechnik GmbH, herewith declares that the drive regulator ECE3AP-02-00 must be used as a component of the control equipment for variable speed motors to be installed in a machine or to be used for the construction of a machine together with other components. The drive regulators are not machines as defined in the machine guideline 89/392/EWG.

Notes and recommendations for the installation and proper operation are included in this technical documentation.

The start-up of the machine is prohibited until it has been determined that the protection and safety requirements of the machine guideline 89/392/EWG including revisions 68/EWG are fulfilled.

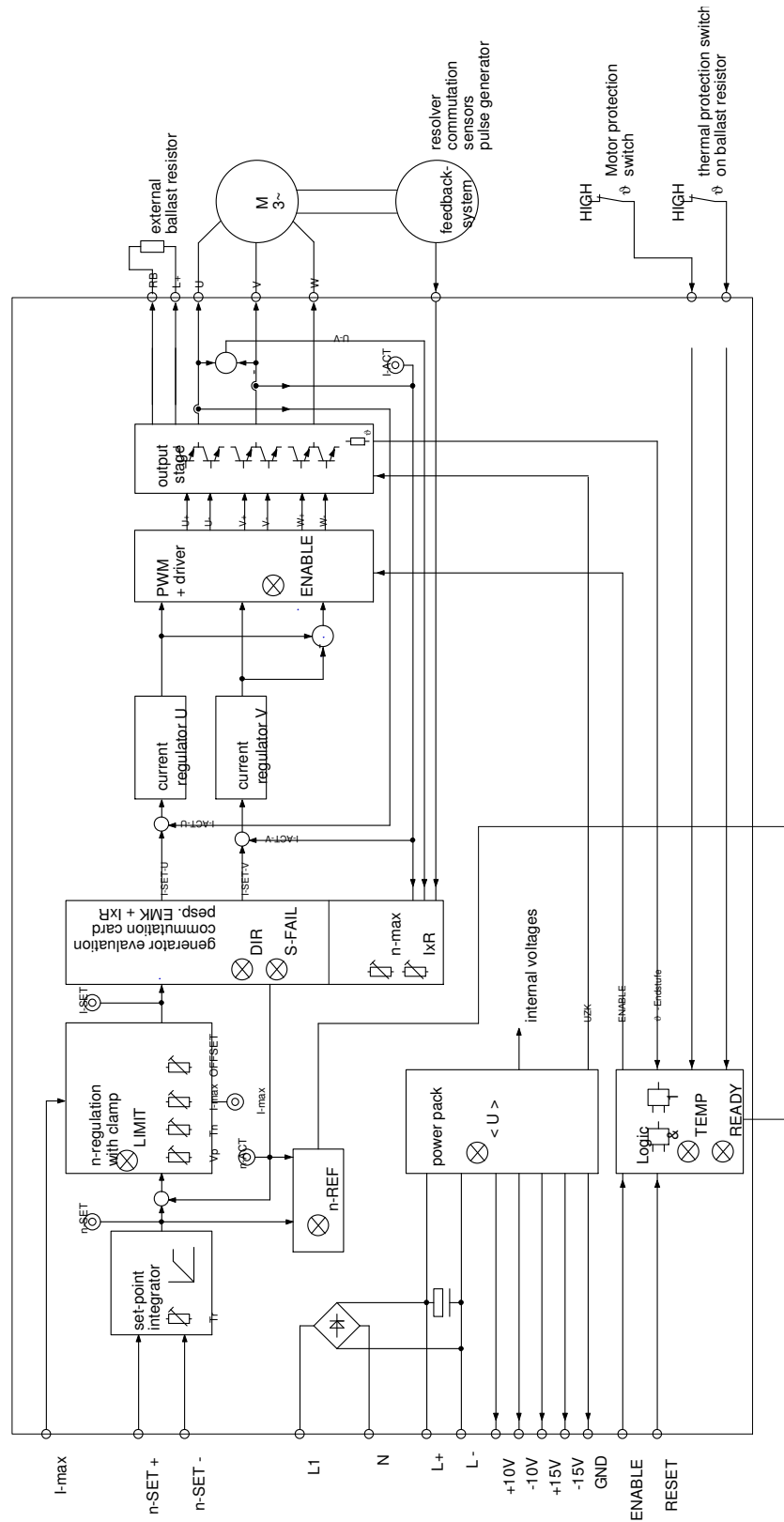
In this technical documentation, the measures are described with which the drive regulator complies with the EMC-limiting values. The electromagnetic compatibility of the machine is based on the method and thoroughness of the conducted installation. The User is responsible for the compliance of the EMC guideline 89/336/EWG including the revisions 92/31/EWG during operation of the machine.

### Norms and regulations observed

- ◆ Installation of high-voltage current plants with electrical operating equipment: DIN VDE 0160
- ◆ Regulations for the set-up of high-voltage current plants: DIN VDE 0100
- ◆ IP-protection systems: EN 60529
- ◆ Basis material for printed circuits: DIN IEC 249 Part 1
- ◆ Printed circuits, circuits boards: DIN IEC 326 Part 1
- ◆ Regulation of air and flow routes: DIN VDE 0110 Part 1-2
- ◆ De-charging of statically electricity (ESD): EN 50082-2
- ◆ Rapid transient interference factors (Burst): EN 50082-2
- ◆ Radio shielding of electrical operating equipment and plants: EN 50081-2, EN 55011

## 10. Enclosure

### 10.1 Block Circuit Diagram



## 10.2 Terminal Overview

For function specification of the individual terminals see Chapter 4.4

X1			SC	SIN	1	X3
1	24V		SB	COS	2	
2	GND	DC-Tacho	SA	REF	3	
				GND	4	
				+15V	5	
X2			track A		1	X4
1	PE		A track/A		2	
2	W		B track B		3	
3	V		track/B		4	
4	U		track 0		5	
5	RB		track /0		6	
6	L-		ENABLE		1	X5
7	L+		∅-MOTOR		2	
8	N		∅-BALLAST		3	
9	L1		RESET		4	
10	PE		n-SET+		5	
			n-SET -		6	
			I-LIMIT		7	
			READY+		8	
			READY -		9	
			n-REF+		10	
			n-REF -		11	
			GND		12	
			+10V		1	X6
			-10V		2	
			+15V		3	
			-15V		4	
			GND		5	

Drive regulator

### 10.3 Commutation Tables

#### Block Commutation

<b>ECE10CM-00</b>		<b>ANTEK</b>	<b>MAYR</b>	<b>Papst</b>	<b>WEG</b> UE 51, 52	<b>ATS</b> SDS 45, 56
Terminal	Function					
X2-2	<b>W</b>				W	W
X2-3	<b>F</b>				F	F
X2-4	<b>U</b>				U	U
X3-1	<b>SC</b>				G <sub>w</sub>	L <sub>r</sub>
X3-2	<b>SB</b>				G <sub>v</sub>	L <sub>s</sub>
X3-3	<b>SA</b>				G <sub>u</sub>	L <sub>t</sub>
X3-4	<b>GND</b>				GND	minus -
X3-5	<b>+15VDC</b>				VCC	plus +

#### Sinusoidal Commutation

<b>ECE10CM-02</b>		<b>ANTEK</b> EC 045, 056	<b>ATS</b> SDS 045, 056			
Terminal	Function					
X2-4	<b>U</b>	U	U			
X2-3	<b>F</b>	F	F			
X2-2	<b>W</b>	W	W			
X3-1	<b>SIN</b>	C	S2			
X3-2	<b>COS</b>	E	S1			
X3-3	<b>REF</b>	A	R1			
X3-4	<b>GND</b>	B, D, F	S4, S3, R2			