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DBSC SERIES 1000 / 1100
SERVO CONTROL
FOR BRUSHLESS AC MOTORS

INSTALLATION & INSTRUCTION MANUAL

04/98
PN 29042A

Made in Germany

IMN 1214

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CONTENTS

1.0 Specification

1.1 Usage Definitions

The drives of the DBSC1000/1100 series are electrical equipment for industrial power installations. They are designed for machine applications, which need variable speed controlled three-phase A.C. motors.
This product is only for use in industrial applications as described in norms EN60204 and VDE0160. This means use DBSC in stationary groundbased applications only. It is not meant for use in home appliances, medical technics, cars, ships or airplanes.
Before the DBSC is put into operation, please contact your Electric-Supply-Company for special operating conditions.

1.2 Identification

DBSC	1	X	XX	X1 X2 X3 X4	Additional Power Supply Option
D igital	Size	Input Voltage	Nominal Current	**X1**: Control Input Option	**1**: $115V_{AC}$/60Hz Main Supply
B ALDOR	(Series 1000)		**02**: 2A	**X2**: Feedback Option	**2**: $24V_{DC}$ Logic Input Supply
S ervo		**0**. DC-Input	**05**: 5A	**X3**: Field Bus Option	**3**: $115V_{AC}$/60Hz + 24VDC
C ontroller		**1**: AC-Input	**10**: 10A **15**: 15A	**X4**: Soft-/Firmware Option	**None**: $230V_{AC}$/50Hz Standard Input

Option - Letter	Option	A	B	C	G	H	W
X1 Control Input Option	RS232 Interface				x	-	
	RS485 Interface				-	x	
	Binary Encoder Simulation				x	x	
	Address DIP Switch				x	x	
	Handwheel Input [1]				x	x	
	Opto Isolated Pulse Follower				x	x	
X2 Feedback Option	Standard (Resolver Commutation)	x	-				
	Encoder Commutation	-	x				
X3 Field Bus Option	Standard (none)	x	-				
	CAN-Bus	-	x				
X4 Soft-/Firmware Option (Windows Software)	Standard (LEVEL I)		-	-			x
	Positioning Option Board (LEVEL III)		x	-			-
	Point-to-Point Positioning (LEVEL II)		-	x			-

Option letter not available
1) Only with resolver commutation

1.3 Features

A DBSC is a 1 axis drive with integrated power supply. It provides the following features:	
POWER SECTION: • Input-voltage: 1- (direct) or 3-phase with transformer ($250V_{AC}$ max) • 4 output current versions (2/5/10/15A) available. • Ratio peak . nominal current – 2:1. Both values independently adjustable. • All DBSC drives are short circuit proof (phase/phase and phase/PE) and require no minimum load. • Output power up to 6.5kVA **CONTROL I/O Section:** • 9 opto isolated control inputs for dedicated drive functions • Diagnostic display on front panel • 1 handwheel (encoder) – input • Serial interface (RS232C) for communication and programming (optional: RS422 or RS485) **GENERAL:** • Protection class IP20 (acc. To DIN40 050 / IEC144) • Cooling: self-ventilation • UL approved (UL-File-No.: E128059)	• DBSC1100 with internal power supply - Power supply consists of rectification, smoothing, regeneration circuit and surge current protection • Brushless-servomotors (2 to 8 poles) can be connected. (Feedback: 1-pole pair resolver or encoder) • Power wiring via terminal screws (max. wiring diameter $4mm^2$/AWG11) • Software amplifier tuning capability with graphic program. • Amplifier configuration adjustable via software • Multi-Drop wiring for amplifier configuration of up to 8 axis (DBSC) • Wiring of control inputs and outputs via plug type screw connection (max. wiring diameter $1,5mm^2$/AWG17) or SUB-D connector • Isolation classification according to DIN 0110 with overvoltage category III

1.4 Declaration of Conformity

Herewith we declare, that our products are components only and not ready for immediate or instant use within the meaning of "Safety law of appliance", "EMC Law" or "Machine directive".

The final mode of operation is defined only by the insertion into the user's construction.

It is the responsibility of the user to verify that his construction is in accordance with existing regulations.

It is prohibited by law to put the machine into operation before verifying that the machine is in accordance with EC directive 89/392 and 921/368.

The supplier declares product conformity with the following standards:

DIN VDE 0160 / 05.88	Electronic equipment for use in electrical power installations
DIN VDE 0100	Erection of power installations with nominal voltages up to 1000V
DIN IEC 326 Teil 1 / 10.90	Design and use of printed boards
DIN VDE 0110 Teil 1-2 / 01.89 DIN VDE 0110 Teil 20 / 08.90	Dimensioning of clearance and creepage distances
EN 60529 / 10.91	Degrees of protection provided by enclosures

1.5 EMC - Conformity and CE - Marking

The application of EMC conformal component and partly systems relieves the observance of EMC Guidelines and the guaranty of conformity for the manufacturer of machines. Therefore all standard components and partly systems will be tested according to the requirements of EMC regulation.
Those tests will be executed by a competent and independent institution. The conformity of the products will be confirmed by a declaration of conformity from the European Community.

The installation instructions refer to elimination of radio interference as well as to immunity from noise for BALDOR Drive Systems.

Thereby the user is informed about the EMC critical parts. The examples don't show the complete possibilities of cabinet components or constructions.

Guidelines for CE Conformity

- **Machine Guideline (89/392/EWG)** - **Machine Safety Law**
- **EMV Guideline (89/336/EWG)** - **EMC Law**
- **Low Voltage Guideline (73/23/EWG)** - **Machine Safety Law**

1.6 Technical Data

All values at T_{amb} = 40 °C, if not otherwise specified.
NOTE: Operation at maximum ratings

1.6.1 Power Section

General	Unit	DBSC1x02	DBSC1x05	DBSC1x10	DBSC1x15
Nominal DC-Bus Voltage $V_{in} = 230V_{AC}$	V_{DC}	320			
Nominal DC-Bus Voltage $V_{in} = 115V_{AC}$	V_{DC}	160			
Output Voltage Line/Line fundamental wave; @$V_{DC\text{-}Bus}$=320V	V_{RMS}	0 ... 250			
Nominal Phase Current (±10%)	A_{RMS}	2	5	10	15
Peak Phase Current (±10%) 1) (2.4 +0.5/-0)s	A_{RMS}	4	10	20	30
Nominal Output Power	kVA	0.87	2.17	4.33	6.51 2)
Efficiency	%	> 95			
Output Frequency	Hz	0 ... 500			
Nominal Switching Frequency	kHz	8.0			

1) valid for zero current initial condition
2) 5.2kVA for DBSC1115

1.6.2 $24V_{DC}$ Input (optional)

24V-Input (optional)	Unit	DBSC1x02-2	DBSC1x05-2	DBSC1x10-2	DBSC1x15-2
Input Voltage Range absolute min./max. max. V_{ripple} = ±10%	V_{DC}	20 ... 60			
Input Current; @ $24V_{DC}$	A_{RMS}	1.4			
Surge Current at Power On @ $24V_{DC}$; @ 100ms	A_{RMS}	2.5			

1.6.3 Velocity Controller

Velocity Controller	Unit	DBSC1x02	DBSC1x05	DBSC1x10	DBSC1x15
Command Input	V_{DC}	0 ... ±10			
Command Signal Resolution	bit	12			
Cycle Time	µs	500			

Velocity Feedback	Unit	DBSC1x02	DBSC1x05	DBSC1x10	DBSC1x15
Feedback System	-	Resolver			
Feedback - Resolution	-	Velocity: < 1500rpm ⇒ Resolution: 16bits Velocity: < 6100rpm ⇒ Resolution: 14bits Velocity: ≥ 6100rpm ⇒ Resolution: 12bits			
Pole Pairs	-	1			
Resolver - Winding - Ratio	-	0.5			

1.6.4 Encoder Output

Encoder Output	Unit	DBSC1x02	DBSC1x05	DBSC1x10	DBSC1x15
Signal	-	RS422			
Encoder Resolutions	ppr	512 / 1024 [1] / 2048 / 4096			

1) ex factory

1.6.5 Pulse / Direction Input

Pulse / Direction Input	Unit	DBSC1x02	DBSC1x05	DBSC1x10	DBSC1x15
Signal	V_{DC}	12-29 / opto isolated			
Operating Mode	-	Pulse and Direction			
Max. Input Frequency	kHz	125			

1.6.6 Encoder - Input

Encoder Input	Unit	DBSC1x02	DBSC1x05	DBSC1x10	DBSC1x15
Signal	-	RS422			
Operating Mode	-	A / B quadrature			
Max. Input Frequency	kHz	125			

1.6.7 Serial Interface

STANDARD (Option: Gxxx)

RS232 - Interface	Unit	DBSC1x02	DBSC1x05	DBSC1x10	DBSC1x15
Communication	-	RS232C (not galvanically isolated)			
Bit Rate	Baud	9600 (not adjustable)			

OPTIONAL (Option: Hxxx)

RS485 - Interface	Unit	DBSC1x02	DBSC1x05	DBSC1x10	DBSC1x15
Communication	-	RS485 (not galvanically isolated)			
Bit Rate	Baud	9600 (not adjustable)			

1.6.8 Mechanical Section

Mechanical	Unit	DBSC1x02	DBSC1x05	DBSC1x10	DBSC1x15
Mounting	-	Panel			
Dimensions	mm	55 x 400 x 265			
Weight	kg	4,5			

1.6.9 Environmental Section

Environmental	Unit	DBSC1x02	DBSC1x05	DBSC1x10	DBSC1x15
Operating Temperature Range	°C	+5 ... +40 Derating: 2.5%/°C for 40°C < T ≤ 50°C(max.)			
Storage Temperature Range	°C	-25 ... +70			
Humidity	%	10 ... 90; not condensating; acc. to DIN40 040, Class F			
Class of Protection (Enclosure)	-	IP20; according to DIN40 050 / IEC 144			
Max. Installation Altitude / M.S.L.	m	1000 above derate: 1,1%/100m			
Shock	-	10G; according to DIN IEC 68-2-6/29			
Vibration	-	1G; 10 ... 150 Hz; according to DIN IEC 68-2-6/29			

1.6.10 Power Supply Section DBSC1100

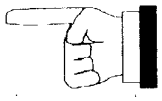
1.6.10.1 Regeneration

Regeneration Control Internal *Regeneration Resistor External*		Unit	DBSC1x02	DBSC1x05	DBSC1x10	DBSC1x15
Switching Threshold	$V_{in} = 230V_{AC}$	V_{DC}	388 ... 375			
	$V_{in} = 115V_{AC}$		180 ... 200			
Nominal / Peak Power		kW	1.0 / 15			
Max. Regeneration Switching Current		A	40			
Max. Load Inductance		µH	100			

1.6.10.2 Rectifier Section

Power Supply Internal		Unit	DBSC1x02	DBSC1x05	DBSC1x10	DBSC1x15
Input Voltage	Nominal	V_{AC}	$V_{in} = 230V_{AC}$ / $V_{in} = 115V_{AC}$			
(+15% / -20%)	Maximum		230 / 115			
	Minimum		265 / 130			
f = 50 to 60Hz			90 / 90			
DC-Bus Voltage	Maximum	V_{DC}	$V_{in} = 230V_{AC}$ / $V_{in} = 115V_{AC}$			
absolute	Minimum		360 / 175			
			125 / 125			
DC-Bus Voltage		V_{DC}	0 ... 360 ($V_{in} = 230V_{AC}$)			
absolute min./max. DBSC1xxx - 2			0 ... 175 ($V_{in} = 115V_{AC}$)			

Legend:

This is an *INFORMATION* sign. If this information is read, installation and / or drive operating problems can be avoided in advance.	
This sign means *ATTENTION.* In all cases it must be read and taken into account. Non-observance can cause dangerous situations for equipment and personnel.	

2.0 Installation Recommendations

The following chapter contains important informationen regarding the
mechanical and electrical installation
as well
SAFETY NOTES
It is strongly recommended to read and observe this chapter carefully.

2.1 Safety Notice

Qualified or trained personnel only should install the machine. Electrical rotating equipment can result in property damage, serious injury, or death, when improperly installed. Equipment should be installed in accordance with the local and safety standards for construction and guide for selection, installation and use of electrical motors and generators.

Suitable for use on a circuit capable of delivering not more than 5000Arms symmetrical amperes, 250VAC maximum per drive rating.

Electrical and/or mechanical alterations are permitted only when power is removed.

Drives with the 24V option can have power to connector X10 without any indication. The monitor and the LED "READY" illuminate only if 24V is switched on.

2.2 Electrical Installation

The wiring, fusing and grounding must be in accordance to the national electrical code and any local codes.

Use of motor thermo switch:
It is recommended to survey the status of this protective device in the position control (i.e. NC / CNC / NextMove / PMAC).
Since the leads can carry high voltage-spikes, isolation by means of a relay should be installed.

Connect the PE of all systems to a central point. The diameter of the cable-lead must be AWG7 (10mm²) min.

2.3 Mechanical Installation

For installation of your system use a cabinet with a protection class that suits your environmental conditions.

As cooling air freely enters the unit, the environment must be free from corrosive chemical substances, oil, vapour, steam, metal particles and dust.

Make sure that cooling is provided.

Make sure that the top of the unit is covered during installation to prevent particles from falling into the unit.

Mount all DBSC vertical (Connector X10 to the top).

Use DBSC1000/1100 in stationary groundbased applications only.

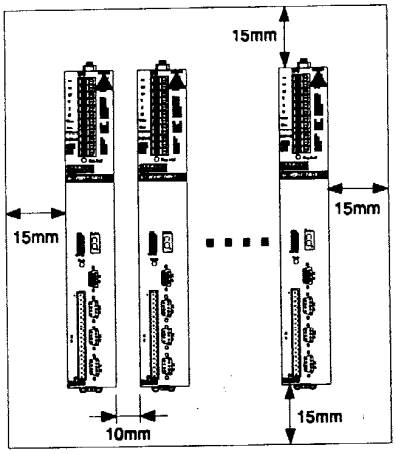
For the terminalblock connections the following tightening torque has to be observed:

0.5 to 0.6Nm

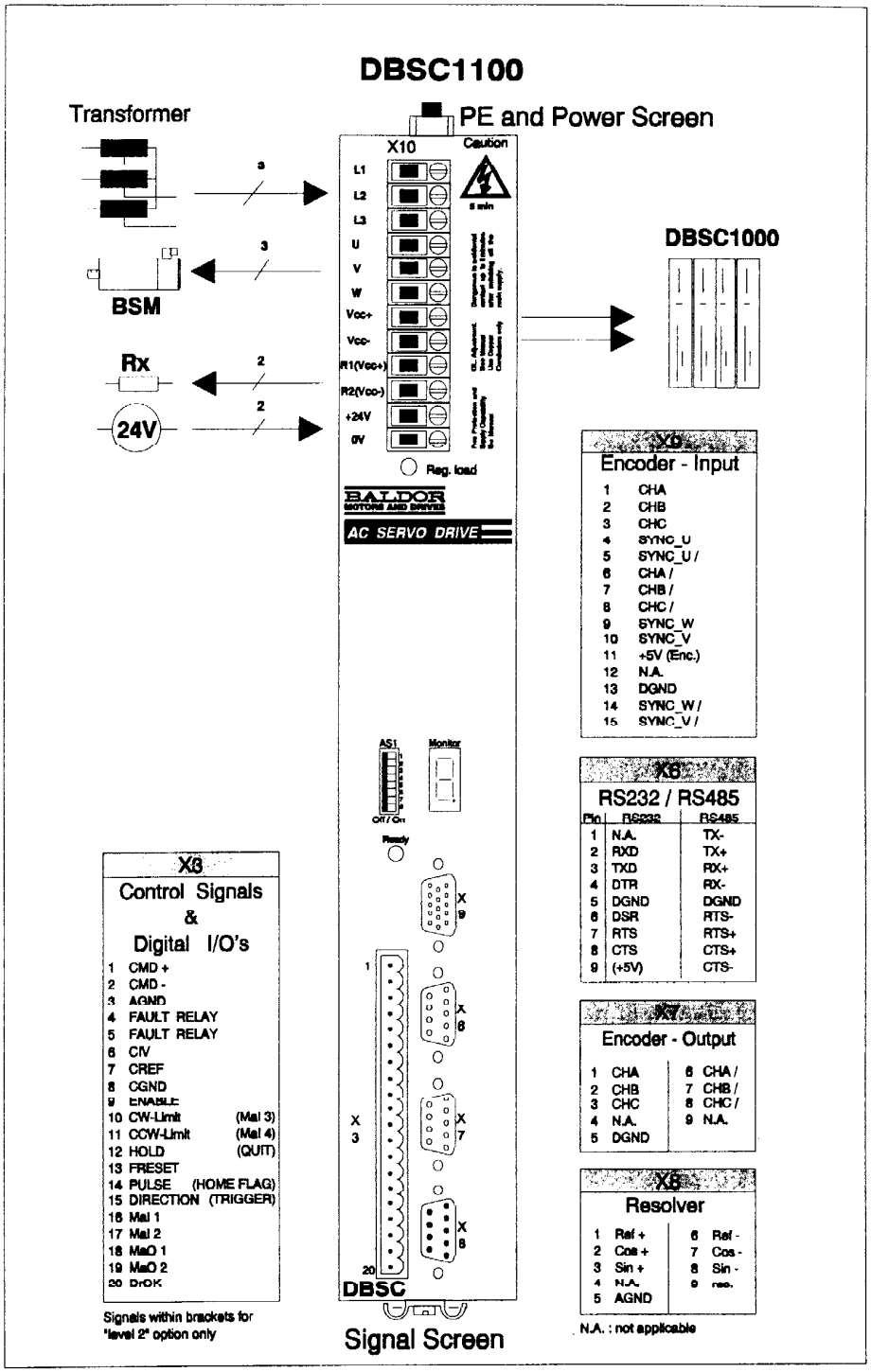
Furthermore only copper conductors should be used.

Sudden blocking of the rotating motorshaft can cause serious damage to motor and drive. It is strongly recommended to install elastic stoppers in the driven machine.

For safe drive operation a clearance distances around and between the drives must be observed.



3.0 Interconnection Diagram



Content of delivery: mating connector to X3.
Order-no's for mating connectors (spare part or completion):

X3: #16000 (20 pole, female) **X6**: #16215 (9 pole, male) **X7**: #16215 (9 pole, male)
X8: #23345 (9 pole, female) **X9**: #23347 (15 pole, male)

4.0 DBSC Wiring

In chapter 4.3 you will find the typical (minimum) wiring of the system . The following pages show some special applications and the typical wiring in more detail.

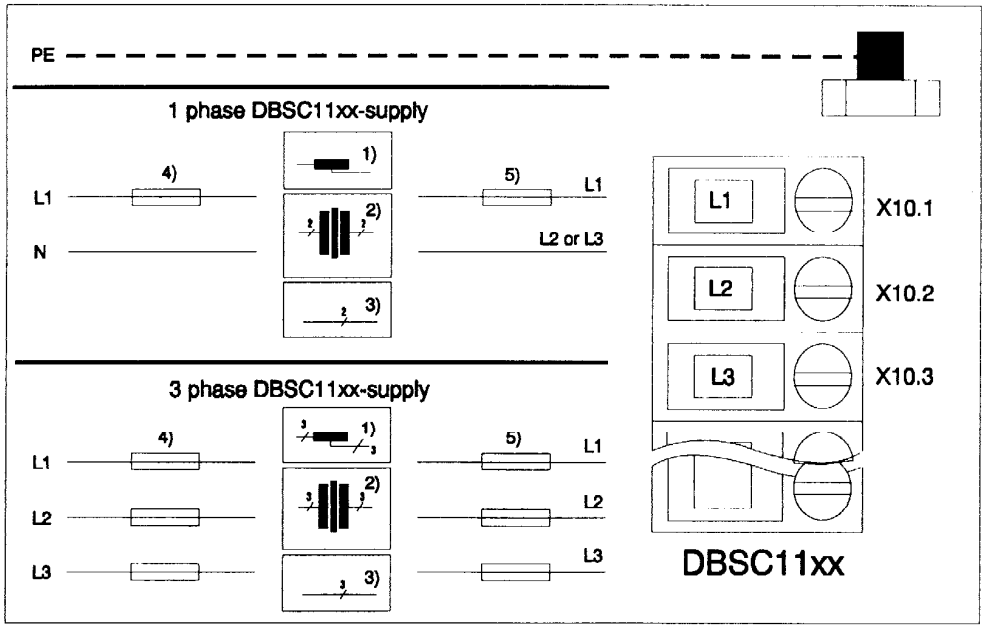
This chapter is valid for all DBSC versions.

> For the system set-up it is nessesary to wire the system step by step.
> It is recommended to follow the system set-up procedure, especially for users who are not very familiar with the DBSC drive series.

4.1 Power Wiring

4.1.1 Power Supply

The power supply wiring is different for **A) DBSC11xx with internal power supply** **and** **B) DBSC10xx without internal power supply**A) DBSC11xx with **internal power supply**The DBSC11xx can be supplied, like shown below, with 1- or 3-phase input voltage. The power supply module consists of rectification, smoothing, regeneration circuit and surge current protection.



1) Autotransformer **2)** Isolating transformer

2) Single phase connection (see also chapter 1 for input voltage)

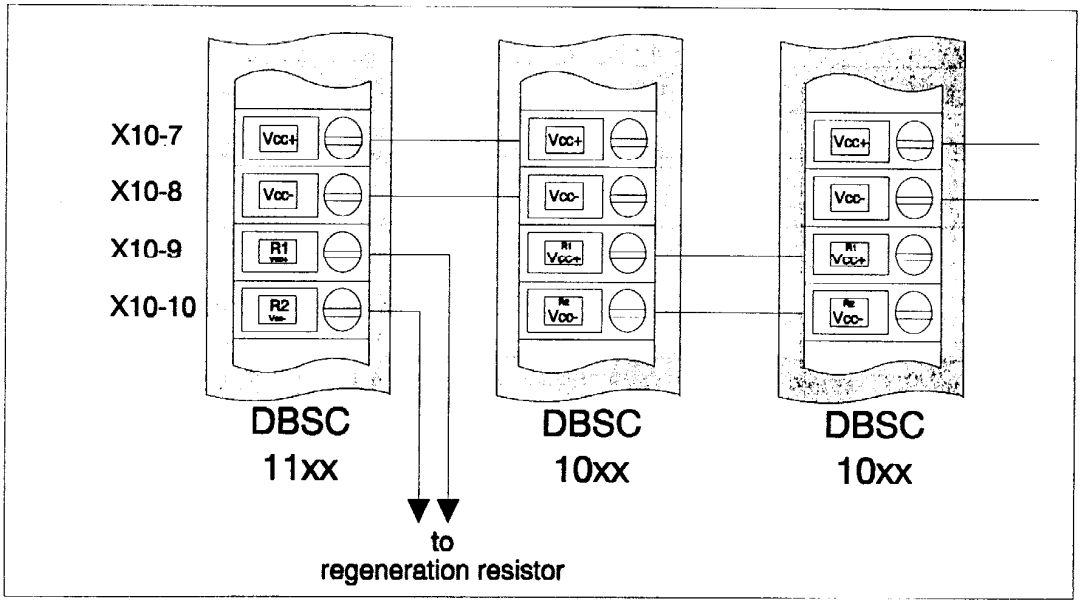
3) The size of the fuse must fit in order to project the power of the transformer.
Fault current breaker are not permitted for fusing the drive (same for point 5).

4) Each DBSC is internaly fused and therefore selfprotected. The shown input fuse is only for cable or lead protection. It is recommended to use a back-up fuse of 16A or 20A (max.); e.g. Neozed type gL slow blow type). For a fuse size of 16A a lead diameter of up to 1.5mm² can be used and for a 20A fuse the max. lead diameter can be up to 2.5mm².

For single phase connection the voltage ripple on the DC-bus is 25Vpp for 5A (peak current DBSC102) and 50Vpp for 10A (peak current DBSC105).
This can limit the max. speed of the motor.

When the DBSC will be supplied directly from the main or via autotransformer, it is
NOT PERMITTED
to connect the
Vcc - to PE.
This connection will damage the DBSC !

B) DBSC10xx without internal power supply For proper DBSC10xx operation an external power supply module is needed, which is providing the DC bus voltage.A power supply module can be a DBSC11xx or a BPS.



The picture above shows the power supply wiring of one or more DBSC10xx, which are supplied from a DBSC11xx.

On DBSC1100 the regeneration resistor is connected to X10-9 and X10-10. On the DBSC1000 this is the DC-bus to allow easy connections of more controllers.

To avoid an actuation of the DBSC back-up fuse, it is recommended to wait about 1 min. between a main power OFF/ON cycle.

4.1.2 Mains Filter

Following results are desired through the application of mains filters:

The electronic system should be protected from high frequency interferences which could enter via the mains cable (noise immunity) and vice versa the mains cable may not transmit interferences from the electronic systems to the adjoining components (elimination of interference).

To choose the fitting mains filter types following points have to be considered:

1. The need of power of the connected controller. Thereby the capacity and the ability of peak phase current has to be considered.

2. The required or present mains impedance.

The table below shows the corresponding mains filter types:

a) Mains Filter for 1 Phase Input

Type	Rated Voltage [V]	Rated Current (at 40°C) [A]	Leakage Current [mA]	Power Losses [W]	Weight [kg]	BALDOR - ID-No
FN 350 - 8 - 29	250	8	5	4,5	0,7	24663
FN 350 - 12 - 29	250	12	5	4,5	0,9	24665
FN 350 - 20 - 29	250	20	5	6,5	0,95	24666

b) Mains Filter for 3 Phases Input

Type	Rated Voltage [V]	Rated Current (at 40°C) [A]	Leakage Current [mA]	Power Losses [W]	Weight [kg]	BALDOR - ID-No
FN 351 - 8 - 29	3x 440	8	16	8,0	1,8	24667
FN 351 - 16 - 29	3x 440	16	16	9,0	1,8	24668
FN 351 - 25 - 33	3x 440	25	170	9,0	3,0	24669
FN 351 - 36 - 33	3x 440	36	170	10,5	3,0	24670
FN 351 - 50 - 33	3x 440	50	190	12,5	3,1	24671

Main filter dimensions are shown in appendix B.

4.1.3 Motor Wiring

The motor must be connected to the drive terminalblock X10:

X10 - 4	**U**	**Phase U**
X10 - 5	**V**	**Phase V**
X10 - 6	**W**	**Phase W**

Depending on the motor there are different connections: Motor BSM1R is equiped with a cable exit (flying leads; not suitable for trailing applications), BSM50, 63 and 80 have a power connector and BSM90 and 100 provide a terminal box.

A wiring example is shown in chapter 4.3.

The sequence of the motor leads is not arbitrary. Therefore the motor leads must be wired in the right sequence to avoid uncontrolled motor function.

Motor Cables

Motorcable	Cable Outer Diameter [mm]	BALDOR ID - No.
4x 1.0 mm² / AWG17	11.6 ±0.4	21599
4x 2.5 mm² / AWG13	14.5 ±0.5	21364
4x 6.0 mm² / AWG9	18.5 ±0.6	21597
4x 10.0 mm² / AWG7	22.8 ±0.4	21598

All cables have to be screened. The maximum cable length is 25m.

A) Connectors

For BSM50, 63 and 80 motors the following power connectors are available. They are suitable for cable screen wiring.

Connection	Designation	BALDOR - ID -No.	
Plug	CONN SET FEM	2x 4 pole	24654A

B) PG - Cable Glands

For BSM90 and 100 motors the following cable glands are available. They are suitable for cable screen wiring.

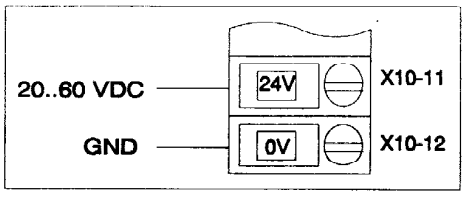
PG Cable Gland	Cable Dimensions	BALDOR ID - No.
PG 13.5	6 - 12 mm Motorcable BALDOR ID-No. 21599	24659
PG 21	13 - 18 mm Motorcable BALDOR ID-No. 21364	24660

Cable glands are according to IP68-DIN 40050.

4.1.4 24V$_{DC}$ - Connection (optional)

A 24V stand-by option is available for all DBSC versions. With this option the control circuits are supplied by an external voltage. The advantage of the option is that, if the main power is switched off control circuits are still supplied and position information does not get lost.

Wiring 24V$_{DC}$-Option:



With the 24V option the DC-Bus voltage can be variable from 0V to maximum Vcc.
NOTE: The velocity controller can be optimized only for a certain DC-Bus voltage. Therefore the controller behavior will change for different DC-Bus voltages.
The current control will be not affected.

4.1.5 Regeneration Resistor Wiring

The regeneration resistor can be installed by the user (see chapter 4.3). If during normal operation **fault "1"** occurs (overvoltage; see chapter 6), a regeneration resistor must be connected to the **DBSC100** to over-come this problem. For regeneration resistor installation the recommedations below should be observed.

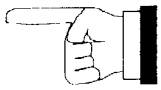
Selection table:

Regeneration Power		Regeneration-Resistor Value	Regeneration Switching Curr.	BALDOR - Order – Number
Peak [kW] 1)	Continous [W]	[Ω]	[A]	
7.5	320	18	20	20321
15	320	10	40	20319

1): Duty cycle = 2% at T = 120s

The regeneration resistor is not automatically included in the delivery.

The regeneration resistor must be mounted horizontal on a vertical surface for full power rating.
For vertical mounting on a horizontal surface the nominal load capacity is reduced to 65%.



Take care of good cooling of the regeneration resistor. The ambient temperature of the resistor can be up to 200°C, in a distance of 30mm.

Keep a safe distance between regeneration resistor and flammable materials. The mounting surface can reach a temperature of 80°C.

Wiring:

The resistor must be wired with a 2 lead screened cable. The resistor housing must be grounded.
A cable (3x 2.5mm² / ID-No.: 11302) can be supplied from BALDOR.

4.2 Control- and Signal Wiring

This chapter is valid for all DBSC versions.

The wiring of the control in- and outputs can be achieved with *one* cable only unlike shown in the pictures below. The outputs *can be* wired, but there is no need for DBSC operation.

4.2.1 Control Inputs

The control inputs below are optoisolated. The ground return for all inputs is "CREF", connector X3.7.
Please note there are two different pin assignements for connector X3 available.

A) Standard DBSC (LEVEL I) / Option letters: xxxW
OR
B) Optional DBSC (LEVEL II) / Option letters: xxxC

What is the difference between Level I and Level II?

LEVEL I: A drive with standard options (xxxW) can configured either in current, velocity or in Pulse-Follower mode.

LEVEL II: A drive with the option xxxC is dedicated for point-to-point positioning. Up to 15 different position can be store on the drive. They and the homing routine can be selected with the machine inputs and executed with the trigger input.

Control Input Function:

LEVEL I

Signalname	Connector Pin	Switch Position / Function	
		closed	open
STANDARD			
ENABLE	X3.9	Drive enabled	Drive disabled
CWLimit	X3.10	Clockwise direction of rotation enabled	Clockwise direction of rotation disabled
CCWLimit	X3.11	Counterclockwise dir. Of rotation enabled	Counterclockwise dir. of rotation disabled
HOLD	X3.12	HOLD function is active	HOLD function is not active
FRESET	X3.13	RESET function active	RESET function not active
PULSE	X3.14	see below	
DIRECTION	X3.15	see below	
MaI 1	X3.16	Machine input 1 = logical 1	Machine input 1 = logical 0
MaI 2	X3.17	Machine input 2 = logical 1	Machine input 2 = logical 0

LEVEL II

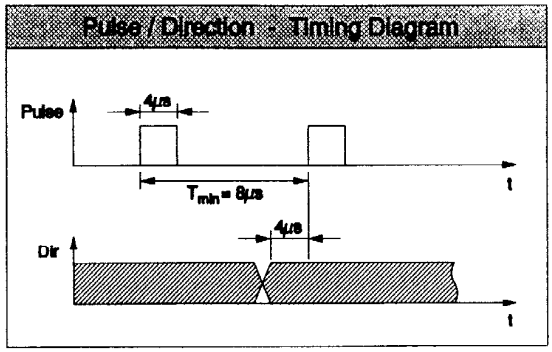
Signalname	Connector Pin	Switch Position / Function	
		closed	Open
OPTIONAL			
ENABLE	X3.9	Drive enabled	Drive disabled
MaI 3	X3.10	Machine input 3 = logical 1	Machine input 3 = logical 0
MaI 4	X3.11	Machine input 4 = logical 1	Machine input 4 = logical 0
QUIT	X3.12	Quit running positioning process	Positioning process will be done
FRESET	X3.13	RESET function active	RESET function not active
HOME FLAG	X3.14	Home flag = closing (or rising) edge	Home flag = opening (or falling) edge
TRIGGER	X3.15	Trigger = closing (or rising) edge	Trigger = opening (or falling) edge
MaI 1	X3.16	Machine input 1 = logical 1	Machine input 1 = logical 0
MaI 2	X3.17	Machine input 2 = logical 1	Machine input 2 = logical 0

Wiring proposal for control inputs see chapter 4.3. Hardware description of the inputs refer to chapter 7.

More about control inputs:

"PULSE & DIR":
(Level I)

A drive with the standard option (xxxW) has a pulse and a direction input. These inputs are like a stepper motor interface. The incoming pulses (frequency) detemine the velocity of the motor and the direction input the sense (CW, if high level and CCW if low level) of motor shaft rotation.



(minimum values)

"HOLD":
(Level I)

If the input is activated the motor will decelerate from the actual velocity to rest with max deceleration (max. time to velocity 0 is set to 0 with Hold function) and keep the reached position in controlled manner. The function is independent of the actual operating mode (current- or velocity mode). Hold-Position function can both be activated by hardware input (X3.12) and by software with the program DBSC.

"MaI x":
(Level I & II)

There are up to 4 machine inputs available. With the standard drive (option xxxW) 2 and with option xxxC totally 4 machine inputs.
LEVEL I: These two inputs can be used together with the internal PLC program.
LEVEL II: Machine input 1 and 2 can either be used together with the PLC program (priorized) or for selection of the programmed point-to-point move. If more than three programmed point-to-point move are needed, the alternative functions of the inputs X3.10 (MAI3) and/or x3.11 (MAI4) must be used. Please note, that the limit switch function is not available in this case. To subsitute (or add-on) the function of the hardware limit switches, software limit switches (only active, after the homing routine has been executed) can be defined.

"FRESET":
(Level I & II)

If the input is activated the following faults can be reset, as far as the fault is eliminated.

- Overvoltage
- Undervoltage
- Resolver fault
- Electronic fusing

"QUIT":
(Level II)

This input cancels the positioning process of the drive. It is an status controlled input and the function can be activated by suppling this input. In case the input was activated the motor will decelerate with a preconfigurated ramp. It can be adjusted with the DBSC-software parameter MOT.ACC.

"HOME FLAG":

This input is for determination of the home position. It is an edge controlled input (Level II) and the input function can be activated by a rising or falling edge (with encoder feedback rising edge only).

"TRIGGER":
(Level II)

With this input a programmed point-to-point move will be started. If the input will be acitivated, the position move addressed with the MaI's will be executed. It is an (rising) edge controlled input.

Functional example of control inputs:

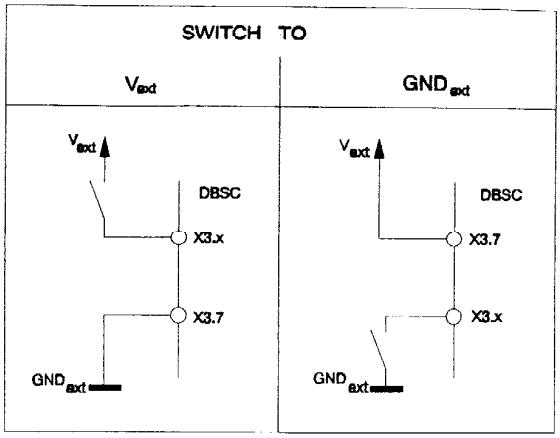
The wiring of the control inputs is also shown in chapter 4.3 .
The picture on the right hand side shows the function and the two wiring principles of the control inputs:

The two wiring versions are:

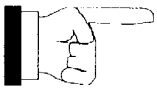
1) Switching to the external control input power supply. The switch will be linked between the control input (X3.x) and the external power supply (V_{ext}). The ground return (GND_{ext}) is permanently wired with CREF (X3.7).

2) Switch to the ground return of the external power supply. The switch will be linked between the control input and the external ground return (GND_{ext}). The external power supply (V_{ext}) is permanently wired with CREF (X3.7).

Voltage range of V_{ext} : +12 ... 29V_{DC}

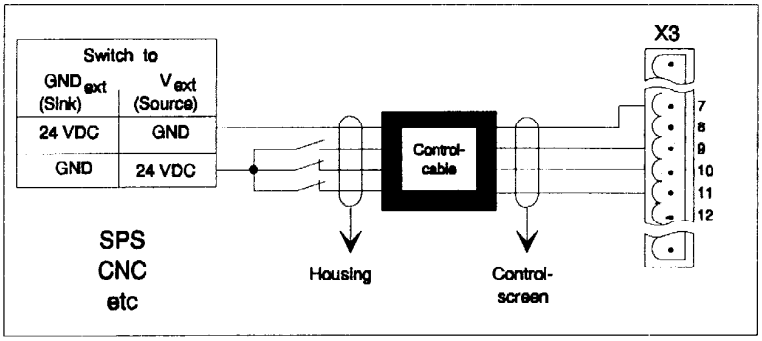


X3.x: "x" for connector pin,
e.g. x=9 → X3.9 = Enable-Input



The control inputs only work properly, if they are supplied with an external voltage.

Control Input Wiring:



4.2.2 Control Outputs

The control outputs must be supplied with an external voltage. The wiring of the control outputs is optional and not nessesary for proper drive operation. All control outputs are available with LEVEL I and LEVEL II.

Control Output Function:

Signalname	Connector Pin	Switch Position / Function	
		active / closed	not active / open
FAULT+ FAULT -	X3.4 X3.5	DBSC happy - no fault	DBSC not happy - drive fault
MaO 1	X3.18	Machine Output 1 = logical 1	Machine Output 1 = logical 0
MaO 2	X3.19	Machine Output 2 = logical 1	Machine Output 2 = logical 0
DrOK	X3.20	Output active - no fault	Output not active = drive fault

More about control outputs:

"FAULT": This output is a relay contact and constists of two connector pins. It indicates the general drive status.

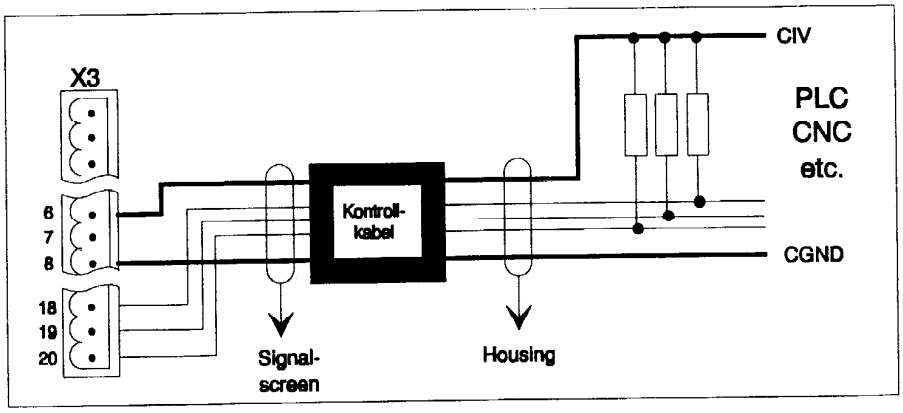
> The FAULT relay contact is not capable to switch any inductive load (relays). Inductive loads can cause some nuisance drive faults.

"DrOK": This output has the same funcionality than the fault relay output. The output is activated in case the drive is ready for work.

"MaO x": These outputs can be used together with the drive internal PLC program. There are 2 machine outputs available.

Control Output Wiring:

The control outputs can be wired like shown below. Chapter 7 shows the hardware circuits of the outputs. All outputs are active "LOW" (sink) and refered to CGND (X3.8).



4.2.3 Resolver

The resolver must be wired to drive connector X8 and on the motor side with signal connector.

Wiring of the resolver in- and outputs:

The wiring is shown in chapter 4.3.
Maximum cable length is 25m

Resolver Cable

Resolvercable		BALDOR ID - No.
Resolvercable	3x [2x 0.14mm^2]	19413

SIGNAL	COLOUR CODE	
Connector - Pin	Standard-Resolvercable	Cable Exit BSM1R
REF + / X8 - 1	red	red / withe
REF - / X8 - 6	blue	yellow / withe
COS + / X8 - 2	green	red
COS - / X8 - 7	yellow	black
SIN + / X8 - 3	pink	yellow
SIN - / X8 - 8	grey	grey

All cables have to be screened.

Connectors

For resolver wiring on motor side the following signal connector is available. They are suitable for cable screen wiring.

Connection	Designation	BALDOR - ID -No.	
Plug	CONN SET FEM	12/6 pole	24655A

On drive side will be wired to a 9 pole SUB-D connector (X8).

4.2.4 Encoder Output

The DBSC has an encoder output (X7), which can be used for position- and/or velocity feedback for a superset controller. The encoder output resolution (*p*ulse *p*er *r*evolution; ppr) can be configured via software. The following resolutions are available with the DBSC version:

512ppr **1024ppr** **2048ppr4096ppr**

Wiring of the encoder output:

A wiring proposal is shown in chapter 4.3.
It is strongly recommended to make the wire connection with a twisted and screened cable.
We recommend the use of the BALDOR encoder cable #13036.

4.2.5 Encoder Input

According to the ordered option the encoder input (X9) can have the following functions:

Handwheel - Mode
or
Feedback Hall / Encoder

A) Handwheel Mode

The DBSC respectively the motor can be configured as slave device from a handwheel encoder. The functionality, ratio between incoming encoder signals and the motor speed, is configurable via software.

B) Feedback Hall / Encoder (Option xBxx only)

With this option the DBSC is capable to do the motor commutation with a hall/encoder instead of the standard resolver. The BSM motor must have the option Exx or Fxx (e.g. BSM63A-EAA). The drive configuration will be done in software.

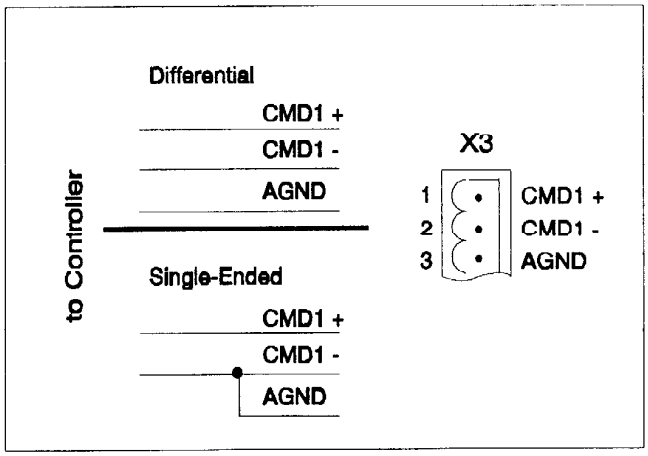
Wiring of the encoder input:

The connector X9 must be wired according to the interconnection diagram (see chapter 3.0).
It is strongly recommended to make the wire connection with a twisted and screened cable.
We recommend the use of the BALDOR encoder cable #13036.

4.2.6 Command Input

The DBSC has an analog command input (±10V). The input can be wired in "single-ended" or in "differential mode".

Wiring of the command input:



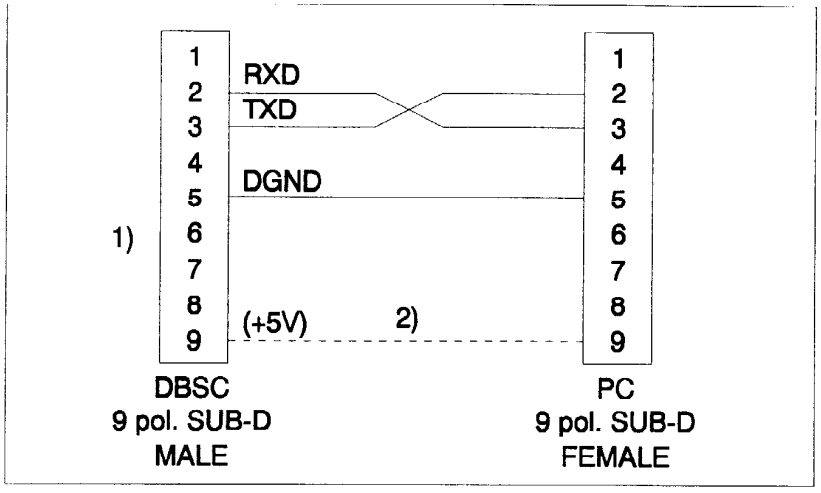
4.2.7 Interface Cables

The bit-rate for communication is 9600 baud. No other bit-rates are possible. To prevent interference it is advised to keep cable length at 1m or less. Shielding interface cables is highly recommended. It is also advised not to run the interface cable next to high power or AC signals such as servo amplifiers, line voltages etc.

The wiring from PC to DBSC connector X6 for serial interface must be as shown below:

A) RS232

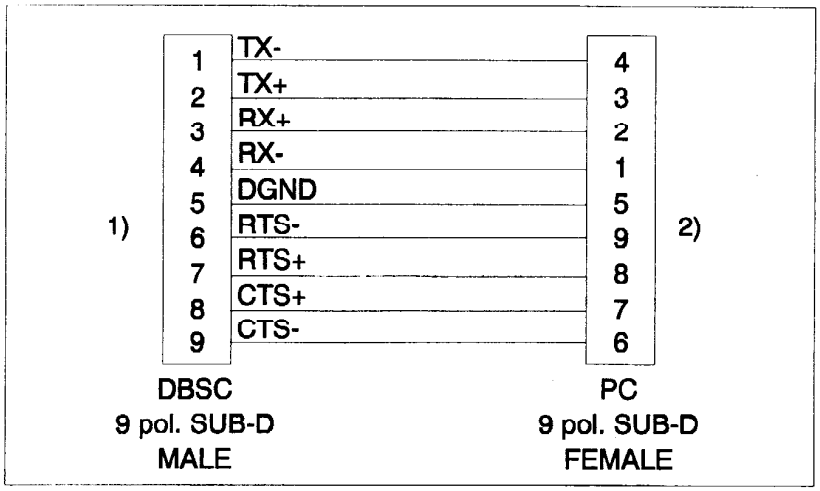
RS232 is the standard interface.



1) No other signals are supported by DBSC control-card
2) The shown wiring is optional The +5V output can be used e.g. to supply hand-held-terminals.

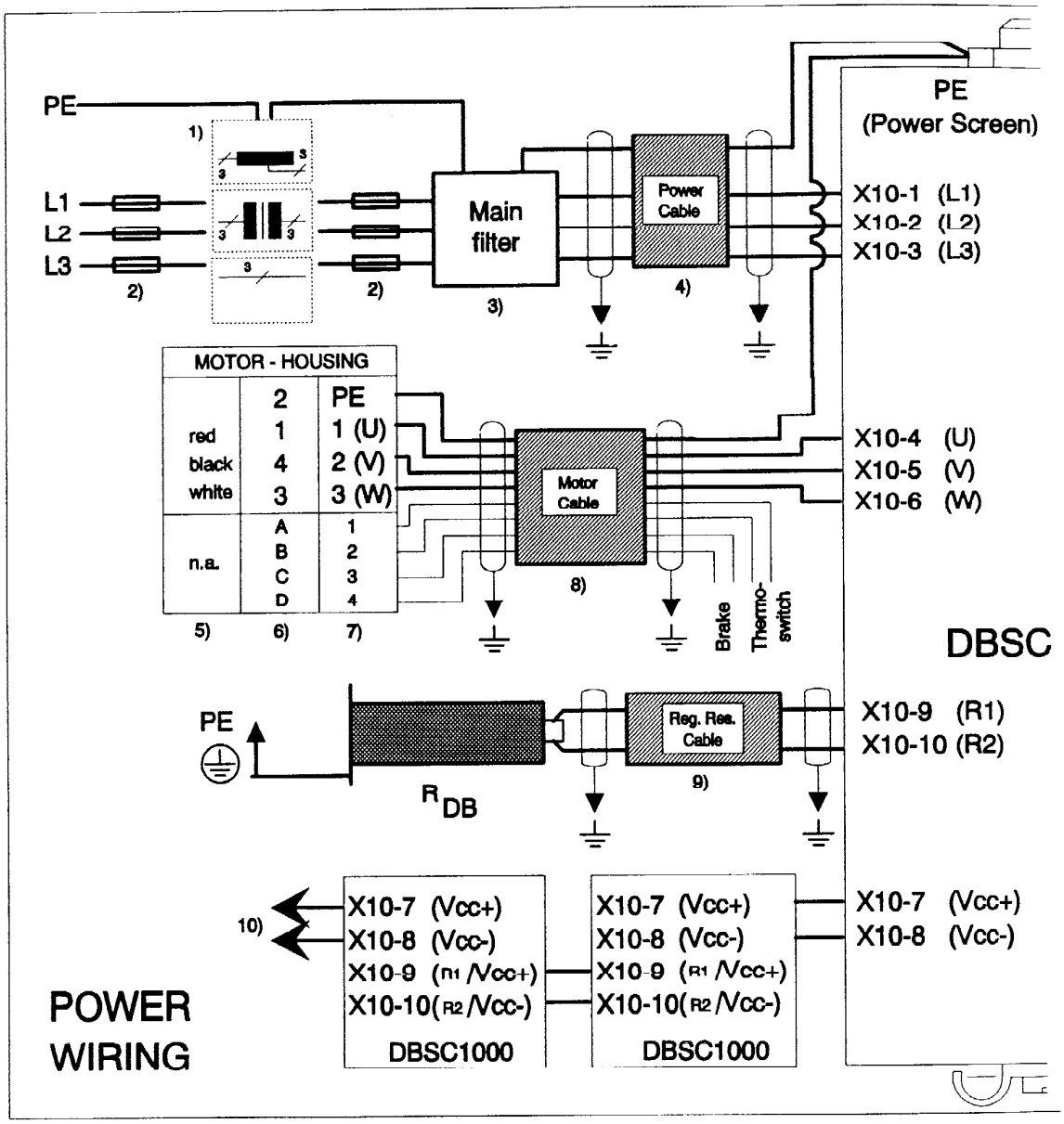
B) RS485

The RS485 is an optional interfaces only and must be ordered separately. For further informations concerning multi-drop applications please refer to appendix D.

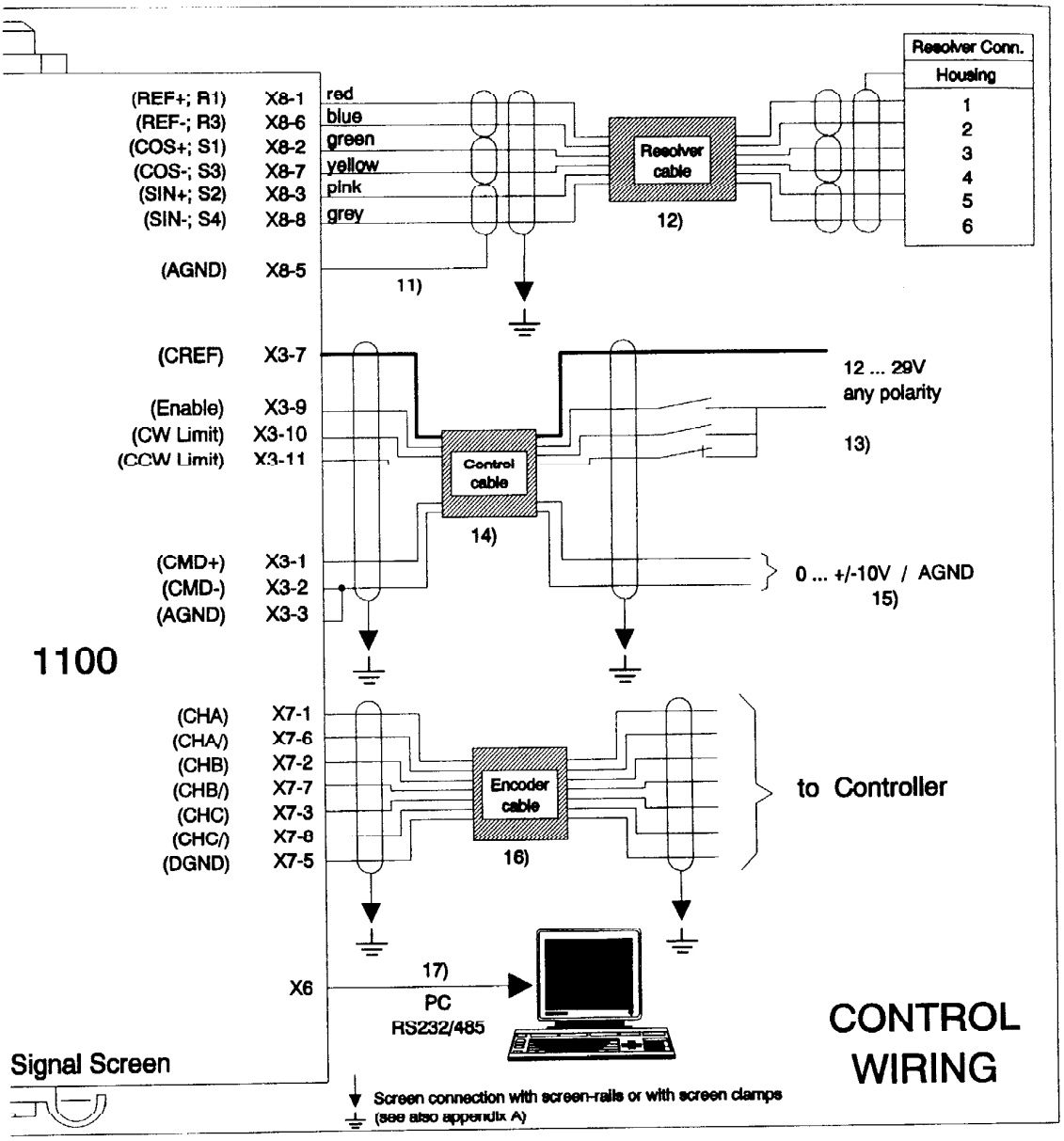


1) No other signals are supported by DBSC control-card.
2) Wiring of PC interface may be different than shown above. Please consult your PC interface description.

4.3 Minimum Wiring Diagram



1) Main Power (Autotransformer, Isolating transformer, 1 phase connection; see also chapter 4.1.1)
2) Fuses (see also chapter 4.1.1)
3) Main Filter (see also chapter .4.1.2 and appendix A)
4) Power cable not available from BALDOR. Lead diameter must fit to the transformer and drive.
5) Flying leads BSM1R
6) Connector BSM50/63/80
7) Terminal box: BSM4/6R, BSM4/6/8F, BSM90/100
8) Motorcable (see also chapter 4.1.3)
9) Sizing and further wiring recommendations see chapter 4.1.5.
10) The total current handling capability of the internal power supply connected to a 3-phase voltage source equals 15A cont. / 30A peak. For 1-phase connection it is 5A cont. / 10A peak. The wiring diameter must fit a total nominal current of the following connected DBSCs. Furthermore the connection between the DBSC amplifiers must be as short as possible.



11) If a very strong affect of EMI will be expected, it is recommended to connect the inside screens to DGND.

12) Resolvercable: #19413; BSM1R has flying leads

13) Functional description of the control inputs see chapter 4.2.1. The control inputs must be supplied with an external voltage source.

14) Control cable not available from BALDOR. Drawing shows the wiring principle only. Can be one or more cables.
NOTE: DGND and AGND are internally linked together. If the used controller does **not** have two independent grounds, only one GND should be wired to the controller to avoid ground-loops.

15) If the wiring is done like shown in the drawing, the motor rotates clock wise (view at motor shaft) with a positive voltage on X3.1 referenced to X3.2.

16) Encodercable #13036, twisted and screened

17) Interface cable refer to 4.2.7

ATTENTION: Please note also chapters 4.0. to 4.2. and Appendix A

5.0 System Set Up Procedure

5.1 Presets

Before applying power to the system, the following settings must be checked.

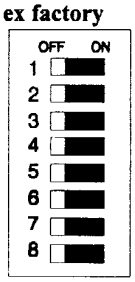
DIP - Switches: Settings and Functions

The pictures show

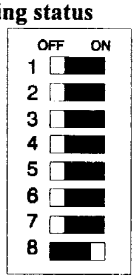
A) settings ex factory
(all DIP-switches "*OFF*")
and
B) operating status
(DIP-switch AS8 "*ON*")

of the DIP-switches.

A) Setting ex factory



B) Operating status



Note: For first time installation always make sure that all DIP-switches are in "*OFF*" position (see picture A) until motor and drive parameters are downloaded.

Card Address Setting / DIP-Switch AS1-4 (Multi-Drop Application)

Each card's address can be set-up by setting the DIP switch on the card as follows:

AS1	AS2	AS3	AS4	Card-Address	
OFF	OFF	OFF	OFF	0 *)	
ON	OFF	OFF	OFF	1	
OFF	ON	OFF	OFF	2	
ON	ON	OFF	OFF	3	
OFF	OFF	ON	OFF	4	
ON	OFF	ON	OFF	5	
OFF	ON	ON	OFF	6	
ON	ON	ON	OFF	7	
OFF	*OFF*	*OFF*	*ON*	*8*	*N.A.*
ON	*OFF*	*OFF*	*ON*	*9*	*N.A.*
OFF	*ON*	*OFF*	*ON*	*10 (hex a)*	*N.A.*
ON	*ON*	*OFF*	*ON*	*11 (hex b)*	*N.A.*
OFF	*OFF*	*ON*	*ON*	*12 (hex c)*	*N.A.*
ON	*OFF*	*ON*	*ON*	*13 (hex d)*	*N.A.*
OFF	*ON*	*ON*	*ON*	*14 (hex e)*	*N.A.*
ON	*ON*	*ON*	*ON*	*15 (hex f)*	*N.A.*

*) ex factory

N.A. : not applicable

Setting / Function DIP - Switch AS5 - 8

DIP-Switch AS	Function	Switch Position ON	Switch Position OFF *
5	no function	-	-
6	Hold - Position	Hold - Position is *active*	Hold - Position is *not active*
7	automatic offset tuning	automatic offset tuning is *active*	automatic offset tuning is *not active*
8	ENABLE	amplifier enabled (*active*)	amplifier disabled (*not active*)

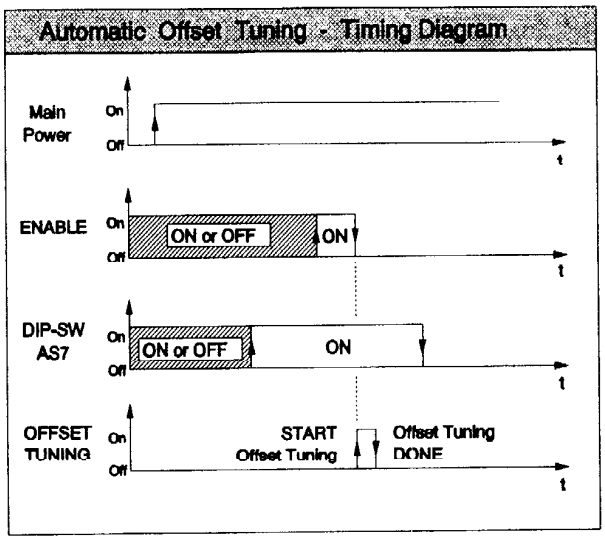
*) ex factory

Further explanations to AS5-8:

AS5: This DIP-switch has no function. Switch position can be on or off.

AS6: If switch is "*ON*" the motor will decelerate from the actual velocity to rest with max deceleration (max. time to velocity 0 is automatically set to 0) and keep the reached position in controlled manner. The function is independent of the actual operating mode (current- or velocity mode). Hold-Position function can also be activated by hardware input (X3.12) or by software with the program DBSC.

AS7: If switch is "*ON*" an automatic offset tuning will be executed if (X3.9) is changed from ENABLE to DISABLE. The purpose of the offset compensation is to achieve a standstill of the motor shaft. Therefore it is important to set the analog command to zero.
It is recommended to leave this switch at "*OFF*".



AS8: In switch position "*OFF*" the amplifier will be disabled. The function is the same as hardware enable-input (X3.9) and software command "SW_ENABLE" via DBSC program.

5.2 System Set Up Step by Step

With all initial settings completed (chapter 5.1), the set-up procedure can begin.

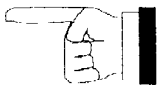
Please perform the initial set-up of the system with no load applied to avoid damaging your equipment due to erraneous handling.

1. Connect your system only to the main power as shown in drawings chapter 4.
   When using a transformer, check the secondary voltage of the transformer. Please refer to the transformer specification.

After the measurements disconnect the transformer from the power.

2. Now you can wire the DBSC drive under observance of chapter 4. System must be idle.
It is **not** advised to connect the motorcable yet. On the other hand the resolver **must** be connected to the drive.
Don't close the ENABLE switch (X3.9).

An external 24 VDC power supply must be connected to the DBSC, if you have the 24V-option.



3. Install the connection between PC and DBSC with the interface cable. Make sure that the enable input (X3.9) is not activated (switch opened or no wiring).
Now turn *ON* the main power. After power on, the LEDs will show the following state:

LED "READY"	=	*GREEN*
LED "REG. LOAD"	=	*OFF*

When the power is *ON* the DBSC monitor will show 4 different signs successively:

1) Sign is not defined
2) Displaytest
3) Option number 1 (e.g.)
4) Option number 2 (e.g.)

After power on procedure the monitor will show the final state:

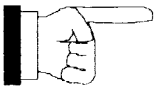
MONITOR	=	Monitor will show **"d"** only; decimal point lower right corner must be *OFF*. (If decimalpoint lower right corner is illuminating the amp-lifier is enabled. To disable the amplifer check enable-input (X3.9)).

Now configure the DBSC drive and then turn *OFF* main power.

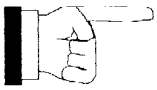
After turning off the power supply, wait about 5 min. to allow discharging of the capacitors inside the main power supply.

4. Now connect the motorcable. Turn *ON* main power again and activate the enable input (X3.9); close the switch (see chapter 4). Also DIP-switch 8 must be in ON position. After that the monitor will show the following operating state:

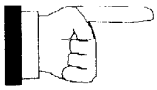
MONITOR	= **" • ; DP"**	decimal point lower right corner must be *ON*.



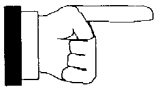
Random power on sequence for 24V resp. bus supply.



If the motor develops no torque and
... montor show a "L" check the wiring of CW and CCW-limits (X3-10; X3-11)
or
... monitor show a "d" check ENABLE input (X3-9) and DIP switch AS8.



If the motor shaft accelerates, turn off the power immediately and check the motor and resolver wiring.



If the decimal point on the monitor does not appear, check the wiring of X3-9 (ENABLE) and DIP-Switch 8.

5. Now you are ready to perform system tuning.

6.0 Status Indicators

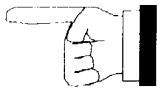
6.1 Status Monitor

The DBSC provides a status monitor. The indicated signs, as well as the LED Ready have the following meaning:

LED Ready	Monitor	Status	Cause
Green	OFF	Amplifier disabled	no fault
Green	. (DP)	Amplifier enabled	no fault
Red	1	Overvoltage amplifier DC bus voltage	Missing, damaged or wrong designed regeneration resistor.
Red	2	Undervoltage only DBSC2000/3000	-
Red	3	Overcurrent 2x Peak Current Crest Value	Power stage fault or motor leads short circiut
Red	4	Over- or Undervoltage; Internal 15V supply	Internal control voltage fault
Red	5	Resolver fault	Parting of the cable or resolver leads short circuit or missing plug-in connec-tion
Red	6	Electronic Fusing (see Fault 7 also)	Amplifier or motor active current overload. Fault detection via software.
Yellow	7	1) I^2t-Limit If I^2t-limit is reached, amplifier will re-duce output current to it's nominal value. After 2.4s (+0,5/-0)s DBSC switches off (amplifier disable) with fault indication "6; electronic fusing" 2) Motor overtemperature 3)Amplifier overtemperature	1) Cycle time between motor accele-ration and deceleration is too short. 2) Missing or faulty motor thermoswitch wiring. Amplifier oversized; active motor torque to high. 3) Amplifier ambient temperatur to high.
Operation Mode Indications			
Red	L	Both limit switches active	Missing limit switch wiring
Green	H	Hold - Position Mode	Input X3.12 active, DIP-switch AS6=ON or activation via software.
Green	d	Amplifier disabled	Disable function active via a) hardware (Connector X3.9 o. DIP-switch AS1.8) b) Software
Green	-|	Limit switch (clock wise) active	Check wiring of X3.10 or limit switch
Green	|-	Limit switch (counter clock wise) active	Check wiring of X3.11 or limit switch

For further monitor indications, please refer to appendix C.

For DBSCs with 24V-option the status monitor works only if the 24V is switched on.

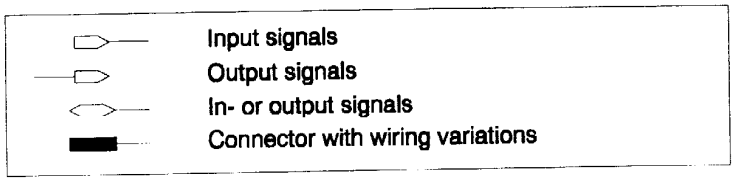


6.2 LED Regeneration Load

This LED located on the frontpanel indicates the activity of the regeneration. During regenerative actions this LED will illuminate *"RED"*. This means, power will dissipated into the regeneration resistor.

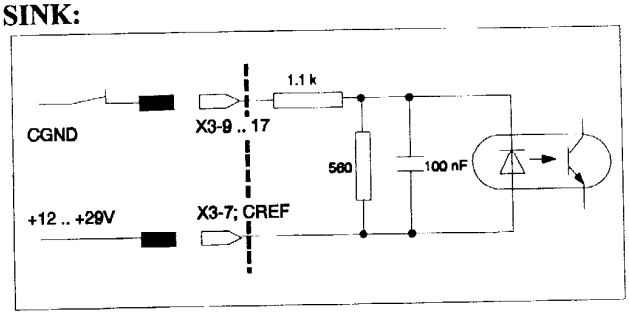
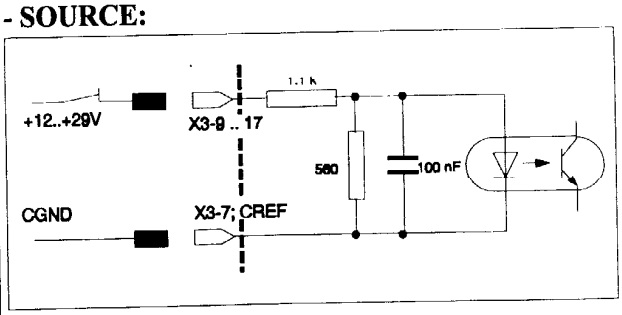
7.0 I/O Hardware Description

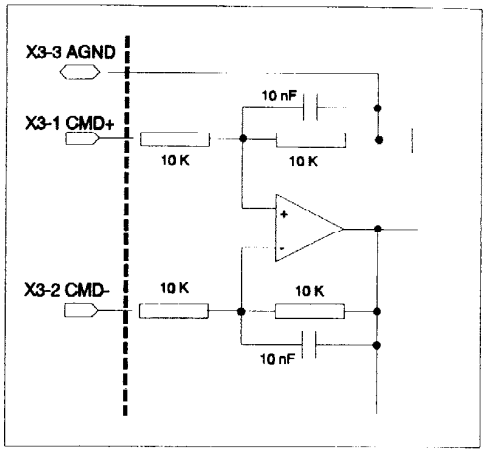
- Legend:



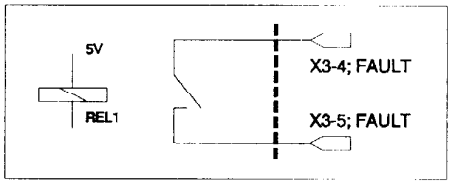
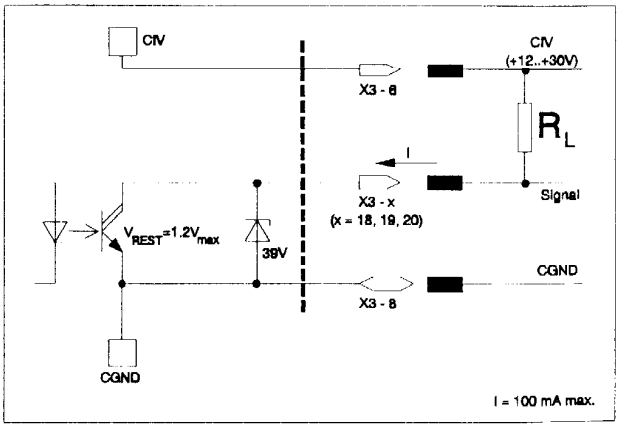
7.1 Input Signals

Digital Inputs Connector X3

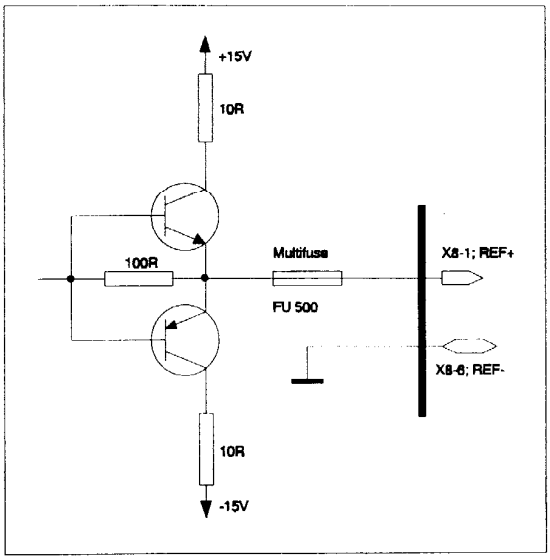
Function	Signal	PIN	Hardware
Enable	ENABLE	9	**- SINK:** 
CW-Limit (Machine Inp. 3)	CWLimit (MaI 3)	10	
CCW-Limit (Machine Inp. 4)	CCWLimit (MaI 4)	11	
HOLD (Quit Process)	HOLD (QUIT)	12	
Fault Reset	FRESET	13	**- SOURCE:** 
Pulse Input (Home Flag)	PULSE (HOME FLAG)	14	
Direction Input (Pos. Trig. Inp.)	DIRECTION (TRIGGER)	15	
Machine Inp. 1	MaI 1	16	
Machine Inp. 2	MaI 2	17	min. Input Impedance R_{IN} = 1.1kΩ; opto coupled; U_{IN} = 12 .. 29V_{DC}; Delay time T_d ~ 60µs max. current at 24V; I = 20mA
Ground Return	CREF	7	

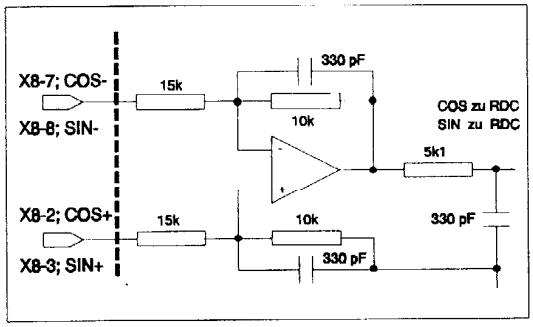
Analog Input Connector X3			
Function	Signal	PIN	Hardware
Velocity- or Current- Command	CMD+ CMD- AGND	1 2 3	$U_{cmd} = \pm 10V_{DC}$ 

7.2. Output Signals

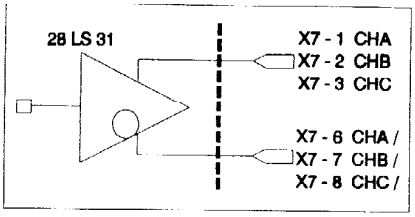
Digital Outputs Connector X3			
Function	Signal	PIN	Hardware
Fault Relay	FAULT REL. FAULT REL.	4 5	 Contact is closed, if system works correct $U_{AC} = 110V$ $I_{max} = 0.3A$ $U_{DC} = 24V$ $I_{max} = 0.8A$
Machine Outp. 1 Machine Outp. 2 Drive OK Customer Interface Voltage Ground Return	MaO 1 MaO 2 DrOK CIV CREF	18 19 20 6 8	

7.3 Resolver

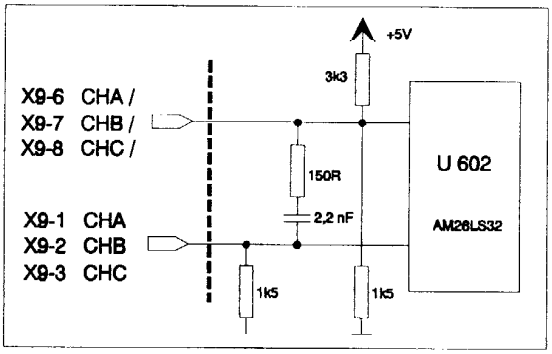
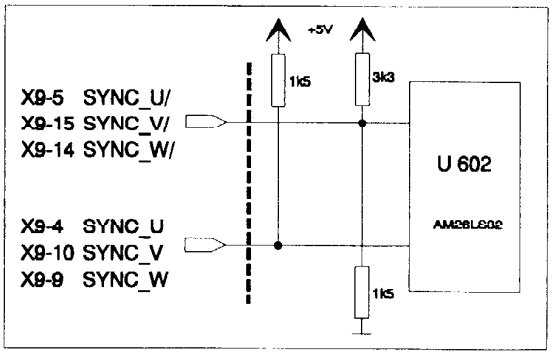
Resolver Signals Connector X8			
Function	Signal	PIN	Hardware
Reference Signal	REF +	1	
	REF -	6	Signal waveform sinusoidal; f = 7.2 .. 8.0kHz; U_{OUT} = 17V_{pp} ±10%

Resolver Signals Connector X8			
Function	Signal	PIN	Hardware
COSINE Input	Cos+	2	
	Cos-	7	
SINE Input	Sin+	3	
	Sin-	8	Input impedance ≈ 17kΩ ; Signal waveform sinusoidal; U_{IN} = 8V_{pp}±10% ; 7.2 .. 8.0kHz

7.4 Encoder Output

Encoder Signals Connector X7			
Function	Signal	PIN	Hardware
Encoder Channel_A	CHA CHA /	1 6	
Encoder Channel_B	CHB CHB /	2 7	
Encoder Channel_C	CHC CHC /	3 8	I/O-standard RS422 TTL-Signal; (f < 275kHz)

7.5 Encoder Input

Encoder Signals Connector X9			
Function	Signal	PIN	Hardware
Encoder Input Channel A & A/	CHA CHA /	1 6	
Encoder Input Channel B & B/	CHB CHB /	2 7	
Encoder Input Channel C & C/	CHC CHC /	3 8	
Hall Input Channel U & U/	SYNC_U SYNC_U /	4 5	
Hall Input Channel V & V/	SYNC_V SYNC_V /	10 15	
Hall Input Chan. W & W/	SYNC_W SYNC_W /	9 14	
Enc. Supply Ground Return	+5V DGND	11 13	I/O-standard RS422 TTL-Signal; (f < 125kHz)

APPENDIX

APPENDIX A

EMC Installation Instructions

To ensure electromagnetical compatibility (EMC) at hostile environment inside the cabinet following instructions are to be observed for construction. The implementation of following provisions enables the reduction of interference down to required levels.

For the Drives technology following key points are to be considered:

- **Grounding**
- **Screening**
- **Filtering**

Furthermore the relevant chapters of the Installation manual for the controllers have to be observed.
For installation of the drives system the starting point is the installation into a cabinet.

For construction of a cabinet the following installation instructions have to be considered:

A) **All metal conducting parts of a cabinet should be arealy conducted to the back plane. Eventually the connections should be placed with an earthing strap at a central grounding point .1)**

B) **There should be a spatial separation between power wiring (motor and power cable) and control wiring. (Avoid interaction space)**

C) **The screen connection of the signal and power cables should be arealy conducted to the screen rails or clamps. The screen rails or clamps should be well conducted to the cabinet.**

D) **The cable to the regeneration resistor has to be screened. The screen connection should be on both sides.**

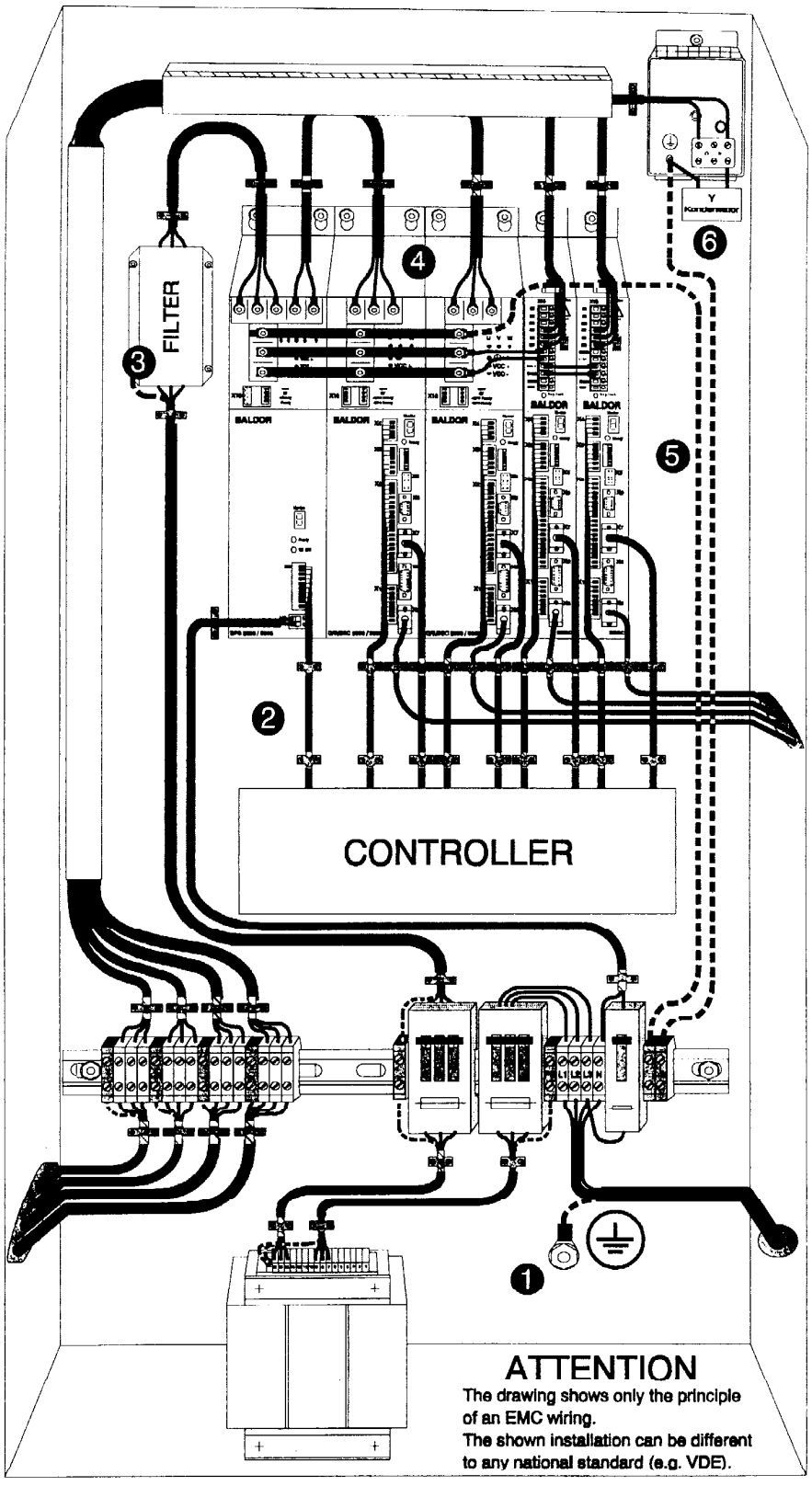
E) **The location of the mains filter has to be situated close to the drive.**

F) **Cables running inside the cabinet should be placed as close as possible to conducting metal, cabinet walls and plates. It is advised to terminate unused wires to chassis ground. 1)**

G) **In case of bad potential balance between the screen connections a compensating lead with at least 10mm² (AWG7) has to be provided additionly to reduce the screen current.**

1) Grounding in general describes all metal parts which can be connected to a protective conductor, e.g. housing of cabinet, motor housing, fundament grounder.

EMC Wiring Principle



❶ CABINET

The drawing shows a cabinet with an electroplated zinc coated back plane, which is arealy conducted to earth. This design will bring the following advantages:

- All parts mounted on the back plane are arealy conducted to earth.
- All screen connections will have a very low impedance to the earth.

General component placement within the cabinet:

There should be a spatial separation between power wiring (motor and power cable) and control wiring.

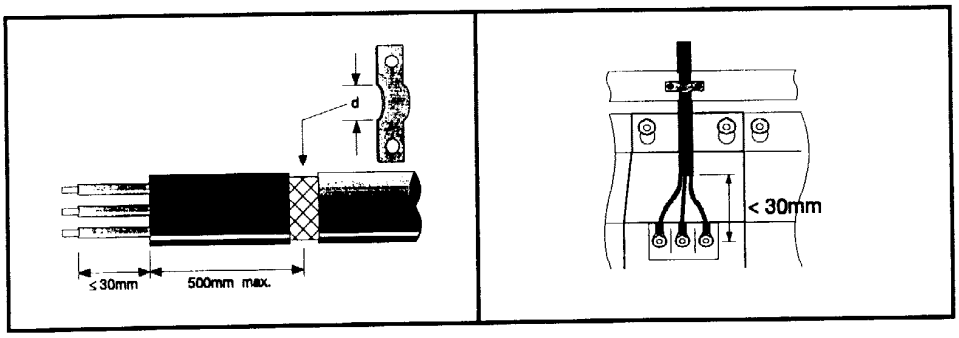
❷ SCREEN CONNECTIONS

All connections between the components should be wired with screened cables.
The cable screens should be connected to screen clamps on both sides.
With this wiring a very good screening effect can be achieved, because the clamps are arealy conducted to the cabinet back plane.

❸ EMC - FILTER

The EMI or main filter should be mounted next to the power supply (here BPS).
For the connection to and from the main filter screened cables should be used. The cable screens should be connected to screen clamps on both sides.

❹ WIRING OF SCREENED CABLES



❺ EARTHING

For safety reasons (VDE0160), all BALDOR components must be connected to earth with a separate cablelead.
The diameter of the cablelead must be at minimum 10mm² (AWG 7).
An earth connetion from the power side must be linked to the housing of the main filter. Between the main filter and the power supply, no earth connection has to be wired.

❻ Y-CAPACITOR

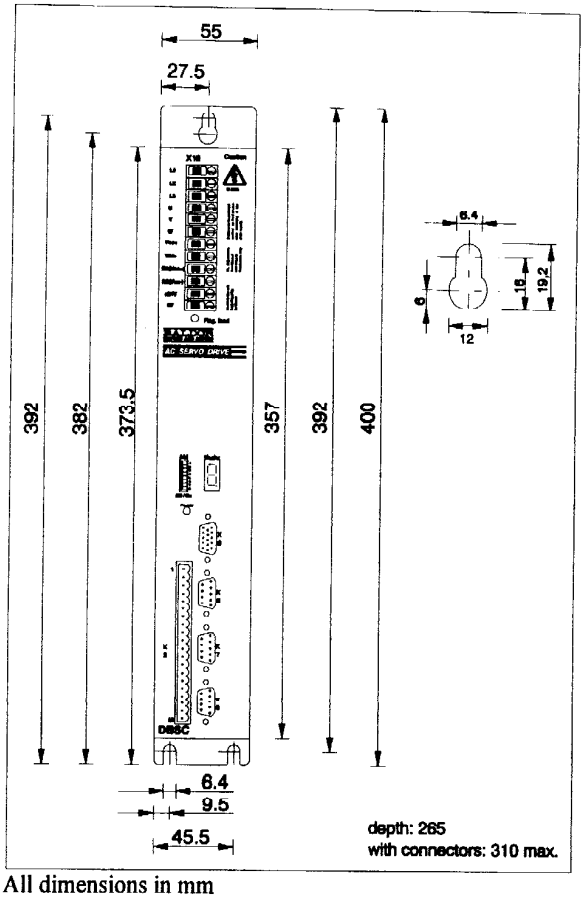
Due connection of the regeneration resistor, the radio emission can be very high. For minimization of this emission it is recommended to connect this Y-capacitor as shown.
It is only permitted to connect the capacitor between resistor housing and terminal pin R1 (lead from DBSC).

Recommendation: 0,1µF / 250VAC Type: PME265 Supplier: RIFA
BALDOR-Ordering-No.: 27104

APPENDIX B

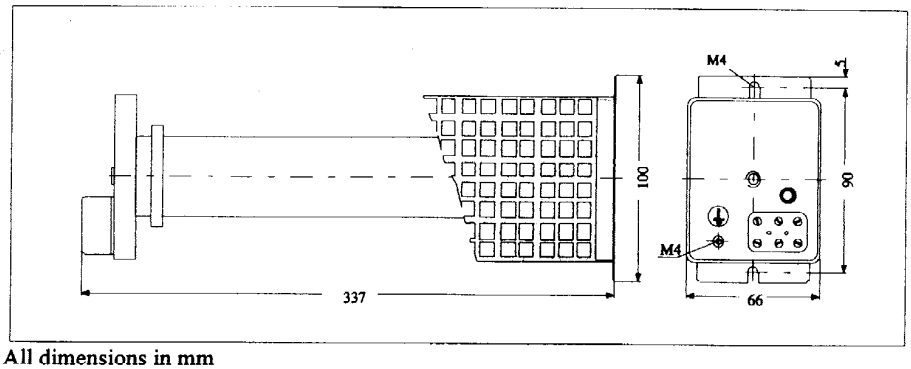
DIMENSIONS

A) DBSC1000/1100



All dimensions in mm

B) Regeneration Resistor



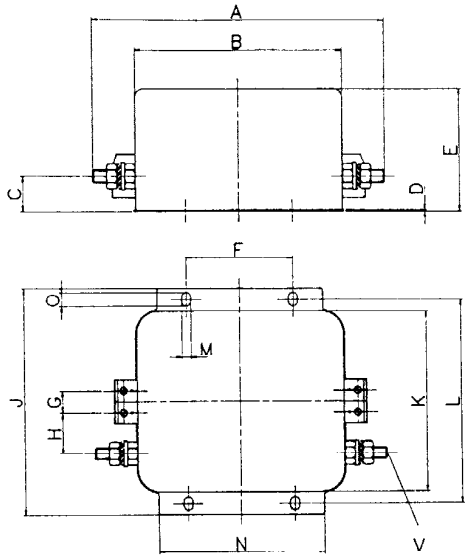
All dimensions in mm

C) Main - Filter

1- phase filter

Dimensions for the following main filters:

FN350 - 8 - 29 **FN350 - 12 - 29** **FN350 - 20 - 29**



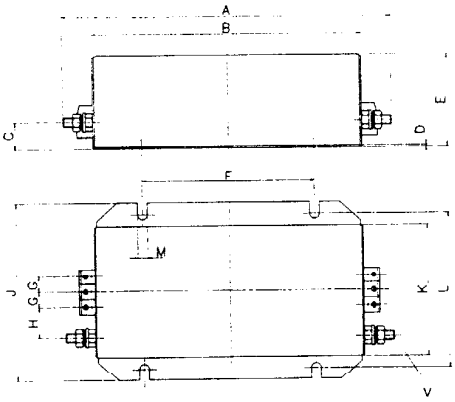
Mått	FN350 - 8 -29 FN350 - 12 -29 FN350 - 20 -29
A	139
B	99
C	16
D	0,6
E	57
F	51
G	10
H	19
J	105
K	84,5
L	95
M	4,4
N	79
O	6
V	M6

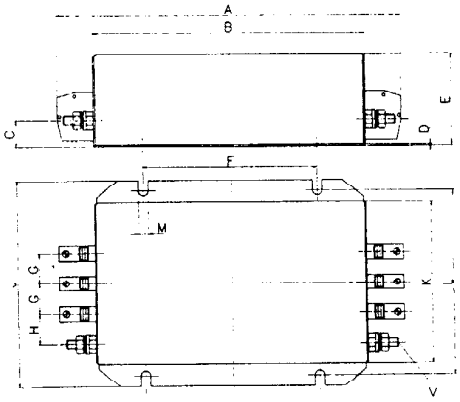
All dimensions in mm

3- phase Filter

Dimensions for the following main filters:

FN351 - 8 - 29 **FN351 - 16 - 29** **FN351 - 25 - 33** **FN351 - 36 -33** **FN351 - 50 -33**





Mått	A	B	C	D	E	F	G	H	J	K	L	M	V
FN351 - 8 - 29	220	180	17	0,75	60	115	10	19,5	115	85	100	6,5	M6
FN351 - 16 - 29	240	200	17	0,75	65	115	10	31	150	119,5	135	6,5	M6
FN351 - 25 - 33 FN351 - 36 - 33 FN351 - 50 - 33	250	200	17	0,75	65	115	20	21	150	120	135	6,5	M6

All dimensions in mm

APPENDIX C

TROUBLESHOOTING

LED Ready	Monitor	Status	Cause
Green	OFF	Amplifier disabled	no fault
Green	. (DP)	Amplifier enabled	no fault
Red	1	Overvoltage amplifier DC bus voltage	Missing, damaged or wrong designed regeneration resistor.
Red	2	Undervoltage only DBSC2000/3000	-
Red	3	Overcurrent 2x Peak Current Crest Value	Power stage fault or motor leads short circiut
Red	4	Over- or Undervoltage; Internal 15V supply	Internal control voltage fault
Red	5	Resolver fault	Parting of the cable or resolver leads short circuit or missing plug-in connection
Red	6	Electronic Fusing (see Fault 7 also)	Amplifier or motor active current overload. Fault detection via software.
Yellow	7	1) I²t-Limit If I²t-limit is reached, amplifier will reduce output current to it's nominal value. After 2.4s (+0.5/-0)s DBSC switches off (amplifier disable) with fault indication "6; electronic fusing" 2) Motor overtemperature 3)Amplifier overtemperature	1) Cycle time between motor acceleration and deceleration is too short. 2) Missing or faulty motor thermoswitch wiring. Amplifier oversized; active motor torque to high. 3) Amplifier ambient temperatur to high.
Red	8	Reserved	-
Red	9	RAM or EPROM fault Fault Relay Fault (Optional) When the LED is red and the status monitor displays a "9", the control either has a wrong or missing EPROM, or the fault relay option has been requested.	Internal control card fault. Fault-Reset activation can help (X3.13 or switch OFF/ON main power supply)
Red	0	Watchdog When the LED is red and the display shows a "0" a watchdog timeout occurred in the processor.	To reset this error you must turn off the controller and waiting about a minute before turning it back on.
Operation Mode Indications			
		Status / Causes	
Green	-	**Burn-In** When the LED is green and the display shows a "-." Moving from the top to the bottom of the display, the controller is in "Burn In" mode. "Burn In" mode can be set by software (only via the terminal) or by hardware via a solder bridge.	

... continued

Green	⌊⁷	**Move Command not accepted** When the LED is green and the display shows a "⌊⁷", it means one of three things 1) More than two move commands have been sent to the control. To go back to the normal status trigger a new move or send a quit to the controller. 2) An uninitialized bufferline has been called by the machine inputs 1 .. 4. To return to normal status you must call an initialized buffer line using the machine inputs 1 .. 4 or send a quit to the controller. 3) During the "Dwell - Time" you can see this symbol, if the Positioning is triggered by hardware.
Green	-|	**Limit switch (clock wise) active** When the LED is green and the status monitor displays a "-|.", the CW-limit switch has been activated. *Probable Cause:* Check wiring of X3.10 or limit switch
Green	|-	**Limit switch (counter clock wise) active** When the LED is green and the status monitor displays a "|-.", the CCW-limit switch has been activated. *Probable Cause:* Check wiring of X3.11 or limit switch
Red	A	**EEPROM Integrity Error** When the LED is red and the status monitor displays a "A", it means that no footer stamp was detected. *Probable Cause:* Power fail during EEPROM update or when EEPROM chip failure. EEPROM data integrity assumed to be bad, so the personality must be downloaded to the drive. When the personality download is finished the header and footer stamp are written to EEPROM and an error reset can be performed.
Red	c	**Controller Design Fail** When the LED is red and the status monitor displays a "c" the velocity controller data in the EEPROM are bad. The velocity controller must be downloaded to the drive, so an error reset can be performed.
Red	C	**CAN-Bus Problem** When the LED is green and the display shows a "C" which is blinking there is an abnormal occurrence of errors on the CAN - Bus. The CAN - System is still bus on. If the display is lit that drive is "BUS - OFF" due to a communications problem. A resynchronisation will be performed within 1 - 2 seconds. *Probable Cause:* A short circuit or wire break occurred on the CAN - Bus system.
Green	d	**Amplifier disabled** When the LED is green and the status monitor display is blank, the amplifier is disabled and there is no fault. When the LED is green and the status monitor displays a "d", the amplifier has been disabled. *Probable Cause:* The amplifier can be disabled by an input, a DIP switch, or by the DBSC software.
	E	**Following Error Warning** When the LED is green and the status monitor displays a "E." a Following Error Warning is activated after following error exceeds the Following Error Warning band. The Warning is not stored and the display vanishes after the following error is reduced to a value within the Following Error Warning band. This flag used in conjunction with the PLC *Note:* This is only an error flag. It is not an error message.

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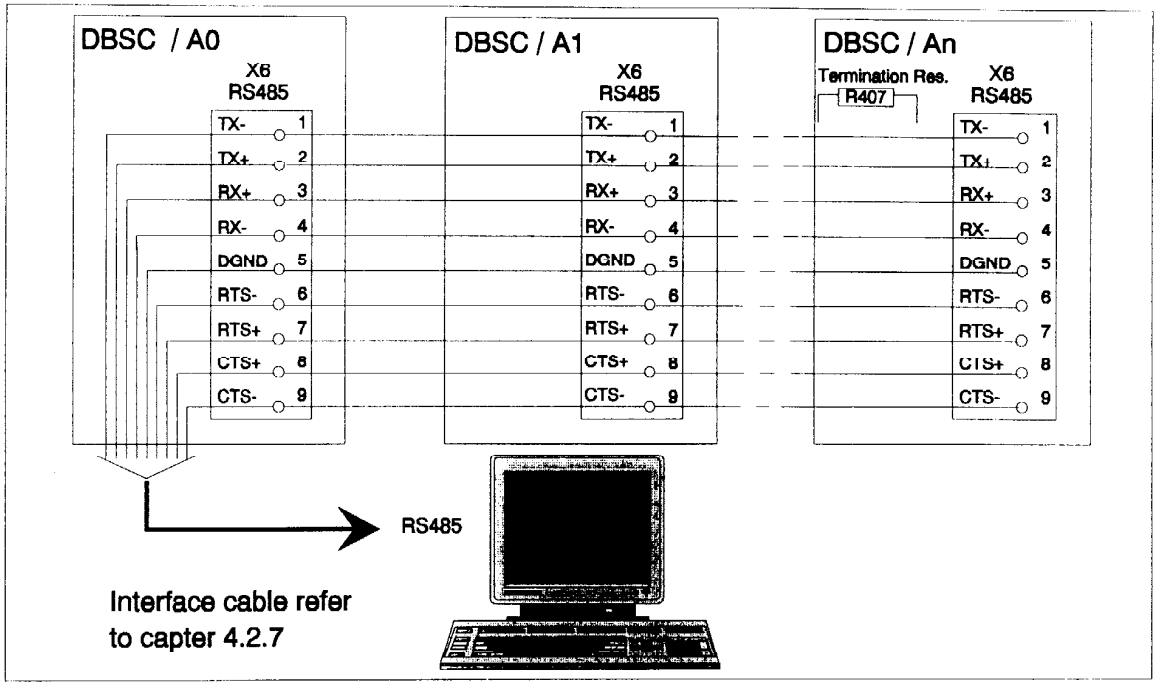
Green	F	**Fatal Following Error** When the LED is green and the status monitor displays a "F." the Following Fatal Error is activated after following error exceeds the user defined Following Fatal Error band. When the "Following Error" exceeds the preset levels set in the window Operation Mode à Positioning or Operation Mode à Tracking or Operation Mode à Pulse Follower This error is stored and must therefore be cleared by the user. As long as the following error does not exceed +/- 215 = 32768 the drive continues its motion. If the following error exceeds +/- 32768 the drive will be stopped immediately. The display will show a "F" and the LED will be red.
Green	H	**Hold - Position Mode** When the LED is green and the status monitor displays a "H" the control has been placed in the hold position mode. *Probable Cause:* The hold position mode can be activated by an input, a DIP switch, or by the DBSC - Software .
Green	J	**Jog - Mode** When the LED is green and the status monitor displays a "J." the control is in "Jog" system mode. The "Jog-Mode" can be stopped or started by the DBSC-Software.
Red	L	**CW and CCW Limit** When the LED is red and the status monitor displays a "L", both the CW and CCW limit switches have been activated at the same time. *Probable Cause:* The limit switches have not been wired into the control.
Green	P	**In Position** When the LED is green and the status monitor displays a "P." the drive is in position and the "Following Error" is less than the preset level.
Red	U	**Version Fault** When the LED is red and the status monitor displays a "U", it means that the content of the control's EPROM is different than the firmware's version. *Probable Cause:* The EPROM in the control has been replaced. Cycle the power on the control and start the DBSC - Software again. The EEPROM is assumed to be empty, so the personality must be downloaded to the drive. This error will occur after using CLEAR command, or if the EEPROM is not functioning. When personality download is finished the header and footer stamp are written to EEPROM and an error reset can be performed.
Red	u	**Power Identify Error** When the LED is red and the status monitor displays a "u", the EE power id not the same as the HW power id (in command terms: DRV.ID not the same as SYS.POWER). The personality that fits the drive must be download as version error is only checked for on power up. An error reset can be performed at run time.

APPENDIX D

Muli - Drop - Applications

This mode is only for users who are using the optional RS485 interfaces. The wiring principle for multi-drop applications is shown below. Each connected DBSC will also get it's own hardware address. The setting must be done by DIP-switches AS1-4 on the front panel.
The picture below shows termination resistors on the last connected DBSC. The resistors are not fitted, ex factory Resistor value depends on cable length. Therefore the value must be determined by the user and also retrofitted on the DBSC-control card. For that purpose the front plate must be removed, and the control card has to be pulled out.

Multi-drop wiring principle for RS485:



APPENDIX E

Software Installation

General: The DBSC Set-up software is Windows-based and guides you through all steps necessary, to set-up your Servo Drive via a serial port of your PC. Online-Help to each topic makes a manual obsolete.

A) Minimum system requirements

Hardware requirements (minimum):

Processor:	Intel 80486 / 33 MHz
RAM:	8MByte
Hard Disk Space:	50Mbyte
Screen:	600 x 480 (min.)
Recommended:	Intel Pentium, 16 MB RAM, 133 MHz, 100MB hard disk space free

Software requirements:

Operating System:	Windows 3.1x
Recommended:	Win95 or Windows NT

B) Installation

To install the DBSC Set-up software on your computer's hard disk, please follow the sequence described below:

1.) Start Windows. Make sure, that no other programs are running, while Installation of DBSC Set-up is done.

2.) Place Installation Disk One in your computer's floppy drive.

3.) Look for A: (if A is your floppy drive) and double click the data Setup.exe.

4.) According to demands from the installation process, insert Installation Disk with required number.

After installation process is finished, a Program Manager Group for DBSC with DBSC ProgMan Icon is created. Double clicking this icon will start the DBSC set-up program.