

# ***ESB-LC***

## **Softstarter for hydraulic elevators**



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## 1 Important Instructions



1. Operating the unit without hood is only allowed if it is fitted in a close cabinet.
2. During operation power converters might have power leading, non-insulated and hot surfaces according to their system of protection.
3. In case of improper removal of the required cover, with improper use, with wrong installation or operating there is danger of death or serious health or material damages.
4. All works of transport, installation and putting into operation as well as maintenance have to be carried out by **qualified expert personnel**. Qualified expert personnel in the sense of basic safety instructions are persons who are familiar with the installation, assembly, commissioning of the product and are qualified to carry out these works.
5. Power converters are components which are intended to be fitted into electrical units and machines. Putting them into operation (i.e. starting the operation as agreed) is only allowed with keeping the EMC-regulation.
6. The technical data as well as the indications concerning leading connection have to be gathered from the type plate and the documentation and to be strictly kept to.
7. For safety reasons, the motors have to be protected **by ptc thermistors** on principle.
8. The elevator should not be operated by a fault current protection switch (**FI switch**).

**Above all this applies while the construction period, in which, as experience shows, the elevators are supplied with current "somehow makeshift", often from a building site main cabinet, which also supplies the manual workers with current. In such a case reserve an own main cabinet for the elevators. See chapter „Installation“ for details.**

9. **Ensure sufficient ventilation** in the control cabinet. There must be at least 5 cm of free airspace above and below the heat sink to ensure sufficient air convection.  
Moreover, leave air holes in the bottom and the cover of the control cabinet, e.g. using perforated plates as offered by most manufacturers of control cabinets for their design. This encourages the air exchange with the outside air and avoids a thermal breakdown of the electronic control unit also in the height of summer.
10. **Capacitors for reactive current compensation**, if really required, must be connected prior to the main switch of the power supply.
11. In order to optimize possible network disturbances, particularly in conjunction with group drives, we recommend the installation of three-phase commutation chokes. These can be ordered from us to suit any size.
12. According EN 12015 the ratio factor of line short-circuit power to apparent power  $R_{SCE}$  has to be minimum 250.
13. Warranty and warranty claims have to be settled according to our General Conditions. Further reaching claims have to be settled separately.

2 EU declaration of conformity

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**EU-Konformitätserklärung**  
 im Sinne der Richtlinien 2014/33/EU und 2014/30/EU

**EU Declaration of Conformity**  
*In terms of directives 2014/33/EU and 2014/30/EU*

**Firma:** RST Elektronik GmbH  
*Company:* Tannenstraße 11  
 DE-74229 Oedheim

**Produktbeschreibung:** Einschaltstrombegrenzer  
*Description of product:* Softstarter

**Typ:** ESB-LC 1 | ESB-LC 2 | ESB-LC 3 | ESB-LC 4 | ESB-LC 5 | ESB-LC 6  
*Type:* ESB-2SH 1 | ESB-2SH 2 | ESB-2SH 3 | ESB-2SH 4 | ESB-2SH 5  
 ESB-2SO 1 | ESB-2SO 2 | ESB-2SO 3 | ESB-2SO 4 | ESB-2SO 5  
 ESB-2S48V 1 | ESB-2S48V 2 | ESB-2S48V 3 | ESB-2S48V 4 | ESB-2S48V 5

Die oben genannten Produkte entsprechen in Konstruktion und Fertigung den Anforderungen der Europäischen Richtlinien 2014/33/EU (Aufzugsrichtlinie) und 2014/30/EU (Elektromagnetische Verträglichkeit).  
*The above mentioned products correspond in construction and production with the requirements of the European Directives 2014/33/EU (Elevator Directive) and 2014/30/EU (Electro-Magnetic Compatibility).*

Folgende harmonisierte Normen werden angewandt:  
*The following harmonized standards are applied:*

<b>EN 81-2 + A3: 2010-08</b>	Sicherheitsregeln für die Konstruktion und den Einbau von Aufzügen – Teil 2: Hydraulisch betriebene Personen- und Lastenaufzüge	<i>Safety rules for the construction and installation of lifts – Part 2: Hydraulic lifts</i>
<b>EN 81-20: 2014-11</b>	Sicherheitsregeln für die Konstruktion und den Einbau von Aufzügen – Aufzüge für den Personen- und Gütertransport – Teil 20: Personen- und Lastenaufzüge	<i>Safety rules for the construction and installation of lifts – Lifts for the transport of persons and goods – Part 20: Passenger and goods passenger lifts</i>
<b>EN 81-50: 2015-02</b>	Sicherheitsregeln für die Konstruktion und den Einbau von Aufzügen – Prüfungen – Teil 50: Konstruktionsregeln, Berechnungen und Prüfungen von Aufzugskomponenten	<i>Safety rules for the construction and installation of lifts – Examinations and tests – Part 50: Design rules, calculations, examinations and tests of lift components</i>
<b>EN 12015: 2014-09</b>	Elektromagnetische Verträglichkeit – Produktfamilienorm für Aufzüge, Fahrtreppen und Fahrstelge – Störaussendung	<i>Electromagnetic compatibility – Product family standard for lifts, escalators and moving walks – Emission</i>
<b>EN 12016: 2013-12</b>	Elektromagnetische Verträglichkeit – Produktfamilienorm für Aufzüge, Fahrtreppen und Fahrstelge – Störfestigkeit	<i>Electromagnetic compatibility – Product family standard for lifts, escalators and moving walks – Immunity</i>

Die obig aufgeführten Produkte sind ausschließlich für den Einsatz in Aufzügen freigegeben, welche der Europäischen Aufzugsrichtlinie 2014/33/EU unterliegen. Es sind somit Aufzugsbauteile, welche weder unvollständige Maschinen noch Sicherheitsbauteile im Sinne der Europäischen Maschinenrichtlinie 2006/42/EG darstellen. Sie sind im Sinne der Europäischen EMV-Richtlinie 2014/30/EU keine selbstständig betreibbaren Geräte. Die Einhaltung der spezifizierten Grenzwerte ist abhängig von der korrekten Installation und Konfiguration einschließlich der Verwendung der in der Betriebsanleitung vorgeschriebenen bzw. integrierten Netzfilter und Netzdrosseln. Die Einbauanweisungen sind hierzu einzuhalten!

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**Die Einschaltstrombegrenzer sind keine gebrauchsfertigen Produkte. Vor Inbetriebnahme in Aufzugsanlagen muss ihre Sicherheit durch entsprechende bauseitige Maßnahmen sichergestellt werden (z.B. korrekte Montage, korrekter Anschluss (insbesondere der Erdung), usw.). Die Montage, elektrische Installation, Inbetriebnahme und Instandsetzung darf nur von ausgebildetem Fachpersonal unter Beachtung der Betriebsanleitung und einschlägiger Vorschriften durchgeführt werden. Planer, Hersteller und Betreiber der Aufzugsanlage sind für die ordnungsgemäße Montage und den sicheren Betrieb verantwortlich.**

*The above mentioned products are solely released for the use in elevators, which are subject to European Elevator Directive 2014/33/EU. Therefore they are elevator components, which are neither machines nor safety components in subject to European Machine Directive 2006/42/EG. They are in subject to European EMC directive 2014/30/EU no independent operable devices. In compliance with specific prescriptive limits depends on the correct installation and configuration, including the use of the required respective integrated mains filter and chokes according to the operating manual. The installation instructions have to be kept!*

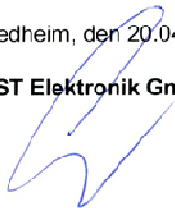
*The softstarters are no ready-for-use devices. Before start-up in the elevator facility the safety has to be assured by according customers measures (e.g. correct assembly, correct connection (especially earthing),...).*

*Assembly, electrical installation, start-up and maintenance have to be done only by skilled staff and under consideration of the operation manual and appropriate instructions.*

*Planner, manufacturer and operator of the elevator facility are responsible for the duly assembly and safe operation.*

Oedheim, den 20.04.2016


**RST Elektronik GmbH**



Hans Dekan  
Geschäftsführer  
Managing Director

### 3 Technical Data

#### 3.1 Electrical Data

- Supply voltage L1-L2-L3:**
- 400 V ± 10%, 50/60 Hz
  - 230 V ± 10%, 50/60 Hz (special design)
  - other voltages on request
- Break time before new start:**      appr. 2 seconds (only if contactor is connected prior to device in L1, L2 L3)
- Temperatures:**                              +5°C ... +50°C
- Protective system:**                              IP 20
- Signal relay (Top of the ramp):**      1 two-way, related voltage: 250 VAC  
 min load: 5V/5mA  
 max continuous current: 6A
- Release input (GS):**
- 

  - Voltage appr. 20V (is delivered by the softstarter – do not feed external voltage!). **The voltage is not potential free and is leading (e.g. in case of loss of 2 phases) mains voltage!**
  - Current appr. 13mA

#### 3.2 Device dimensioning

The suitable device must be selected by the nominal current of the motor of the hydraulic elevator. The maximum values are shown in table below.

Size	max. nominal motor current for hydraulic elevators		Terminals
	Standard-wiring	W3-wiring	
ESB-LC 1	25 A	38 A	10mm <sup>2</sup>
ESB-LC 2	33 A	50 A	10mm <sup>2</sup>
ESB-LC 3	46 A	69 A	16mm <sup>2</sup>
ESB-LC 4	65 A	98 A	16mm <sup>2</sup>
ESB-LC 5	90 A	135 A	35mm <sup>2</sup>
ESB-LC 6	135 A	200 A	95mm <sup>2</sup>
maximum switching frequency 60 starts/hour			

Table: Maximum nominal currents



**The definitive value is the motor current. The nominal motor currents given above are maximum values which are not allowed to be exceeded!**

### 3.3 Three-phase choke

While starting the device produces radio disturbances and low-frequency harmonics because of phase-shifting operation. These will be effectively reduce by a 3-phase choke in the power supply line.

The suitable 3-phase choke must always be selected according to the **nominal current** of the motor. The maximum nominal motor currents are shown in table below.

type	nominal current
ESB-KDR-1	max. 25 A
ESB-KDR-2	max. 38 A
ESB-KDR-3	max. 50 A
ESB-KDR-4	max. 69 A
ESB-KDR-5	max. 98 A
ESB-KDR-6	max. 135 A
ESB-KDR-7	max. 155 A

**Table: three-phase chokes**

### 3.4 Inrush current factor

The factor between "limited" inrush current and nominal motor current may be between 1,0 and 2,0 if the device is adjusted well. This value is very strong depending on the motor and the adjustment of the ESB-LC:

The ESB-LC raises the voltage linear. The current is not measured and controlled. The reduction of the current appears because of physical fundamental laws.

A short start-up time causes high inrush currents. An extreme false adjustment (Time = min and Offset = max) causes nearly the same inrush current as switching on the motor directly.

For this reason a concrete factor for the limited inrush current can not be given.

## 4 Mechanical data

### 4.1 Dimensions and weights

Size	Width	Height	Depth	Weight
ESB-LC 1	200 mm	230 mm	115 mm	ca. 2,6 kg
ESB-LC 2	200 mm	230 mm	115 mm	ca. 2,6 kg
ESB-LC 3	200 mm	230 mm	130 mm	ca. 3,8 kg
ESB-LC 4	216 mm	230 mm	173 mm	ca. 5,9 kg
ESB-LC 5	216 mm	230 mm	173 mm	ca. 7,3 kg
ESB-LC 6	380 mm	400 mm	210 mm	ca. 19,2 kg

**Table: Dimensions and weights**

### 4.2 Device fixing

The devices ESB-LC 1...5 will be mounted with 3 internal wrenching bolts. The device ESB-LC 6 will be mounted with 4 bolts.

## 5 General description

### 5.1 Basics

If a non-synchronous machine is switching on directly or by star-delta-switching, mains fluctuations are caused. The current pulse while the start-up time causes short lows and breakings in the mains-network (some milliseconds). The consequences are more or less heavy interferences to other consumers, for example disturbances in radios and TV's, light flickers, data missing in computers or unintended events in electronic appliances.

To get rid of this problem you can use a soft start device. The aim is to decrease the start-up current considerable and to improve the behaviour and lifetime of the elevator-system.

With the "ESB-LC" the voltage at the non-synchronous machine is driven up to nominal voltage within an adjustable time. The motor is always delta-connected, the torque builds up steadily. The motor starts slowly and accelerates softly.

### 5.2 Applications

The devices of the series "ESB-LC" may be used for hydraulic elevators to lift directive.

### 5.3 Advantages

The "ESB-LC" has following additional advantages:

- Compact dimensions and low-space requirement through microprocessor controlling.
- Simple connection into the motor feed line (standard-wiring).
- The motor starts automatically if the three-phase line voltage is applied. You may also or additional start the motor with an external release contact connected to the "ESB-LC".
- The motor voltage increases during the start-up phase to 100%. The start-up time and start-voltage are adjustable with potentiometers.
- Signal emission (relay point, top of the ramp) if the full voltage is achieved. With this relay external loads (e.g. valves) may be switched.
- Simple installation and commissioning without any problems.

### 5.4 Construction

The "ESB-LC" is constructed with a power part and an electronic board.

The power part exists of a power heat sink with thyristors, which are building a fully controlled three-phase thyristor regulator.

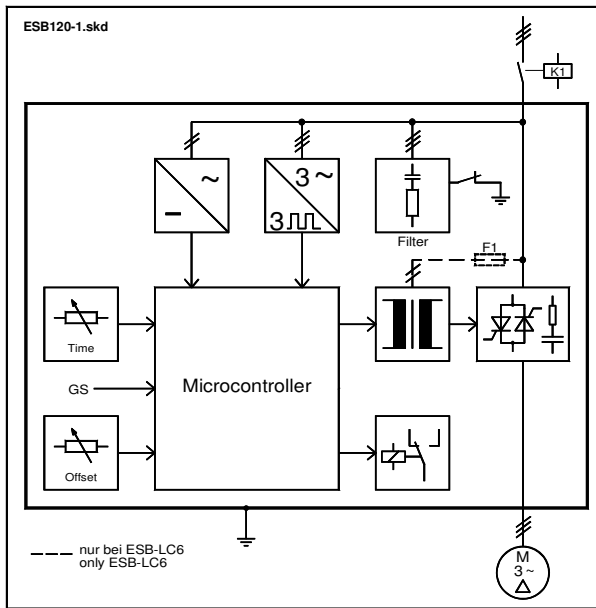
The electronic board, also containing the internal supply for pulse-firing, is mounted directly on the thyristors. At the front of the electronic board there is a two-pole and three-pole terminal. You can connect an external release signal (potential free contact) at the two-pole terminal "GS" (GS1 and GS2). The three-pole terminal (11, 12, and 14) leads the contacts of the signal-relay away.



### 5.5 Function

After switching on the 3-phase supply the thyristor set and the control unit are powered.

The internal voltage builds up and is indicated by the green LED "Power". If the start is released (by bridge at terminal "GS" or by closed external release contact), the yellow LED "GS" lights up. After that the adjustment of the two potentiometers will be recognized. The motor voltage will be increased within a fixed time up to 100%. The period of start-up time is directed by the adjustment of potentiometer "Time". The start voltage at the motor can be adjusted between 0% and appr. 40% with potentiometer "Offset".



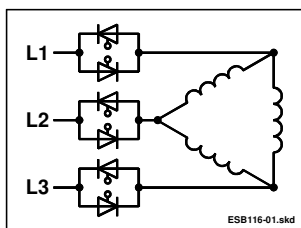
After reaching full voltage the signal-relay (top of the ramp) attracts and the red LED "Relay" lights up.

After switching off the 3-phase supply the device becomes idle and the electronic will be resetted (appr. 2 seconds after switching off). If the release contact "GS" is opened while powering the device, the electronic is resetted also.

Figure: Block diagram ESB-LC (Standard-wiring)

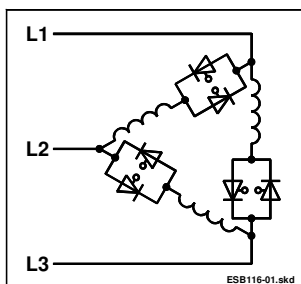
### 5.6 Standard- and W3-wiring

The motor may be connected in standard-wiring and W3-wiring.



If you use the standard-wiring, the "ESB-LC" is connected between mains and motor. The motor is connected with three wires. There are two thyristors in each main line. With the standard-wiring the motor may be star-connected also.

Figure: Standard-wiring



If you use the W3-wiring there are always two thyristors in series to a coil. The current through the thyristors is lower, so you can use a smaller size of the "ESB-LC". However the motor must be connected with six wires, which means more time for wiring. With the W3-wiring the motor is always delta-connected.

Figure: W3-wiring

## 6 Installation

### 6.1 General information

The power converters have to be protected from excessive stain. Above all, during transport and handling it is not allowed to bend any components nor it is allowed to alter any insulation spaces. The electronic components and contacts must not be touched.



Power converters contain electrostatically endangered components, which may easily be damaged by improper handling. People who work at these units must discharge themselves by touching an earthed object.

Electrical components must not be damaged or broken mechanically (possible damage to health).

While working on charged power converters the valid national regulations for accident preventions have to be kept (e.g. VGB4).

The electrical installation has to be carried out according to the relevant regulations (e.g. lead cross sections, protections, earth wiring).

The installer of the elevator is responsible for the keeping of the limiting values required by the EMC-regulations.

### 6.2 Fitting

The device must be mounted **vertically** (that means, the ribs of the heat sink should stand vertically), to ensure optimal heat removal.

For better ventilation of the power unit it is necessary to keep a gap of at least **5 cm** above and below the device.

#### 6.2.1 Fixing holes ESB-LC 1...5

The devices ESB-LC 1...5 will be mounted in the control cabinet with 3 internal wrenching bolts.

If you want to use a common assembly plate for ESB-LC 1...5 in the control cabinet, you may make the threads like on drawing number 5.199.xx (see appendix in the manual).

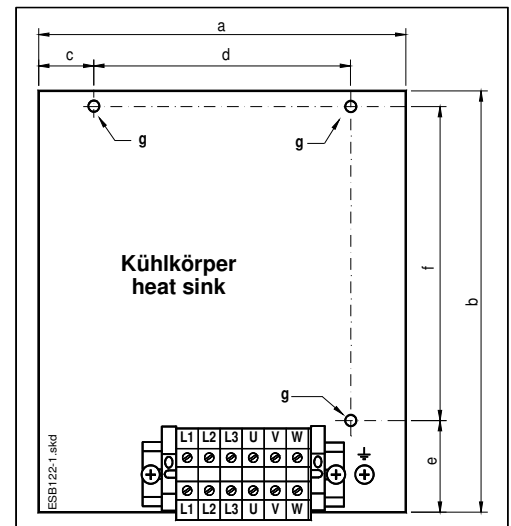


Figure: Mechanical dimensions ESB-LC1...5

Size	a	b	c	d	e	f	g	Height of the heat sink
ESB-LC 1	200	230	20,0	160	50	170	Ø 7	25
ESB-LC 2	200	230	20,0	160	50	170	Ø 7	25
ESB-LC 3	200	230	20,0	160	50	170	Ø 7	40
ESB-LC 4	216	230	36,5	143	50	170	Ø 7	83
ESB-LC 5	216	230	36,5	156	60	160	Ø 7	83

Table: fixing holes ESB-LC 1...5 (all dimensions in mm)

6.2.2 Fixing holes ESB-LC 6

Size	a	b	c	d	e
ESB-LC 6	380	400	340	360	9

Table: Mechanical dimensions ESB-LC-6

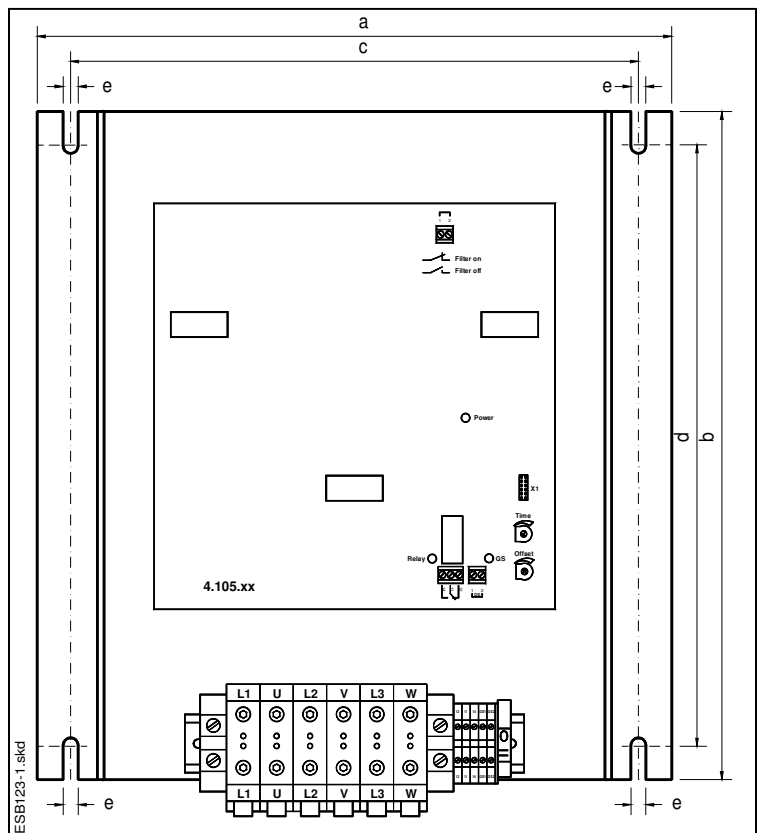


Figure: fixing holes ESB-LC-6

### 6.3 Connection

The **mains line** must be connected with the terminals **L1, L2, L3**. The protective earth (PE) must be connected with the M5 earth screw or the PE-terminal.

The contacts of the signal relay may be connected at the three-pole connection at the front of the PCB to switch external loads (e. g. valves).

If necessary, the device may additionally be released with an external switch (potential free), which is connected to the two-pole connection "GS" at the front of the PCB. If connecting the switch, the bridge must be removed.

#### 6.3.1 Advices for wiring ESB-LC 1...5

The flexible wires for connecting the pcb-terminals (GS1, GS2, 11, 12, and 14) have to be led out of the device above the left end bracket.

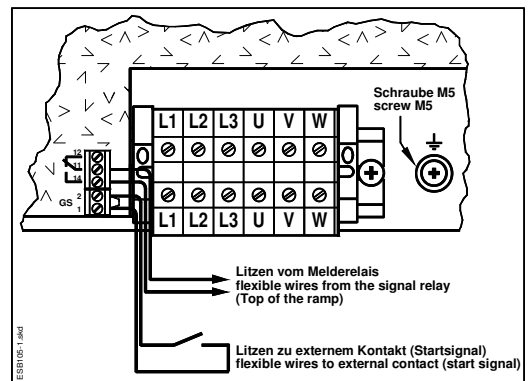


Figure: cable running

#### 6.3.2 Connection in standard-wiring

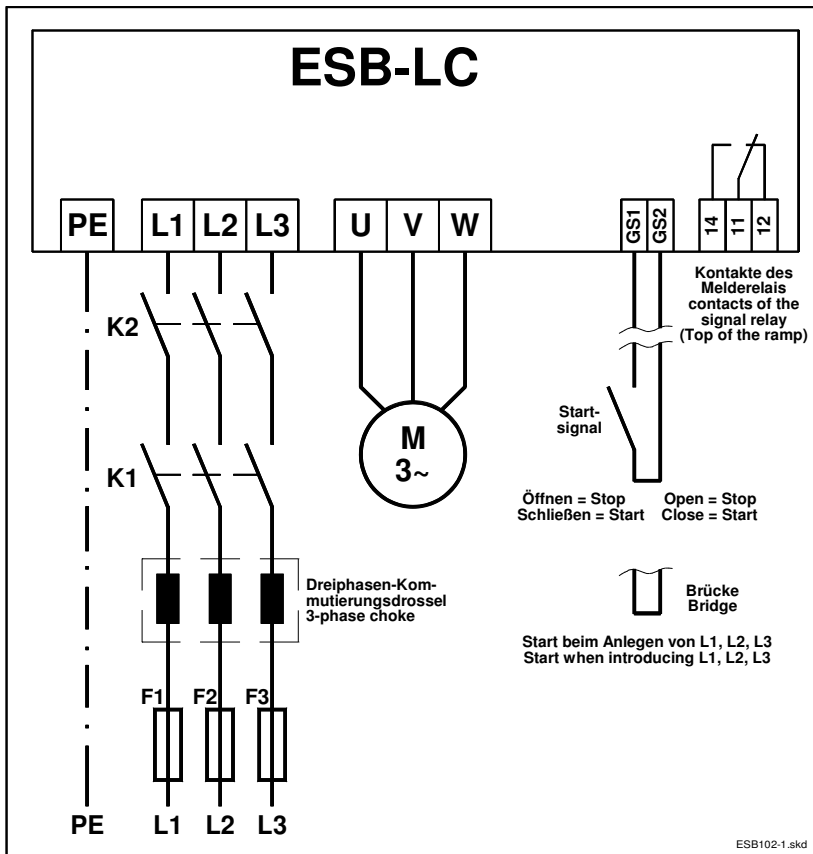


Figure 6.3.2-1 shows the principal order of the device in an elevator system with two contactors.

It is also possible to wire one or all two contactors between terminal U, V, W and the motor. If doing this, the secondary contact (closing contact) of the respective contactor should be wired in series in the release line (GS1 - GS2).

Figure: Wiring diagram standard-wiring

### 6.3.3 Connection in W3-wiring

The motor must be connected **additionally** with the three phases L1, L2 and L3 comparing to the standard-wiring.

If a 3-phase choke is used, it must be suitable for the **motor current!**

In the W3-wiring the motor is **delta-connected**.

#### 6.3.3.1 Contactors in the mains line

The figure shows the principal order of the device in an elevator system with two contactors with W3-wiring.

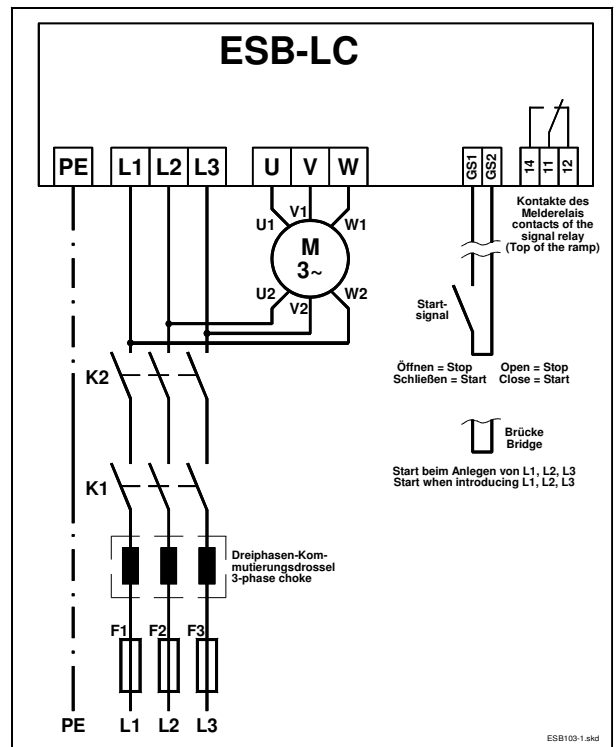


Figure: Wiring diagram W3-wiring (contactors in the mains line)

#### 6.3.3.2 Contactors in the motor line

In principle it is possible to wire the contactors in the motor lines. The nominal current through the contactor is factor  $\sqrt{3}$  smaller than the nominal motor current. The order of the contactors in this wiring is shown in the figure.

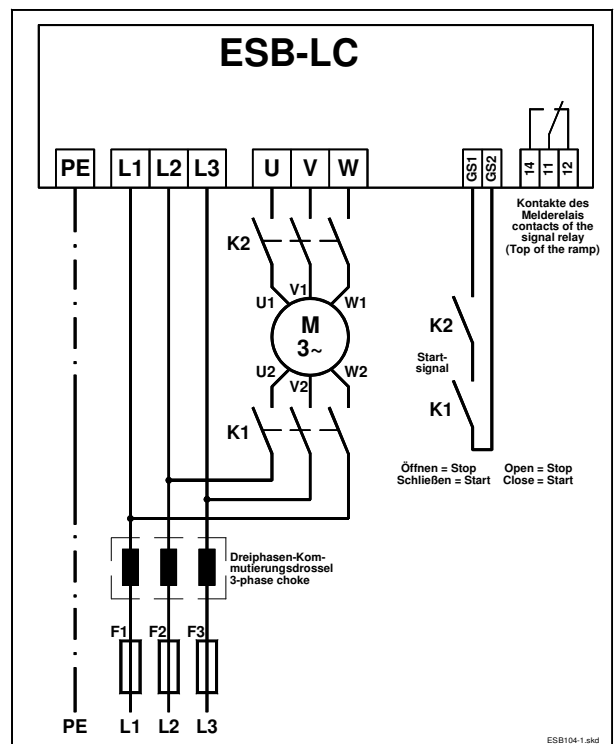


Figure: Wiring diagram W3-wiring (contactors in the motor line)

## 7 Commissioning instruction

### 7.1 Safety instructions

Units with build-in power converters eventually must be equipped with additional operational monitoring systems and protective gear according to the newest valid safety regulations, e.g. law of technical work material, regulations of accident prevention etc.

After separating the power converters from the distribution voltage, power leading components and terminals must not immediately be touched because of possibly charged condensators. During operation all coverings and doors have to be closed.

### 7.2 General information

The device is pre-adjusted by the manufacturer, so that the motor can be started immediately if all connections are made.

If the power is introduced, the internal power is indicated with the green LED "Power" on the PCB.

The yellow LED "GS" lights up, if the start-input is bridged or the external switch is closed. If adjusted by the manufacturer (Time = max , Offset = min) the voltage at the motor rises from 0% up to 100% within appr. 5 seconds.

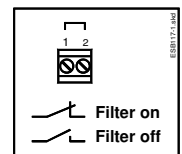
After reaching full voltage the signal relay on the PCB attracts and the red LED "Relais" lights up.

### 7.3 Operating with FI switch

The softstarter ESB-LC has RC-components against earth to reduce disturbances (EMC). The static divert current is about 5 mA. During the switch-on time or if having unsymmetrical mains, this current may be bigger, so that a fault current protection switch with 30 mA threshold current can be released.

#### Solutions:

- a) Use a special FI switch for electronic drives with **higher threshold release** (e.g. from Siemens).
- b) The connection from the filter to protective earth (PE) is conducted above a PCB terminal. If you have problems with a FI switch, especially if supplied from a building site main cabinet, the bridge in the PCB terminal may be momentary removed (see figure). After normal supply the bridge must be put in to fulfil the EMC-regulations.



7.4 Indication and control elements



Adjustment takes place at open device. All components can lead dangerous voltage. Only adjust if you are sure that the device is disconnected from the mains!

The voltage at the release input GS is not potential free and leads (e.g. in case of loss of 2 phases) full mains voltage!

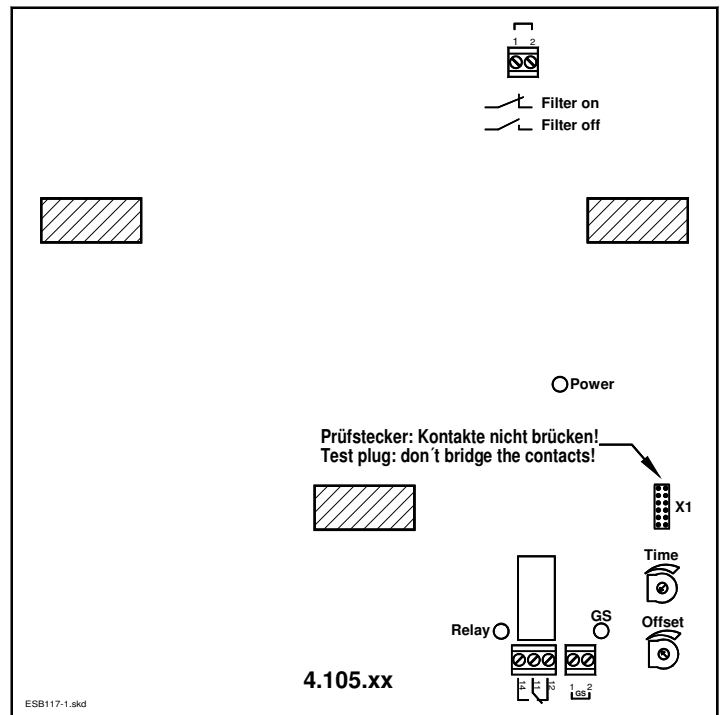
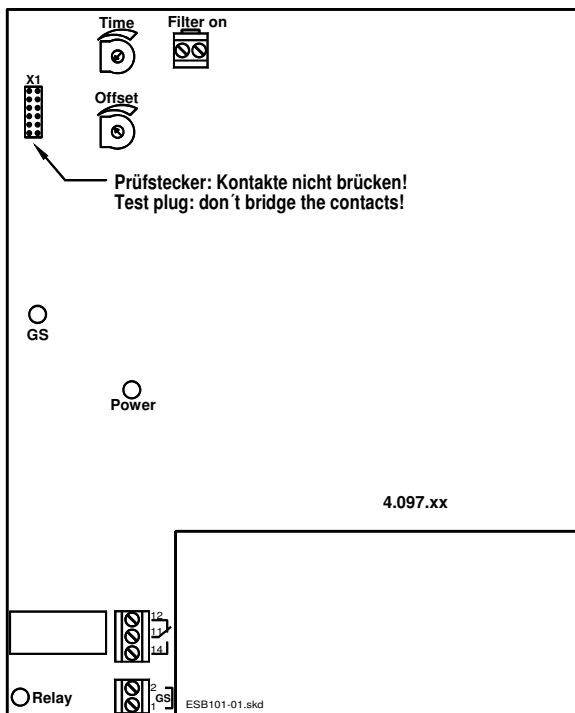
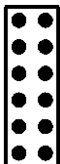


Figure: indication and control elements ESB-LC1...5 Figure: indication and control elements ESB-LC 6

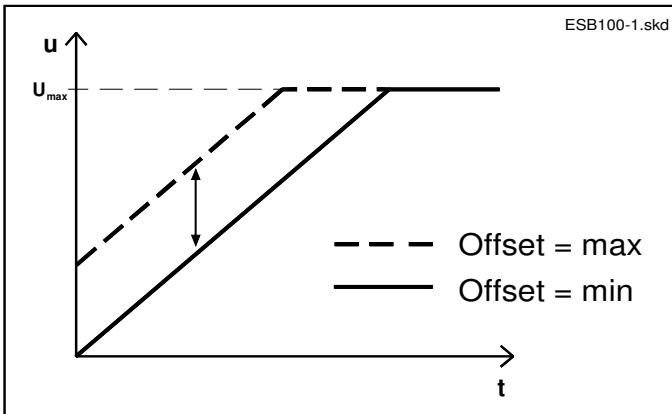


**NOTE:**

The header X1 beside the potentiometers is only for manufacturers use to test the device after assembling.

Never bridge the contacts (e. g. by jumper or by bending the contacts)!

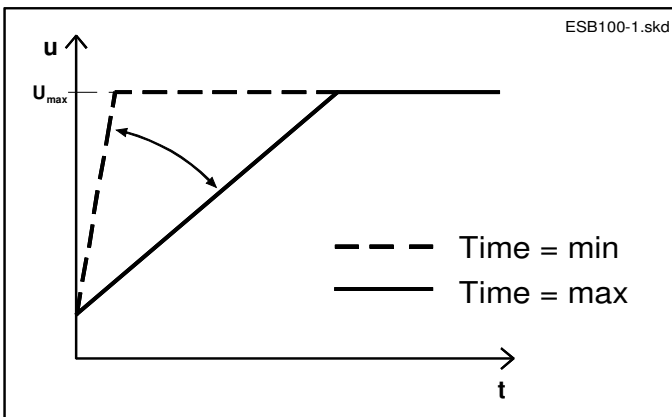
7.5 Adjustments



First adjust the start voltage of the ramp with the potentiometer "Offset", that the flow of the motor current starts shortly after switching the main contactor to avoid unnecessary delay times. Turn the potentiometer clockwise in small steps and start the motor. Repeat this process up to getting a good result.

Setting range: 0 ... 40 %  
 Factory setting: 0 %

Figure: Adjustment of potentiometer „Offset“



Through increasing the offset (start voltage) the starting time automatically gets shorter. If the start-up time is too long, it may be shortened as follows:

Turn potentiometer "Time" anticlock-wise in small steps and start the motor. Repeat this process till the start-up time is short enough.

Setting range: 0 ... 5 s \*\*  
 Factory setting: 5 s

\*\* maximum value at start voltage „Offset = 0“

Figure: Adjustment of potentiometer „Time“

**NOTES:** The start-up time should only be as short as absolutely necessary. The shorter the start up time, the higher the starting current!

The effect of the adjusted value of potentiometer "Offset" depends on the kind of wiring (standard- or W3-wiring) and the phase sequence. If you have the W3-wiring with right hand turning phase sequence the motor starts a little bit later with the same adjustment as in standard-wiring. If you have the W3-wiring with left hand turning phase sequence the motor starts a little bit earlier with the same adjustment as in standard-wiring.



## 8 Description of errors

Effect	Cause	Removal
Motor does not run	One or more phases are missing	Check fuses Check wiring
	Drive contactor doesn't attract	Check wiring
	LED „Power“ doesn't light up	Check wiring
	LED of the start signal (GS) doesn't light up	Close external release switch respectively connect bridge at terminal „GS“
Motor hums, but motor does not run	Wrong wiring (W3 wiring)	Check wiring
Tug at starting (not at adjustment „Time = max“ and „Offset = min“)	Wrong adjustment of potentiometer „Offset“ and/or „Time“	Adjust potentiometers new
Start up time is too short or too long	Wrong adjustment of potentiometer „Offset“ and/or „Time“	Adjust potentiometers new
FI switch wired prior the device releases	Divert current from the EMC-filter	See chapter „FI switch“
Direction of the rotation of the motor is wrong	---	<u>Standard wiring:</u> Change 2 phases in mains line or motor line  <u>W3 wiring:</u> Change 2 phases in mains line (before the junction of the wires going to the motor!)

Table: Effect of error and removal

## 9 Maintenance

As the modern electronically construction components are very durable and are naturally not subject to any mechanical wear and tear, normally no special service and maintenance will be necessary to be carried out on the device.

Within general service of the elevators, however, some things should be checked:

### a) Heat sink of the ESB-LC:

It has to be taken care of the ribs of the heat sink being not congested by dust accumulations. In general residential and office buildings problems like this don't occur as a rule.

### b) PCB of the ESB-LC:

With a dirty and dusty environment, especially with industrial elevators e.g. within the range of chemical and similar industries, possible dust accumulations on the PCB and in the power components have to be blown off occasionally in order to avoid tracking currents and flashovers.

The relay contact points from the signal relay must be checked for consumption.

The flexible wires connected with the PCB-terminals (GS1, GS2, 11, 12, 14) must be checked for their fitting.

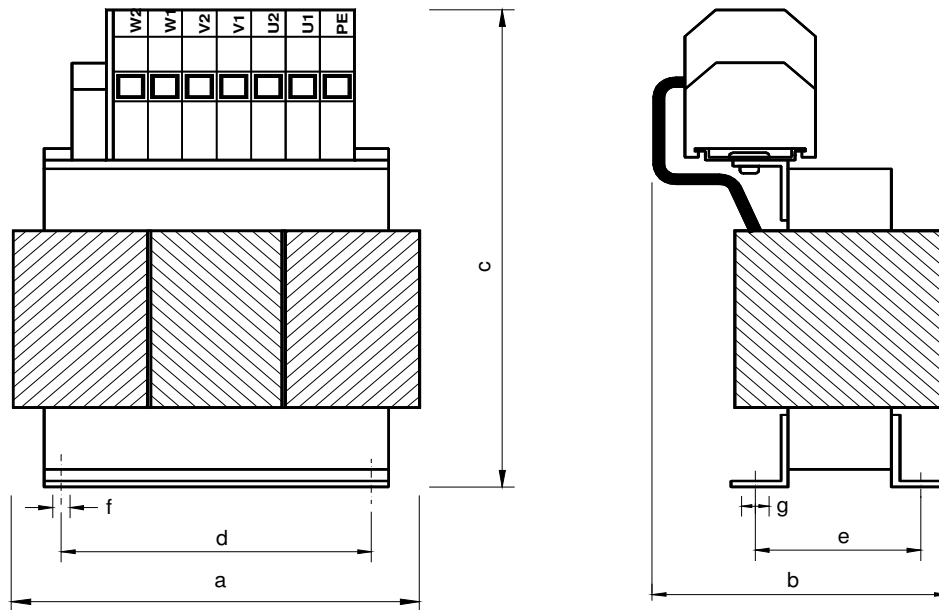
### c) Power Unit:

The power terminals must be checked for their fitting.

■ ■ ■ ■ Subject to change without prior notice ■ ■ ■ ■

10 Appendix

10.1 Dimensions of 3-phase choke



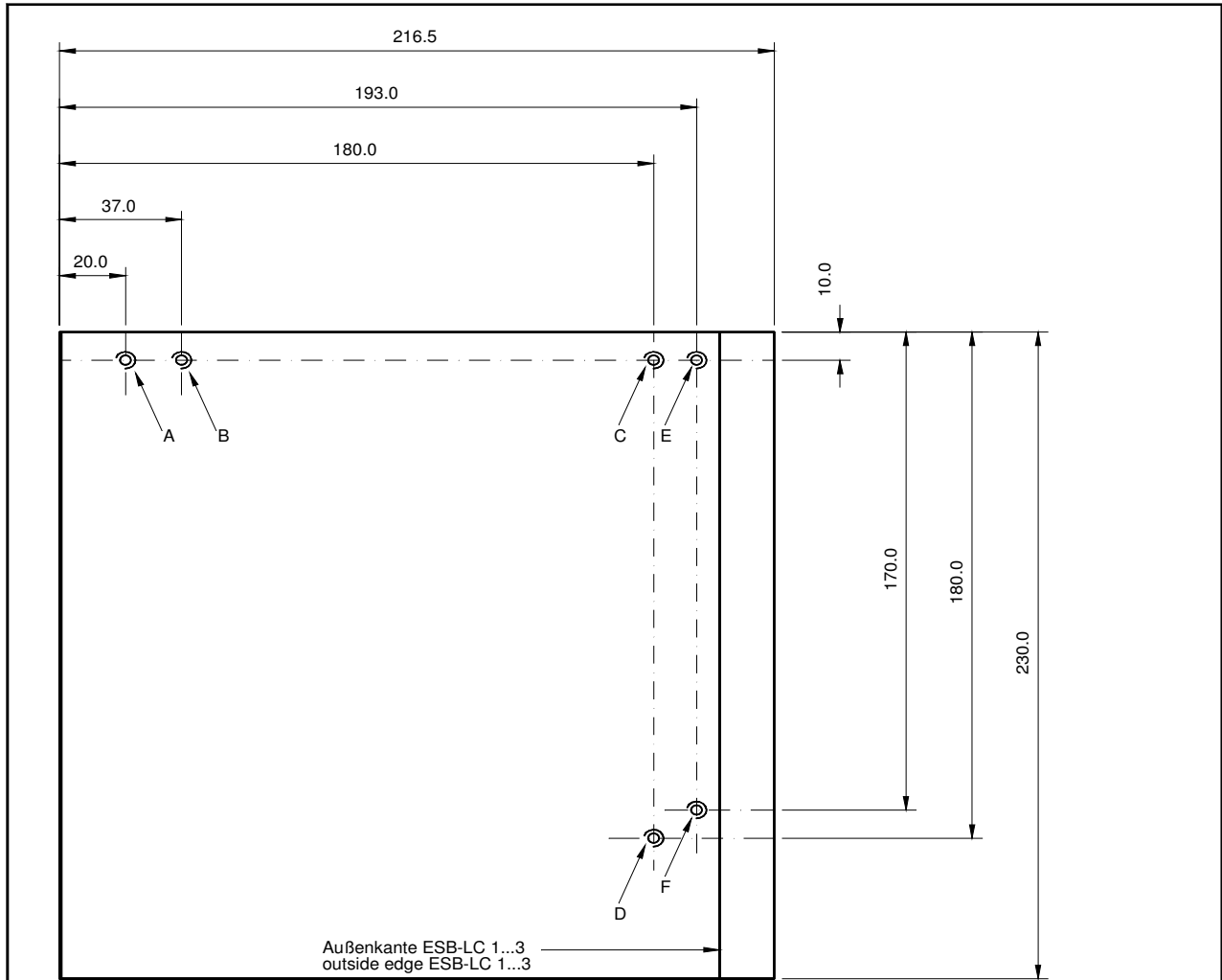
Abmessungen in mm  
dimensions in mm

Type Typ	Nominal motor-current Motor-Nennstrom	Terminals Klemmen	a *)	b *)	c *)	d	e	f	g	Weight (appr.) Gewicht (ca.)
ESB-KDR-1	max. 25,0 A	10 mm <sup>2</sup>	120	81	165	90	38	4,5	8,5	2,2 kg
ESB-KDR-2	max. 37,5 A	10 mm <sup>2</sup>	120	78	165	90	39	4,5	8,5	2,5 kg
ESB-KDR-3	max. 49,5 A	16 mm <sup>2</sup>	121	91	165	90	49	4,5	8,5	3,2 kg
ESB-KDR-4	max. 69,0 A	35 mm <sup>2</sup>	150	106	210	113	65	5,7	11,0	5,7 kg
ESB-KDR-5	max. 98,0 A	35 mm <sup>2</sup>	190	115	230	170	58	7,5	11,5	7,0 kg
ESB-KDR-6	max. 135,0 A	70 mm <sup>2</sup>	190	137	245	170	76	7,5	11,5	10,0 kg
ESB-KDR-7	max. 155,0 A	Werte auf Anfrage / values on request								

\*) Maximalwerte, genauer Wert abhängig vom Drosselhersteller  
\*) maximum values, exact value depending on the producer of the choke

<b>ESB-KDR</b>			Maßstab		
			Zchngs.-Nr.: <b>5.213.44</b>		
			Datum	Name	<b>Abmessungen Kommutierungs-drossel</b> <b>dimensions 3-phase choke</b>
		Bearb.	10.04.02	Janz	
		Gepr.			
		Norm			
44	1653				
43		13.08.93	Kieweg		
42		05.05.97	Müller		
41					
Index	Rev.	Änd.Nr.	Freigabe	Name	
				<b>RST ELEKTRONIK GMBH</b> Tannenstr.11 D-74229 Oedheim	
				Datei: 5-213-44.skd	
				Blatt 1 1 Bl.	

10.2 Combined drilling plan for ESB-LC1...5



Baugröße / size	Befestigungspunkte fixing points					
	A	B	C	D	E	F
ESB-LC 1...3	x		x	x		
ESB-LC 4		x	x	x		
ESB-LC 5		x			x	x

alle Maßangaben in mm  
all dimensions in mm

alle Gewinde M6  
all threads M6

<b>ESB-LC 1...5</b>		Maßstab <b>1:2</b>	
		Zchngs.-Nr.: <b>5.199.41</b>	
		Datum	Name
		Bearb. 04.07.98	Müller
		Gepr.	
		Norm	
<b>RSTELEKTRONIK GMBH</b> Tannenstr.11 D-74229 Oedheim			Blatt 1
			1 Bl.
41		Datei: 5.199.41	
Index	Rev.	Änd.Nr.	Freigabe Name

**Gemeinsamer Bohrplan für ESB-LC 1...5  
Common drill plan for ESB-LC 1...5**