

Operating Instructions



F00009y



Discharging Bar exBAR

Series EXR5C / EXR50 / EXR50US
for AC Operation

BA-en-2019-2301



List of contents

1	Outline of appliance EXR5C / EXR50 / EXR50US	6
2	Safety	7
2.1	Proper use	7
2.2	Identification of risks and hazards	8
2.3	Work and operational safety	8
2.4	Contact protection	11
2.5	Inspection of the protective resistors - contact protection	11
2.6	Technical advance	11
3	Installation and assembly	12
3.1	Assembling the discharging bar	12
3.2	Length of the high voltage cable	16
3.3	Adjust the angle coupling	17
3.4	Connecting the high voltage cable to the power supplies, generators and the distributor boxes	18
4	Operation	19
4.1	Startup	19
4.2	Function control	19
5	Maintenance	20
6	Trouble-shooting	21
7	Technical specifications EXR5C / EXR50 / EXR50US	22
8	Dimensions	23
9	Spare parts and accessories	24
A	Annex	26
A.1	Discharging bar EXR50US	26
	Declaration of Conformity	27

Dear customer

The EXR5C / EXR50 / EXR50US discharging bars are designed for the active discharging of disruptive static charges which develop in production processes in explosion hazard area.

The discharging bars and the power supply are used mainly in cases where disruptive static charges on fast-moving material webs impair production processes and need to be eliminated. The bars are operated with an alternating voltage of 5 kV at 50...60 Hz and are approved for use in explosive atmosphere of the group IIG and IID and comply with the device category 2 (Category 2 apparatus, zone 1).

The advantages of the EXR5C / EXR50 / EXR50US discharging bar:

- ultimate discharge range and hence enhanced depth effect
- high active discharge power through patented, isolated ground conductors
- high safety standards through passive discharge power with deactivated power supply / generator / distributor
- safety through function and malfunction monitoring
- continuous assembly slotting guarantees flexible installation
- no health hazards in case of electric shocks when making contact with individual tips (≤ 10 tips).

Due to differences in the surface charge profiles on different materials, charges with both polarities are provided by the discharging bars. The corona section with its optimized geometrical configuration ensures ultimate discharging efficiency.

The optimum discharge effect is guaranteed in conjunction with the ES53 resp. ES53US Eltex high voltage power supplies resp. the Eltex POWER CHARGER PC high voltage generator with discharging unit.

Please read the operating instructions carefully before starting the instrument. This will help you prevent personal injuries and damage to property.

Please give us a call if you have any suggestions, proposals or ideas for improvements. We greatly appreciate feedback from the users of our appliances.

1. Outline of appliance EXR5C / EXR50 / EXR50US

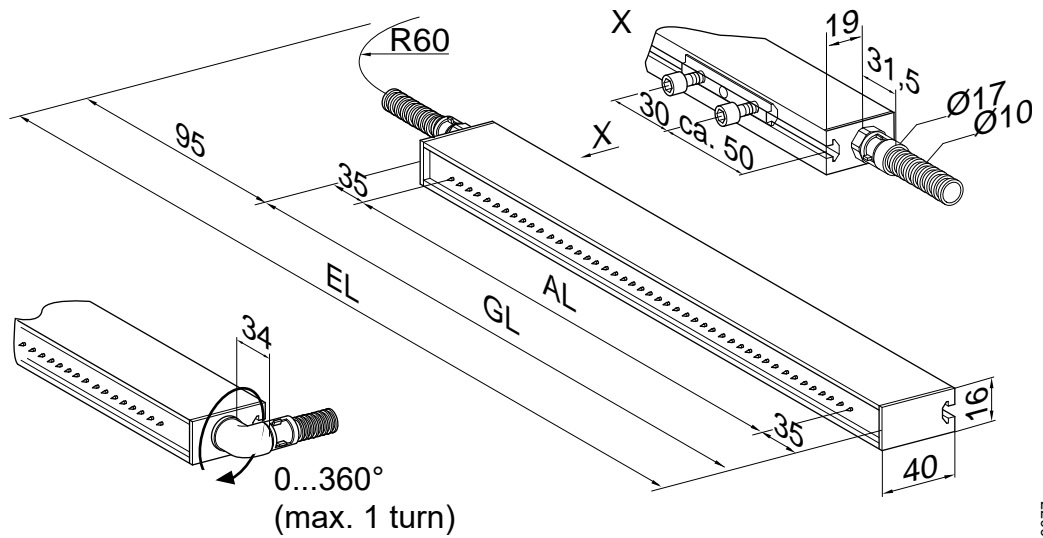


Fig. 1:
Overview and
dimensions of the
discharging bar

Maximum active length = 5910 mm

Grid width = 15 mm

EL = Installation length

AL = Active length

EXR5C / EXR50: GL = Total length AL + 70 mm (35 + 35 mm)

EXR50US: GL = Total length AL + 85 mm (50 + 35 mm)
see drawing chapter A

The high voltage cable leads out from the bar in either an axial or radial direction and is firmly encapsulated with the bar. The radial connection can be rotated by 360° and is locked in the desired position by means of a lock nut.

2. Safety

The Series EXR5C / EXR50 / EXR50US discharging bars have been designed, built and tested using state-of-the-art engineering and have left the factory in a technically and operationally safe condition. If used improperly, the bars may nevertheless be hazardous to personnel and may cause injury or damage. Read the operating instructions carefully and observe the safety notices.

Always observe the rules and regulations applying in your country with reference to opening and repairing electrical appliances in explosion hazard area.



Warning!

Do not touch the emission tips of the discharging bars when the supply voltage from the power supply is switched on. Always disconnect the supply voltage to the power supply / generator before carrying out any cleaning or maintenance work.

The manufacturers will not assume any liability and warranty if the units are used improperly or outside the intended purpose.

For warranty conditions, please refer to the General Terms and Conditions (GTC), see www.eltex.de.

2.1 Proper use

The Series EXR5C / EXR50 / EXR50US discharging bars must be used only for discharging static charges from material surfaces. Other uses are not permitted.

The EXR5C / EXR50 / EXR50US discharging bars must be operated only together with the dedicated ES53 resp. ES53US Eltex high voltage power supplies resp. the Eltex POWER CHARGER PC high voltage generator with discharging unit. These devices guarantee the optimum adaptation to the required operational data for the different active bar lengths. Safe operation of the bars is ensured only by using the Eltex power supplies / generators.

Modifications or changes to the discharging bars are not permitted. Use only original Eltex spare parts and equipment.

2.2 Identification of risks and hazards

Possible risks and hazards resulting from the use of the units are referred to in these operating instructions with the following symbols:



Warning!

This symbol appearing in the operating instructions refers to operations which, if carried out improperly, may result in serious personal injury.



Caution!

This symbol appearing in the operating instructions refers to operations which, if carried out improperly, may result in damage to property.



Ex Warning!

This symbol denotes the special conditions which must be observed when operating the system in explosion hazard areas as specified in the EX approvals.

2.3 Work and operational safety



Warning!

Carefully observe the following notes and the complete [chapter 2 "Safety", page 7!](#)

- Before carrying out repairs, cleaning or maintenance work and before resetting the unit after malfunctions, switch off the power supply / generator and disconnect the supply voltage (see [chapter 5 "Maintenance", page 20](#), [chapter 6 "Trouble-shooting", page 21](#)).
- Before carrying out any work involving the units, the machine which has the units fitted must not be in operation (see [chapter 5 "Maintenance", page 20](#), [chapter 6 "Trouble-shooting", page 21](#)).
- Any work involving the units must be carried out by qualified electricians (see [chapter 5 "Maintenance", page 20](#), [chapter 6 "Trouble-shooting", page 21](#)).
- The unit may only be used by qualified personnel trained for explosion hazard areas.
- The bars passively absorb energy from the moving substrate web. The high voltage cable must be plugged in or grounded to the power supply / generator. If the high voltage cable is disconnected, the plug is live (high voltage) and applies with full power on the plug; this may cause a spark discharge and may lead to a risk of injury. Disconnected high voltage plugs are not permitted or have to be grounded (see [chapter 5 "Maintenance", page 20](#)).
- The bar must be mounted such that mechanical damage to the bar tips is ruled out (see [chapter 3.1 "Assembling the discharging bar", page 12](#)).



- To attach the bars, use only sliding nuts and bolts made of plastic (see [chapter 3.1 "Assembling the discharging bar", page 12](#)).
- In explosion dust hazard areas provide that the tips of the bar point either horizontally or vertically downwards or at any angle between these two positions and that the flash power of the dust is >0.4 mJ (see [chapter 3.1 "Assembling the discharging bar", page 12](#), [chapter 7 "Technical specifications EXR5C / EXR50 / EXR50US", page 22](#)).
- When routing the cable, select the attachment points such that mechanical damage to the cable (e.g. chafing against rotating machine parts) is ruled out (see [chapter 3.1 "Assembling the discharging bar", page 12](#)).
- In applications involving moving bars, the high voltage cable must be attached such that there is no cable movement near the connection zone of the power supply / generator (see [chapter 3.1 "Assembling the discharging bar", page 12](#)).
- If electrically conductive substrates or substrates coated with conductive material (e.g. metal foil or metal composites) are used in the printing process, the discharging and the mains voltage of the power supply / generator must be switched off in these printing units.
- The distance of the emission points to the conductive, earthed printing press area should be greater than to the substrate to be discharged (see [chapter 3.1 "Assembling the discharging bar", page 12](#)).
- In bilateral discharging, the bars must not be mounted in opposition to each other. The distance between both bars should be greater than twice the bar distance from the web (see [chapter 3.1 "Assembling the discharging bar", page 12](#)).
- Both the lengths of the high voltage cable and of the active bars are limited, observe maximum lengths (see [chapter 3.2 "Length of the high voltage cable", page 16](#)).
- The maximum permissible angle of turn of the angle coupling is 360° (see [chapter 3.3 "Adjust the angle coupling", page 17](#)).
- Before connecting the high voltage cables to the power supplies / generators / distributors, the machine which has the bars fitted must not be in operation and the supply voltage to the power supply / generator must be disconnected (see [chapter 3.4 "Connecting the high voltage cable to the power supplies, generators and the distributor boxes", page 18](#), [chapter 5 "Maintenance", page 20](#), [chapter 6 "Trouble-shooting", page 21](#)).
- Check the discharging bars and the high voltage cables at regular intervals for any damage. Damaged components must be repaired or replaced before continuing to operate the unit, or the bar or cable must be disabled.
- The function control of the discharging bars has to be done outside of the explosion hazard area (see [chapter 4.2 "Function control", page 19](#)).



- Keep the bars clean at all times.
Dirt results in malfunctions and in premature wear of the units.
- When cleaning the bars do not soak the bars and the high voltage cable in solvent and do not damage the emission tips; allow the solvent to evaporate completely before restarting the unit (see [chapter 5 "Maintenance", page 20](#)), [chapter 6 "Trouble-shooting", page 21](#)).
- In explosion hazard areas Group II Gas subdivision B it must be ensured that the possibility of the discharge pins being effectively connected together, e.g. by dirt or contamination, is avoided (see [chapter 5 "Maintenance", page 20](#)), [chapter 7 "Technical specifications EXR5C / EXR50 / EXR50US", page 22](#)).
- Do not touch the emission tips - risk of injury.
If the high voltage supply is connected, reflex responses to electrical irritation can lead to secondary accidents; the charging bar as such is safe to touch. If contact is made (≤ 10 tips), the energy transferred is so low that there is no risk of injury.
- Potential risk for wearers of cardiac pacemakers:
Moving the chest closer than 3.5 cm to the emission tips of the discharging bars or making surface contact with several emission tips (touching a single tip is not critical) can result in a temporary switchover of the cardiac pacemaker into the fault mode. Permanent proximity or contact can therefore cause severe problems. If it is likely that the chest of such a person comes closer than 3.5 cm to the emission tips of the discharging bar, or if several emission tips are touched at the same time, the appropriate warning notices must be displayed.
- Mechanical or electrical modifications of the discharging bars are not permitted. Shortening the shielded high voltage cable on the connecting side of the power supply / generator is permitted. Extending the cable is permitted only when using the Eltex distributor as well as original high voltage cables and glands.
- The operation of the bars can generate ozone. The ozone concentration levels developing near the bars depend on many different factors such as site of installation, bar current and voltage, air circulation, etc., and can therefore not be specified in general terms.
If the maximum allowable concentration of ozone must be observed at the site of installation of the bar, the concentration must be measured on site.
The AGW value (maximum admissible concentration) serves to assess the ozone concentration at the workplace. The user must make sure that the appropriate national AGW value is at no times exceeded, e.g. in Germany the ozone concentration occurring during the operation of the system must not exceed the recommended value based on international limits of 0.06 ml/m³ (0.12 mg/m³).



2.4 Contact protection

As the site of installation and/or use of the units is outside the control of Eltex, contact protection against inadvertent contact by personnel as specified by the employers' liability insurance association have to be provided (e.g. DGUV V3 in Germany). Contact protection made of conductive material must be grounded.

2.5 Inspection of the protective resistors - contact protection

The function and the appearance of the protective resistors must be inspected at regular intervals. The inspection intervals are specified in the accident prevention regulations, as amended (e.g. in Germany DGUV V3).

The function of the series resistors must be checked using a suitable measuring device. The test voltage must be 1,000V. The measured resistance between the high-voltage connection and the individual emission tip must not fall below 120 MOhm and not exceed 180 MOhm.

2.6 Technical advance

The manufacturer reserves the right to make changes to the technical specifications without prior notice in order to adapt the units to state-of-the-art engineering. Eltex will provide the latest information on any changes or modifications in the operating instructions on request.

3. Installation and assembly

3.1 Assembling the discharging bar

Attach the Series EXR5C / EXR50 / EXR50US discharging bars to the machine wall, using flame-retardant GRP assembly material. For easier installation we recommend using the assembly material offered by Eltex. Fig. 2 shows the installation principle.

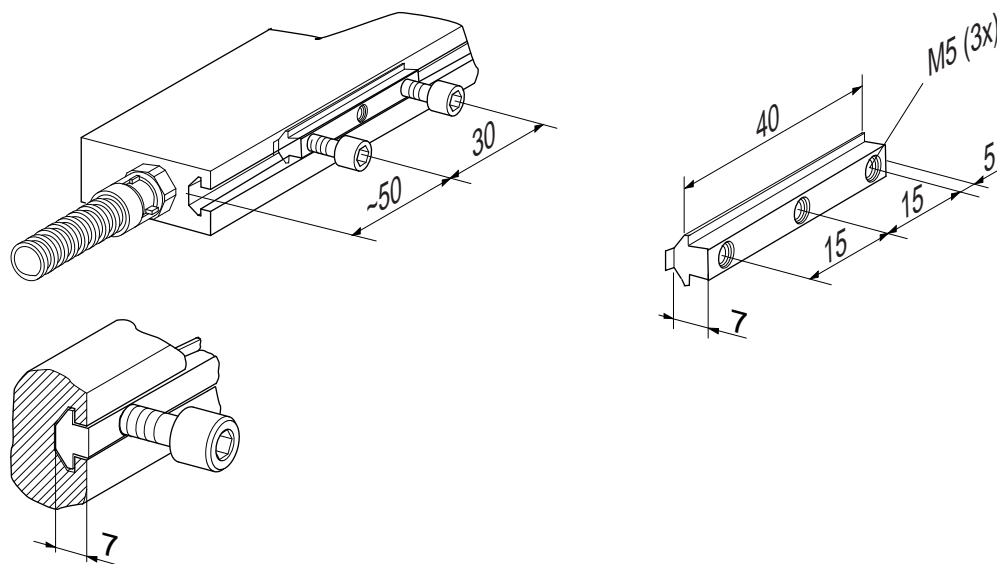


Fig. 2:
Assembling the
discharging bar

The profiled assembly section of the discharging bar is grooved. The sliding nuts pushed into this groove serve as bolt attachments for the GRP material, allowing the discharging bars to be installed.

Max. bolt depth 6.5 mm

Torque 0.4 Nm

Secure bolts (e.g. Loctite 243)



Caution!

Use only sliding nuts and bolts made of plastic!

below 1 meter total length: 2 per bar

below 2 meters total length: 3 per bar

below 3 meters total length: 4 per bar

below 4 meters total length: 5 per bar

below 5 meters total length: 6 per bar

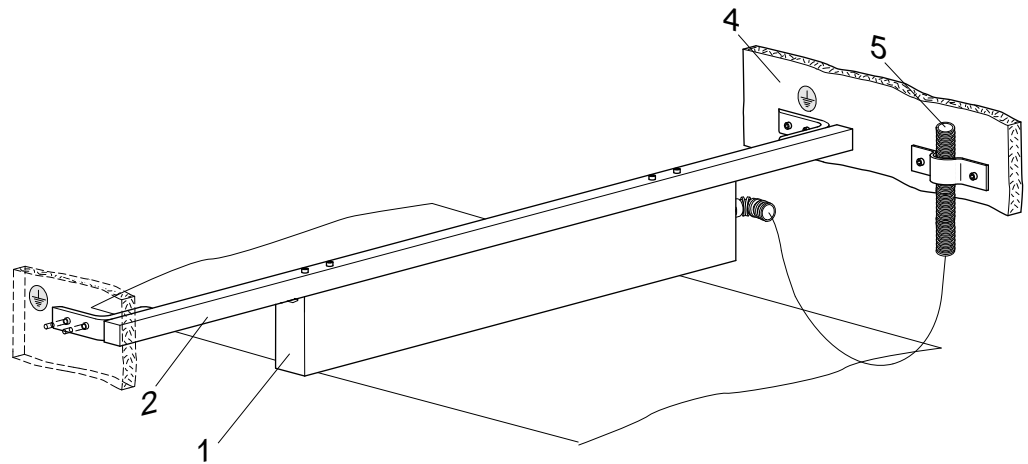
below 6 meters total length: 7 per bar

An optional alternative is attaching the bars using a round GRP rod. Fig. 4 shows an assembly example. The bar is attached to the GRP rod via plastic holders plugged into the installation groove. Longer bars require an additional angle bracket bolted to the GRP rod to prevent the bar from sagging.

Plastic holder

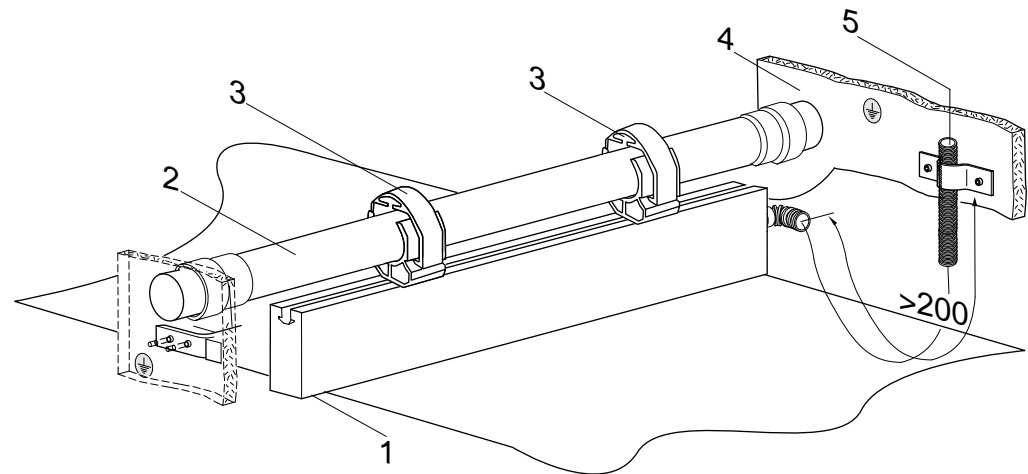
below 1 meter total length: 3 per bar
below 2 meters total length: 5 per bar
below 3 meters total length: 7 per bar
below 4 meters total length: 9 per bar
below 5 meters total length: 11 per bar
below 6 meters total length: 13 per bar

Fig. 3:
*Assembly example
EXR5C with GRP
rod and steel
brackets for
attachment to the
machine wall*



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Fig. 4:
*Assembly example
EXR5C with GRP
rod*



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- 1 bar
- 2 GRP rod
- 3 plastic holder
- 4 machine wall
- 5 high voltage cable with flexible tube



Warning !

For safety in operation, please note the following:



- The bar must be mounted such that mechanical damage to the bar tips is ruled out.
- To attach the bars, use only sliding nuts and bolts made of plastic.
- In explosion dust hazard areas provide that the tips of the bar point either horizontally or vertically downwards or at any angle between these two positions and that the flash power of the dust is >0.4 mJ.
- When routing the cable, select the attachment points such that mechanical damage to the cable (e.g. chafing against rotating machine parts) is ruled out.
- In applications involving moving bars, the high voltage cable must be attached such that there is no cable movement near the connection zone of the power supply unit / generator.
- Switch off the bar when working with metal film or metal composites!

Locating the discharging bar

The best possible discharge results are achieved if the bar is located in areas with minimum web capacities. In practical terms this means placing the bar with maximum distances from the machine environment, i.e. no installation of the discharging bar at idler rollers.

A rough guideline:



A space with the radius R of the bar distance from the web ought to be kept free of any conductive material (Fig. 5). The distance of the emission points to the conductive, earthed printing press area should be greater than to the substrate to be discharged.

Depending on application, the distance between discharging bar and substrate ought to be 30...100 mm.

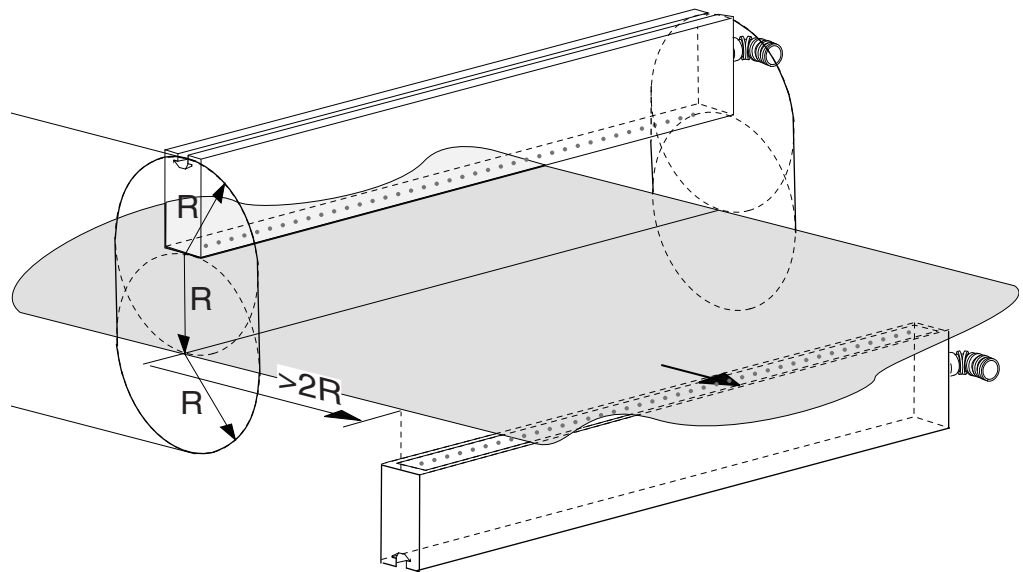


Fig. 5:
Zone free of con-
ductive material
with the dimen-
sions R



In bilateral discharging, the bars must not be mounted in opposition to each other. The distance between both bars should be greater than twice the bar distance from the web.

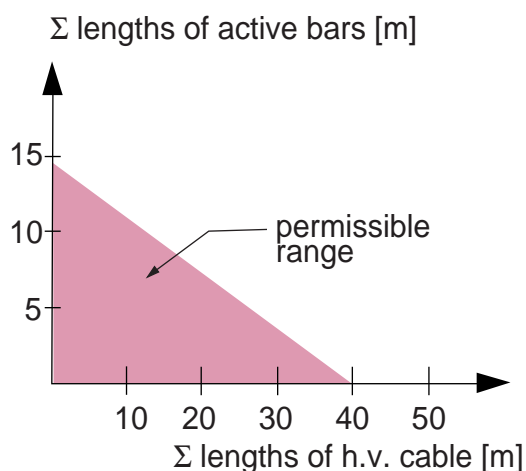
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3.2 Length of the high voltage cable



Both the lengths of the high voltage cable and the active bars are limited. The shielded high voltage cables cause a capacitive load on the transformer inside the power supply / generator. The maximum loading capacity is a result of the function of the total active bar length and the total length of all high voltage cables. Fig. 6 demonstrates this principle for the ES53 resp. ES53US Eltex high voltage power supplies resp. the Eltex POWER CHARGER PC high voltage generator with discharging unit.

Fig. 6:
Loading capacity
of the power
supply / generator
as factor of bar
length and length
of high voltage
cable



Example: The maximum permissible total cable length with a 3 meter active bar length is 32 meters.

Connecting the ES53 resp. ES53US Eltex high voltage power supplies resp. the Eltex POWER CHARGER PC high voltage generator with discharging unit see Operating Instructions of the used unit.

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3.3 Adjust the angle coupling

If the bar has a angle coupling, then it is aligned towards the tips during ex factory delivery.

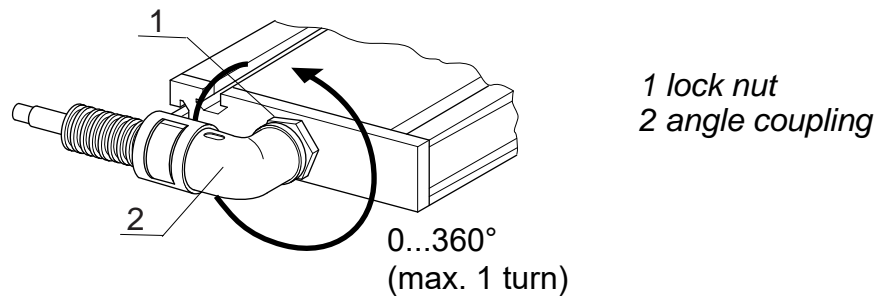


Fig. 7:
Angle coupling

To turn the angle connection, proceed as follows:

- loosen the lock nut
- align the angle coupling in its desired position
- re-tighten the lock nut



The maximum permissible angle of turn of the angle coupling is 360°.

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3.4 Connecting the high voltage cable to the power supplies, generators and the distributor boxes

The connection of the high voltage cable of the discharging bars to the power supplies is described in the operating instructions of the respective power supplies.



Warning!

Electric shock hazard!

Work may be carried out only if:

- the supply voltage to the power supply / generator has been disconnected,
- the machine is at standstill because the bars pick up charges if the substrat web is running.

4. Operation

The discharging bars must be operated only in connection with the ES53 resp. ES53US Eltex high voltage power supplies resp. the Eltex POWER CHARGER PC high voltage generator with discharging unit with 5 kV AC output.

These power supplies guarantee the optimum adaptation to the specified operating conditions and are approved for use in explosive atmosphere.

4.1 Startup

Once all the connections and the installation have been correctly made, the system is operational and the supply voltage can be switched on at the power supply / generator.

4.2 Function control

Use the Eltex Volt Stick or a glow-lamp voltage tester to check the proper function of the emission tips. Quote Article No. 109136 when ordering the Volt Stick from Eltex.



Ex-Warning!

The function control has to be done outside of the explosion hazard area.

5. Maintenance



Warning!

Electric shock hazard!

- Do not carry out any maintenance or repair work without first switching off the power supply / generator and disconnecting the supply voltage.
- The machine which has the units fitted must not be in operation.
- The bars passively absorb energy from the moving substrate web. The high voltage cable must be plugged in or grounded to the power supply / generator. If the high voltage cable is disconnected, the plug is live (high voltage) and applies with full power on the plug; this may cause a spark discharge and may lead to a risk of injury. Disconnected high voltage plugs are not permitted or have to be grounded.
- Repairs and maintenance work must be carried out by qualified electricians only.

To ensure the trouble-free function of the discharging bars, clean the bars at least once a week with compressed air free of oil and water (6×10^5 Pa and standard compressed air pistol) and a brush with soft plastic bristles (article RBR22, see [chapter 9 "Spare parts and accessories", page 24](#)).



In explosion hazard areas Group II Gas subdivision B it must be ensured that the possibility of the discharge pins being effectively connected together, e.g. by dirt or contamination, is avoided.

Clean grease, ink, glue, paper dust, etc. off the discharging bar using a suitable solvent (Cleaning gasoline). Do not soak the bars and the high voltage cable in solvent!



Warning!

Risk of deflagration!

Allow the solvent to evaporate before restarting the unit.



Caution!

Do not damage the emission tips when cleaning. Brush only in longitudinal direction.

Inspection of the protective resistors - contact protection

The function and the appearance of the protective resistors must be inspected at regular intervals. The inspection intervals are specified in the accident prevention regulations, as amended (e.g. in Germany DGUV V3).

The function of the series resistors must be checked using a suitable measuring device. The test voltage must be 1,000V. The measured resistance between the high-voltage connection and the individual emission tip must not fall below 120 MOhm and not exceed 180 MOhm.

6. Trouble-shooting



Warning!

Electric shock hazard!

- Do not carry out any maintenance or repair work without first switching off the power supply / generator and disconnecting the supply voltage. No voltage must apply at the discharging bars.
- The machine which has the units fitted must not be in operation.
- Repairs and maintenance work must be carried out by qualified electricians only.

Malfunction:

Effectiveness of the application declining.

Cause:

Dirty discharging bars.

Measure:

Clean bar with compressed air and a brush. Clean grease, ink, oil, etc. off the bar with a suitable solvent (Cleaning gasoline).

For further malfunctions, refer to the operating instructions for the power supply / generator.



Caution!

Do not damage the emission tips when cleaning. Do not leave the discharging bar to soak in the solvent!



Warning!

Risk of deflagration!

Allow the solvent to evaporate before restarting the unit.

7. Technical specifications

EXR5C / EXR50 / EXR50US

Bar element	glass-fibre-reinforced plastic GRP
Encapsulation material	polyurethane, UL-94 V-0
Emission tips	stainless steel
Installation material	plastic sliding nuts
Operating Ambient temperature	0...+40 °C (+32...+104 °F)
Ambient humidity	max. 70 % RH, non-dewing
Dimensions	profile: 16 x 40 mm, max. length 5,980 mm, see Fig. 8
Weight	approx. 0.8 kg/m
Operating voltage	max. 5 kV AC, 50/60 Hz
High voltage supply	via ES53 resp. ES53US Eltex high voltage power supplies resp. the Eltex POWER CHARGER PC high voltage generator with discharging unit
High voltage connection	high voltage cable encapsulated, axial or radial (rotatable by 360°) lead-out
Short-circuit current/tip	max. 0.046 mA
Contact protection	according EN 61140
EX Approval	<p>BAS98ATEX2179X</p> <p>⊕_{Ex} II 2 G IIA T6 or</p> <p>⊕_{Ex} II 2 G IIB T6 if it is ensured that the possibility of the discharge pins being effectively connected together is avoided.</p> <p>⊕_{Ex} II 3 D T100°C provided that the tips of the bar point either horizontally or vertically downwards or at any angle between these two positions and that the flash power of the dust is >0.4 mJ.</p>
UL Approval (EXR50US)	Class I, Group D; Class II, Group G; Class III; File No. E81984

as shown on
appliance
marking:



8. Dimensions

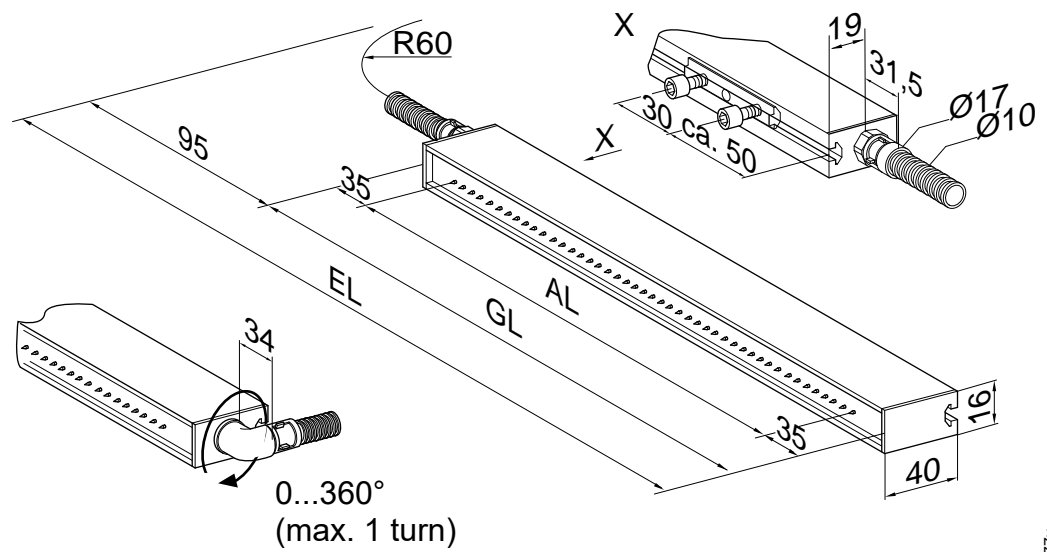


Fig. 8:
Dimensions
discharging bar

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EL = Installation length
AL = Active length

EXR5C / EXR50: $GL = \text{Total length } AL + 70 \text{ mm } (35 + 35 \text{ mm})$

EXR50US: $GL = \text{Total length } AL + 85 \text{ mm } (50 + 35 \text{ mm})$
see drawing chapter A

9. Spare parts and accessories

Article	Article No.
Power supply 5 kV, max. 6,2 mA	ES53/___
Power supply 5 kV, max. 6,2 mA (UL)	ES53US/___
High voltage distributor, discharging, 4 terminals (1 high voltage cable, 4 outputs) specify plug and socket type and cable length	ESV61
High voltage distributor, discharging, 2 terminals (1 high voltage cable, 2 outputs) specify plug and socket type and cable length	ESVY61/___
Plug "L" Kit for cutting high voltage cable to size with flexible tube for power supply ES53 and distributor ESV	103289
Mounting material for bars: slide nut with screws and washers	105826
Plastic countersunk screw, M5x8	101020
Plastic countersunk screw, M5x10	KSR00030
Plastic countersunk screw, M5x30	108525
Plastic cheese-head screw, M5x10	KSR00012
Plastic cheese-head screw, M5x16	KSR00013
Plastic cheese-head screw, M5x25	KSR00015
Plastic cheese-head screw, M5x35	KSR00016
Plastic cheese-head screw, M5x50	KSR00017
Adapter plate, with screws 2 x M5 by 1 x M8	101807
Adapter plate for version S01, with screws 2 x M5 by 1 x M8	101824
GRP round rod Ø 20 mm	100864
Bar holder for round rod	101075
Attachment clip for round rod	MCH02434
GRP reinforcement angle bracket	102568
Flexible conduit tubing for high voltage cable	MCH02438
Kit - Bar holder	
Bar holder with clamps	HA01/___
Bar holder with perforated plate	HA02/___
Bar holder with assembly angle bracket	HA50/___

Article	Article No.
Cleaning brush with handle	RBR22
Volt Stick	109136
Operating Instructions (sepcify language)	BA-xx-2019

Please specify the article number when ordering.

A. Annex

A.1 Discharging bar EXR50US

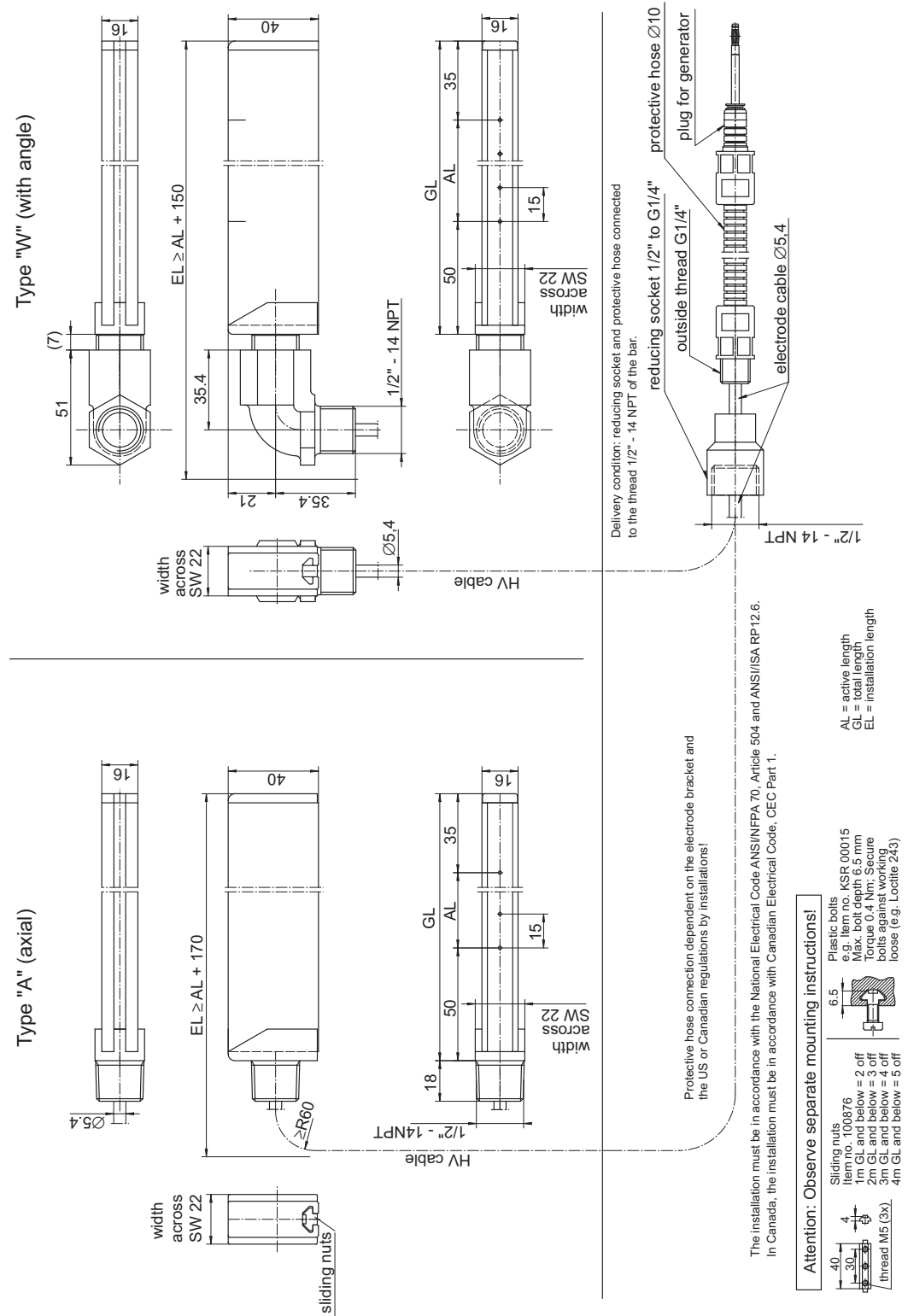


Fig 9:
EXR50US
discharging bar

EU-Declaration of Conformity

CE-2019-en-2212




Eltex-Elektrostatik-Gesellschaft mbH
Blauenstraße 67 - 69
D-79576 Weil am Rhein



declares in its sole responsibility that the product

Discharging Bar EXR50 / EXR5C / EXR50US (according to Eltex reference code)

Identification:  II 2 G IIB T6; II 3 D T 100°C
Certification-no.: BAS 98 ATEX 2179 X
Notified body: SGS Fimko Oy, Takomotie 8, FI-00380 Helsinki, NB No. 0598

complies with the following directives and standards.

Relevant EU-Directive:

2014/34/EU

Directive: Equipment or Protective System intended for use in potentially explosive Atmospheres

Relevant EU-Directive:

2014/35/EU

Low Voltage Directive

Harmonized standard applied:

EN 60204-1:2018

Safety of machinery – Electrical equipment of machines – General requirements

Relevant EU-Directive:

2014/30/EU

EMC Directive

Harmonized standard applied:

EN IEC 61000-6-2:2019

Electromagnetic compatibility (EMC)
Generic standards – Immunity for industrial environments

EN 55011:2016 + A1:2017
+ A11:2020 + A2:2021

Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – limits and methods of measurement

Relevant EU-Directive:

2011/65/EU

RoHS Directive

in the version effective at the time of delivery.

Eltex-Elektrostatik-Gesellschaft mbH keep the following documents for inspection:

- proper operating instructions
- plans
- other technical documentation

Weil am Rhein, 07.12.2022
Place/Date


Lukas Hahne, managing director

Eltex offices and agencies

The addresses of all
Eltex agencies can be
found on our website at
www.eltex.de



Z01007y



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