

Installation Instructions for TIRESCA[®] - Bus bars



Type: **TE _ _ _ 1 kV – 72,5 kV**

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THIS TECHNICAL DOCUMENTATION INCLUDES:

1. TECHNICAL DATA
2. GENERAL EXPLANATIONS
3. GENERAL INSTALLATION INDICATIONS
4. INSTALLATION INSTRUCTIONS
5. CHECK UP BEFORE PUTTING INTO SERVICE
6. OPERATION AND MAINTENANCE INSTRUCTIONS

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1. TECHNICAL DATA

1.1 DESCRIPTION

Three- or four-phase set of insulating Bus bars, type TEL / TE_ _ _ (see our Order confirmation), with TIRESCA[®]-insulation for indoor-indoor or indoor-outdoor application.

1.2 ELECTRICAL DATA

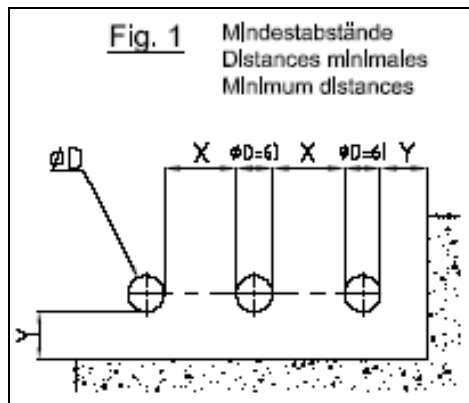
Check the Rated Voltage on the MGC test Certificate delivered. Compare this value with the table below to get the exact specific electrical data of the system.

Rated Voltage U _r : [kV] (as per IEC)	Power frequency test 1 minute U _p : [kV] rms	Impulse withstand voltage 1,2 / 50 μs, U _{imp} : (BIL) [kV] crest.	
<i>Type TEL_ _ _ , fully insulated</i>			
			Creepage distance [mm]
1	6	--	40
3,6	10	40	60
7,2	20	60	90
<i>Type TE_ _ _ , partially insulated</i>			
Rated Voltage U _r : [kV] (as per IEC)	Power frequency test 1 minute U _p : [kV] rms (tested without insulators)	Impulse withstand voltage 1,2 / 50 μs, U _{imp} : (BIL) [kV] crest.	
12	28	--	
17,5	28	--	
24	28	--	
36	28	--	
40.5	28	--	
52	28	--	
72,5	28	--	

1. TECHNICAL DATA (continued)

1.3 INDOOR MINIMUM DISTANCES

Distances between phase-phase and phase-earth for indoor operation.



Rated Voltage U_r : [kV]	Power frequency test 1 minute, dry U_p : [kV] rms	Dry impulse withstand voltage 1,2 / 50 μ s, U_{imp} : (BIL) [kV] crest.	Conductor without insulation - bare	Conductor with TIRESKA insulation	
			Conductor without insulation bare	X [mm]	Y [mm]
12	28	75	120	50	55
17,5	38	95	160	70	76
24	50	125	220	100	130
36	70	170	320	145	230
40,5	80	190	360	330	500
52	95	250	480	330	500
72,5	140	325	630	330	500

1. TECHNICAL DATA (continued)

1.4 MECHANICAL DATA OF THE BUSBARS

Type TEL: Over the surface of the insulation, protection tube in polyamide or fibre glass shields the active insulation against the mechanical injuries and humidity. The different type and dimensions of the bus bars can takes from table below.

MGC standard Busbar type and sizes	Outer Dimensions of the Busbar [mm]	Remark
<i>Type TEL___, fully insulated up to Un=7,2kV</i>		
TEL 55	Ø55	<i>with polyamide protection tube</i>
TEL 67	Ø67	<i>with polyamide protection tube</i>
TEL 80	Ø80	<i>with polyamide protection tube</i>
TEL 106	Ø106	<i>with polyamide protection tube</i>
TEL 146	Ø146	<i>with polyamide protection tube</i>
TEL 130	Ø135	<i>with fibre glass protection tube</i>
TEL 160	Ø157	<i>with fibre glass protection tube</i>
TEL 200	Ø208	<i>with fibre glass protection tube</i>
TEL 250	Ø250	<i>with fibre glass protection tube</i>

1. TECHNICAL DATA (continued)

Type TE: Over the surface of the insulation, protection tube in polyamide or fibre glass shields the active insulation against the mechanical injuries and humidity. The different type and dimensions of the bus bars can takes from table below.

MGC standard Busbar type and sizes	Outer Dimensions of the Busbar [mm]	Remark
<i>Type TE_ _ _ , partially insulated, Un=12-72,5kV</i>		
TEL 55	Ø55	<i>with polyamide protection tube</i>
TEL 67	Ø67	<i>with polyamide protection tube</i>
TEL 80	Ø80	<i>with polyamide protection tube</i>
TEL 106	Ø106	<i>with polyamide protection tube</i>
TEL 146	Ø146	<i>with polyamide protection tube</i>
TEL 130	Ø135	<i>with fibre glass protection tube</i>
TEL 160	Ø157	<i>with fibre glass protection tube</i>
TEL 200	Ø208	<i>with fibre glass protection tube</i>
TEL 250	Ø250	<i>with fibre glass protection tube</i>

1.5 OPERATING CONDITIONS

Ambient operating temperature -40 up to +40° C

Higher operating temperatures on request

Max. standard height for the installation above sea level 1000 m

Higher elevations on request

2. GENERAL EXPLANATIONS

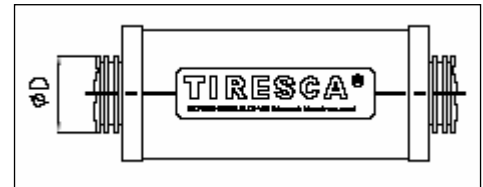
2.1 THE TIRESCA® BUSBARS

The conductor is made up of a cylindrical profile in aluminium alloy Ac 041 or Copper Cu-ETP. The insulation lies directly on the conductor and consists of vacuum casted, epoxy resin. Over the surface of the insulation, corrugated protection tube in polyamide or smooth protection tube in fibre glass shields the active insulation against the mechanical injuries. Furthermore, the corrugation provides an increase of the creeping distance on the end of the bar.

2.2 THE - INSULATING - I CYLINDER

Protection class: IP 43 (standard).
IP 67, IP 68 (option).

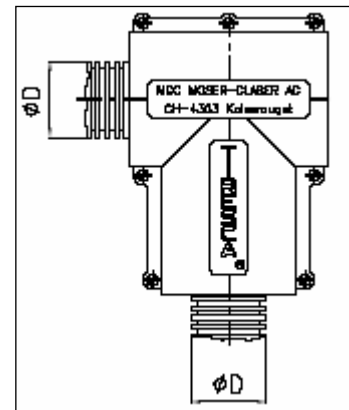
The Insulating sleeves are mounted over the high voltage connections between the bars and insulate them. The insulating cylinders consists of a filament-wound fibre glass tube.



2.3 THE TIRESCA® - INSULATING - L CYLINDER

Protection class: IP 43 (standard).
IP 67, IP 68 (option).

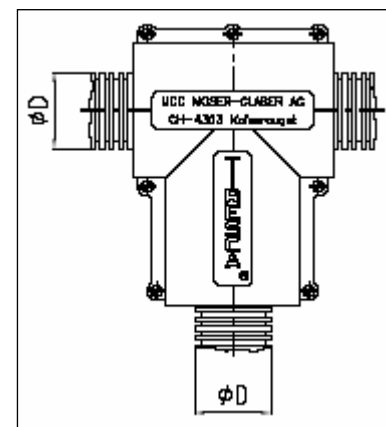
The Insulating sleeves are mounted over the high voltage connections between the bars and insulate them. The insulating cylinders consists of a Polyurethane casted cover.



2.4 THE TIRESCA® - INSULATING - T-OFF CYLINDER

Protection class: IP 43 (standard).
IP 67, IP 68 (option).

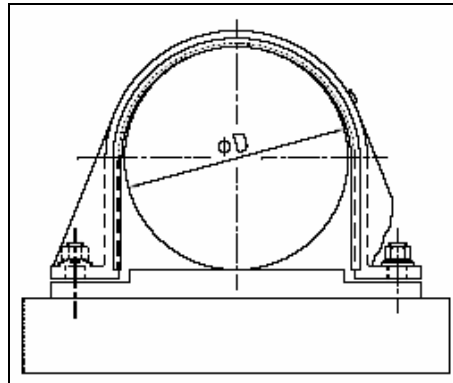
The Insulating sleeves are mounted over the high voltage connections between the bars and insulate them. The insulating cylinders consists of a Polyurethane casted cover.



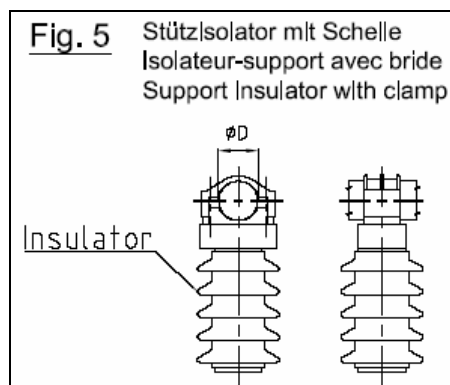
3. GENERAL INSTALLATION INDICATIONS

3.1 FASTENING OF THE BARS

Type TEL: The fastening of the bars occurs by means of aluminium clamps.



Type TE: The fastening of the bars occurs by means of polyamide clamps and a support insulator.



The number of fixing clamps of each bar is given by the short circuit stresses, the distance between them is determined in order to obtain a free length (distance between supports) not equivalent to that caused by an oscillation frequency of 100 or 120 Hz .
For these reasons it is important to pay attention to the position and the execution of the fastening of the bars as per our drawings.

3. GENERAL INSTALLATION INDICATIONS (continued)

3.2 HIGH CURRENT CONNECTIONS

The high current connections have to be assembled in such a way to avoid production of excessive heat and to avoid corrosion. It is important that the contact surfaces are treated and that sufficient contact pressure is continuously ensured.

It is absolutely necessary that only the materials, indicated on the drawings are used and that the instruction, given on the drawings are observed.

3.3 THE CYLINDERS

The insulating cylinders are slipped over the high current connections and centralised by special rings, which also close the cylinder (see drawing, if cylinders delivered only).

3.4 GROUNDING

3.4.1 GROUNDING OF THE BARS - TIRESCA®

There is no grounding on the TIRESCA Busbars.

3.4.2 GROUNDING OF THE CYLINDER - TIRESCA®

There is no grounding on the TIRESCA cylinder.

3.4.3 GROUNDING OF THE OTHER METALLIC PARTS (≡)

The other metallic parts (fixing clamps, supports, etc.) must be grounded. Keep care not to form any loop.

4. INSTALLATION INSTRUCTIONS

4.1 MANIPULATION OF BARS

The material should not be stored outdoors. For safety reasons it has to be protected all the time against humidity. The bars have to be carefully manipulated. When handling, avoid to knock them. By thin, long bars, avoid swings and too much bending of these. The creepage distances of the bars and the cylinders must be free of dust / pollution.

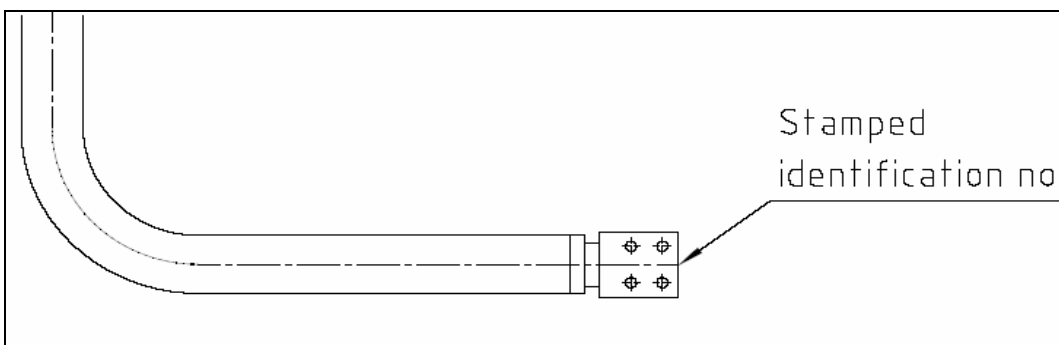
4.2 MANIPULATION OF CYLINDERS

The material should not be stored outdoors. It has to be protected all the time against humidity. The covers/cylinders have to be carefully manipulated. The inside of the covers/cylinders must be free of dust / pollution before there installed.

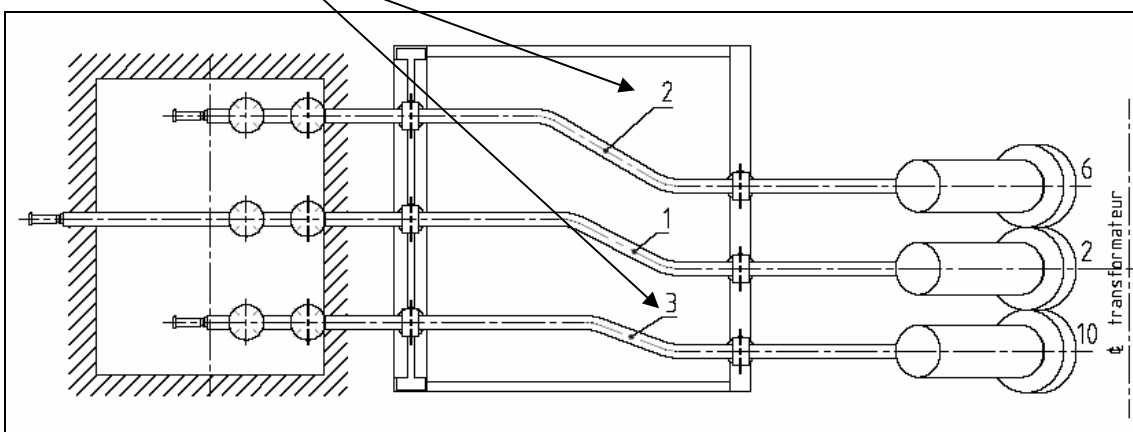
4.3 IDENTIFICATION, DISPOSITION AND FASTENING OF THE BARS

Each bar has a serial number stamped on its one end in the connection. The position of the bar can be found with the list of equipment and the installation drawings.

Stamped Identification number.



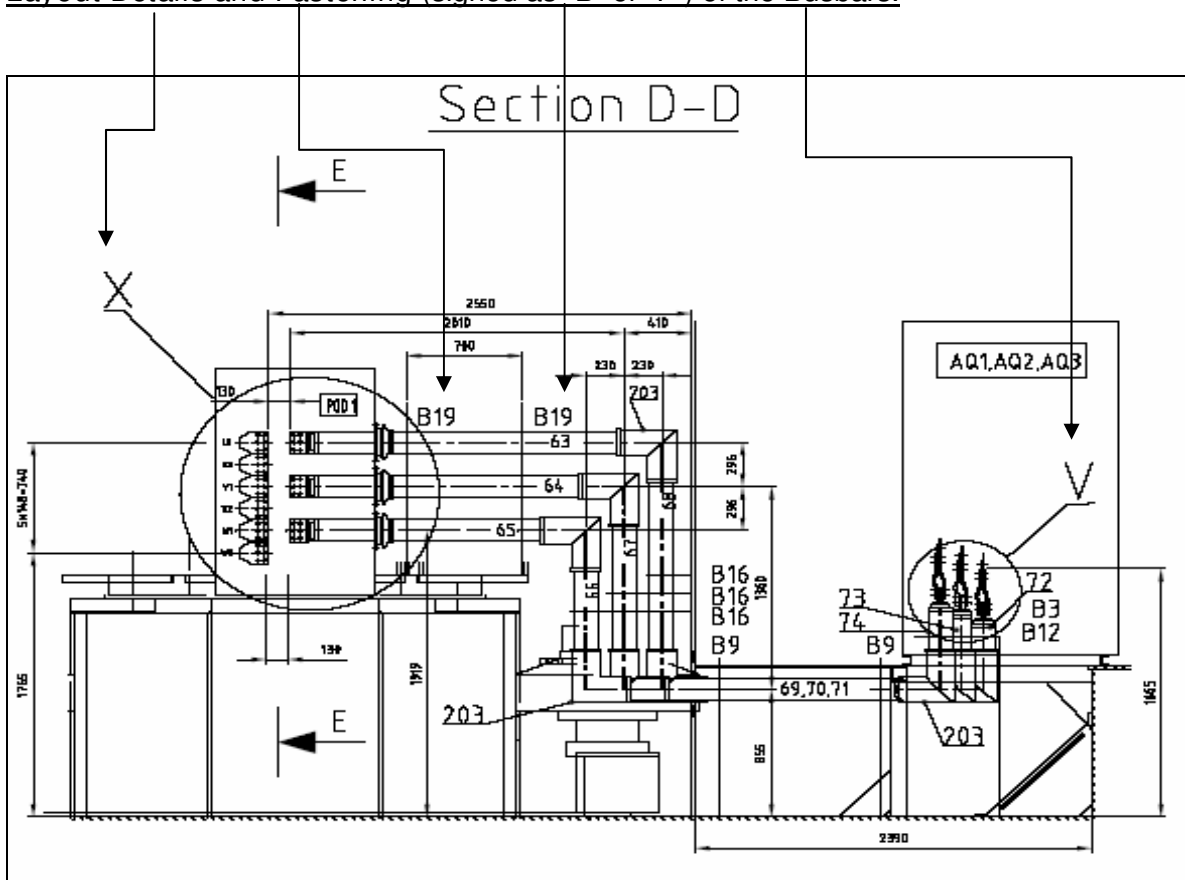
Layout drawing: Item number of the busbar.



List of equipment, Item number of the Busbar, article number and serial number.


Pos.	Teilenummer Item Article No:	Bezeichnung / Dimension Description / Dimension	Bemerkung Remark	kg /Stk kg / pcs.	Werkstoff Material	Total / Res. Qty/Spare	Delief. Delivered
1	D2050300S01	TIRESCA-Schiene 24kV / 1250A (S) TIRESCA-busbar	EA05.0102.1.1	23	Al	1 pcs	
2	D2050300S02	TIRESCA-Schiene 24kV / 1250A (S) TIRESCA-busbar	EA05.0102.1.2	28	Al	1 pcs	
3	D2050300S03	TIRESCA-Schiene 24kV / 1250A (S) TIRESCA-busbar	EA05.0102.1.3	23	Al	1 pcs	
4	AO12300	Ro-Cu ø80x15 ring		3,6801	Cu ETP H	,135 M 3x40 mm	
6	D3990294S01	Isolier Muffe 90° / ø170x490 Insulating sleeve				6 pcs	
7	D4960077-01	Deckel 35xø170/8xM8 Cover		10,2		6 pcs	
8	D4960078-02	Ring 35xø159/61/8xM8 Ring				6 pcs	

Layout Details and Fastening (signed as "B" or "F") of the Busbars.






4. INSTALLATION INSTRUCTIONS (continued)

Layout Details and Fastening (signed as "B" or "F") of the Busbars.

<u>List of equipment</u>							
Fastening of TIRESKA busbar Details see drawing No.: D1030066							
Fastening of TIRESKA busbar B13 and B14 see drawing No.: D0030044							
Fastening of TIRESKA busbar B1- B12 see drawing No.: D0030043							
Details of TIRESKA busbar X, V, Y und Z see drawing No.: D0030033							
Typ type type	Gruppe groupe groupe	Sätze jeux sets	Schiene barre busbar	Ø Leiter Ø conducteur Ø conductor	Material	Radien rayons radii	Materialliste Liste de matériel List of equipment
TEL	10	2	Ø 106	Ø 80/50	Al	400	D0030032S01
 Tol. as per DIN 7168/ISO 2768 Welding as per SN 210350		PROJECT INFORMATION			SCALE	1:50	FORMAT AD
		FILE NAME & EXTENSION			MGC ORDER NO. / MGC PROJECT NO.		
					EA20030096		
		DATE			TECHNICAL TERM		
		Drawn 16.05.2003			TIRESKA-busbars-connection		
		Design 14.07.2003			3,9 kV / 2500 A		
		Check 14.07.2003					

4.4 USED SIGNS IN OUR LAYOUTS

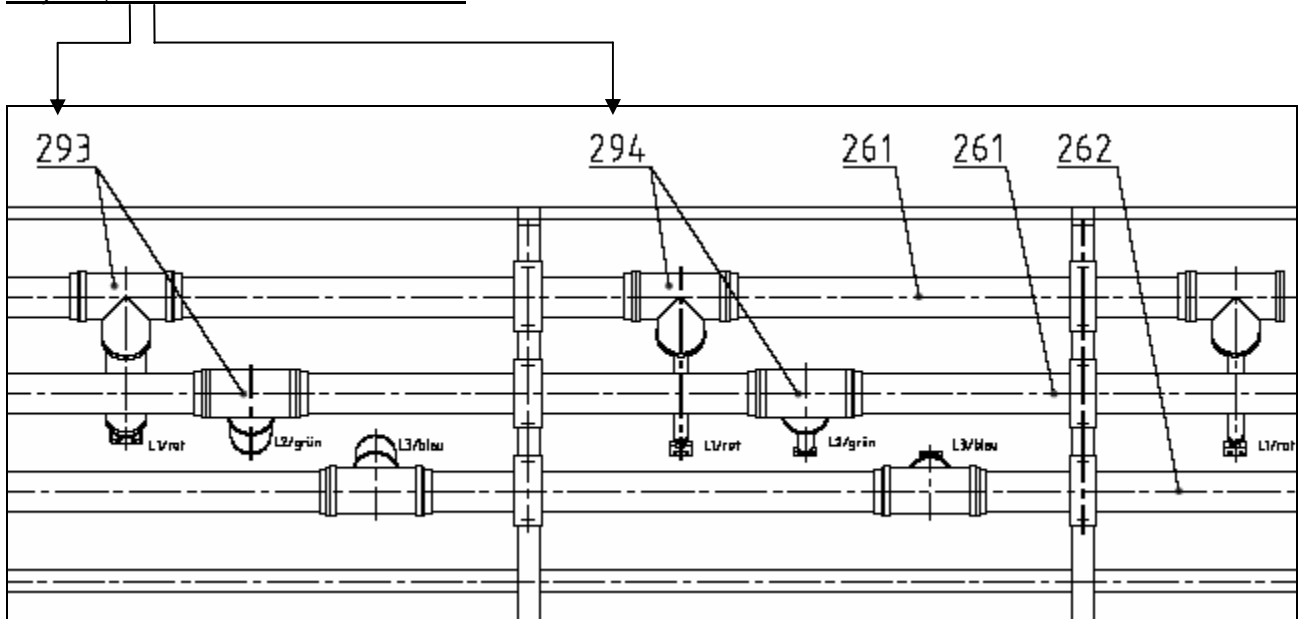
	Starre Verbindung (beidseitig verschraubt) Raccord rigide (visse des deux côtés) Rigid connection (screwed on both sides)
	Flexible Verbindung (beidseitig verschraubt) Raccord flexible (visse des deux côtés) Flexible connection (screwed on both sides)
	Erdung Metallteile Mise à la terre des parties métalliques Earthing metallic parts

4. INSTALLATION INSTRUCTIONS (continued)

4.5 IDENTIFICATION AND DISPOSITION OF THE CYLINDERS

Each cylinder has a Article number which can be found by the Item number in the list of equipment.

Layout, Item number of the sleeve.



List of equipment, Item number of the sleeve and article number.

Pos.	Teilenummer	Bezeichnung / Dimension	Bemerkung	kg /Stk	Werkstoff	Total / Res.	Gelief.
Item	Article No:	Description / Dimension	Remark	kg / pcs.	Material	Qty/Spare	Delivered
256	D2050066S01	TIRESCA-Schiene 12kV / 4000A (I) TIRESCA-busbar	EA04.0200.1-3.256	39	Cu	3 pcs	
257	D2050067S01	TIRESCA-Schiene 12kV / 4000A (I) TIRESCA-busbar	EA04.0200.1-3.257	66	Cu	3 pcs	
293	D1050006S01	Tiresca-T-Muffe 12kV / 4000A TIRESCA-T-sleeve				6 sets	
294	D1050007S01	Tiresca-T-Muffe 12kV / 4000A TIRESCA-T-sleeve				3 sets	
207	D4050042-01	Lasche 100x20x264	versilbert	9.4	Cu ETP HH	2 pcs	

4. INSTALLATION INSTRUCTIONS (continued)

4.6 FASTENING OF THE BARS

The fastening of the bars occurs as per our drawings (see page 10). The assembly of the clamps is indicated on drawing for the fastening, detail – Fxxx (see drawing). The clamps are fixed with special suspensions screws on double C channels or with insulators on existing steel construction.

4.7 HIGH CURRENT CONNECTIONS

Refer to the Installations Instructions given on drawing !!!

Example of Working steps (Connection with contact discs):

4.7.1 PREPARATION

Clean the contact surface with burnish mat. Remove the dust accrued from the surface with some clean dry cloth. Coat the contact surfaces immediately with KP contact grease P1 (about 1mm thick).

4.7.2 ASSEMBLING

Grease all bolts. Observe the following succession for the assembling of the different items: Screw head, plain washer, connection parts, contact discs, plain washer, Belleville, Hex. head nut. Tight up with a torque wrench, torque = see drawing.

4.8 ASSEMBLING OF THE CYLINDERS

Assembling of the cylinders, as per drawing.

4.9 BELLOWS AND SEALINGS

See details on drawings (see page 10). In order to increase the water tightness, coat the packing disks, bellows, O-rings, etc. with some silicon grease.

4. INSTALLATION INSTRUCTIONS (continued)

4.10 GROUNDING

Install a grounding bar or cable of copper, minimum 50 mm² (in our scope of supply if ordered only), along the busbar. This grounding bar can be fastened on the double C channels delivered. It has to be connected to ground at one point, preferably in the middle of its length.

4.11 GROUNDING OF THE BARS - TIRESCA®

There is no grounding on the TIRESCA Busbars.

4.12 GROUNDING OF THE OTHER METALLIC PARTS

The supports, channels, etc. must be grounded. Avoid to form any loop.

5. CHECK UP BEFORE PUTTING INTO SERVICE

5.1 FASTENING OF THE BARS

- Check if the intervals between the fixation points are made in accordance to the installation drawings.
- Check if the fixations have been applied at the right places.

5.2 ALL HIGH CURRENT CONNECTIONS

All high current screwings have to be realised according to the given prescriptions on the drawings.

- Check if the appropriate connecting parts corresponding to the dimension dispositions, material, have been used.
- Control the torque as final check according the table bellow.

Table-1, for high current connections with Al Elast Contact Disks ø37mm <u>Contact surface blank: Aluminium- Aluminium or Aluminium-Copper</u>			
Screws steel 8.8	Torque [Nm]	Screws, stainless steel A4-80	Torque [Nm]
M8	22	M8	22
M10	46	M10	43
M12	80	M12	75
M16	120	M16	120

Table-2, for high current connections with copper, silver or tin plated surfaces <u>Contact surface: Copper – Copper, Copper – silver or tin plated, silver plated - silver plated</u>			
Screws steel 8.8	Torque [Nm]	Screws, stainless steel A4-80, acc. DIN 43 673 Tab.3	Torque [Nm]
M8	22	M8	16
M10	44	M10	30
M12	75	M12	60
M16	120	M16	120

Screws which have this indicated value of torque are ok. Screws having a torque value less than indicated must be tightened at the value indicated above.

5. CHECK UP BEFORE PUTTING INTO SERVICE (continued)

5.3 THE CYLINDER - TIRESKA®

- Check if the cylinder is assembled according the drawing.

5.4 THE GROUNDING - TIRESKA®

5.4.1 *There is no grounding on the TIRESKA Busbars.*

5.4.2 *There is no grounding on the TIRESKA cylinder.*

5.4.3 Each channel fixing material, supports, etc., has to be grounded. However, take care not to form any loop.

5.5 CHECKLIST

It is remained indispensable to make a final check of the Installation according our Checklist *CL0000(D)* for German, *CL0000(E)* for English and *CL0000(F)* for French (*in preparation*). After applying of checklist please send us a signed copy back to register your successful completed final check of the installation.

6. OPERATION AND MAINTENANCE INSTRUCTIONS

6.1 HIGH CURRENT SCREWINGS

One single check of the torque after about 2 years of operation.

Control torque is 80 % of the original value

for screws St 8.8 M8 =	18 Nm
M10 =	37 Nm
M12 =	65 Nm
M16 =	95 Nm

Screws which have this indicated value or more are o.k. Screws with a lower torque value than indicated above must be tightened to the original values.

In case the attainable screws are found all right while checking, a control of the screws inside the insulating cylinders may not be necessary.

6.2 CREEPAGE DISTANCES (terminal parts of the Busbars) FOR TYPE TEL

About once per 4 years, according to amount and kind of dust, creepage distance (see table on page 2) of the Busbars can be cleaned with a clean dry cloth (if necessary only).

