PRESS WELDED SHUNTS

CONCEPT and DESIGN :

The FORISSIER press welded shunts are made up of an assembly of strips. The terminals are manufactured according to the press welding process. This same process allows the solid reconstitution of the material which constitutes the terminals under the associated combinations of both pressure and temperature.
Consequently, the contact resistance between the strips does not exist any longer, same for the rooting up effect of the material at the time of machining, drilling or punching of the endplates.

THE RANGE :

Standard widths : 20 mm – 35 mm – 48 mm – 58 mm – 80 mm – 100 mm - 120 mm – 150 mm – 200 mm (other dimensions upon request).
Strip thickness : 0.1 mm, 0.2 mm and 0.3 mm.
Shunt Thickness : as from 10 mm up to 40 mm (other dimensions upon request).

Options :

- External strips insertion with silver plated strips to guarantee the end plates protection without any chemical treatment.
- Surface treatment of the terminals : tinned – silvered – nickel plated or gold plated.
- Added contact plates.
- Terminal finishing : machining - drilling or punching.
- Customized specific shaping.
- Extra flexible shunt mechanically strengthened
- Other welding or assembling process :
  - MIG welding
  - Tin welding
  - Riveting
  - Rolled up shunt

SCOPE of APPLICATION :

All applications linked to power and supply production, furnaces, electrolysis.
Medium voltage electrical appliances (Switchboards – Circuit breakers – Inverters/converters)
Transformers – power distribution.

ADVANTAGES :

The press welded process enables to preserve the physical characteristics (electrical – mechanical and thermic) of the strips assembling .

. Press welding :
- Shaping of the shunts.
- Surface treatment of the terminals : tinned or silvered with DALIC process.

. BT press welding :
- Additional silvered strip without any residual chemical rejection during the exploitation.
- Limitation of the temperature rising during the welding process in order to prevent the oxidation of the raw material on the flexible part of the shunt together with contact endplate.

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TECHNICAL CHARACTERISTICS :

STRIPS

Copper classification :	ISO 1337	
	- Désignation :	Cu-OF(oxygen free)
	- Mini copper grade :	99.9 %
	- Resistivity : 20° maxi (annealed) :	1.7241 µ Ω cm (100%I ACS)

Copper characteristics :	0 state	H 14 state
- Tensile strength :	200 Mpa mini	350 Mpa mini
- Elongation :	30 % mini	6 %
- Vickers hardness :	< 55 HV (norme spécifie 65 HV maxi)	≥ 100 HV

SURFACE TREATMENT OF THE TERMINALS

Electrolytic tinning :	- 5 µm (for standard applications) - 10 µm (for corrosive environment)
Silvering :	- 2 µm DALIC process - 5 µm for the external strips

DESIGNATION

CS	FD	Section	CN	100 x 10 x 400
Flexible Connexion	In strip	in mm^2 (sqmm)	Raw material red copper	width x thick x length in mm

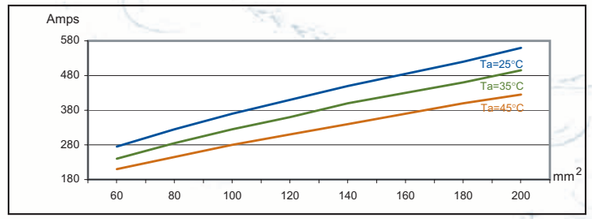
PRESS WELDED SHUNTS

Allowable currents relating to the CSA of the shunts for room temperatures of 25°C, 35°C and 45°C (Ta).

The diagrams and data are based on one connection working in a stabilized room temperature.The shunt is vertically installed and cooled by natural convection. The open space around the shunt is equal or more important than the width of the shunt.

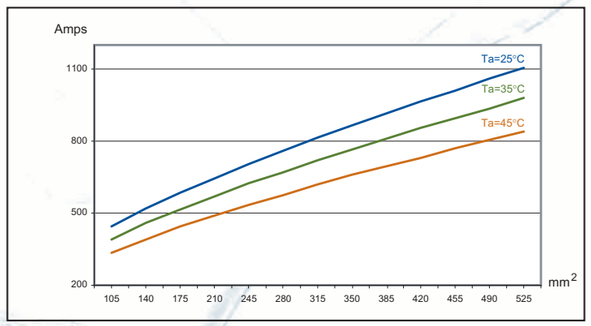
Width 20 mm

Width (mm)	Thickness (mm)	Section (mm^2)	Ta=25°C I max	Ta=35°C I max	Ta=45°C I max
20	3	60	275	240	210
20	4	80	325	285	245
20	5	100	370	325	280
20	6	120	410	360	310
20	7	140	450	400	340
20	8	160	485	430	370
20	9	180	520	460	400
20	10	200	560	495	425



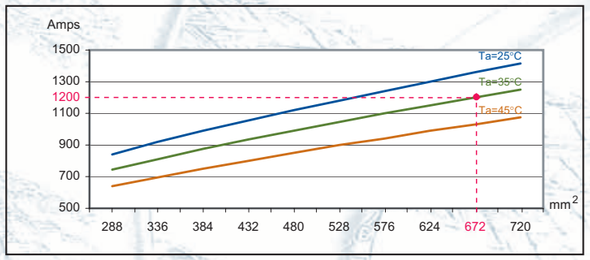
Width 35 mm

Width (mm)	Thickness (mm)	Section (mm^2)	Ta=25°C I max	Ta=35°C I max	Ta=45°C I max
35	3	105	445	390	335
35	4	140	520	460	390
35	5	175	585	515	445
35	6	210	645	570	490
35	7	245	705	625	535
35	8	280	760	670	575
35	9	315	815	720	620
35	10	350	865	765	660
35	11	385	915	810	695
35	12	420	965	855	730
35	13	455	1010	895	770
35	14	490	1060	935	805
35	15	525	1105	980	840



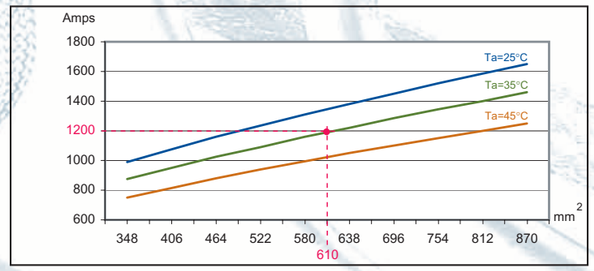
Width 48 mm

Width (mm)	Thickness (mm)	Section (mm^2)	Ta=25°C I max	Ta=35°C I max	Ta=45°C I max
48	6	288	840	745	640
48	7	336	920	810	695
48	8	384	990	875	750
48	9	432	1055	935	800
48	10	480	1120	990	850
48	11	528	1180	1045	900
48	12	576	1240	1100	940
48	13	624	1300	1150	990
48	14	672	1360	1200	1030
48	15	720	1415	1250	1075



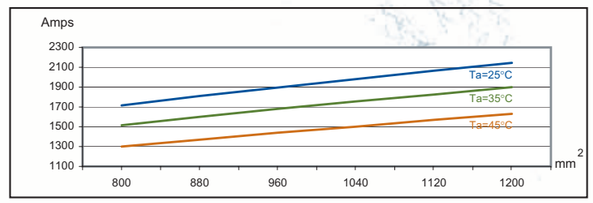
Width 58 mm

Width (mm)	Thickness (mm)	Section (mm^2)	Ta=25°C I max	Ta=35°C I max	Ta=45°C I max
58	6	348	990	875	750
58	7	406	1075	950	815
58	8	464	1160	1025	880
58	9	522	1235	1090	940
58	10	580	1310	1160	995
58	11	638	1380	1220	1050
58	12	696	1450	1285	1100
58	13	754	1520	1345	1150
58	14	812	1585	1400	1200
58	15	870	1650	1460	1250



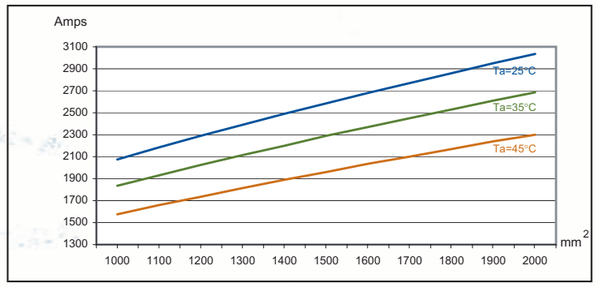
Width 80 mm

Width (mm)	Thickness (mm)	Section (mm^2)	Ta=25°C I max	Ta=35°C I max	Ta=45°C I max
80	10	800	1715	1515	1300
80	11	880	1810	1600	1370
80	12	960	1895	1680	1440
80	13	1040	1980	1755	1500
80	14	1120	2065	1825	1570
80	15	1200	2145	1900	1630



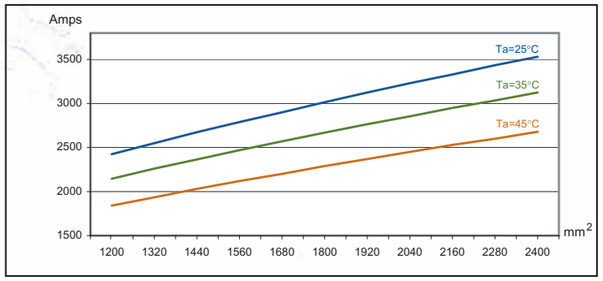
Width 100 mm

Width (mm)	Thickness (mm)	Section (mm^2)	Ta=25°C I max	Ta=35°C I max	Ta=45°C I max
100	10	1000	2075	1835	1575
100	11	1100	2185	1930	1660
100	12	1200	2290	2025	1735
100	13	1300	2390	2115	1815
100	14	1400	2490	2200	1890
100	15	1500	2585	2290	1960
100	16	1600	2680	2370	2035
100	17	1700	2770	2450	2100
100	18	1800	2860	2530	2170
100	19	1900	2950	2610	2240
100	20	2000	3035	2685	2300



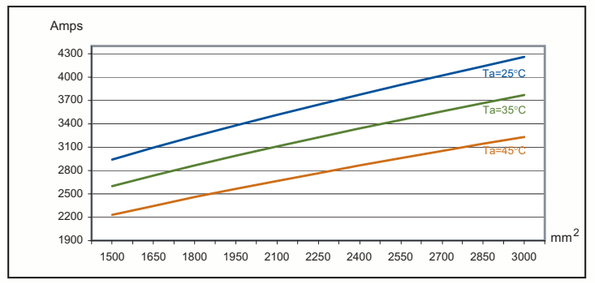
Width 120 mm

Width (mm)	Thickness (mm)	Section (mm^2)	Ta=25°C I max	Ta=35°C I max	Ta=45°C I max
120	10	1200	2425	2145	1840
120	11	1320	2550	2260	1935
120	12	1440	2675	2365	2030
120	13	1560	2790	2470	2120
120	14	1680	2900	2570	2200
120	15	1800	3015	2670	2290
120	16	1920	3125	2765	2370
120	17	2040	3230	2855	2451
120	18	2160	3330	2950	2530
120	19	2280	3435	3035	2600
120	20	2400	3530	3125	2680



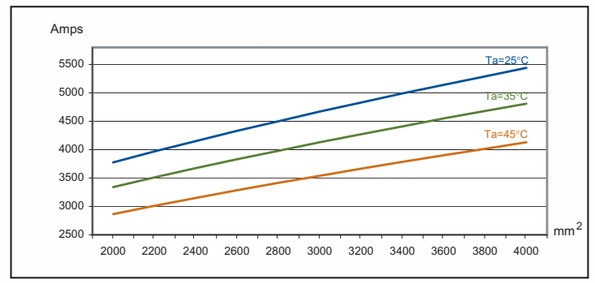
Width 150 mm

Width (mm)	Thickness (mm)	Section (mm^2)	Ta=25°C I max	Ta=35°C I max	Ta=45°C I max
150	10	1500	2940	2600	2230
150	11	1650	3095	2735	2345
150	12	1800	3240	2865	2460
150	13	1950	3380	2990	2565
150	14	2100	3515	3110	2665
150	15	2250	3645	3225	2765
150	16	2400	3775	3340	2865
150	17	2550	3900	3450	2960
150	18	2700	4020	3560	3050
150	19	2850	4140	3665	3145
150	20	3000	4260	3770	3230



Width 200 mm

Width (mm)	Thickness (mm)	Section (mm^2)	Ta=25°C I max	Ta=35°C I max	Ta=45°C I max
200	10	2000	3775	3340	2865
200	11	2200	3970	3510	3010
200	12	2400	4150	3675	3150
200	13	2600	4330	3830	3285
200	14	2800	4500	3980	3415
200	15	3000	4670	4130	3540
200	16	3200	4830	4270	3665
200	17	3400	4990	4410	3785
200	18	3600	5140	4550	3900
200	19	3800	5290	4680	4015
200	20	4000	5440	4810	4130



Selection :

The diagram enables the selection of the press welded shunts according to the different parameters :

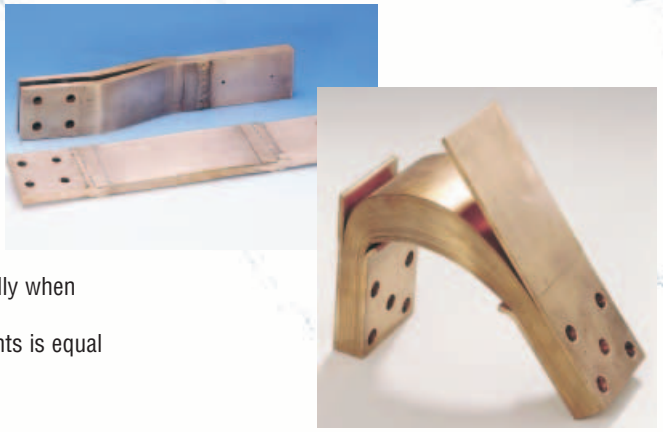
- Current (amps) requested.
- Room temperatures of 25°C, 35°C or 45°C.
- The width of the shunt.

Selection's example :

Our example reflects a current flow capacity of 1200 Amps, and a room temperature of 35°C.
The possibilities are the crossing of the red dotted lines :
The possibilities are as follows :

- If width is 48 mm and CSA 672 sq mm thickness is 672 / 48 = 14 mm
- If width is 58 mm and CSA 610 sq mm thickness is 610 / 58 = 10.5 mm

The final choice depends on the width of the terminal.



SETTING UP :

1. Implantation.

Shunts are preferentially set up vertically when they are used in parallel.
The minimum distance between 2 shunts is equal to the thickness of the shunt.

2. Parallel installation.

In case of several shunts put in parallel on a same phase, it is necessary to calculate the total section needed including the following balancing coefficient :

Number of shunts	Coefficient
2	1,8
3	2,5
4	3,2
5	3,9
6	4,4
8	5,5
10	6,5

1. Definition of the number of shunt.

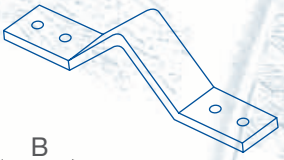
2. Calculation of the dimensional section current by shunt :

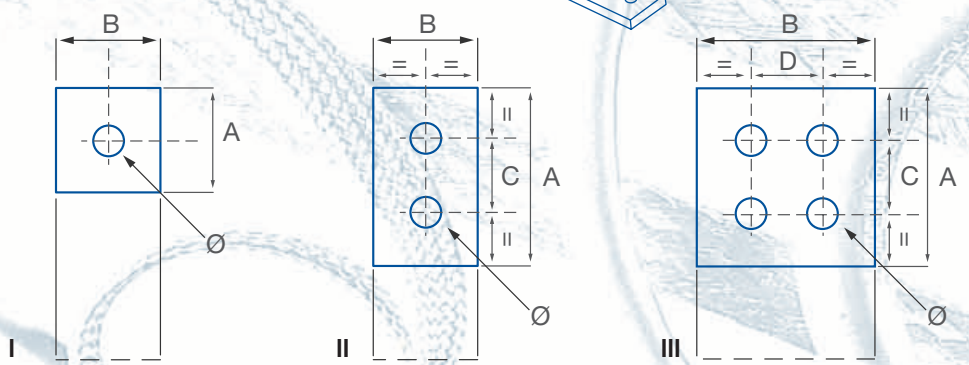
$$\text{The dimensional section current} = \frac{\text{Total current}}{\text{Coefficient}}$$

3. The allowable section for each shunt is directly read on the diagram, and based on the calculation of the dimensional section current by shunt **(stage 2)**.

3. Terminals finish.

Three standards : type I, II and III

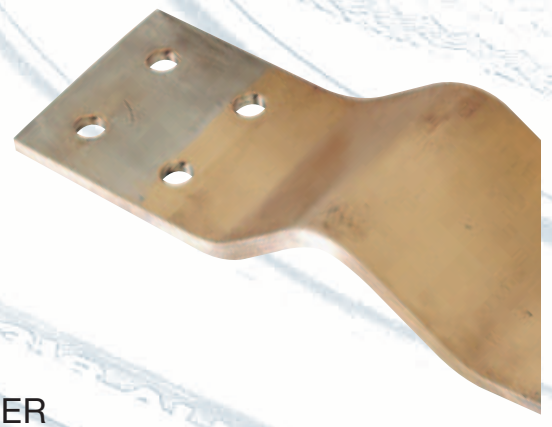




Requested information :

- Position of holes A, B, C, and D
- Diameter : Ø

Other finish upon request.



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