

Metal coated steel sheets and coils

Ultra high-strength formable steels

Litec

Metal coated, ultra high-strength formable steels are developed for demanding applications that require cold formability, high strength, good corrosion resistance and light structures.

Applications

- frame and cross beams
- vertical beams
- side impact beams
- safety components

Ruukki is a metal expert you can rely on all the way, whenever you need metal based materials, components, systems or total solutions. We constantly develop our product range and operating models to match your needs.

- **DP steels**

Dual-Phase (DP) steels are steels which have a multi-phase microstructure consisting of a dispersion of hard martensite islands. Characteristic of these steel grades is low yield strength / tensile strength ratio (R_p/R_m). In particular, the level of strain hardening is high at the beginning of forming, as a result of which stretch forming properties are good.

- **CP steels**

Complex-Phase (CP) steels are steels having a ferrite/bainite matrix containing martensite. Precipitation hardening can be used, if necessary, to complement these strengthening phases. Thanks to the structure of these steels, the yield strength/tensile strength ratio (R_p/R_m) is significantly higher than that of DP steels. CP steels are the best choice for applications demanding high strength and small bending radius.

- **TRIP steels**

TRIP (Transformation Induced Plasticity) steels have excellent formability. This makes them suitable for components having a complex shape and requiring high strength and good energy absorption capability. The excellent combination of high strength and formability of TRIP steels is the result of the phase transformation of the retained-austenite to martensite during the forming process.

Litec steels do not usually age but they bake harden at elevated temperatures (see Figure 2).

- **Coating materials**

The zinc coating (Z) of Litec steels is lead-free, as a result of which the zinc crystallizes into a minimized, even spangle that meets high requirements set for appearance. Thanks to the good formability of lead-free coatings, the corrosion protection, for example, in areas which have been bent is good. The small spangle coating is designated by the letter M.

Galfan (ZA) is a zinc-aluminium alloy coating with an aluminium content of approximately 5 %. This coating has better anticorrosive and forming properties than normal zinc coatings. The surface is uniform and smooth.

Galvannealed (ZF) is a zinc-iron alloy coating. It is produced by means of heat treatment and gives the zinc an iron content of about 10 %. ZF coated steels are excellent for resistance welding applications and are designed for use in high-quality paint-coated products. The surface produced is greyish and matte.

- **Surface quality**

- **Normal surface (A)**

Flaws in the surface such as local roughness, imprints, scratches, small pits, variation in pattern size, dark spots, stripe marks and minor passivation stains are allowed. Run-off marks may appear.

- **Improved surface (B)**

Improved surface (B) is obtained by skin pass rolling. Minor flaws in the surface such as skin pass marks, minor scratches, small indentations, run-off marks and minor passivation stains are allowed.

- **Surface treatment**

Chemical passivation or oiling is usually used to protect the surface against white rust, caused by moisture, during transport and storage.

Litec steels are usually delivered in the oiled condition (O) but chemical passivation (C) or both chemical passivation and oiling (CO) are available on request. Should a customer so wish, the surface can also be left unprotected, but this is at their own responsibility.

- **Inspection document**

The inspection document type agreed upon in conjunction with the order is delivered in compliance with standard EN 10204.

- **Weldability**

Recommended welding methods for Litec steels are resistance, laser and HF welding, also arc welding can be used for joining Litec steels. The welding parameters should be adjusted to match the chemical and mechanical properties of the Litec steel. DP and CP steels have relatively low alloying element contents and have generally good weldability. When choosing the welding parameters for TRIP steels the higher alloying contents have to be taken into account.

When resistance welding Litec steels, the electrode force should be about 35 – 50 % higher than that for low-carbon steel grades. Acceptable welding current range is larger at longer welding times, but too long welding times should be avoided. The tensile strength of the weld increases with increasing steel strength. Due to the higher carbon and alloy contents of Litec TRIP steels the weld hardness is high. The fracture properties of the joint can be improved by applying pulsed welding current or by post-weld heat treatment. Multi-impulse welding may be used especially with higher thicknesses or with TRIP steels, independent of thickness.

Galvan-coated, Litec steels can be welded using the same parameters as for hot dip galvanised steels. Galvannealed-coated, Litec steels have much larger welding current range and longer electrode life than corresponding HDG steels.

Litec steels are extremely suitable for laser welding but the formability of the weld is lower than that of the base material. Formability can be partly restored by e.g. laser post-weld heat treatment or local inductive heat treatment.

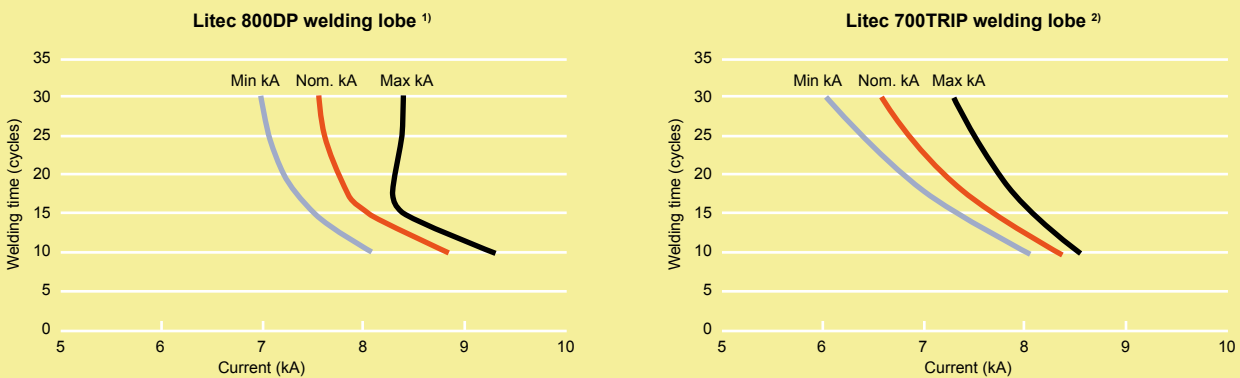
Figure 1 shows an example of the welding parameters for Litec 800DP and Litec 700TRIP steels. Information regarding other steel grades is available from Ruukki's Customer Service.

● **Paintability**

Metal-coated surfaces are very suitable for painting. In order to ensure adhesion of the paint, however, any chemical passivation, protective oil or other impurities must be removed from the surfaces to be painted. If a better than normal painted surface is required, improved surface quality (B) should be used.

● **Weld time**

Figure 1



Sheet thickness 1,2 mm, electrode tip diameter ø 6 mm.

¹⁾ Electrode force F 3,6 kN.

²⁾ Electrode force F 4 kN.

Values are for guidance only.

● **Chemical composition**

Table 1

Steel grade	Content %					
	C max	Si max	Mn max	Al max	Cr+Mo max	Nb+Ti max
DP steels						
Litec 600DP	0.17	0.80	2.20	2.00	1.00	0.15
Litec 800DP	0.18	0.80	2.50	2.00	1.00	0.15
Litec 1000DP ¹⁾	0.23	0.80	2.50	2.00	1.00	0.15
CP steels						
Litec 600CP	0.18	0.80	2.20	2.00	1.00	0.15
Litec 800CP	0.18	0.80	2.20	2.00	1.00	0.15
Litec 1000CP ²⁾	0.23	0.80	2.20	2.00	1.20	0.15
TRIP steels						
Litec 700TRIP ¹⁾	0.32	0.80	2.50	2.00	0.60	0.20
Litec 800TRIP ²⁾	0.32	0.80	2.50	2.00	0.60	0.20

¹⁾ Supply of this steel grade must be agreed separately.

²⁾ Under development.

• **Mechanical properties and coatings**

Table 2

Testing direction is transverse to the rolling direction

Steel grade	Yield strength R _{p0.2} MPa Minimum	Tensile strength R _m MPa Minimum	Elongation A ₈₀ % Minimum			Bake hardening BH ₂ MPa Minimum ³⁾	Coatings ⁴⁾
			Thickness mm				
			≤ 0.50	0.50 – 0.70	> 0.70		
DP-steels							
Litec 600 DP	340 – 420	600	16	18	20	30	Z, ZA, ZF ⁵⁾
Litec 800 DP	450 – 560	780	10	12	14	30	Z, ZA, ZF ⁵⁾
Litec 1000 DP ¹⁾	600 – 750	980	6	8	10	30	Z
CP-steels							
Litec 600CP	350 – 500	600	12	14	16	30	Z, ZA, ZF ⁵⁾
Litec 800CP	500 – 700	780	6	8	10	30	Z, ZA, ZF ⁵⁾
Litec 1000CP ²⁾	700 – 900	980	3	5	7	30	Z
TRIP-steels							
Litec 700TRIP ¹⁾	430 – 550	690	19	21	23	40	Z, ZA
Litec 800TRIP ²⁾	470 – 600	780	17	19	21	40	Z, ZA

¹⁾ Supply of this steel grade must be agreed separately.

²⁾ Under development.

³⁾ Not guaranteed for ZF-coated steel grades.

⁴⁾ Coating mass in compliance with standard EN 10346

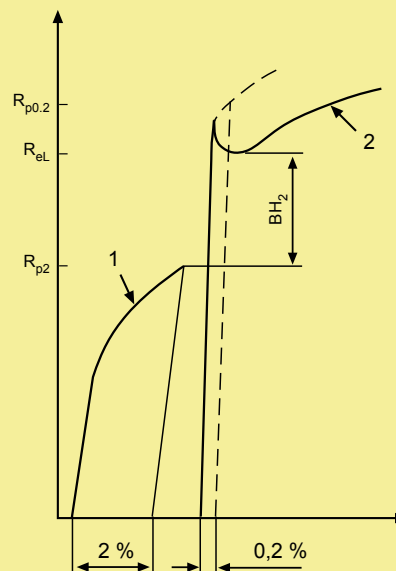
⁵⁾ ZF-coating must be agreed separately. The elongation value of ZF-coated products will be reduced by 2 units.

• **Determination of bake hardening (BH₂)**

Figure 2

1. Plastic prestrain of 2 %.
2. Tensile test after heat treatment.

After prestrain of 2 % the test piece is heated at 170°C for 20 minutes. The tensile test is carried out after this.



• **Corresponding steel grades**

Table 3

Ruukki	EN 10346	EN 10336: 2007
Litec 600DP	HCT600X	HCT600X
Litec 800DP	HCT780X	HCT780X
Litec 1000DP	HCT980X	HCT980X
Litec 600CP	HCT600C	HCT600C
Litec 800CP	HCT780C	HCT780C
Litec 1000CP	HCT980C	HCT980C
Litec 700TRIP	HCT690T	HCT690T
Litec 800TRIP	HCT780T	HCT780T

Original documents must be used in detailed comparisons.

• **Our Customer Service is happy to give you further information**

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