



FORGINGS FOR LARGE CALIBER GUNS

Aubert & Duval has over 70 years of experience as a leading supplier of high performance steels for defense applications, including forgings for large caliber gun barrels and breech components.



CLARM® grades
*Blank barrels up to 10 meters
for enhanced action range*



Customer benefits

- + Combat proven
- + High endurance
- + Excellent behavior in any environmental conditions
- + Resistance to intensive fire rates
- + Extended munitions range
- + Long cycle life maintaining high accuracy
- + Optimized properties of dedicated alloys grades
- + Providing global solution for breech blocks, breech rings and barrels
- + Dedicated Technical Support and R&D Team

Increasing system life

Aubert & Duval CLARM® grades offer unique ability for:

- + Thickness Reduction due to high mechanical performances to decrease weight impact
- + Increasing systems service life and maximum range
- + Cost reduction (maintenance & logistics) to battlefield
- + Capable of withstanding higher pressures, resulting in greater maximum ranges than traditional materials.

Aubert & Duval has the capability to vertically heat treat barrels in order to minimize distortion and residual stresses in the product, avoiding barrel deformation during machining and firing.

LARGE CALIBERS

Why using CLARM® steel grades?

- + 3 different CLARM® Grades depending on final requirements
- + Optimized chemical analyses for the best YS/KV (-40°C) and YS/K1C compromise
- + High toughness at -40°C; Typical K1C in the 140/180 MPa.m^{1/2} range
- + Elevated temperature tensile strength up to 400°C
- + Allow homogeneous yield strength along the barrel for optimum autofrettage
- + Heat treated in vertical position for lower deformation and mechanical properties homogeneity

Choose the best grade for your application

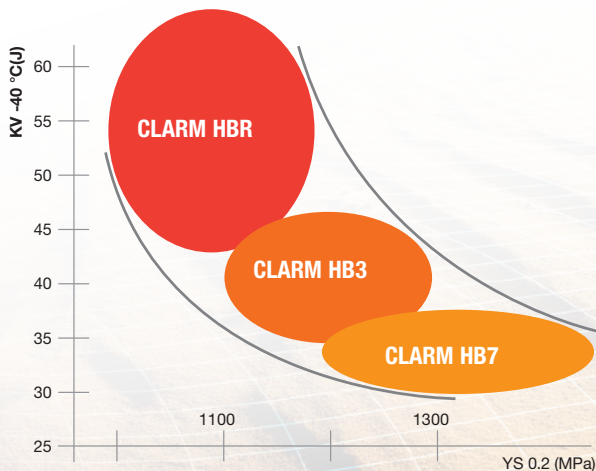
The choice of steel grade for gun barrel forgings is mainly governed by a compromise between yield strength (YS) and toughness at low temperatures (KV-40°C).

To define this compromise, the choice of optimum material for large gun barrels obviously leads to the Ni-Cr-Mo or Ni-Cr-Mo-V steels with a carbon content between 0.3 and 0.4% to guarantee the best strength and toughness balance. The chemical composition can be adjusted to achieve the desired, final mechanical properties.

Among all steel grades for artillery application available at Aubert & Duval, three of them are specifically designed for gun blanks and mortar barrel forgings.

• CLARM®HBR / CLARM®HB3 / CLARM®HB7

The CLARM® family is famous worldwide for its exceptional combination of tensile strength, ductility and toughness. The steel grade choice is mainly governed by the required compromise between yield strength (YS) and toughness at low temperature (KV-40°C). See drawing below.



Corresponding data sheets available on our website



Applications design

- + **Field towed guns:**
105 - 155 mm
- + **Tank guns:**
90 - 100 - 105 - 120 - 125 - 130 - 140 mm
- + **Self-propelled howitzers:**
155 mm
- + **Naval guns:**
40 - 57 - 76 - 127 mm
- + **Mortars:**
60 - 81 - 120 mm
- + Breech ring and breech block to complete any firing set

CLARM®HBR

The CLARM®HBR has an optimized chemical analysis for a high level of impact toughness and the best compromise between strength and toughness. The good hardenability provides homogenous mechanical properties in massive forgings parts after quench and tempering heat treatment.

Combining high quenching rates and elevated tempering temperatures results in a best toughness / ultimate strength compromise.

CLARM® HBR & CLARM®HB7

The search for even higher mechanical characteristics led to the development of the CLARM®HBR and CLARM®HB7 grades, the latter allowing yield strength of more than 1300MPa combined with exceptional K1c values.