# HYBRID
## Optimized Sol-Gel Technology.

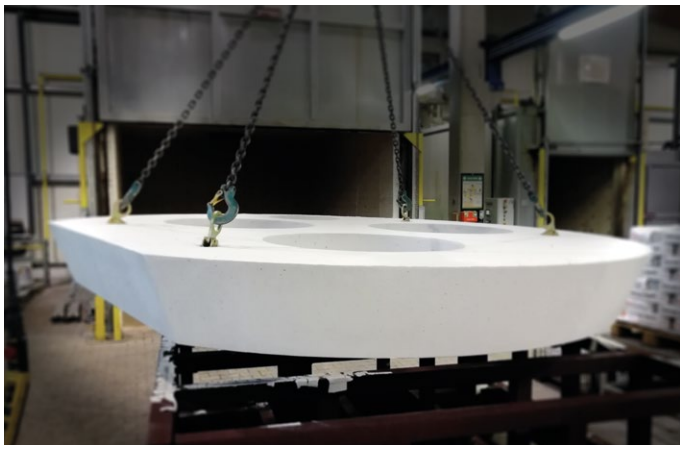
# Hybrid technology
## Further development of Sol-Gel bonded castables

**The new development: Hybrid technology**
With the development of REFRACAST® Hybrid castables, Refratechnik Steel has optimized the technology of Sol-Gel bonded, cement-free castables even further. Based on our established Nanobond castables, which already exhibit numerous technical advantages compared with cement containing castables, with this advancement to Hybrid castables, we have now also considerably increased the strengths in the low temperature range. Hybrid castables are based on a two-component material.

Hybrid technology permits the combination of faster heating up and high strength at low temperatures. It is therefore ideally suited for applications in which high strengths are required in the range of 20 - 1000 °C; for example in the production of prefabricated components or the lining of fluidized bed furnaces and refuse incineration plants.

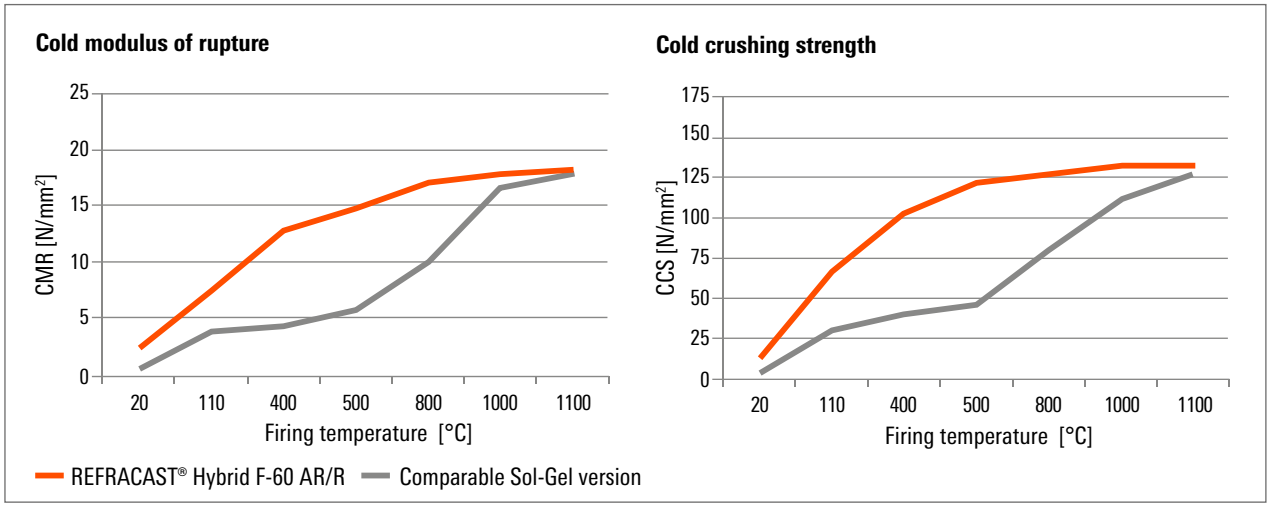
**Advantages of Hybrid castables compared with conventional cement containing castables:**
- Faster heating up with shorter downtimes
- Cost and energy-saving
- Very good adherence on existing refractory materials
- Installation possible on hot surfaces and with high ambient temperatures
- Higher application temperature limits
- Optimized thermomechanical behaviour
- Long storage life of 12 months
- Increased cold crushing strength and modulus of rupture as well as optimized abrasion resistance in the temperature range below 1000 °C.

**Manufacture of prefabricated components**
4-ton electric arc furnace delta section made of REFRACAST® Hybrid A-72 C/TS – demolded and dried

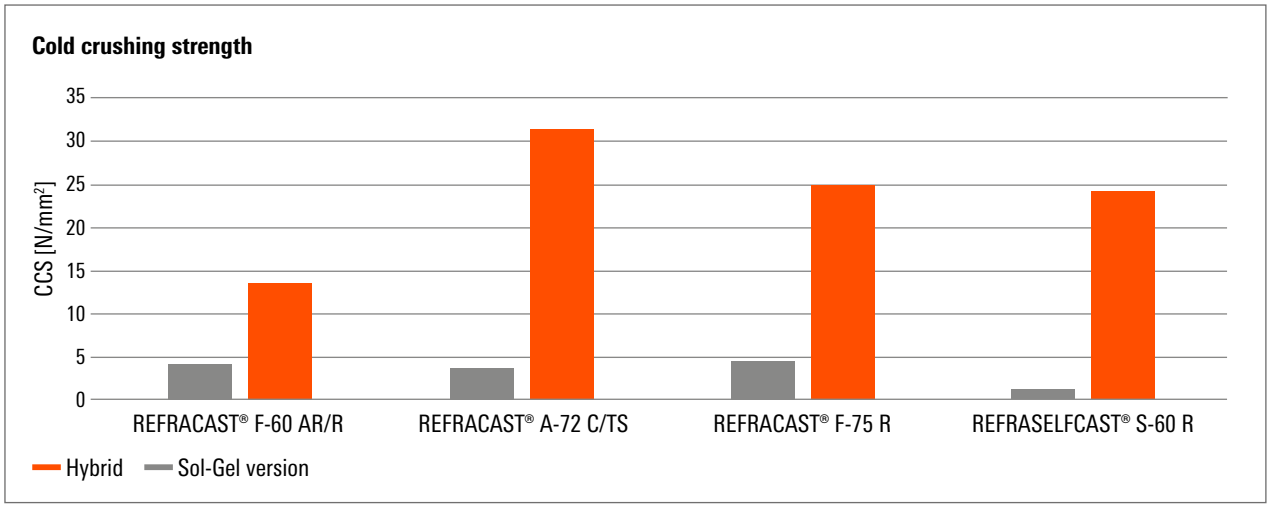


**Strength comparisons of REFRACAST® Hybrid F-60 AR/R and a Sol-Gel bonded castable**
Hybrid exhibits clear advantages compared with the Sol-Gel version in the range of 20 - 1000 °C




**Comparison of cold crushing strength of Hybrid castables and Sol-Gel bonded castables at 20 °C/24 h**
Hybrid castables exhibit a significant increase in cold crushing strength compared with Sol-Gel bonding




**Excerpt from our product portfolio**

| Quality | Application temperature max. °C | $Al_2O_3$ % | $SiO_2$ % | SiC % | Cold modulus of rupture after drying at 110 °C/24h | Cold crushing strength |
|---|---|---|---|---|---|---|
| **REFRACAST® Hybrid A-72 C/TS** | 1700 | > 75 | < 23 | - | 14.0 | 130.0 |
| **REFRACAST® Hybrid F-60 AR/R** | 1650 | > 50 | < 40 | > 6.5 | 8.0 | 65.0 |
| **REFRACAST® Hybrid F-75 R** | 1600 | > 71 | < 26 | - | 12.5 | 105.0 |
| **REFRACAST® Hybrid T-90** | 1700 | > 90 | < 8 | - | 10.0 | 100.0 |
| **REFRASELFCAST® Hybrid F-75 R** | 1600 | > 71 | < 26 | - | 7.0 | 55.0 |
| **REFRASELFCAST® Hybrid S-60 R *** | 1550 | < 33 | < 10 | > 56.0 | 15.0 | 135.0 |
| **REFRASELFCAST® Hybrid S-75 R *** | 1550 | < 17 | < 10 | > 73.0 | 10.0 | 75.0 |
| **REFRAJETCRETE® Hybrid F-60 AR/R** | 1650 | > 50 | < 40 | > 6.5 | 10.0 | 90.0 |

* in reducing atmosphere

Development of customer-specific types are possible on request.

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