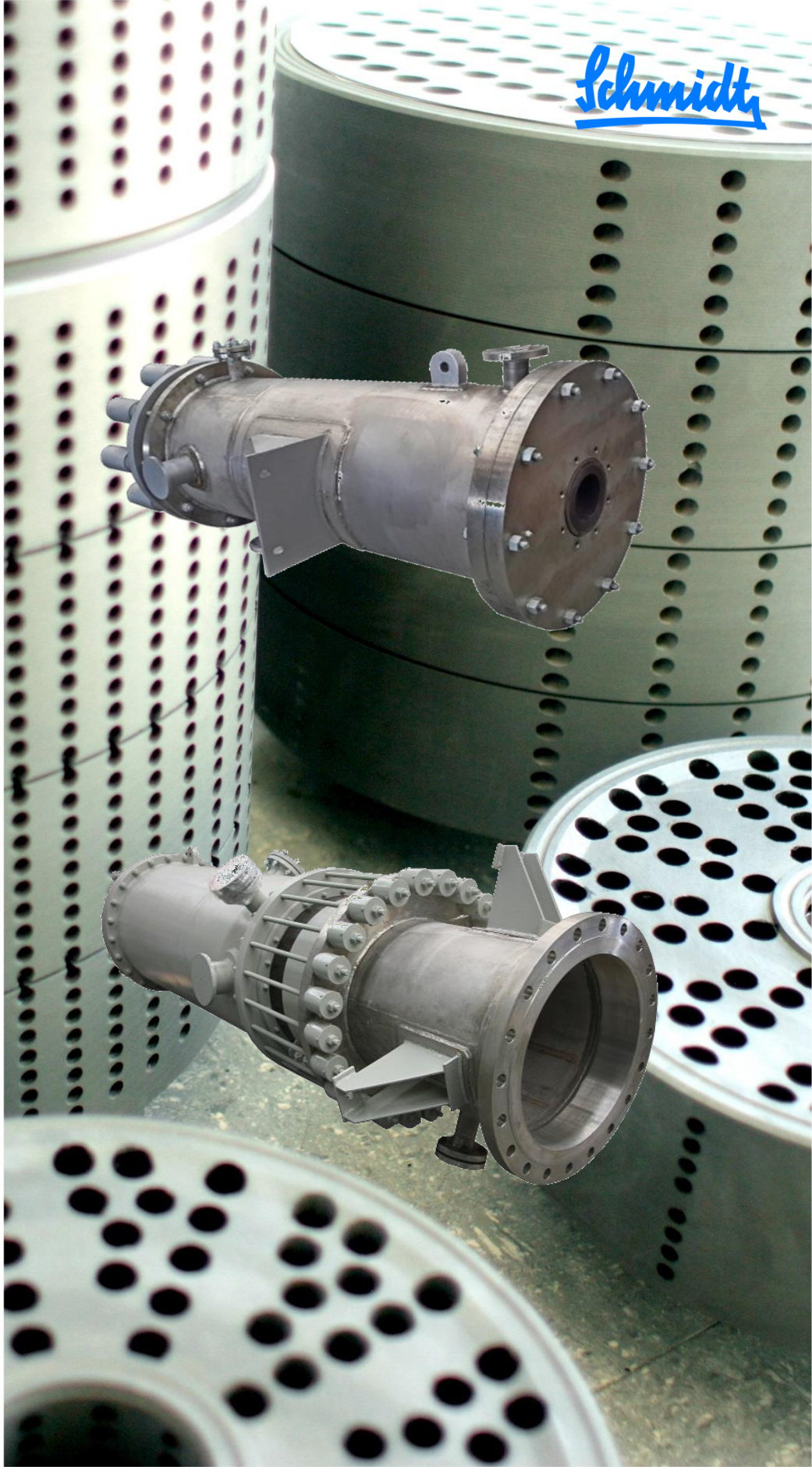
Graphite Technology



SIGMA **G-BLOC**
SIGMA **G-TUBE**
SIGMA **G-TOWER**

GT-KELITE
GT-KELITE+
GT-FLON
GT-CARB

API HEAT TRANSFER

PERFORMANCE IS EVERYTHING

SIGMA G, the complement and alternative to high nickel alloys, Tantalum, Titanium for corrosive applications.

Main markets

- Pharmacy
- Fine chemical
- Agro chemical (pesticide, herbicide, fertilizer)
- Steel industries (pickling and acid regeneration plant)
- Petro chemical (plastics)

HCl pickling liquor heater

Main applications

- Heating, cooling, evaporation, condensation of corrosive medium
- Waste acid, waste water and gas treatment (scrubber, falling film absorber, boiler)
- Concentration, crystallization by evaporation with hydrochloric acid, sulfuric acid or phosphoric acid
- Separation and purification of corrosive chemical products
- Acid dilution units
- Vacuum steam jet technology

Reactor condenser for xylene / thionyl chloride, pharmaceutical

SIGMA G, synonym of graphite heat exchangers and equipment with improved design.

Our unique equipment design is “user friendly” and allow harshest operating conditions.

- SHOCK PROTECT® against water / steam hammering
- STABLE LOAD® against stress fatigue
- STRESS FREE® against piping stress
- High thermal shock resistance

Chlorine incinerator scrubber unit, weak acid cooler

SIGMA G, synonym of exceptional graphite grade for extended lifetime.

TOYO TANSO manufactures the world highest quality graphite in Japan.

TOYO grade selected by API for heat exchanger, shows the highest mechanical strength and fatigue resistance on the market.

GT-TOYO grades are characterized by:

- The highest level of corrosion resistance among graphite materials
- The highest mechanical performances on the market
- The highest thermal transfer efficiency on the market

Sulfuric acid 85 % - 160 °C cooler

TOYO TANSO
Inspiration for Innovation

www.sttanso.com

Schmidt

GT Graphite Technology

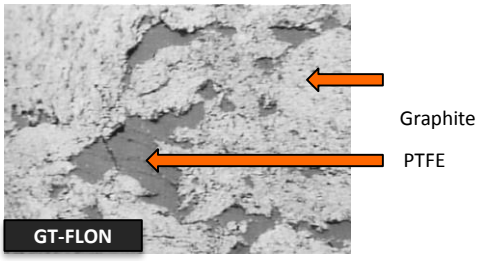
Outstanding corrosion resistant materials

Highly oxidative medium

Our grade GT-FLON is insensitive to solvents, organics which usually corrode traditional “phenolic resin” impregnated materials. Outperform in pharmaceutical batch processes, agro chemical, stainless steel pickling baths.

Our Silicon carbide (SiC) offers an excellent alternative materials to metals, super-alloys for very corrosive applications (chlorine and bromine compounds) and high purity processes.

Unlike metals, corrosion resistance is seldom affected by contaminants (chlorides, fluorides,…).



Micrography of impregnated graphite structure (x1000)

Impregnation of graphite will give imperviousness property. We use proprietary resin and latest technology which shorten production lead time. Four grades of impregnated graphite, using three different resin types are available to cover most applications.

We are the second company in the world able to supply “real” PTFE impregnated graphite.
Our GT-FLON show extraordinary corrosion properties outclassing traditional phenolic resin impregnated graphite.

Typical severe application examples

Media		Conc. up to (%)	Temp up to (°C)
HF	hydrofluoric acid	100%	200°C
HNO_3	nitric acid	40%	150°C
H_2SO_4	sulfuric acid	95%	180°C
HBr	hydrobromic acid	100%	200°C
HCl	hydrochloric acid	100%	200°C
H_3PO_4	phosphoric acid	100%	200°C
NH_4Cl	ammonium chloride	100%	200°C
$CaCl_2$	calcium chloride	100%	200°C
$CuCl_2$, $CuSO_4$	cupric chloride & sulfate	100%	200°C
$FeCl_3$	ferric chloride	100%	200°C
KOH, NaOH	caustic potash & soda	100%	200°C

Grade SIGMA G	GT-KELITE	GT-KELITE+	GT-FLON	GT-CARB
Graphite grain size (mm)	0.8 - 0.5	0.043 - 0.008	0.043- 0.008	0.8-0.008
Impregnating resin type	Phenolic		Pure PTFE	Carbon
Density	1.82	1.89	1.92	1.76-1.89
Flexural strength (MPa – ASTM C651)	27.0	43.0 – 50.0	32.0 – 42.0	32.0 – 42.0
Compression strength (MPa – ASTM C695)	65.0	118.0 – 159.0	91.0 – 130.0	80.0 – 130.0
Young modulus (GPa – ASTM C559)	9.0	11.0	11.0	9.0-11.0
Max permissible material temperature (^{0}C)	200	250	250	430
Recommended for	Moderate pressure / temperature / corrosion.	Higher pressure / temperature. Frequent thermal cycling. Higher corrosion resistance.	Highest corrosion resistance even in oxidative and strong base media. Frequent thermal cycling.	Highest temperature in non oxidative media.

Graphite Technology

SIGMA G-BLOC : modular stacked graphite blocks

- Compactness
- Modular construction
- Fast assembly / disassembly
- Standardized spare parts
- Possibility to use corrosive media on both side with a protective coating / lining on shell side
- Outstanding corrosion resistance (GT-KELITE / GT-CARB / GT-FLON)
- SHOCK PROTECT® design of blocks against water / steam hammering
- STABLE LOAD® design of compression spring against stress fatigue
- STRESS FREE® which avoid piping stress on graphite components

- Standard 8 barg, 200 °C. From 0.3 m^2 to 800 m^2.
- Customized higher design parameters available on request

SIGMA G-TUBE : shell and graphite tubes

- High heat transfer area
- High process / service section for big flow (15,000 m^3/h)
- Gaskets limited at tubesheet location
- Outstanding corrosion resistance (GT-KELITE)
- STABLE LOAD® design of compression spring against stress fatigue
- Erosion reinforcement as an option
- Tubes are available with carbon fiber reinforcement for application with high vibrations and mechanical stress
- Gasketed baffle on service side for cooler

- Standard 6 barg, 180 °C. From 5 m^2 to 1000 m^2.
- Customized higher design parameters available on request

SIGMA G-TOWER : column, reactors & internals

Tray in GT-KELITE for distillation column (MCA process)

- Column for distillation and reactors
- Temperature up to 430 °C, pressure up to 10 barg incl. vacuum
- Distributor, trays , packing support grids, mist eliminator support, dip-pipe… for tantalum, graphite, fluoropolymers lined and glass lined tower

Services

- Start-up and operating assistance
- Dedicated maintenance during lifetime of your units
- Quick support - Field Service – Spare-Parts availability
- Replacement, optimization and repair of your existing equipment (cubic, blocks, shell and tubes) without piping modification
- Expertise to remedy recurrent failure or lack of performances

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