

HEAT EXCHANGERS WHICH OFFER A BUNDLE OF ADVANTAGES

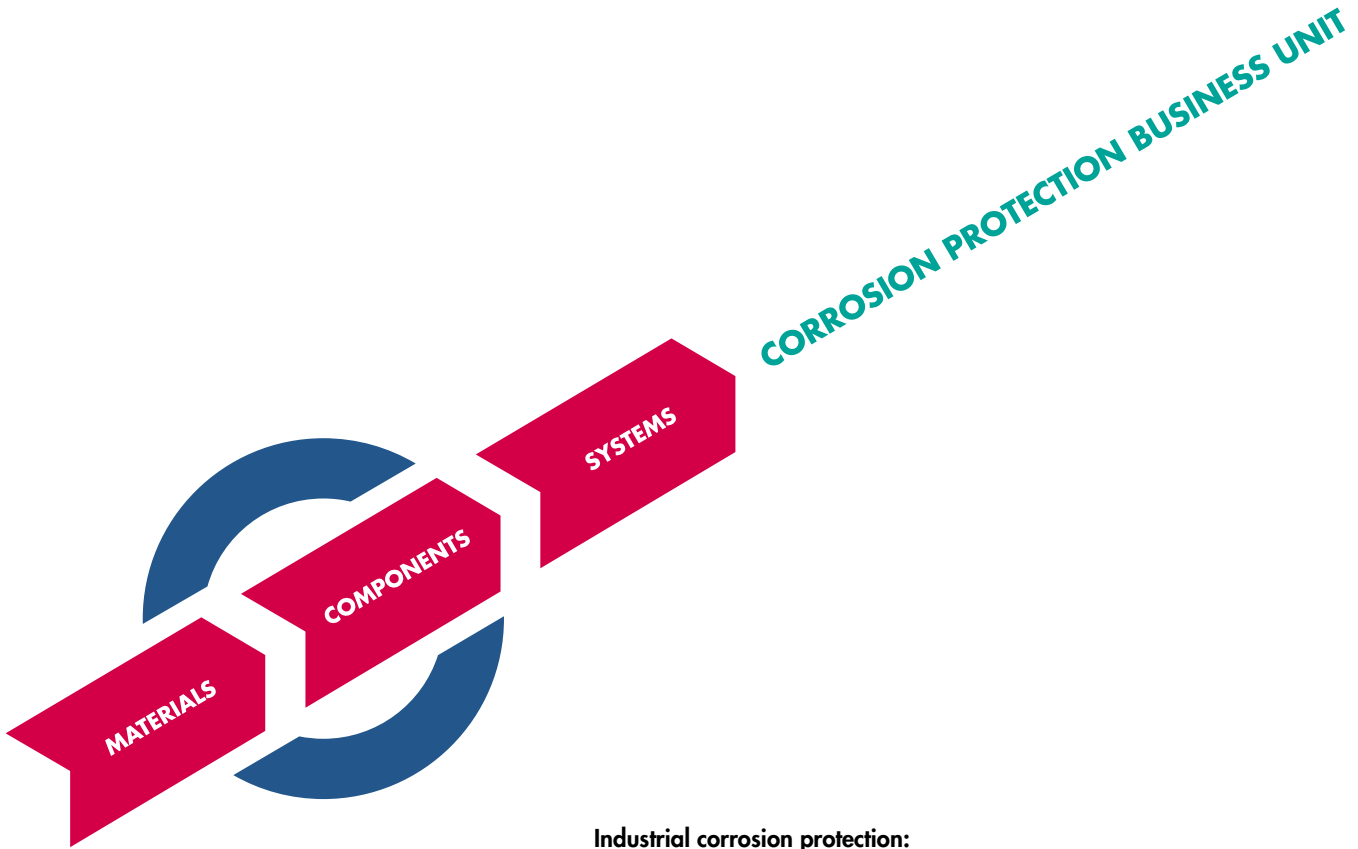
SHELL-AND-TUBE HEAT EXCHANGERS



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COMPLETE SYSTEMS CREATE NEW BENEFITS



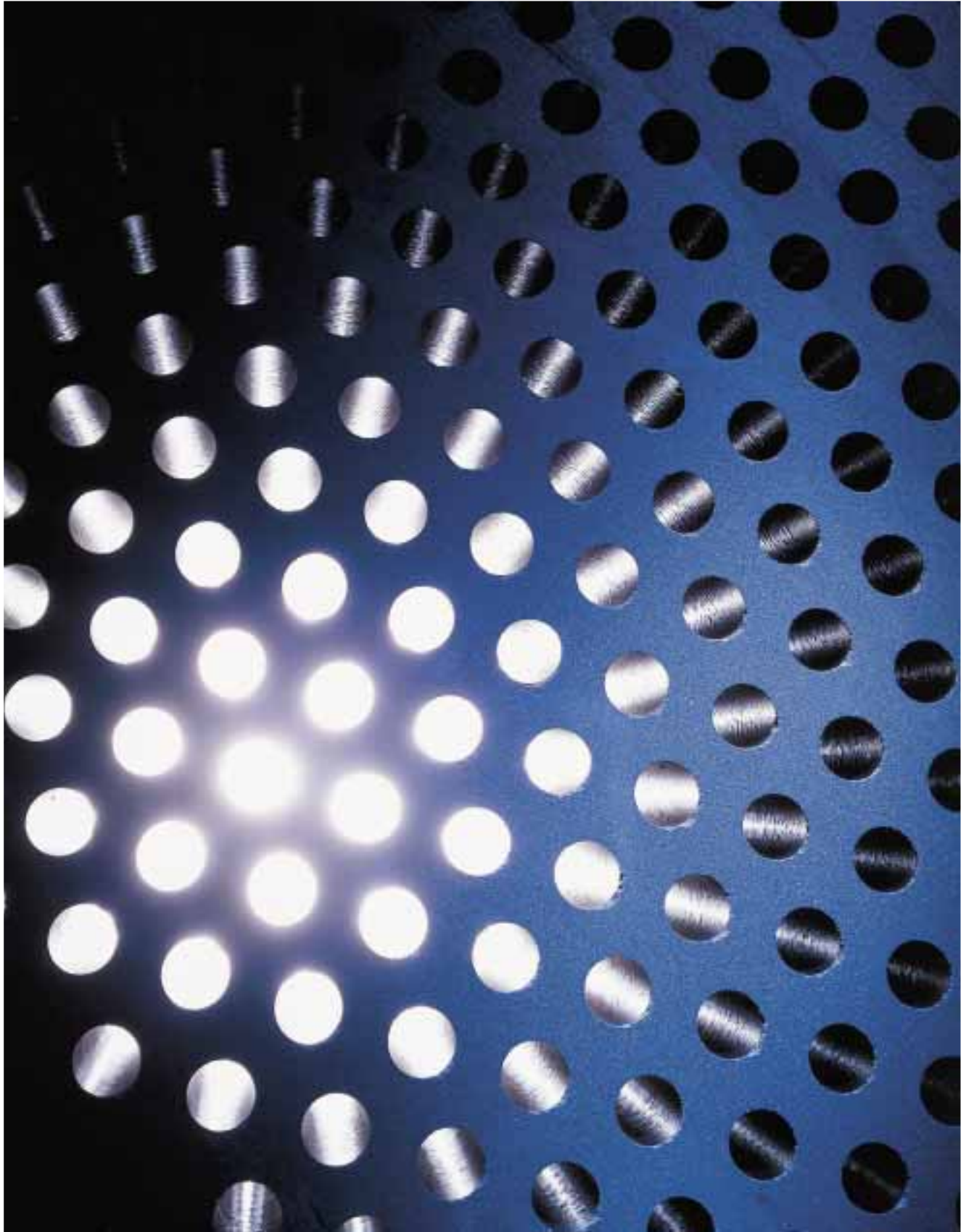
Industrial corrosion protection:

A host of suppliers and subcontractors, difficult coordination and non-harmonized bids for materials, components, process equipment, packages and systems make efficient planning and execution of new plants a complex, time-consuming task. It doesn't have to be that way. We can now offer you a fully comprehensive range of products and services for industrial corrosion protection – we are the only producer in the world that is able to do so. We offer a complete system from a single source – from optimized material selection through interface management, production, delivery and installation right up to the warranty.

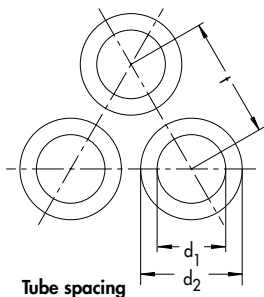
Our system approach is based on the combined expertise in materials and the decades of experience of three leading companies in corrosion protection.

These companies – SGL TECHNIK, HAW LININGS and KCH – have now been merged into the SGL ACOTEC GmbH, the German-based headquarters of the global Corrosion Protection Business of the SGL CARBON GROUP.

You can save yourself time and trouble in the future – by taking advantage of our comprehensive, system-based range of products and services.

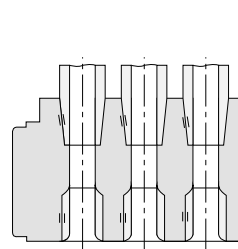


OUR SHELL-AND-TUBE HEAT EXCHANGERS COMBINE KNOW-HOW AND EXPERIENCE

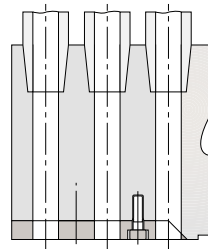


Tube spacing

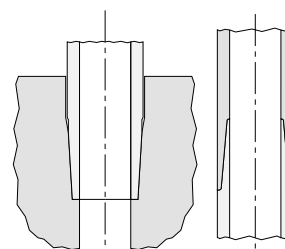
| Type of tube | 0 | 1 | 2 | 3 |
|--------------|----|----|----|----|
| d_1 mm | 15 | 22 | 25 | 37 |
| d_2 mm | 26 | 32 | 37 | 50 |
| t mm | 33 | 39 | 44 | 57 |



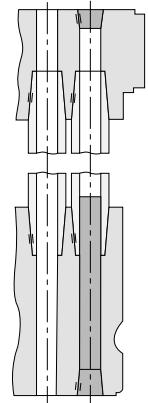
Abrasive wear protection of tube sheet
Wear sleeves



Wear plate



Cemented joints
Tube/tube sheet and tube/tube



Plugging

The strengths of our shell-and-tube heat exchangers in [®]DIABON process equipment graphite lie in their combination of many advantages. Advantages which pay off for you in day-to-day service. On the basis of our pooled know-how and our experience, we manufacture shell-and-tube heat exchangers which are highly efficient and economical in operation. Our know-how in the field of graphite production and our expertise in heat exchangers result in synergies which benefit you. SGL ACOTEC offers system-based, customer-focused solutions to problems – and in the field of shell-and-tube heat exchangers, convincing advantages:

- All seals are external for ease of inspection
 - With admission of steam on the service side, excellent drainage of the condensate
 - Low pressure drops
 - High efficiency
 - Ease of repair: e.g. plug or replace tube
 - Large heat exchange areas (over 2,000 m²)
 - Price advantage for medium and large heat exchange areas
 - High heat transfer capacity
 - Complete drainage
 - Extensive scope for combination with other materials
 - Little tendency to erosion, even at high velocities, due to abrasive wear protection.
- On this basis, shell-and-tube heat exchangers in DIABON graphite are used as heaters, coolers, condensers, falling-film coolers, evaporators and absorbers, especially in the treatment of:
- Hydrochloric acid
 - Sulfuric acid
 - Hydrofluoric acid
 - Phosphoric acid
 - Chlorinated hydrocarbons
 - Organic and inorganic media
 - Waste acids
 - Combustion gases



Tube bundle without steel shell ▶



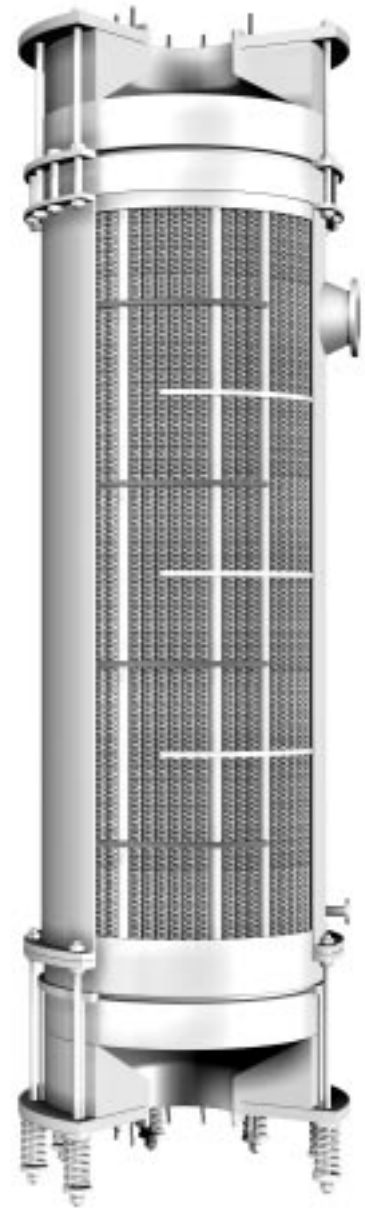
SHELL-AND-TUBE HEAT EXCHANGERS? OFFER OUTSTANDING ADVANTAGES!

System-based shell-and-tube heat exchangers: Products which are giving excellent service to our customers. Safe and reliable in design, with high heat transfer capacity and high economy in operation, the shell-and-tube heat exchangers supplied by SGL ACOTEC perform outstandingly in day-to-day service throughout the world. Their great advantage is that these heat exchangers combine an optimum design with the high thermal conductivity and universal corrosion resistance of our synthetic resin-impregnated graphite grades DIABON NS 1 and NS 2.

Design? Simply the best!

It is their sophisticated design which enables SGL ACOTEC's shell-and-tube heat exchangers to perform so reliably in actual service. Shell-and-tube heat exchangers in DIABON graphite are constructed from the following components:

- DIABON NS 1/ NS 2/ HF 1/ HF 2 graphite tubes with or without carbon fiber reinforcement in standard dimensions of 26/15, 32/22, 37/25 and 50/37 mm
- Standard tube lengths up to 7.5 m and longer
- Two tube sheets with or without carbon fiber reinforcement – one fixed and the other floating, relative to the shell
- Baffle cages with baffles made from DIABON graphite, or from other materials on request
- Headers made from DIABON NS 1/ NS 2 graphite or other materials. The header in contact with the floating tube sheet is braced against the tube sheet by a dual clamping tie rod system. Using a dual system provides an additional safeguard
- Shell made from steel with anti-corrosion lining or from other materials
- Partition plates in the headers allow several passes through the tube bundle, when required in the process.



▲ Shell-and-tube heat exchanger with
®DIABON HF 1 graphite tubes

◀ Various tube bundle designs –
standard or carbon
fiber-reinforced



▲ Special design of abrasive wear protection at the inlet tube sheet

Corrosion resistance? To virtually everything!

The basic materials of our shell-and-tube heat exchangers, namely DIABON NS 1 and DIABON NS 2 process equipment graphite, are resistant to virtually all organic and inorganic media. For heat exchange between two corrosive media, we supply special designs on request with a suitable anti-corrosion lining or coating of the steel shell (rubber, PTFE, enamel, etc.).

O-ring seal? Offers great advantages!

Our long experience has shown that O-ring seals offer substantial advantages over stuffing box packings:

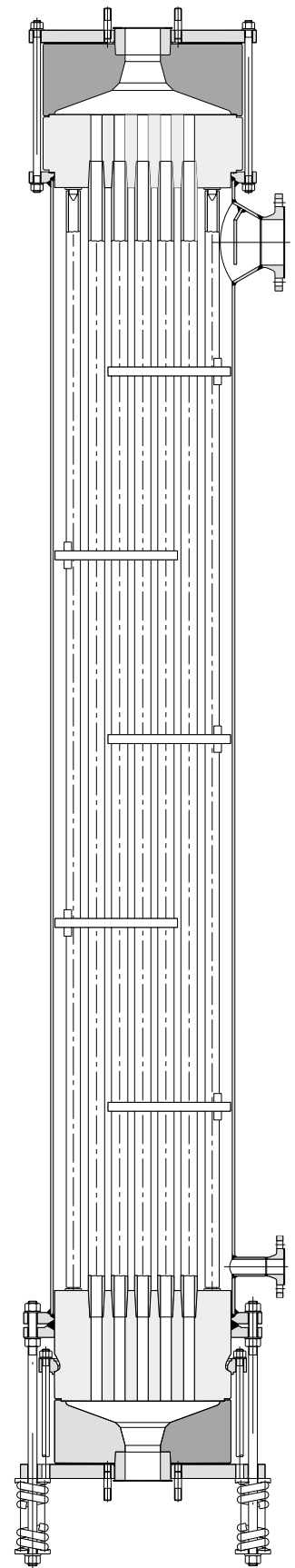
- Extremely low coefficients of friction
- High coefficients of sliding friction
- Low acting forces
- Universal resistance of O-ring seals
- Ease of adjustment
- Ease of replacement
- Long service life
- Low maintenance cost

Pressures and temperatures? Permitted to a high degree!

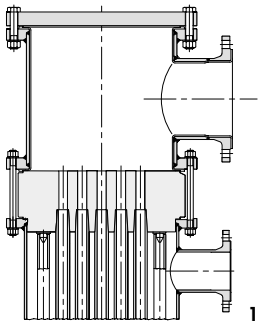
A maximum permissible material temperature of 200 °C has been determined for DIABON NS 1 and NS 2 graphite tubes by the South German Technical Supervisory Board (TÜV). Moreover, strength certification up to G-32-00-200 can be given for the tubes. The design pressures are up to 16 bar gauge for the service side and up to 6 bar gauge for the product side. Special designs are supplied for higher pressures up to 12 bar gauge.

Training? Pays off for you!

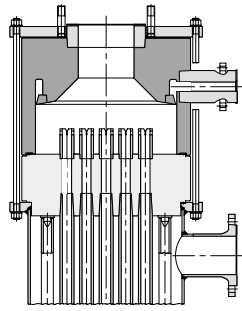
Maintenance of shell-and-tube heat exchangers in DIABON process equipment graphite is simple. Therefore it can be easily carried out on site – by your personnel. For this purpose, we put your technical personnel through our training courses. This enables repairs and overhauls to be carried out quickly and economically. In addition, our specialists are always at your service – whatever your problem. We also supply spare parts quickly and easily – usually from stock.



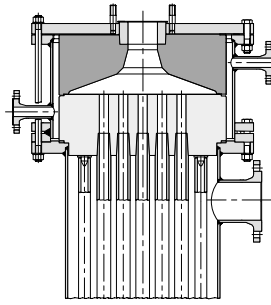
Sectional view of a standard shell-and-tube heat exchanger ▶



1

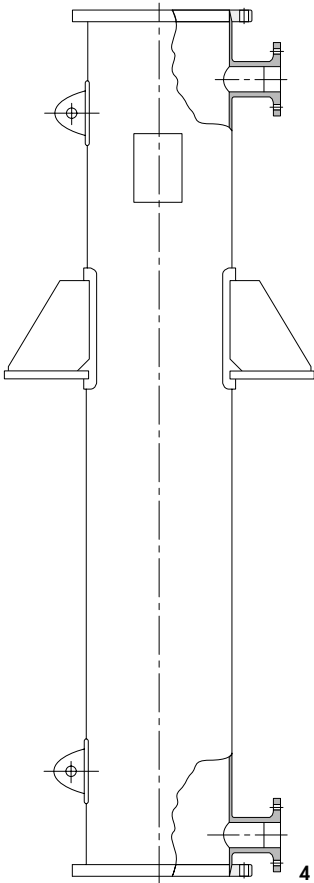


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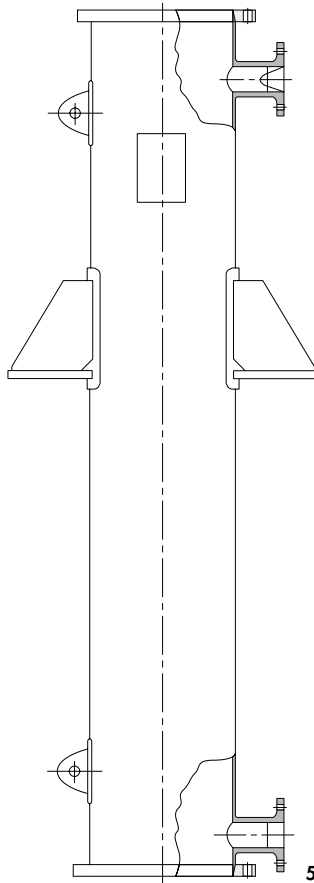


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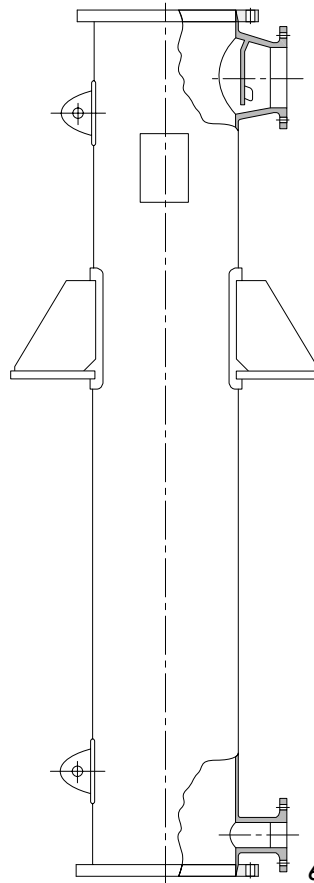
- ◀ 1 Extended top header
- steel with corrosion-resistant lining -
- 2 Falling-film header in °DIABON graphite
- 3 Cooled header in °DIABON graphite
for high gas inlet temperatures



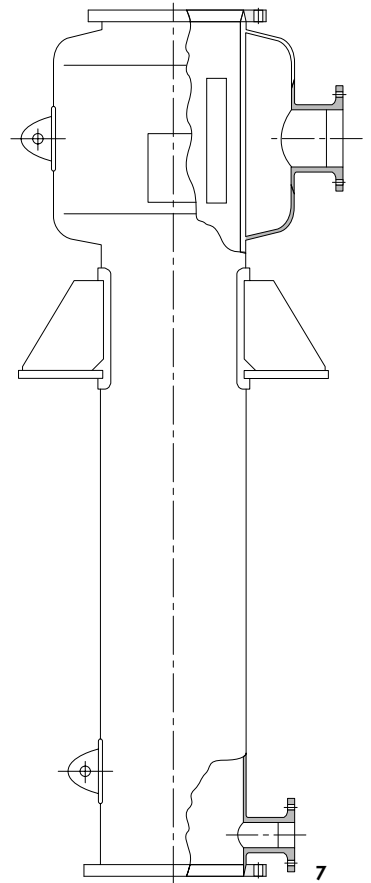
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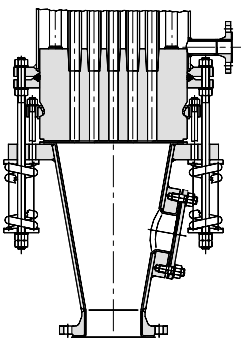


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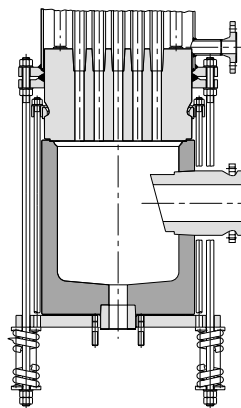


7

- ▲ 4 Standard steel shell
- 5 Steel shell with steam inlet distributor
- 6 Steel shell with conical steam inlet nozzle
- 7 Steel shell with 360° steam distributor



8



9

- ◀ 8 Conical steel bottom section with a corrosion-resistant lining
- 9 Extended °DIABON graphite bottom section
for separating gases and liquids



®DIABON HF 1 GRAPHITE TUBE? REINFORCED WITH CARBON FIBER!

In developing the carbon fiber-reinforced DIABON HF 1 graphite tube, we have found a way to increase the operational reliability of shell-and-tube heat exchangers in DIABON graphite appreciably and expand their range of application under high-stress conditions.

The DIABON HF 1 tube is a DIABON NS 1 graphite tube around which highly pretensioned fibers are wound like a net.

Advantage: The reinforcement does not impair resistance to corrosion because the chemical resistance of the reinforcement is identical to that of synthetic resin-impregnated graphite.

The elastic behavior of the carbon fiber ensures that the tension on the reinforcement is retained even under sharply fluctuating load or stress surges – no fatigue is experienced.

Due to the carbon fiber's negative coefficient of thermal expansion, the tension on the reinforcement is increased further when the temperature rises. As a result, the bursting pressure and maximum leakage resistance pressure are greater at higher temperatures than at room temperature.

Reinforcement with carbon fibers markedly improves the mechanical properties of graphite components. Today, most evaporators in DIABON graphite are supplied with carbon fiber-reinforced tube sheets.

| | | ®DIABON HF 1 graphite ¹⁾ | ®DIABON NS 1 graphite |
|---|--------------------|--|--------------------------|
| Flexural strength, longitudinal | N/mm ² | >52 | >52 |
| Bursting pressure | 20 °C bar (gauge) | 110 | 80 |
| | 50 °C bar (gauge) | 120 | 75 |
| Resistance to pressure surges (steam hammer) | relative % | 250 | 100 |
| Leakage pressure ^{2) *} | bar (gauge) | 3 | 0 |
| Coefficient of permeability | cm ² /s | 10-6 | 10-6 |
| Thermal conductivity | W/(K·m) | 50 ³⁾ | >60 |
| Thermal stability limit ⁴⁾ | °C | 200 | 200 |

1) ®DIABON graphite tube reinforced with ®SIGRAFIL HF carbon fibers

2) on a cracked tube under internal pressure from water

3) effective value, calculated from the tube's heat transfer

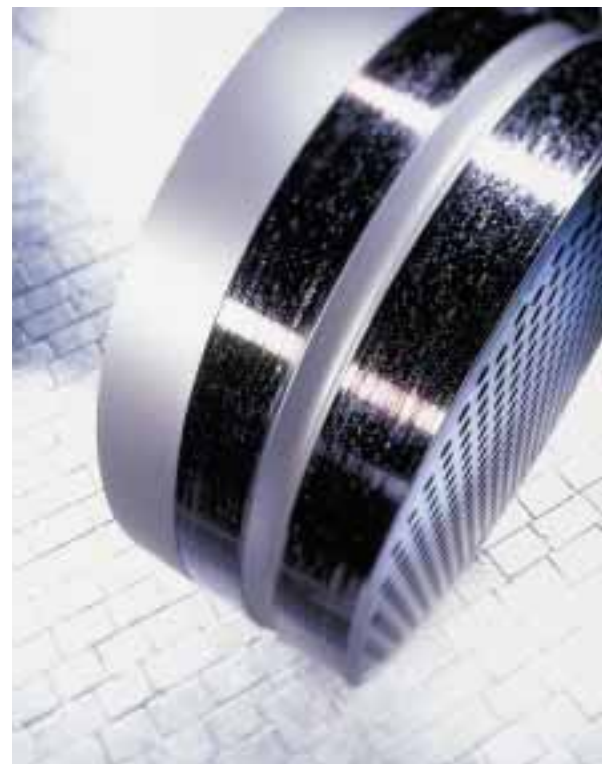
4) depends on operating medium

5) pressure up to which no appreciable loss of medium occurs from the cracked tube under brief pressure surges

Carbon fiber reinforcement gives graphite tubes the following improved properties:

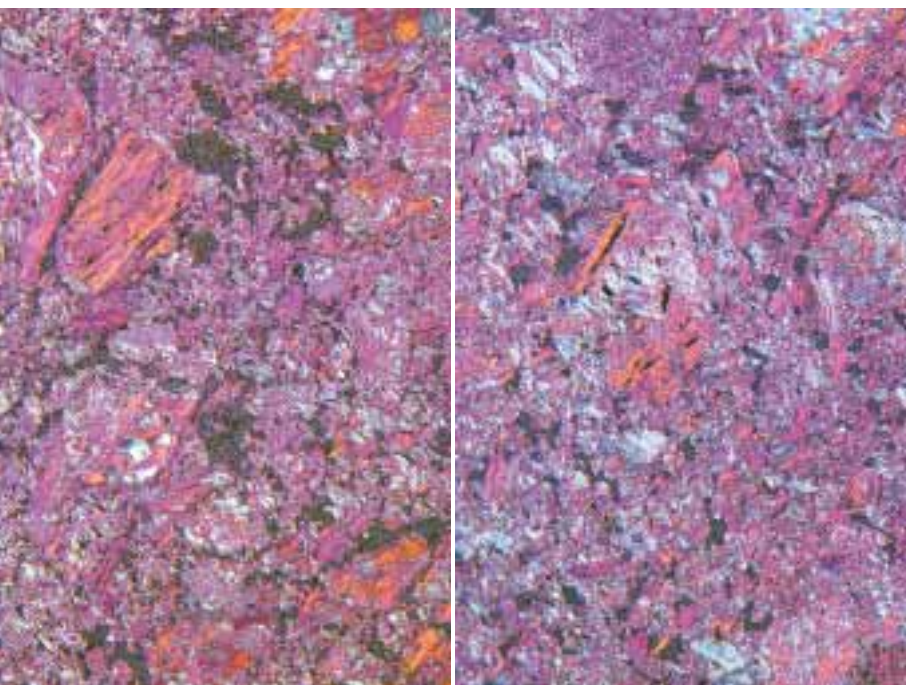
- Increased bursting pressure
This tube is especially well suited to cleaning with pressurized water
- Resistance of a cracked tube to leakage
Should a longitudinal crack occur in a reinforced DIABON HF 1 graphite tube as a result of over-stressing, the tube will still remain leakproof to liquid up to a differential pressure of 2 bar. In the event of sudden severe internal pressure stress and resultant cracking, the overpressure is rapidly released by the crack widening to about 1 mm. In all instances, the reinforcement prevents any spalling from the tube and a consequent escape of product in large quantities. The shell space suffers virtually no fouling. Usually, the equipment can continue in operation without interruption until the next planned shutdown.

▼ Carbon fiber-reinforced tube sheet



OUR GRAPHITES? EXTREMELY CAPABLE MATERIALS!

Whichever material is being used, you can rely on the highest quality – and, therefore, on shell-and-tube heat exchangers which are dependable in service through their economy and durability.



▲ Micrograph of [®]DIABON NS 1 graphite, magnification 50x ▲ Micrograph of [®]DIABON NS 2 graphite, magnification 50x

DIABON NS 1 graphite? Good performance comes as standard!

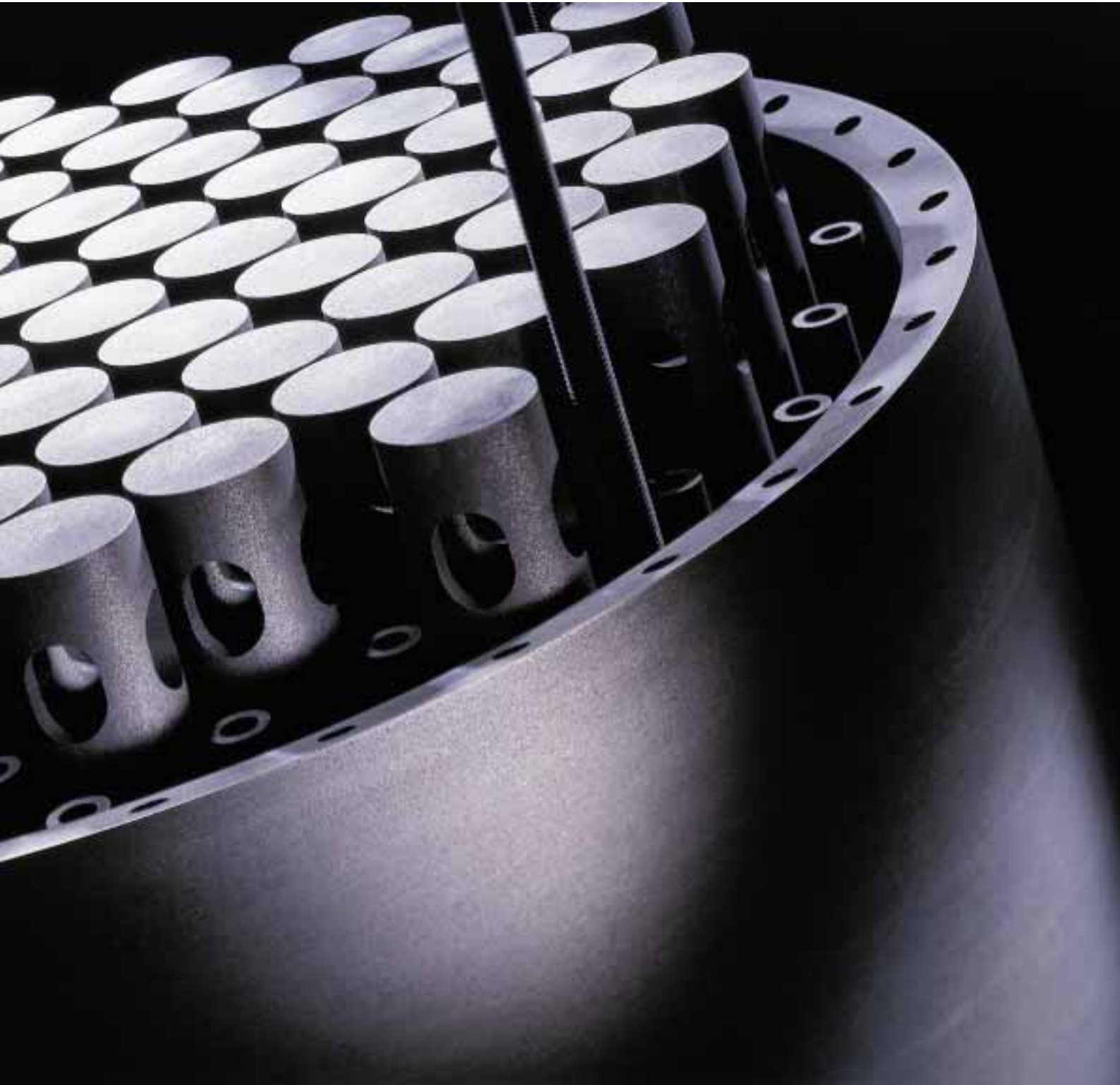
DIABON NS 1 is our trademark for a synthetic resin-impregnated fine-grain graphite with a homogeneous material structure and a uniform pore size distribution. The pores of the raw graphite are completely sealed with synthetic resin.

DIABON NS 2 graphite? An easy-care material!

DIABON NS 2 is our trademark for a synthetic resin-impregnated fine-grain graphite with a homogeneous material structure and a uniform pore size distribution. It is characterized by even higher strength, better corrosion resistance and lower sensitivity to swelling than DIABON NS 1 graphite in the presence of strong solvents. Again with DIABON NS 2 graphite, the pores of the raw graphite are completely sealed with synthetic resin.



Falling-film design ▶





OUR PRINCIPLE – QUALITY FIRST AND LAST

No question: Continuous quality assurance is an integral part of SGL CARBON's corporate philosophy. So in order to guarantee consistently high quality, we work to a targeted quality management system as a basis for meeting our quality commitment. As the world's largest manufacturer of carbon and graphite products, process equipment and systems for the chemical industry and environmental protection technology, we find targeted quality management vital in ensuring that customer's specified quality standards are attained – and seen to be attained.

SGL ACOTEC's quality management system is certified in accordance with ISO 9001 and/or the Safety Quality License for China.

Terms of reference? Designed for international requirements!

To be able to offer the same standards of quality anywhere in the world, shell-and-tube heat exchangers from SGL ACOTEC are designed to meet international regulations.

| | |
|--------------------------|---------------|
| AD specification | Germany |
| ASME | USA |
| UDT | Poland |
| ISPESL | Italy |
| APAVE | France |
| Stoomwezen | Netherlands |
| JIS | Japan |
| BS | Great Britain |
| Safety Q. License | China |
| SVTI | Switzerland |

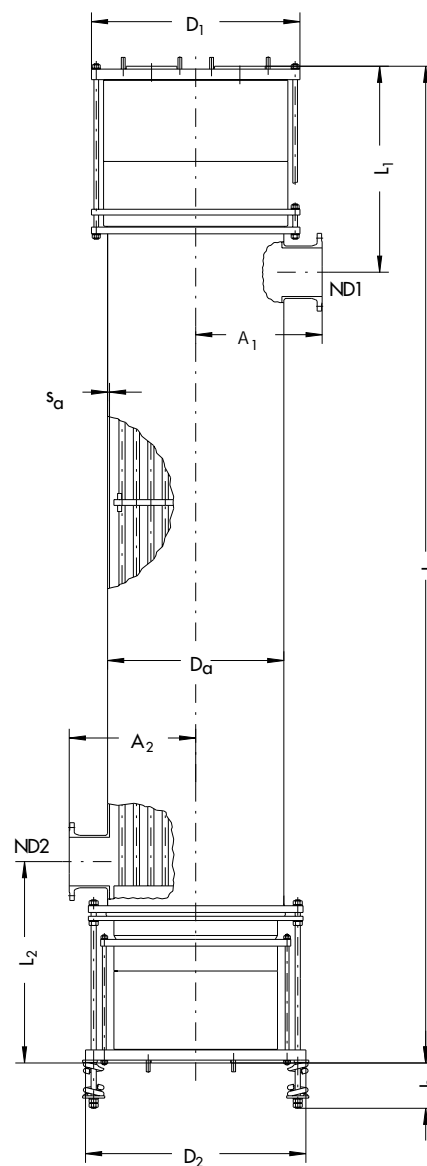
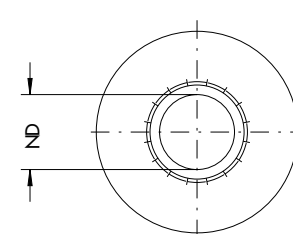
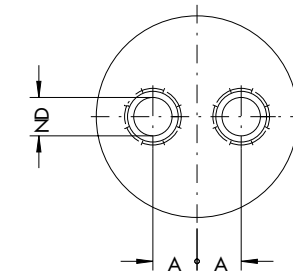


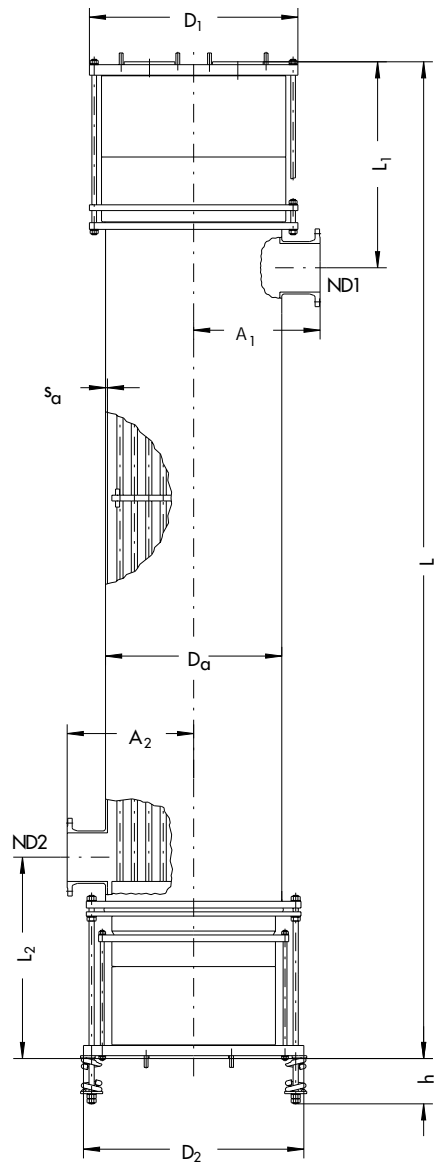
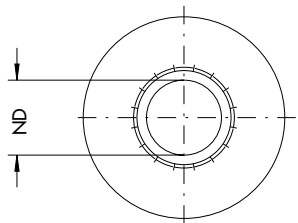
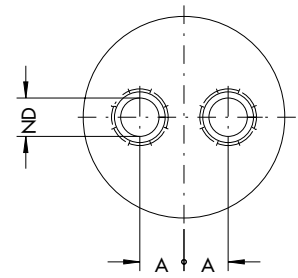
| 3 bar | | 3 bar | | 6 bar | | 6 bar | | Dimensions | | | | Nozzle | | | | | | | | Nozzle | | | | |
|-------------|---------|---------------|---------|-------------|----------|---------------|---------|------------|----------|----------|-------------|----------|----------|----------|--------------|----------|----------|-----------|----------|--------|-----|--|-----------|----------|
| single pass | | multiple pass | | single pass | | multiple pass | | Da mm | Sa mm | D1 mm | 3 bar | | 6 bar | | Product side | | | | | | | | ND1 mm | A1 mm |
| L mm | L mm | L mm | L mm | D2 mm | D2 mm | h mm | h mm | | | | single pass | 2 passes | 3 passes | 4 passes | 2 passes | 3 passes | 4 passes | ND2 mm | A2 mm | | | | | |
| - | - | - | - | 1901 | 1911 | 193.7 | 5.4 | 280 | - | 325 | - | 180 | 50 | - | 25 | - | - | 45 | - | 65 | 250 | | | |
| - | - | - | - | 2401 | 2411 | 250 | 6 | 345 | - | 395 | - | 180 | 80 | 40 | 40 | - | 80 | 60 | - | 80 | 275 | | | |
| - | - | - | - | 2901 | 2911 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 3401 | 3411 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 1960 | 1970 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 2460 | 2470 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 2960 | 2970 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 3460 | 3470 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 1980 | 1995 | 276 | 6 | 370 | - | 425 | - | 180 | 100 | 50 | 50 | - | 80 | 60 | - | 80 | 290 | | | |
| - | - | - | - | 2480 | 2495 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 2980 | 2995 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 3480 | 3495 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 2561 | 2586 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 3061 | 3086 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 3561 | 3586 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 4561 | 4586 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 5061 | 5086 | 332 | 6 | 425 | - | 492 | - | 210 | 125 | 65 | 50 | 50 | 95 | 90 | 95 | 100 | 320 | | | |
| - | - | - | - | 5561 | 5586 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6061 | 6086 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6561 | 6586 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 7061 | 7086 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 7561 | 7586 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 8061 | 8086 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 2645 | 2660 | 404 | 6 | 500 | - | 565 | - | 210 | 150 | 100 | 80 | 65 | 115 | 105 | 115 | 100 | 350 | | | |
| - | - | - | - | 3145 | 3160 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 3645 | 3660 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 4645 | 4660 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 5145 | 5160 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 5645 | 5660 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6145 | 6160 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6645 | 6660 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 7145 | 7160 | 418 | 6 | 515 | - | 580 | - | 210 | 150 | 100 | 80 | 80 | 120 | 110 | 120 | 125 | 360 | | | |
| - | - | - | - | 7645 | 7660 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 8145 | 8160 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 3170 | 3205 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 3670 | 3705 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 4670 | 4705 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 5170 | 5205 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 5670 | 5705 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6170 | 6205 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6670 | 6705 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 7170 | 7205 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 7670 | 7705 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 8170 | 8205 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 3215 | 3250 | 452 | 6 | 545 | - | 615 | - | 210 | 150 | 100 | 100 | 80 | 125 | 115 | 125 | 125 | 375 | | | |
| - | - | - | - | 3715 | 3750 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 4715 | 4750 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 5215 | 5250 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 5715 | 5750 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6215 | 6250 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6715 | 6750 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 7215 | 7250 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 7715 | 7750 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 8215 | 8250 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 3264 | 3304 | 494 | 8 | 590 | - | 670 | - | 230 | 200 | 100 | 100 | 100 | 140 | 120 | 160 | 125 | 400 | | | |
| - | - | - | - | 3764 | 3804 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 4764 | 4804 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 5264 | 5304 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 5764 | 5804 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6264 | 6304 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6764 | 6804 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 7264 | 7304 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 7764 | 7804 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 8264 | 8304 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 3809 | 3849 | 518 | 8 | 625 | - | 695 | - | 230 | 200 | 125 | 125 | 100 | 140 | 145 | 160 | 150 | 410 | | | |
| - | - | - | - | 4809 | 4849 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 5309 | 5349 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 5809 | 5849 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6309 | 6349 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6809 | 6849 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 7309 | 7349 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 7809 | 7849 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 8309 | 8349 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 3889 | 3939 | 574 | 8 | 680 | - | 750 | - | 230 | 200 | 125 | 125 | 100 | 150 | 140 | 170 | 150 | 440 | | | |
| - | - | - | - | 4889 | 4939 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 5389 | 5439 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 5889 | 5939 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6389 | 6439 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 6889 | 6939 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 7389 | 7439 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 7889 | 7939 | | | | | | | | | | | | | | | | | | | |
| - | - | - | - | 8389 | 8439 | | | | | | | | | | | | | | | | | | | |

| 3 bar single pass L mm | 3 bar multiple pass L mm | 6 bar single pass L mm | 6 bar multiple pass L mm | Dimensions | | | | 3 bar | | 6 bar | | Nozzle Product side | | | | | | Nozzle Service side | | |
|---------------------------------|-----------------------------------|---------------------------------|-----------------------------------|------------|----------|----------|----------|----------|---------|---------|----------|------------------------|----------|----------|---------|---------|---------|------------------------|-----------|----------|
| | | | | Da mm | Sa mm | D1 mm | D2 mm | D2 mm | h mm | h mm | ND mm | ND mm | ND mm | ND mm | A mm | A mm | A mm | ND1 mm | ND2 mm | A1 mm |
| 3705 | 3750 | 3924 | 3979 | | | | | | | | | | | | | | | | | |
| 4705 | 4750 | 4924 | 4979 | | | | | | | | | | | | | | | | | |
| 5205 | 5250 | 5424 | 5479 | | | | | | | | | | | | | | | | | |
| 5705 | 5750 | 5924 | 5979 | | | | | | | | | | | | | | | | | |
| 6205 | 6250 | 6424 | 6479 | 584 | 8 | 690 | 740 | 760 | 180 | 230 | 250 | 150 | 125 | 125 | 160 | 145 | 170 | 150 | 440 | |
| 6705 | 6750 | 6924 | 6979 | | | | | | | | | | | | | | | | | |
| 7205 | 7250 | 7424 | 7479 | | | | | | | | | | | | | | | | | |
| 7705 | 7750 | 7924 | 7974 | | | | | | | | | | | | | | | | | |
| 8205 | 7250 | 8424 | 8479 | | | | | | | | | | | | | | | | | |
| 3710 | 3775 | 3949 | 4019 | | | | | | | | | | | | | | | | | |
| 4710 | 4775 | 4949 | 5019 | | | | | | | | | | | | | | | | | |
| 5210 | 5255 | 5449 | 5519 | | | | | | | | | | | | | | | | | |
| 5710 | 5755 | 5949 | 6019 | | | | | | | | | | | | | | | | | |
| 6210 | 6255 | 6449 | 6519 | 608 | 8 | 715 | 765 | 785 | 180 | 230 | 250 | 150 | 150 | 125 | 160 | 160 | 180 | 200 | 450 | |
| 6710 | 6755 | 6949 | 7019 | | | | | | | | | | | | | | | | | |
| 7210 | 7255 | 7449 | 7519 | | | | | | | | | | | | | | | | | |
| 7710 | 7755 | 7949 | 8019 | | | | | | | | | | | | | | | | | |
| 8210 | 8255 | 8449 | 8519 | | | | | | | | | | | | | | | | | |
| 3765 | 3865 | 4054 | 4144 | | | | | | | | | | | | | | | | | |
| 4765 | 4865 | 5054 | 5144 | | | | | | | | | | | | | | | | | |
| 5265 | 5365 | 5554 | 5644 | | | | | | | | | | | | | | | | | |
| 5765 | 5865 | 6054 | 6144 | 654 | 8 | 760 | 825 | 845 | 180 | 230 | 250 | 200 | 150 | 125 | 175 | 175 | 185 | 200 | 475 | |
| 6265 | 6365 | 6554 | 6644 | | | | | | | | | | | | | | | | | |
| 6765 | 6865 | 7054 | 7144 | | | | | | | | | | | | | | | | | |
| 7265 | 7365 | 7554 | 7644 | | | | | | | | | | | | | | | | | |
| 7765 | 7865 | 8054 | 8144 | | | | | | | | | | | | | | | | | |
| 8265 | 8365 | 8554 | 8644 | | | | | | | | | | | | | | | | | |
| 3785 | 3905 | 4084 | 4194 | | | | | | | | | | | | | | | | | |
| 4785 | 4905 | 5084 | 5194 | | | | | | | | | | | | | | | | | |
| 5285 | 5405 | 5584 | 5694 | | | | | | | | | | | | | | | | | |
| 5785 | 5905 | 6084 | 6194 | | | | | | | | | | | | | | | | | |
| 6285 | 6405 | 6584 | 6694 | 696 | 8 | 800 | 855 | 875 | 180 | 230 | 300 | 200 | 150 | 150 | 185 | 170 | 190 | 200 | 500 | |
| 6785 | 6905 | 7084 | 7194 | | | | | | | | | | | | | | | | | |
| 7285 | 6405 | 7584 | 7694 | | | | | | | | | | | | | | | | | |
| 7785 | 6905 | 8084 | 8194 | | | | | | | | | | | | | | | | | |
| 8285 | 7405 | 8584 | 8634 | | | | | | | | | | | | | | | | | |
| 3864 | 3979 | 4188 | 4303 | | | | | | | | | | | | | | | | | |
| 4864 | 4979 | 5188 | 5303 | | | | | | | | | | | | | | | | | |
| 5364 | 5479 | 5688 | 5803 | | | | | | | | | | | | | | | | | |
| 5864 | 5979 | 6188 | 6303 | | | | | | | | | | | | | | | | | |
| 6364 | 6479 | 6688 | 6803 | 740 | 8 | 845 | 910 | 925 | 210 | 230 | 300 | 200 | 150 | 150 | 190 | 180 | 190 | 200 | 520 | |
| 6864 | 6979 | 7188 | 7303 | | | | | | | | | | | | | | | | | |
| 7364 | 7479 | 7688 | 7803 | | | | | | | | | | | | | | | | | |
| 7864 | 7979 | 8188 | 8303 | | | | | | | | | | | | | | | | | |
| 8364 | 8479 | 8688 | 8803 | | | | | | | | | | | | | | | | | |
| 3968 | 4089 | 4311 | 4441 | | | | | | | | | | | | | | | | | |
| 4968 | 5089 | 5311 | 5441 | | | | | | | | | | | | | | | | | |
| 5468 | 5589 | 5811 | 5941 | | | | | | | | | | | | | | | | | |
| 5968 | 6089 | 6311 | 6441 | | | | | | | | | | | | | | | | | |
| 6468 | 6589 | 6811 | 6941 | 814 | 8 | 940 | 988 | 1023 | 210 | 250 | 350 | 250 | 200 | 150 | 210 | 200 | 220 | 250 | 560 | |
| 6968 | 7089 | 7311 | 7441 | | | | | | | | | | | | | | | | | |
| 7468 | 7589 | 7811 | 7941 | | | | | | | | | | | | | | | | | |
| 7968 | 8089 | 8311 | 8441 | | | | | | | | | | | | | | | | | |
| 8468 | 8589 | 8811 | 8941 | | | | | | | | | | | | | | | | | |
| 3984 | 4134 | 4365 | 4510 | | | | | | | | | | | | | | | | | |
| 4984 | 5134 | 5365 | 5510 | | | | | | | | | | | | | | | | | |
| 5484 | 5634 | 5865 | 6010 | | | | | | | | | | | | | | | | | |
| 5984 | 6134 | 6365 | 6510 | | | | | | | | | | | | | | | | | |
| 6484 | 6634 | 6865 | 7010 | 852 | 10 | 985 | 1025 | 1060 | 210 | 250 | 350 | 250 | 200 | 150 | 225 | 200 | 250 | 250 | 575 | |
| 6984 | 7134 | 7365 | 7510 | | | | | | | | | | | | | | | | | |
| 7484 | 7634 | 7865 | 8010 | | | | | | | | | | | | | | | | | |
| 7984 | 8134 | 8365 | 8510 | | | | | | | | | | | | | | | | | |
| 8484 | 8634 | 8865 | 9010 | | | | | | | | | | | | | | | | | |
| 4034 | 4219 | 4435 | 4615 | | | | | | | | | | | | | | | | | |
| 5034 | 5219 | 5435 | 5615 | | | | | | | | | | | | | | | | | |
| 5534 | 5719 | 5935 | 6115 | | | | | | | | | | | | | | | | | |
| 6034 | 6219 | 6435 | 6615 | | | | | | | | | | | | | | | | | |
| 6534 | 6719 | 6935 | 7115 | 918 | 10 | 1050 | 1110 | 1130 | 230 | 250 | 400 | 300 | 200 | 200 | 240 | 240 | 280 | 250 | 610 | |
| 7034 | 7219 | 7435 | 7615 | | | | | | | | | | | | | | | | | |
| 7534 | 7719 | 7935 | 8115 | | | | | | | | | | | | | | | | | |
| 8034 | 8219 | 8435 | 8615 | | | | | | | | | | | | | | | | | |
| 8534 | 8719 | 8935 | 9115 | | | | | | | | | | | | | | | | | |
| 4158 | 4328 | 4590 | 4705 | | | | | | | | | | | | | | | | | |
| 5158 | 5328 | 5590 | 5705 | | | | | | | | | | | | | | | | | |
| 5658 | 5828 | 6090 | 6205 | | | | | | | | | | | | | | | | | |
| 6158 | 6328 | 6590 | 6705 | | | | | | | | | | | | | | | | | |
| 6658 | 6828 | 7090 | 7205 | 1002 | 10 | 1135 | 1203 | 1243 | 230 | 280 | 400 | 300 | 250 | 200 | 260 | 260 | 250 | 300 | 650 | |
| 7158 | 7328 | 7590 | 7705 | | | | | | | | | | | | | | | | | |
| 7658 | 7828 | 8090 | 8205 | | | | | | | | | | | | | | | | | |
| 8158 | 8328 | 8590 | 8705 | | | | | | | | | | | | | | | | | |
| 8658 | 8823 | 9090 | 9205 | | | | | | | | | | | | | | | | | |

| 3 bar single pass L mm | 3 bar multiple pass L mm | 6 bar single pass L mm | 6 bar multiple pass L mm | Dimensions | | | | 3 bar | | 6 bar | | Nozzle Product side | | | | | | Nozzle Service side | |
|---------------------------------|-----------------------------------|---------------------------------|-----------------------------------|-------------------------|----------|----------|----------|----------|---------|---------|-------------------------|------------------------|----------------------|----------------------|---------------------|---------------------|---------------------|------------------------|----------|
| | | | | steel shell Da mm | Sa mm | D1 mm | D2 mm | D2 mm | h mm | h mm | single pass ND mm | 2 passes ND mm | 3 passes ND mm | 4 passes ND mm | 2 passes A mm | 3 passes A mm | 4 passes A mm | ND1 mm | A1 mm |
| 4243 | 4433 | 4640 | 4715 | | | | | | | | | | | | | | | | |
| 5243 | 5433 | 5640 | 5715 | | | | | | | | | | | | | | | | |
| 5743 | 5933 | 6140 | 6215 | | | | | | | | | | | | | | | | |
| 6243 | 6433 | 6640 | 6715 | | | | | | | | | | | | | | | | |
| 6743 | 6933 | 7140 | 7215 | 1070 | 10 | 1215 | 1290 | 1330 | 230 | 280 | 500 | 350 | 250 | 250 | 280 | 280 | 300 | 300 | 680 |
| 7243 | 7433 | 7640 | 7715 | | | | | | | | | | | | | | | | |
| 7743 | 7933 | 8140 | 8215 | | | | | | | | | | | | | | | | |
| 8243 | 7433 | 8640 | 8715 | | | | | | | | | | | | | | | | |
| 8743 | 7933 | 9140 | 9215 | | | | | | | | | | | | | | | | |
| 4317 | 4507 | 4665 | 4740 | | | | | | | | | | | | | | | | |
| 5317 | 5507 | 5665 | 5740 | | | | | | | | | | | | | | | | |
| 5817 | 6007 | 6165 | 6240 | | | | | | | | | | | | | | | | |
| 6317 | 6507 | 6665 | 6740 | | | | | | | | | | | | | | | | |
| 6817 | 7007 | 7165 | 7240 | 1134 | 10 | 1275 | 1345 | 1385 | 230 | 280 | 500 | 350 | 300 | 250 | 290 | 290 | 325 | 300 | 720 |
| 7317 | 7507 | 7665 | 7740 | | | | | | | | | | | | | | | | |
| 7817 | 8007 | 8165 | 8240 | | | | | | | | | | | | | | | | |
| 8317 | 8507 | 8665 | 8740 | | | | | | | | | | | | | | | | |
| 8817 | 9007 | 9165 | 9240 | | | | | | | | | | | | | | | | |
| 4361 | 4566 | 4705 | 4790 | | | | | | | | | | | | | | | | |
| 5361 | 5566 | 5705 | 5790 | | | | | | | | | | | | | | | | |
| 5861 | 6066 | 6205 | 6290 | | | | | | | | | | | | | | | | |
| 6361 | 6566 | 6705 | 6790 | | | | | | | | | | | | | | | | |
| 6861 | 7066 | 7205 | 7290 | 1157 | 10 | 1300 | 1385 | 1425 | 230 | 280 | 500 | 350 | 300 | 250 | 300 | 300 | 330 | 300 | 730 |
| 7361 | 7566 | 7705 | 7790 | | | | | | | | | | | | | | | | |
| 7861 | 8066 | 8205 | 8290 | | | | | | | | | | | | | | | | |
| 8361 | 8566 | 8705 | 8790 | | | | | | | | | | | | | | | | |
| 9861 | 9066 | 9205 | 9290 | | | | | | | | | | | | | | | | |
| 4441 | 4641 | 4740 | 4875 | | | | | | | | | | | | | | | | |
| 5441 | 5641 | 5740 | 5875 | | | | | | | | | | | | | | | | |
| 5941 | 6141 | 6240 | 7375 | | | | | | | | | | | | | | | | |
| 6441 | 6641 | 6740 | 7875 | | | | | | | | | | | | | | | | |
| 6941 | 7141 | 7240 | 7375 | 1216 | 12 | 1360 | 1430 | 1470 | 230 | 280 | 500 | 400 | 300 | 250 | 310 | 300 | 330 | 300 | 760 |
| 7441 | 7641 | 7740 | 7875 | | | | | | | | | | | | | | | | |
| 7941 | 8141 | 8240 | 8375 | | | | | | | | | | | | | | | | |
| 8441 | 8641 | 8740 | 8875 | | | | | | | | | | | | | | | | |
| 8941 | 9141 | 9240 | 9375 | | | | | | | | | | | | | | | | |
| 4455 | 4650 | 4760 | 4940 | | | | | | | | | | | | | | | | |
| 5455 | 5650 | 5760 | 5940 | | | | | | | | | | | | | | | | |
| 5955 | 6150 | 6260 | 6440 | | | | | | | | | | | | | | | | |
| 6455 | 6650 | 6760 | 6940 | | | | | | | | | | | | | | | | |
| 6955 | 7150 | 7260 | 7440 | 1249 | 12 | 1390 | 1465 | 1505 | 230 | 280 | 600 | 400 | 300 | 300 | 325 | 320 | 350 | 300 | 775 |
| 7455 | 7650 | 7760 | 7940 | | | | | | | | | | | | | | | | |
| 7955 | 8150 | 8260 | 8440 | | | | | | | | | | | | | | | | |
| 8455 | 8650 | 8760 | 8940 | | | | | | | | | | | | | | | | |
| 8955 | 9150 | 9260 | 9440 | | | | | | | | | | | | | | | | |
| 4595 | 4725 | 4870 | 5080 | | | | | | | | | | | | | | | | |
| 5595 | 5725 | 5870 | 6080 | | | | | | | | | | | | | | | | |
| 6095 | 6225 | 6370 | 6580 | | | | | | | | | | | | | | | | |
| 6595 | 6725 | 6870 | 7080 | | | | | | | | | | | | | | | | |
| 7095 | 7225 | 7370 | 7580 | 1363 | 12 | 1510 | 1620 | 1660 | 230 | 280 | 600 | 400 | 350 | 300 | 350 | 350 | 370 | 350 | 830 |
| 7595 | 7725 | 7870 | 8080 | | | | | | | | | | | | | | | | |
| 8095 | 8225 | 8370 | 8580 | | | | | | | | | | | | | | | | |
| 8595 | 8725 | 8870 | 9080 | | | | | | | | | | | | | | | | |
| 9095 | 9225 | 9370 | 9580 | | | | | | | | | | | | | | | | |
| 4610 | 4740 | 4965 | 5180 | | | | | | | | | | | | | | | | |
| 5610 | 5740 | 5965 | 6180 | | | | | | | | | | | | | | | | |
| 6110 | 6240 | 6465 | 6680 | | | | | | | | | | | | | | | | |
| 6610 | 6740 | 6965 | 7180 | | | | | | | | | | | | | | | | |
| 7110 | 7240 | 7465 | 7680 | 1429 | 12 | 1575 | 1680 | 1720 | 230 | 280 | 600 | 400 | 350 | 300 | 370 | 370 | 400 | 350 | 870 |
| 7610 | 7740 | 7965 | 8180 | | | | | | | | | | | | | | | | |
| 8110 | 8240 | 8465 | 8680 | | | | | | | | | | | | | | | | |
| 8610 | 8740 | 8965 | 9180 | | | | | | | | | | | | | | | | |
| 9110 | 9240 | 9465 | 9680 | | | | | | | | | | | | | | | | |
| 4781 | 4931 | 5021 | 5271 | | | | | | | | | | | | | | | | |
| 5781 | 5931 | 6021 | 6271 | | | | | | | | | | | | | | | | |
| 6281 | 6431 | 6521 | 6771 | | | | | | | | | | | | | | | | |
| 6781 | 6931 | 7021 | 7271 | | | | | | | | | | | | | | | | |
| 7281 | 7431 | 7521 | 7771 | 1437 | 12 | 1605 | 1712 | 1712 | 230 | 280 | 600 | 400 | 350 | 300 | 390 | 390 | 430 | 400 | 910 |
| 7781 | 7931 | 8021 | 8271 | | | | | | | | | | | | | | | | |
| 8281 | 8431 | 8521 | 8771 | | | | | | | | | | | | | | | | |
| 8781 | 8931 | 9021 | 9271 | | | | | | | | | | | | | | | | |
| 9281 | 9431 | 9521 | 9771 | | | | | | | | | | | | | | | | |
| 5041 | 5191 | 5251 | 5300 | | | | | | | | | | | | | | | | |
| 6041 | 6091 | 6251 | 6300 | | | | | | | | | | | | | | | | |
| 6541 | 6691 | 6751 | 6800 | | | | | | | | | | | | | | | | |
| 7041 | 7191 | 7251 | 7300 | | | | | | | | | | | | | | | | |
| 7541 | 7691 | 7751 | 7800 | 1489 | 12 | 1715 | 1820 | 1880 | 230 | 280 | 600 | 450 | 400 | 350 | 440 | 440 | 480 | 400 | 910 |
| 8041 | 8191 | 8251 | 8300 | | | | | | | | | | | | | | | | |
| 8541 | 8191 | 8751 | 8800 | | | | | | | | | | | | | | | | |
| 9041 | 9191 | 9251 | 9300 | | | | | | | | | | | | | | | | |
| 9541 | 9691 | 9751 | 9800 | | | | | | | | | | | | | | | | |

| | 3 bar | 3 bar | 6 bar | 6 bar | Dimensions | | | | Nozzle Product side | | | | | | | | Nozzle Service side | | | | |
|-------|-------------|---------------|-------------|---------------|-------------|------|------|-------|---------------------|-------|-------|-------------|----------|----------|----------|----------|---------------------|----------|-----|----|--|
| | single pass | multiple pass | single pass | multiple pass | steel shell | | | 3 bar | 6 bar | 3 bar | 6 bar | single pass | 2 passes | 3 passes | 4 passes | 2 passes | 3 passes | 4 passes | ND1 | A1 | |
| | L | L | L | L | Da | Sa | D1 | D2 | D2 | h | h | ND | ND | ND | ND | A | A | A | ND2 | A2 | |
| | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | mm | |
| 5140 | 5290 | 5355 | 5405 | | | | | | | | | | | | | | | | | | |
| 6140 | 6290 | 5855 | 5905 | | | | | | | | | | | | | | | | | | |
| 6640 | 6790 | 6355 | 6405 | | | | | | | | | | | | | | | | | | |
| 7140 | 7290 | 6855 | 6905 | | | | | | | | | | | | | | | | | | |
| 7640 | 7790 | 7355 | 7405 | 1562 | 12 | 1765 | 1870 | 1930 | 230 | 230 | 600 | 450 | 400 | 350 | 440 | 440 | 480 | 400 | 910 | | |
| 8140 | 8290 | 7855 | 7905 | | | | | | | | | | | | | | | | | | |
| 8640 | 8790 | 8355 | 8405 | | | | | | | | | | | | | | | | | | |
| 9140 | 9290 | 8855 | 8905 | | | | | | | | | | | | | | | | | | |
| 9640 | 9790 | 9355 | 9405 | | | | | | | | | | | | | | | | | | |
| 5290 | 5440 | 5505 | 5655 | | | | | | | | | | | | | | | | | | |
| 5790 | 5940 | 6005 | 6155 | | | | | | | | | | | | | | | | | | |
| 6290 | 6440 | 6505 | 6655 | 1605 | 12 | 1815 | 1920 | 1950 | 230 | 230 | 600 | 450 | 400 | 350 | 440 | 440 | 480 | 400 | 910 | | |
| 6790 | 6940 | 7005 | 7155 | | | | | | | | | | | | | | | | | | |
| 7290 | 7440 | 7505 | 7655 | | | | | | | | | | | | | | | | | | |
| 7790 | 7940 | 8005 | 8155 | | | | | | | | | | | | | | | | | | |
| 8290 | 8440 | 8505 | 8655 | | | | | | | | | | | | | | | | | | |
| 8790 | 8940 | 9005 | 9155 | | | | | | | | | | | | | | | | | | |
| 9290 | 9440 | 9505 | 9655 | | | | | | | | | | | | | | | | | | |
| 5440 | 5590 | 5720 | 5870 | | | | | | | | | | | | | | | | | | |
| 5940 | 6090 | 6320 | 6370 | | | | | | | | | | | | | | | | | | |
| 6490 | 6590 | 6820 | 6870 | | | | | | | | | | | | | | | | | | |
| 6990 | 7090 | 7320 | 7370 | 1663 | 12 | 1865 | 1970 | 1970 | 230 | 230 | 600 | 450 | 400 | 350 | 440 | 440 | 480 | 500 | 910 | | |
| 7490 | 7590 | 7820 | 7870 | | | | | | | | | | | | | | | | | | |
| 7990 | 8090 | 8320 | 8370 | | | | | | | | | | | | | | | | | | |
| 8490 | 8590 | 8820 | 8870 | | | | | | | | | | | | | | | | | | |
| 8990 | 9090 | 9320 | 9370 | | | | | | | | | | | | | | | | | | |
| 9490 | 9590 | 9820 | 9870 | | | | | | | | | | | | | | | | | | |
| 5590 | 5740 | 5800 | 5950 | | | | | | | | | | | | | | | | | | |
| 6090 | 6240 | 6300 | 6450 | | | | | | | | | | | | | | | | | | |
| 6590 | 6740 | 6800 | 6950 | | | | | | | | | | | | | | | | | | |
| 7090 | 7240 | 7300 | 7450 | 1734 | 12 | 1915 | 2020 | 2020 | 230 | 230 | 600 | 450 | 400 | 350 | 440 | 440 | 480 | 500 | 910 | | |
| 7590 | 7740 | 7800 | 7950 | | | | | | | | | | | | | | | | | | |
| 8090 | 8240 | 8300 | 8450 | | | | | | | | | | | | | | | | | | |
| 8590 | 8740 | 8800 | 8950 | | | | | | | | | | | | | | | | | | |
| 9090 | 9240 | 9300 | 9450 | | | | | | | | | | | | | | | | | | |
| 9590 | 9740 | 9800 | 9950 | | | | | | | | | | | | | | | | | | |
| 5740 | 5890 | 5980 | 6130 | | | | | | | | | | | | | | | | | | |
| 6240 | 6390 | 6490 | 6630 | | | | | | | | | | | | | | | | | | |
| 6740 | 6890 | 6990 | 7130 | | | | | | | | | | | | | | | | | | |
| 7240 | 7390 | 7490 | 7630 | 1784 | 12 | 1965 | 2070 | 2070 | 230 | 230 | 600 | 450 | 400 | 350 | 440 | 440 | 480 | 500 | 910 | | |
| 7740 | 7890 | 7990 | 8130 | | | | | | | | | | | | | | | | | | |
| 8240 | 8390 | 8490 | 8630 | | | | | | | | | | | | | | | | | | |
| 8740 | 8890 | 8990 | 9130 | | | | | | | | | | | | | | | | | | |
| 9240 | 9390 | 9490 | 9630 | | | | | | | | | | | | | | | | | | |
| 9740 | 9890 | 9990 | 10130 | | | | | | | | | | | | | | | | | | |
| 5880 | 6030 | 6150 | 6300 | | | | | | | | | | | | | | | | | | |
| 6380 | 6530 | 6650 | 6800 | | | | | | | | | | | | | | | | | | |
| 6880 | 7030 | 7150 | 7300 | | | | | | | | | | | | | | | | | | |
| 7380 | 7530 | 7650 | 7800 | 1845 | 12 | 2015 | 2120 | 2120 | 230 | 230 | 600 | 450 | 400 | 350 | 440 | 440 | 480 | 500 | 950 | | |
| 7880 | 8030 | 8150 | 8300 | | | | | | | | | | | | | | | | | | |
| 8380 | 8530 | 8650 | 8800 | | | | | | | | | | | | | | | | | | |
| 8880 | 9030 | 9150 | 9300 | | | | | | | | | | | | | | | | | | |
| 9380 | 9530 | 9650 | 9800 | | | | | | | | | | | | | | | | | | |
| 9880 | 10030 | 10150 | 10300 | | | | | | | | | | | | | | | | | | |
| 5950 | 6100 | 6240 | 6390 | | | | | | | | | | | | | | | | | | |
| 6450 | 6600 | 6740 | 6890 | | | | | | | | | | | | | | | | | | |
| 6950 | 7100 | 7240 | 7390 | | | | | | | | | | | | | | | | | | |
| 7450 | 7600 | 7740 | 7890 | 1896 | 12 | 2070 | 2170 | 2170 | 230 | 230 | 600 | 450 | 400 | 350 | 440 | 440 | 480 | 600 | 950 | | |
| 7950 | 8100 | 8240 | 8390 | | | | | | | | | | | | | | | | | | |
| 8450 | 8600 | 8740 | 8890 | | | | | | | | | | | | | | | | | | |
| 8950 | 9100 | 9240 | 9390 | | | | | | | | | | | | | | | | | | |
| 9450 | 9600 | 9740 | 9890 | | | | | | | | | | | | | | | | | | |
| 9950 | 10100 | 10240 | 10390 | | | | | | | | | | | | | | | | | | |
| 6018 | 6168 | 6318 | 6468 | | | | | | | | | | | | | | | | | | |
| 6518 | 6668 | 6818 | 6968 | 1945 | 12 | 2130 | 2220 | 2220 | 230 | 230 | 600 | 450 | 400 | 350 | 440 | 440 | 480 | 600 | 950 | | |
| 7018 | 7168 | 7318 | 7468 | | | | | | | | | | | | | | | | | | |
| 7518 | 7668 | 7818 | 7968 | | | | | | | | | | | | | | | | | | |
| 8018 | 8168 | 8318 | 8468 | | | | | | | | | | | | | | | | | | |
| 8518 | 8668 | 8818 | 8968 | | | | | | | | | | | | | | | | | | |
| 9018 | 9168 | 9318 | 9468 | | | | | | | | | | | | | | | | | | |
| 9518 | 9668 | 9818 | 9968 | | | | | | | | | | | | | | | | | | |
| 10018 | 10168 | 10318 | 10468 | | | | | | | | | | | | | | | | | | |





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PE-205/08-2001e Printed in Germany



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