



Hydrex 5003

Ultra high pressure hydraulic system
for heat exchanger tubes expansion

Production

Tubes expansion



A winning story since 1961

The Beginning

At the end of the 1950s, Domenico Franco Agostino became the Italian representative of Albert Otto, a German manufacturer of tube expanders. In 1961 Franco Agostino's Albert Otto Italiana was founded and in 1972, after purchasing an area of 10,000 square metres in the municipality of Bagnolo Cremasco, Maus Italia Sas was established.

The Growth

In 1976 his son Stefano, a mechanical engineer, joined the company. Together with his father, he studied products, introduced new machinery onto the market and filed the first patents by Maus Italia. Above all, Stefano was firmly convinced that people are the very heart of a company's success. Therefore, he invested in human capital by valuing people and roles, and he surrounded himself with skilled operators as well as technical, commercial and administrative collaborators. The result was a winning, competent and proactive team.

His daughter Anna - also a mechanical engineer - has been working in the company since 2016, giving new impetus and energy to the business her father and grandfather had built.

Father and daughter work together side by side every day to guarantee the excellence of Maus Italia and support all customers worldwide with competence and passion: the company's distinctive traits.



Stefano Agostino

CEO - Mechanical Engineer

Anna Agostino

COO - Mechanical and Management Engineer



In-house production of each component ***Workshop 4.0 and 24/7 production control***

The production of Maus Italia branded items is entirely carried out in Bagnolo Cremasco, in the heart of an Italian industrial area 30 km southeast of Milan.

The company boasts a 4.0 workshop equipped with state-of-the-art machinery, an in-house heat treatment room and a final inspection department that allow Maus Italia to independently manage every phase of the manufacturing process of its wide range of products whilst maintaining high quality standards.



Quality first. ***Design and development***

One of Maus Italia's strengths is its willingness to understand its customers' needs.

Our technical department is always ready to find operational solutions to the most complex applications, even via feasibility studies. We develop accurate work processes, draw with FEM analyses to verify our mechanical-structural performance and optimise the manufacturing process of each component.

Ready To Deliver

A well-stocked and complete warehouse of finished products enables Maus Italia ship quickly to customers all over the world according to a ready-to-deliver logic.

The warehouse is fully located within our premises in Bagnolo Cremasco at controlled temperatures and conditions to guarantee the maximum safety and quality of Maus Italia products for all our customers.

Quality, environment and safety policy

Research, quality and safety are the watchwords of Maus Italia Spa.

Maus Italia has several projects underway aimed at increasingly sustainable development and integrates environmental concerns into its business model. The company's actions, behaviour and development choices are focused not only on the short run but rather mainly on a medium and long-term horizon.



Every day in over 80 country worldwide

Find an official distributor in your country



| The expansion process

Hydraulic expansion finds its best application in the expansion of the welded tubes for the approach to the tube-sheet hole. Exceptionally fast and competitive single pass execution, in special way for expansion lengths exceeding 100 mm (≈ 4") where it replaces the traditional expansion for the approach of the welded tubes.

Requested data

Maus Italia designs and manufactures dedicated tools for hydraulic expansion (probes) according to the following customer data:

<i>D_i</i>	Tube inner diameter
<i>d_e</i>	Tube outer diameter
<i>sp</i>	Tube thickness
<i>dim</i>	Expanded tube inner diameter
<i>D_f</i>	Diameter of the hole on the tube-sheet
<i>SP</i>	Tube-sheet thickness
<i>Le</i>	Expansion length
<i>RE</i>	Expansion depth
<i>W</i>	Distance between expansion and tube-sheet (flush)
<i>m1(yp1)</i>	Tube material according to standards ("yeld point")
<i>m2(yp2)</i>	Tube-sheet material according to standards ("yeld point")
<i>t</i>	Drilling pitch
<i>n</i>	Number of tubes to expand

A Introduction of the probe in the tube

It must be carried out by trying to keep the probe perpendicular to the tube-sheet surface until it is fully inserted.

B Water loading (low pression)

Through the equipped HWH-4000 water pipe DW-5, demineralized water is loaded in a couple of seconds, filling the gap between the probe and the tube to expand, until a pressure of 150 Bar (2170 psi) is reached.

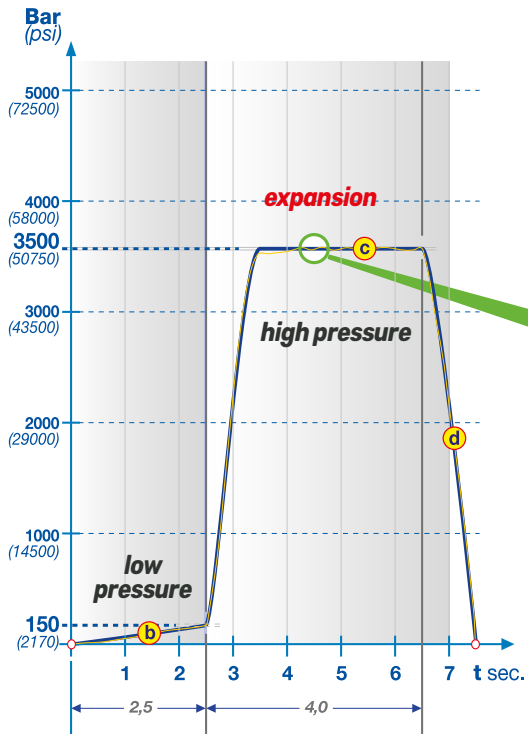
C Achievement of the high pression

Water pression increases constantly in the following four seconds, always controlled by the CCP software supplied, until 3500 Bar (50750 psi) are reached, in the example taken into consideration. The expansion has taken place, correctly.

D Water recovery

In less than one second th DW-5 demineralized water is recovered in the tank, through the water pipe HWH-4000, ready to be reused in the next expansion process.

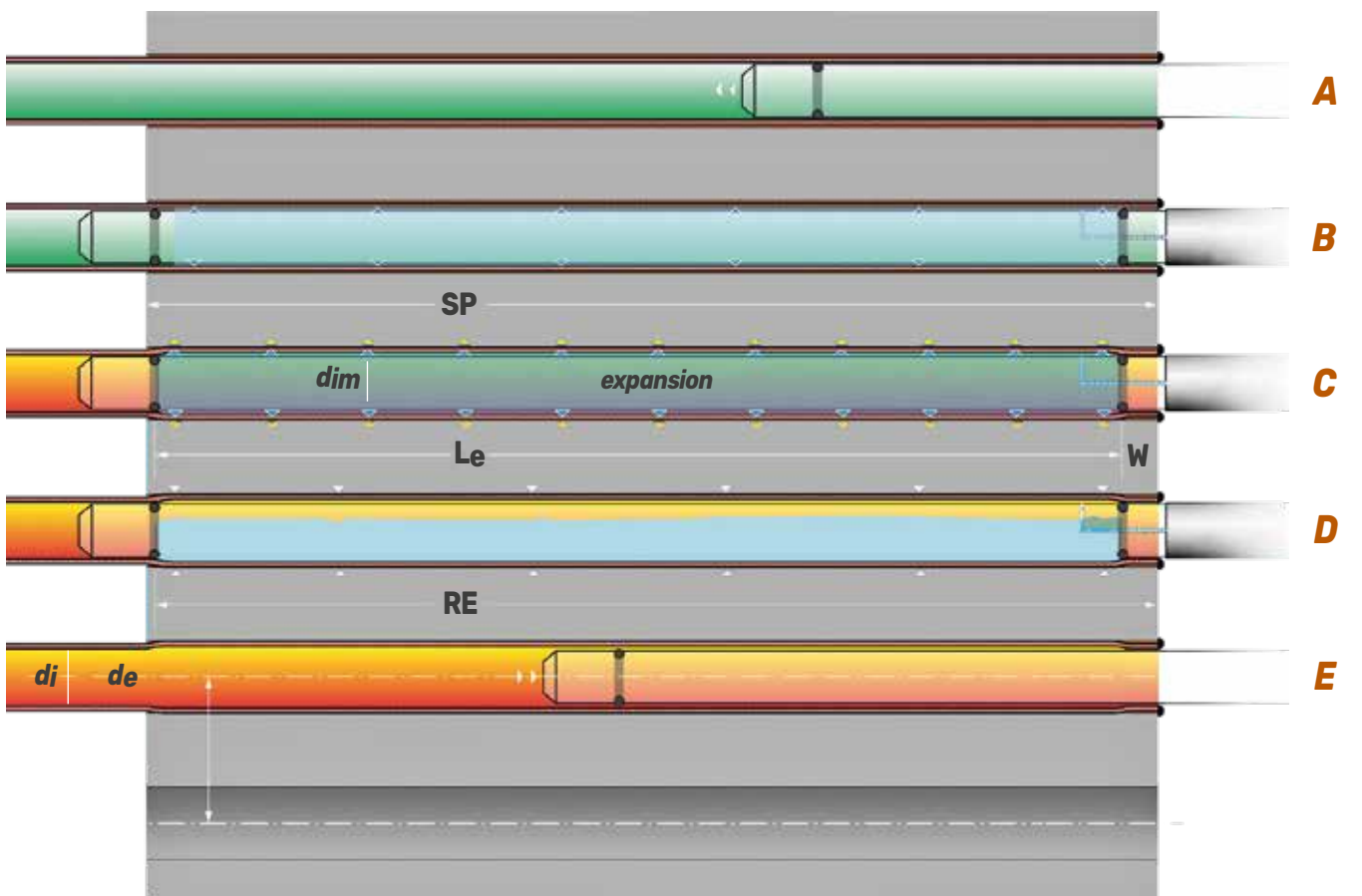
E Extraction of the probe



CCP

Continuous control of the ultra high pressure required for the expansion, designed by Maus Italia to eliminate out of tolerance expansions:

- Actual curve
- Theoretical curve



Duration and pressure values as shown below and in the graph are only an example, and may vary according to the data provided.



Hydrex system

Ultra high pressure hydraulic system for heat exchanger tubes expansion

Attentive to the increasingly stringent specifications dictated by designers in petrochemical field, Maus Italia designs and builds Hydrex 5003, the fourth generation of a product acclaimed by our customer for more than 40 years.



Guarantee of repeatability

± 1,5% of the pressure at the probe



Up to 5000 bar (72500 Psi)

Ultra high pression



No crevice corrosion

It preserves the welding



Electrical cabinet

Electrical cabinet according to CEI EN 60204-1



Hydraulic system

All hydraulic components are inside of the cabinet carter



Control console

Control console equipped with a 9" wide touch screen display for an intuitive control of all operating parameters

Thanks to its last generation touch screen control panel, the Hydrex 5003 ensures an extremely simple learning and daily use. Innovative software designed by Maus Italia facilitates the daily work:

CCP

It allows the continuous control of the high pressure set for the expansion, as designed by Maus Italia to eliminate out of tolerance expansions.

SAC

Advanced calculation system aimed to define the working suggested pressure according to the tube and tube-sheet features.

Storage on USB key of:

- set programs
- report of pressure values

Repeatability tolerance

Selection of the desired language

Realtime display of:

- pressure (Bar)
- pressure diagram (Bar)
- cycle time
- count of hydraulic expansions performed

Special settings

Settings of special parameters for the complete customization of all the machine functions.



SAC

A real calculator dedicated to the definition of the correct pressure, on the basis of the customer data.



Parameter setting

Panel for setting all the parameters needed for building the theoretical diagram of the hydraulic expansion.



Tack expansion

Control interface (only for Hydrex 5003 S) to manage the tube pre-welding positioning.



CCP

Dedicated software for the continuous control of the set expansion pressure and the allowed tolerances.



Expansions reports

Each expansion cycle performed is traced together with its reference parameters and logged to a report file.



Pressures and time

Pressure setting for oil and water circuits, tolerances and times of automatic expansion cycle.



Graphic report

Diagram of each expansion cycle, for a visual inspection of the correctness of the set curve.



Hydrex 5003

Ultra high pressure hydraulic system for expanding heat exchangers tubes with minimum inside diameter of 7,00 mm (0.276")

An evolution of the previous version, Hydrex 5003, it features:

- **a new model of light probe holder** equipped with a highly ergonomic handle, made of aluminium and special materials suitable for ultra high pressures
- **update of the mechanics and electronics** that make it extremely handy, flexible and unique in its kind
- **new software** that allows the operator to export/print in standard PDF format the diagram of each approach, to assure a very high repeatability ($\pm 1.5\%$)



The Hydrex 5003 includes:

- **Hydraulic Power Unit** mounted on a trolley, equipped with a 9" wide touch screen control panel and dedicated CCP and SAC software
- **Probe holder HDP-4001** with quick coupling for probe replacing, integrated remote control and 5 m (16.4 Ft) electric connection cable
- **5 m (16.4 Ft) HWH-4000 ultra high pressure hose** connecting the controller to the probe.

According to the dimensional features of the expansion to carry out, Maus Italia delivers the appropriate tools (called probes).

VDP

Example of variable diameter probe, manufactured according to customer specifications.

HDP-4001

Probe holder with quick coupling standard supply with Hydrex 5003 with aluminium ergonomic handle and probe shank in special material for ultra high pressure.



Led lights

- Automatic end cycle
- Required pressure reached
- Expansion cycle in progress
- Alarm

Quick couplig

Remote control

- Red push button "stop" cycle "reset" alarm
- Green push button "start" cycle

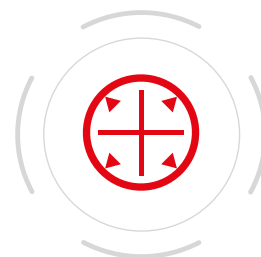
Hydrex 5003 S

Hi-Tech ultra high pressure hydraulic system for controlled positioning of tubes (prior to welding) and probe (during tube expansion)

Hydrex 5003 S is the 'full optional' version of series 5003, that Maus Italia has developed for typical usage in the nuclear sector.

In addition to what described for the base model, with the Hydrex 5003 S the following items are also supplied:

- The device HF-6000 for positioning the tube "tack expansion" - before welding, that, connected to Hydrex 5003 S with a power cable and two hydraulic hoses, ensures a gentle approach of the tube to the hole in the tube-sheet by clamping the tube, a reliable reference point with respect to the tube-sheet surface (flush recessed or protruding), thus providing the preconditions for a proper operation of a TIG orbital welding unit.
- The device 2TH-400 that, anchored to the tubes adjacent to the tube to expand on the tube-sheet, holds the HDP-4001 probe support and holds the probe within the tube in the longitudinal position, as prescribed by design, during the expansion process.



Tack expansion

Hydraulic expansion with anchoring



PDP

Example of a probe with variable diameter designed to avoid contamination during the expansion process. Built according to customer specifications.

**HDP-4001****Probe holder**

- Ergonomic
- Lightweight
- Integrated remote controller (24v)

**+ 2TH-400****Hydraulic anchoring device**

Longitudinal position, expansion guaranteed

- Preserves the inner tube sheet from crevice corrosion
- Preserves the welding (external tube sheet)

Reduction of operator effort

**HF-6000****Portable hydraulic system (tack expansion)**

- Radial positioning guaranteed
- Integrated remote controller (24V)
- Positioning of the tube without contamination





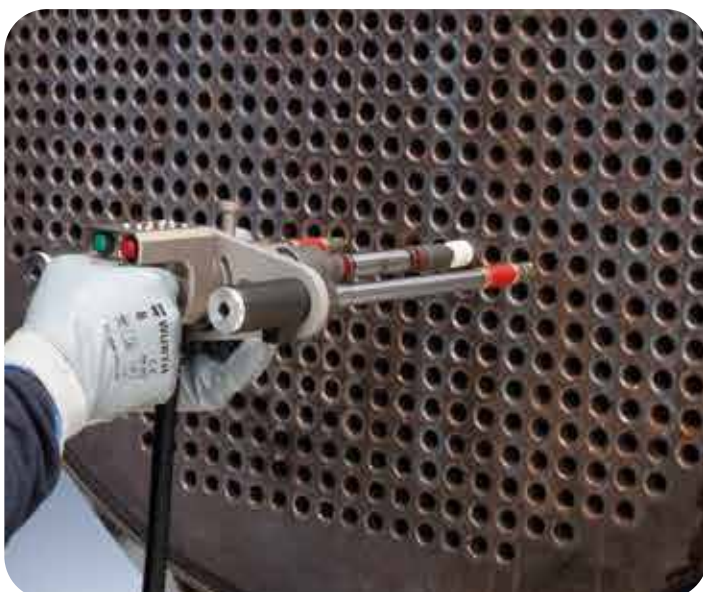
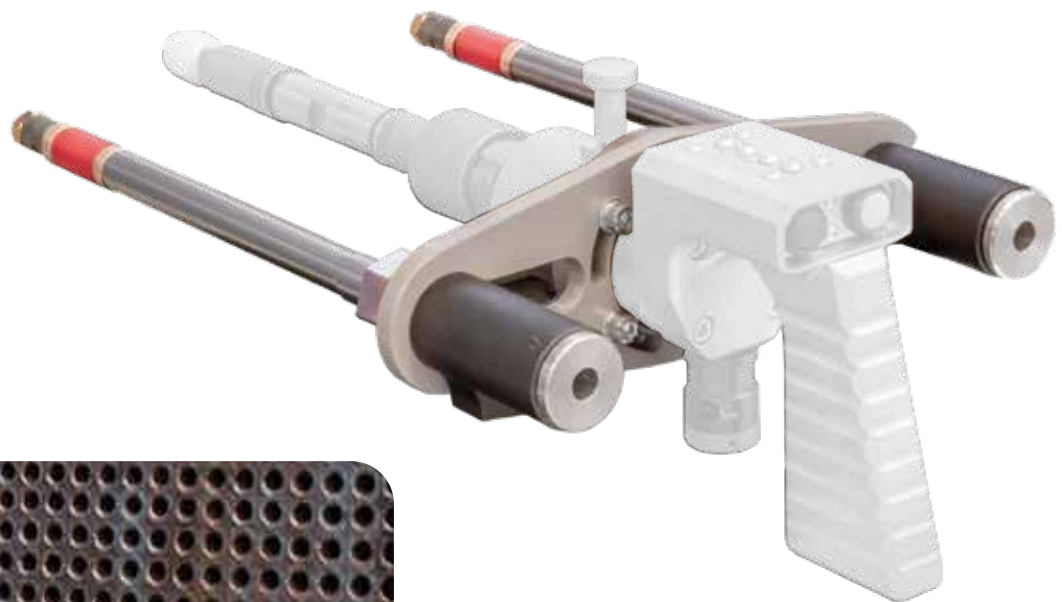
2TH-400

Hydraulic device for supporting the probe holder HDP-4001 and for maintaining the probe longitudinal position

The 'double tube holder' includes two identical hydraulic expansion tools (called 'noses ') manufactured according to the customer data, mounted on the HDP-4001 probe holder through a steel bracket that assures a full freedom of adjustment.

The operator, at each hydraulic expansion, together with the probe, inserts the 2 'noses' of the device 2TH-400 inside two pipes located near the tube to expand. The expansion and anchoring of such noses will maintain the probe in longitudinal position, to ensure that both sides of the expanded portion will follow the design specifications, independently from the strength and the diligence of the operator.

In addition to assuring the operator safety, it greatly reduces the operator effort in maintaining the probe correct position during the expansion process of each tube.



His device eliminates the crevice corrosion and the cracks in the weld

Maximum accuracy of the expansion position

No crevice corrosion

HF-6000

Portable Hydraulic System 'Tack expansion' for the controlled positioning of the tubes prior to welding

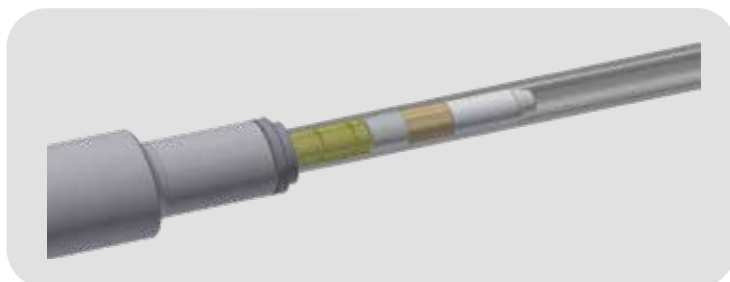
HF-6000 is a portable hydraulic head with polymer ring expansion tool to avoid contamination during the locking process. The main function of this system is to lock the tubes into the desired position by making a careful approach to the tube-sheet hole, to ensure a reliable reference point with respect to the tube-sheet surface (flush recessed or protruding), thus providing the preconditions for a proper operation of a TIG orbital welding unit.

The Hydrex 5003 S control software allows to calibrate the adhesion strength of the tube to the wall of the hole.
The minimum application inside diameter is 12 mm (0.039').

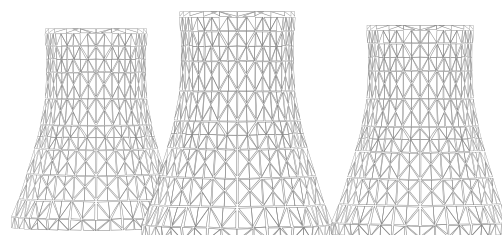
Even in this case, according to the dimensional characteristics provided by the customer, the Maus Italia proposes and manufactures the appropriate expansion tools and related spare parts.



Tack expansion
Controlled positioning
without contamination



This device grants tube positioning, allowing the outlet of welding gas between the tube and tube-sheet hole



| Sonde ad aggancio rapido

Quick coupling probes with fixed and variable diameter for the hydraulic tubes expansion, for use with the probe holder HDP-4001

The tools proposed by Maus Italia for use with Hydrex 5003 and Hydrex 5003 S include three different quick-coupling probes models to be mounted on the probe holder HDP-4001.

Each type of probe is designed and manufactured by Maus Italia according to the data provided by customers.

FDP

Fixed diameter probe.

It is provided for expansions of tubes in the di range 7.0 to 30.0 mm (0,315" fino a 0, 181")

VDP

Variable Diameter Probe. Particularly suited to compensate for the manufacturing tolerances of the tubes. It is provided for expansions of tubes in the di range 15.9 to 50.8 mm (0,626" fino a 2")

PDP

Variable Diameter Probe.

Specifically designed for the nuclear sector, with technical precautions aimed to prevent metal contamination.

It is provided for expansions of tubes in the di range 13.0 to 30.0 mm (0,512" fino a 0, 181")



Maus Italia technical staff is available to recommend the ideal solution by making available its 40+ years of experience in hydraulic expansion.

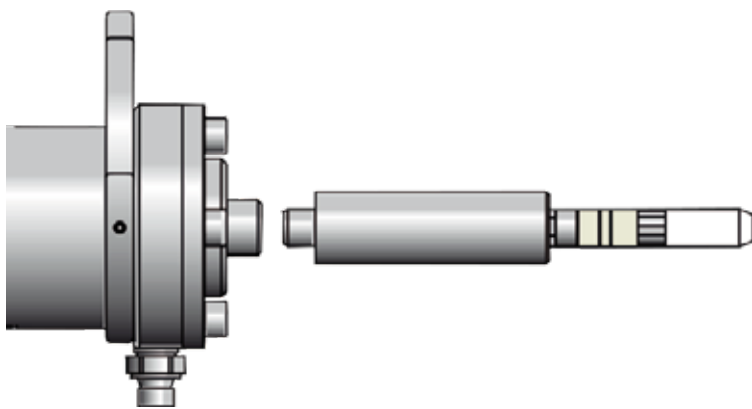
In addition to the characteristics of the materials employed and the position of the tube with respect to the tube sheet (flush to the tube sheet, recessed or protruding), the main parameters needed to define the size of the recommended mandrel are:

- ***d_i*** Tube inner diameter
- ***L_e*** Expansion length
- ***W*** Distance between expansion and tube-sheet

Utensili espansori

Quick coupling polymer ring expander tools, for locking the tubes to the tube-sheet before welding, for use with system HF-6000 (tack expansion)

The tools proposed by Maus Italia for use with the full optional version Hydrex 5003 S and the system HF-6000 include steel tools with quick coupling, series TTE, and a series of rings made of expandable polymer to ensure the locking of the tube inside the tube-sheet hole, without any contamination.



TTE

Expander tool with rings made of expandable polymer.

It is available for expansions of tubes in the di range 8.0 to 30.0 mm (0,315" fino a 0,181")

In addition to the characteristics of the materials employed and the position of the tube with respect to the tube sheet (flush to the tube sheet, recessed or protruding), the main parameters needed to define the size of the recommended mandrel are:

- d_i Tube inner diameter
- L_e Expansion length
- W Distance between expansion and tube-sheet

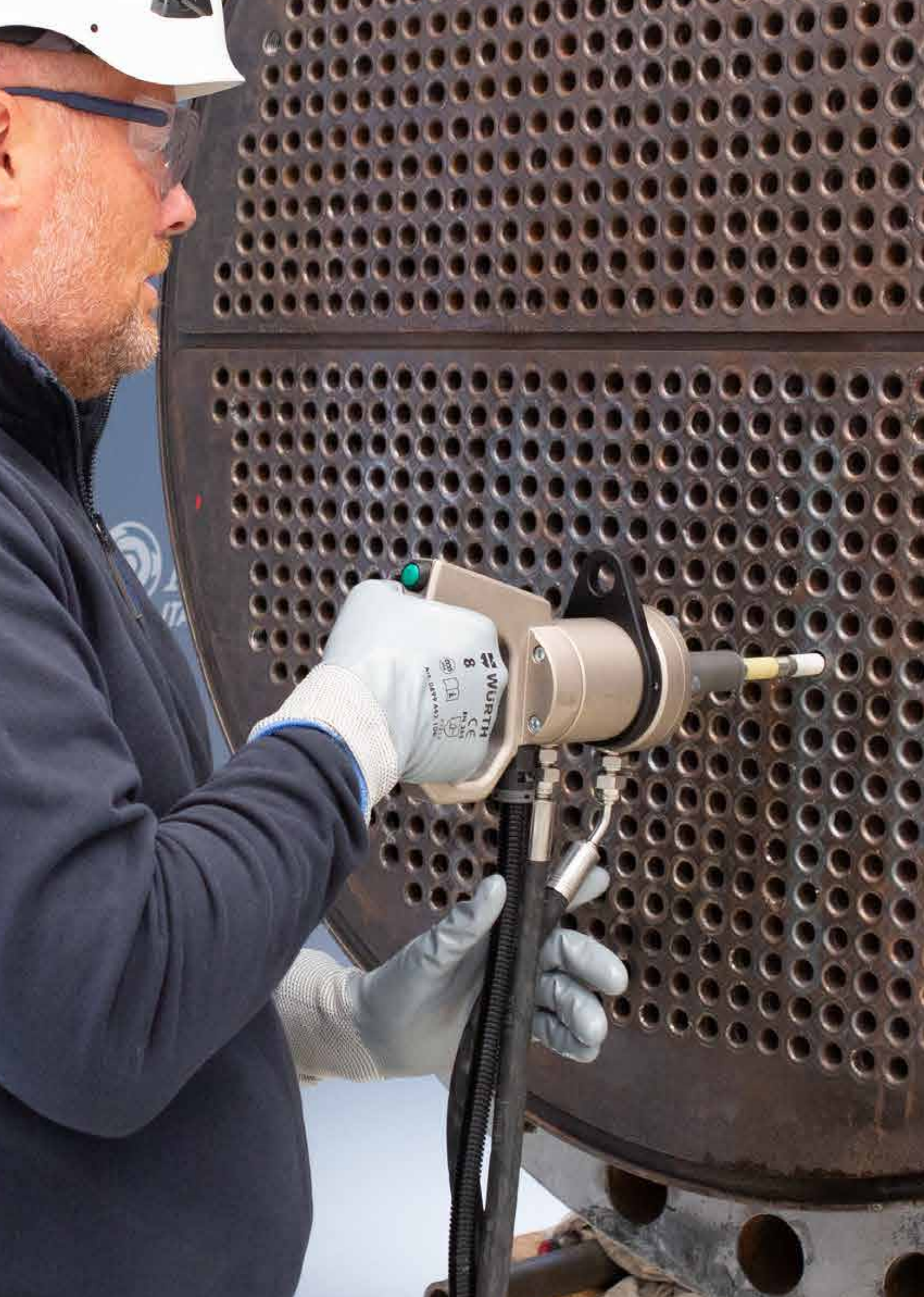
Even in this case, the Maus Italia technical staff is available for recommending the best solution.

Hydraulic Expansion Service

Tube mapping / Hydraulic expansion / Expansion reports

More teams of Maus Italia specialized operators, equipped with Hydrex 5003 are available to assist your staff, at the appropriate time, in carrying out hydraulic expansions.





Technical features

System

Supply

Voltage
Frequency
Installed power

Dimensions

Lenght **A**
Width **B**
Height **C**
Weight (empty)
Weight (full loader)
Colours
Height for transport **Ct**
Packing dimensions

Packing weight
Degree of protection

Capacità

Oil tank
Flow rate
Max pressure (h2o)

Hydrex 5003

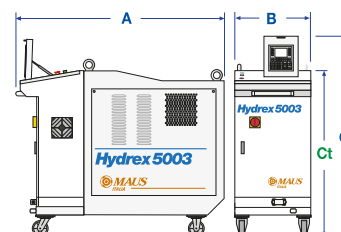
400 Volt (3 Ph)
50 Hz
7,5 Kw

1600 mm (62,99 inches)
600 mm (23,62 inches)
1600 mm (62,99 inches)
440 Kg (970 Lb)
550 Kg (1213 Lb)
7030 - 7035 RAL
1330 mm (52,36 inches)
1830x980x1660 mm
(72.05x38.58x65.35 inches)
610 Kg (1344 Lb)
IP 55

Hydrex 5003S

400 Volt (3 Ph)
50 Hz
7,5 Kw

1600 mm (62,99 inches)
600 mm (23,62 inches)
1600 mm (62,99 inches)
470 Kg (1036 Lb)
580 Kg (1279 Lb)
7030 - 7035 RAL
1330 mm (52,36 inches)
1830x980x1660 mm
(72.05x38.58x65.35 inches)
650 Kg (1433 Lb)
IP 55



HDP-4001

Supply

Voltage

Dimensions

Lenght
Width
Height
Weight
Colours
Degree of protection

Capacity

Max pressure (h2o)

Hydrex 5003

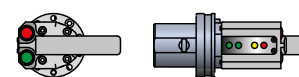
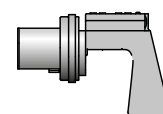
24 Volt DC

185 mm (7.28 inches)
75 mm (2.95 inches)
130mm (5.12 inches)
1,7 Kg (3.82 Lb)
Al-Ox - Inox
IP 55

Hydrex 5003S

24 Volt DC

185 mm (7.28 inches)
75 mm (2.95 inches)
130mm (5.12 inches)
1,7 Kg (3.82 Lb)
Al-Ox - Inox
IP 55



HDP-4001+2TH-400

Supply

Voltage

Dimensions

Length

Width

Height

Weight

Colours

Degree of protection

Capacity

Max pressure (h2o)

Hydrex 5003S

24 Volt DC

303 mm (11.93 inches)

75 mm (2.95 inches)

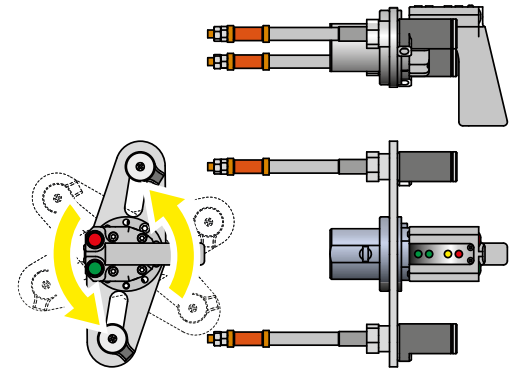
122÷227 mm (4.80÷8.94 inches)

3,2 Kg (7.05 Lb)

Al-Ox - Inox

IP 55

4000 Bar (58000 Psi)



HF-6000

Supply

Voltage

Dimensions

Length

Width

Height

Weight

Colours

Degree of protection

Hydrex 5003S

24 Volt DC

211 mm (8.31 inches)

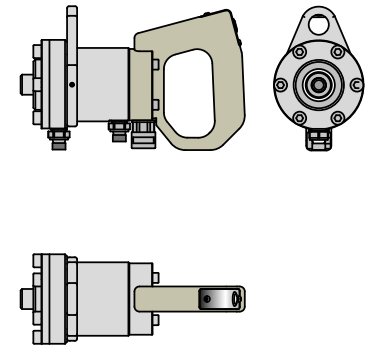
90 mm (3.54 inches)

145 mm (5.71 inches)

3,2 Kg (7.05 Lb)

Al-Ox - Inox

IP 55



HWH-4000

Dimensions

Length

Capacity

Max pressure

Hydrex 5003

5 m (16.4 Ft)

4000 Bar (58000 Psi)

Hydrex 5003S

5 m (16.4 Ft)

4000 Bar (58000 Psi)

HyKIT-5000

Balancer TPB-20

Flexible hoses (Oil)

Flexible hoses (H2o)

Hydrex 5003

Q.ty 1

Q.ty 2

Q.ty 1

Hydrex 5003S

Q.ty 1

Q.ty 2

Q.ty 1

For use with pressure up to 5000 Bar (72500 psi)

For the most demanding expansions, where the required pressure may reach up to 5000 Bar (72500 Psi) it will be necessary to move the pressure multiplier of the demineralized water (HX-5000) out of the Hydrex 5003. FDP probes can be directly bolted onto the HX-5000 unit. For the support connections and extension, the optional kit Hy-KIT-5000 is available, as per table in the page.

Heat exchanger's world

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Maus Italia S.p.A.

SP 415 KM 30 (nuova strada di arrocco)
26010 Bagnolo Cremasco (CR) Italy
PIVA: 00141010199

Telefono: +39 0373 2370

expo@mausitalia.it
www.mausitalia.it





mausitalia.it

