

NEW



Hydrex 5003/5003 S

**Ultra high pressure
hydraulic system *for*
heat exchanger
tubes expansion**

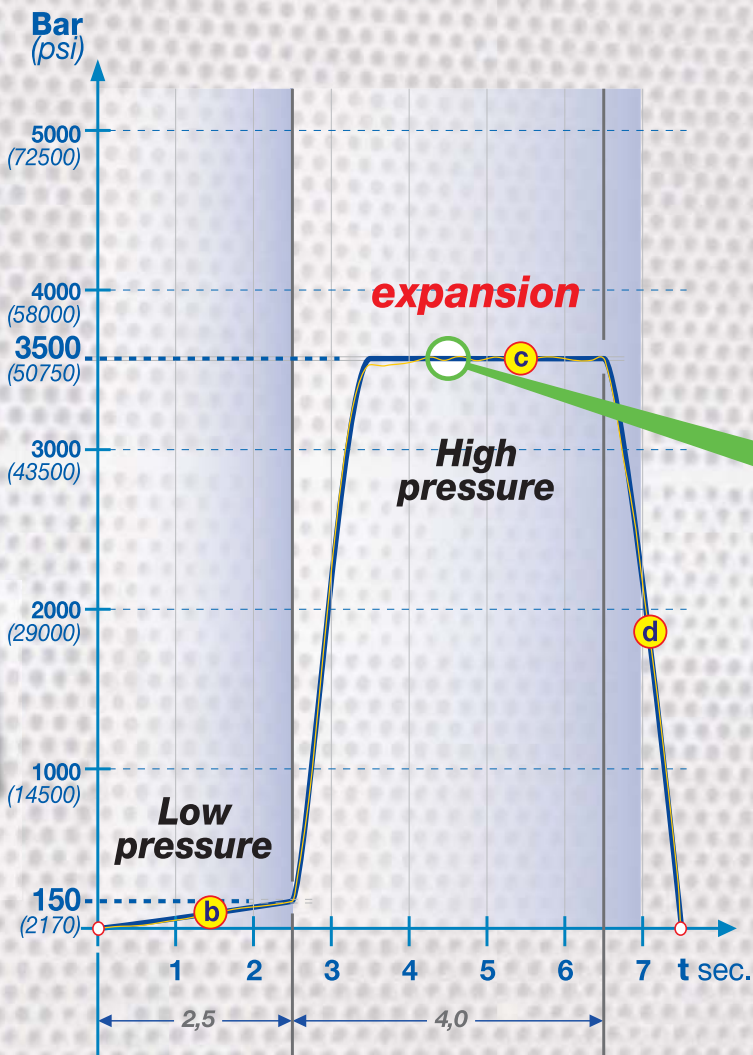


Hydrex 5003

CE

MADE IN ITALY

No stresses
Welding preserved



Requested data

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

d_i tube inner diameter
 d_e tube outer diameter
 sp tube thickness
 dim expanded tube inner diameter

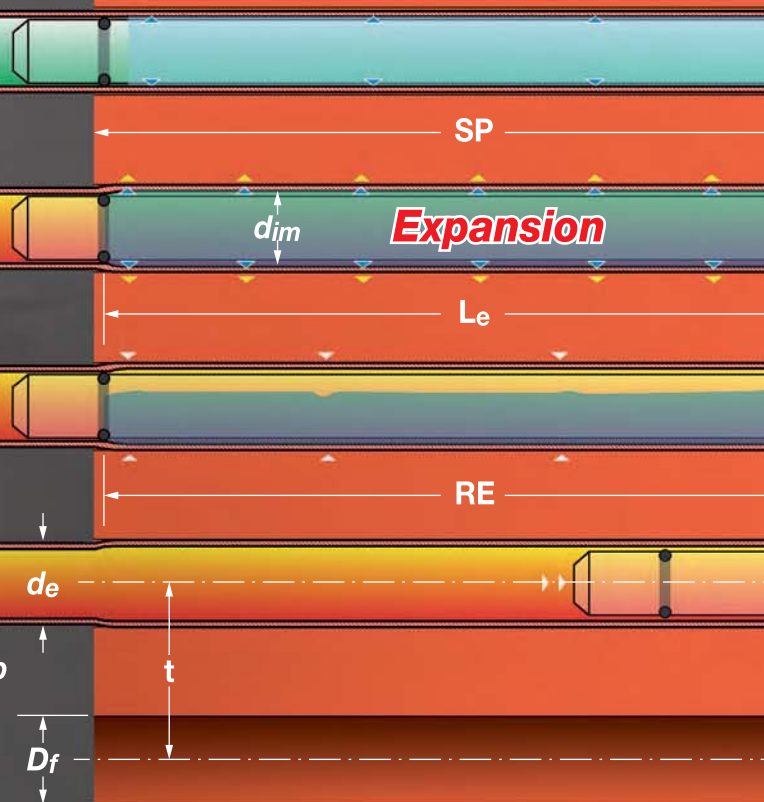
D_f diameter of the hole on the tube-sheet
 SP tube-sheet thickness

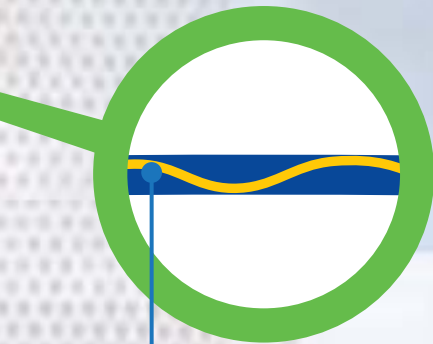
L_e expansion length
 RE expansion depth
 W Distance between expansion and tube-sheet (flush)

$m1(yp1)$ tube material according to standards (yield point)

$m2(yp2)$ tube-sheet material according to standards (yield point)

t drilling pitch
 n number of tubes to expand





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 

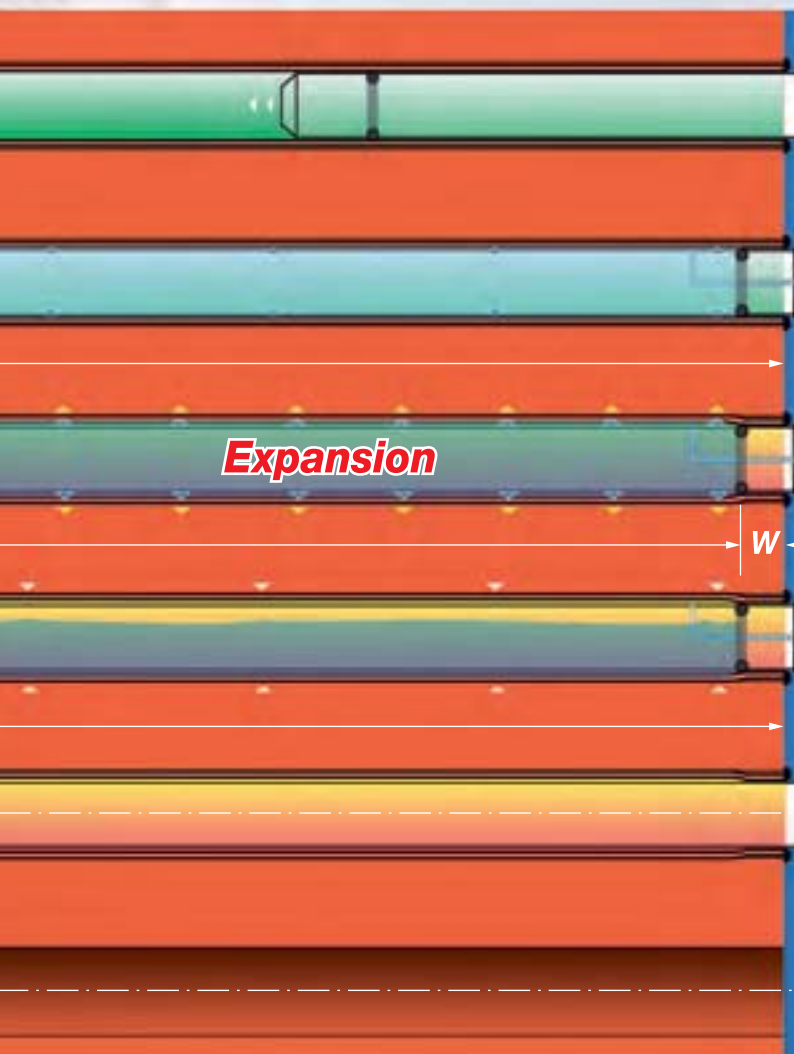
Introduction to **Hydrex** process for the **hydraulic tubes expansion** by means of ultra high pressure water

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 ($\approx 4"$)** where it replaces the *traditional expansion* for the approach of the welded tubes.

Description of the process

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



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 (as reported by the 'probe inserted' proximity sensor)

b

Water loading (low pressure)

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 pressure

Water pressure 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 the **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

Guarantee of repeatability
• $\pm 1,5\%$ of the pressure at the probe

**Up to
5000 Bar
(72500 Psi)**

LED indicators

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

Quick coupling

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.

Integrated Remote Control

Red ● push button
"STOP" cycle
"RESET" alarms

Green ● push button
"START" cycle

On board controls
24V
On board controls

Hydrex 5003

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

Graphical Report

Diagram exporting and printing for each approaching operation, to ensure a report of the approaching operation performed

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 15 years.

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 ($\pm 1.5\%$)**.

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 **probe insertion control device, 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)**.

Hydrex 5003

Hydrex 5003

**Hydraulic expansion
with anchoring**
No crevice corrosion

**Up to
5000 Bar
(72500 Psi)**

PDP

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



**NO CREVICE
CORROSION**

HDP-4001
Probe holder

+ 2TH-400
Hydraulic anchoring device

- Ergonomic
- Light
- Integrated remote controller (24V)

- Longitudinal position, expansion guaranteed
 - Preserves the inner tube sheet from crevice corrosion
 - Preserves the welding (external tube sheet)
- Reduction of operator effort



Hydrex 5003S

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** or in the "high quality" heat exchanger tube working process.

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

- the **HF-6000** device 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 **2TH-400** device, 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*.

Here too, according to the dimensional features of the expansion to carry out, Maus Italia **delivers the appropriate tools**.

Hydrex 5003S

Controlled positioning of the tube without contamination (pre-welding) - Tack expansion

HF-6000

Portable Hydraulic System (tack expansion)

- Radial position guaranteed
- Integrated Remote Control (24V)
- Positioning of the tube without contamination

2TH-400



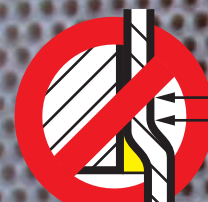
Hydraulic device for
supporting the probe holder
HDP-4001 and for
maintaining the probe
longitudinal position

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.

This device eliminates the crevice corrosion and the cracks in the weld.

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.



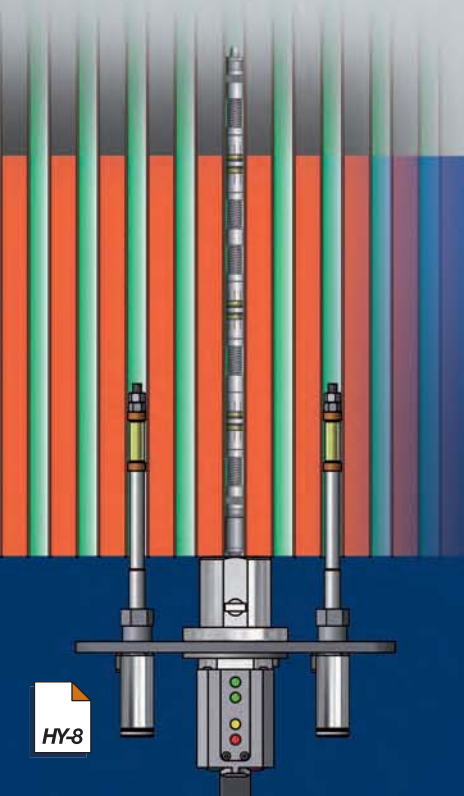
**NO "CREVICE
CORROSION"**

**Maximum accuracy of the
expansion position
It preserves the welding**



2TH-400

By a pressure of 400 Bar (5800 psi), the heads of the two 'noses' are expanded inside the tubes, granting the precise positioning of the probe for all expansion process last.





**Controlled positioning
without contamination
(pre-welding)**

HF-6000

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

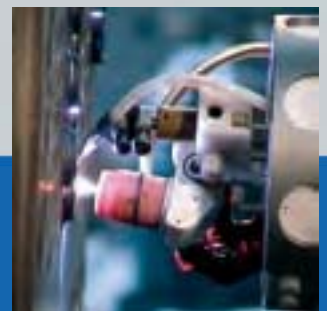
HF-6000 is a portable hydraulic head with polymer ring expansion tool to avoid contamination during the locking process.

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.

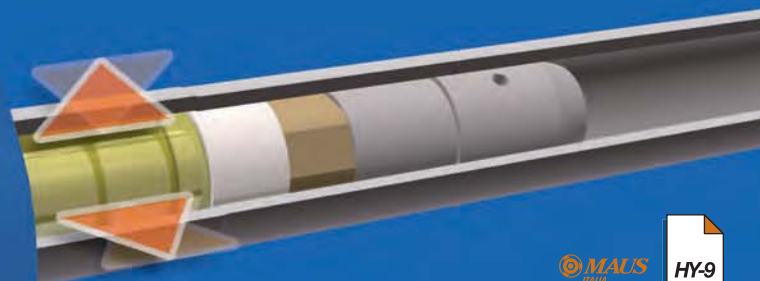
The minimum application inside diameter is **12 mm (0.039")**.

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**.



HF-6000

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





Hydraulic system



Electrical cabinet according to CEI EN 60204-1 standard



USB connection
(on back side)



Digital Pressure Gauge

Thanks to the certificated pressure transducer, expansion pressure is displayed in a continuous manner.



Parameter Setting

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



CCP

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



Pressures and time

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



SAC

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



Tack expansion

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



Expansions report

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



Hydrex

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

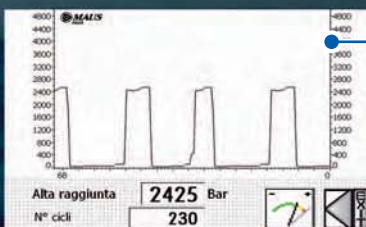
Advanced **calculation system** aimed to define the working pressure according to the tube and tube-sheet characteristics.

Main specifications

- Storage on USB key
 - set programs
 - report of pressure values
- Repeatability tolerance
- Selection of the desired language
- Real time display of:
 - pressure (psi/bar)
 - pressure diagram (psi/bar)
 - cycle duration
 - count of hydraulic expansions performed

Graphic report

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



Special settings

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



Hydrex-tools

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 8.0 to 30.0 mm (**0.315" to 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" to 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" to 0.181"**).



Maus Italia technical staff is available to recommend the ideal solution by making available its 30+ years of experience in hydraulic expansion.



In addition to the characteristics of the materials involved, the main parameters needed to define the size of the recommended probe are:

d_i Tube inner diameter

L_e Expansion length

W Distance between expansion and tube-sheet (flush)



Hydrex-tools

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" to 0.181"**).

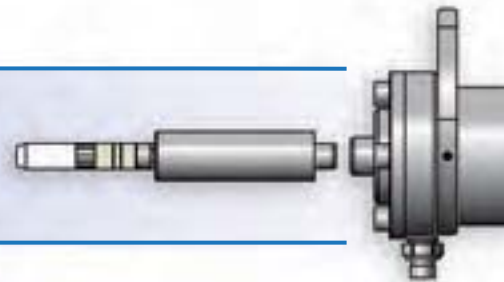
In addition to the characteristics of the materials employed and the position of the tube with respect to the tube sheet (*flush to the tube sheet, recessed or protruding*), the main parameters needed to define the size of the recommended mandrel are:

d_i Tube inner diameter

L_e Expansion length

W Distance between expansion and tube-sheet (*flush*)

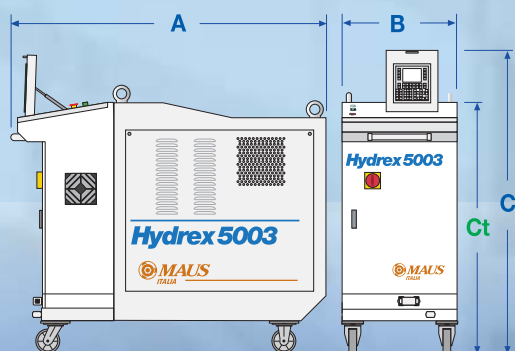
Even in this case, the Maus Italia technical staff is available for recommending the best solution.



**Tube mapping
Hydraulic expansions
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.



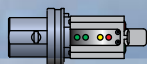
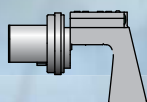


Hydrex 5003 - Hydrex 5003 S

Supply		Hydrex 5003	Hydrex 5003 S
Voltage	Volt - Ph	400 - 3	
Frequency	Hz	50	
Installed power	Kw	7,5	
Dimensions			
Length	A mm (Inches)	1600 (62.99)	
Width	B mm (Inches)	600 (23.62)	
Height	C mm (Inches)	1600 (62.99)	
Weight (empty)	Kg (Lb)	440 (970)	470 (1036)
Weight (fully loader)	Kg (Lb)	550 (1213)	580 (1279)
Colours	RAL	7030 - 7035	
Height for transport	Ct mm (Inches)	1330 (52.36)	
Packing dimensions	mm (Inches)	1830x980x1660 (72.05x38.58x65.35)	
Packing weight	Kg (Lb)	610 (1344)	650 (1433)
Degree of protection	IP	55	
Capacity			
Oil tank	Lt (GalUS)	80 (21.13)	
Flow rate	Lt (GalUS)	8 (2.11)	
Max. pressure (H2O)	Bar (Psi)	5000 (72500)	

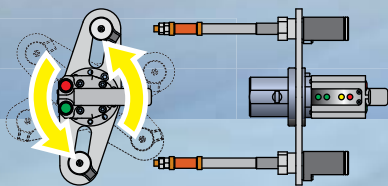
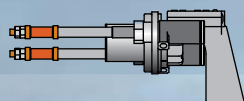


HDP-4001

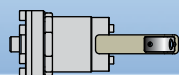
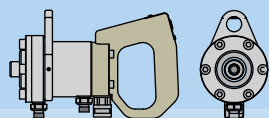


Supply		Hydrex 5003	Hydrex 5003 S
Voltage	Volt DC	24	
Dimensions			
Length	mm (Inches)	185 (7.28)	
Width	mm (Inches)	75 (2.95)	
Height	mm (Inches)	130 (5.12)	
Weight	Kg (Lb)	1,7 (3.82)	
Colours		Al-Ox - Inox	
Degree of protection	IP	55	
Capacity			
Max. pressure (H2O)	Bar (Psi)	4000 (58000)	

HDP-4001 + 2TH-400



Supply		Hydrex 5003	Hydrex 5003 S
Voltage	Volt DC	—	24
Dimensions			
Length	* mm (Inches)	—	303 (11.93)
Width	mm (Inches)	—	75 (2.95)
Height	mm (Inches)	—	122÷227 (4.80÷8.94)
Weight	Kg (Lb)	—	3,2 (7.05)
Colours		—	Al-Ox - Inox
Degree of protection	IP	—	55
Capacity			
Max. pressure (H2O)	Bar (Psi)	—	4000 (58000)



HF-6000

Supply		Hydrex 5003	Hydrex 5003 S
Voltage	Volt DC	—	24
Dimensions			
Length	mm (Inches)	—	211 (8.31)
Width	mm (Inches)	—	90 (3.54)
Height	mm (Inches)	—	145 (5.71)
Weight	Kg (Lb)	—	3,2 (7.05)
Colours		—	Al-Ox - Inox
Degree of protection	IP	—	55



HWH-4000

Dimensions		Hydrex 5003	Hydrex 5003 S
Length	m (Ft)	—	5 (16.4)
Capacity			
Max. pressure (H2O)	Bar (Psi)	—	4000 (58000)

HyKIT-5000

		Hydrex 5003	Hydrex 5003 S
Balancer TPB-20	Q.tà	—	1
Flexible hoses (Oil)	Q.tà	—	2
Flexible hose (H2O)	Q.tà	—	1

OIL-H46

Hydraulic oil specific
for **Hydrex** system



DW-5

Demineralized water
for **Hydrex** system



**Up to
5000 Bar
(72500 Psi)**

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.

