

**CRYOGENIC TRANSFER PUMPS
FOR LIQUEFIED GASES**

 **DISTRIBUTION**
CRYO STAR



THE CRYOSTAR GROUP

As a pioneer in the design and manufacture of cryogenic equipment, CRYOSTAR started out in 1967 producing cryogenic pumps for liquefied industrial gases. The company has become a major actor in the field of industrial and medical gases, clean power generation, LNG and hydrocarbon applications. CRYOSTAR brings to you over 50 years of experience and know-how.

With its headquarters located in France and Business Centers in Brazil, China, India, Russia, Singapore, the United Kingdom, and the United States of America, along with numerous partners, CRYOSTAR is always close to customers, available and ready to act. CRYOSTAR employs close to 650 people all over the world. They are CRYOSTAR's strongest asset. Together they share the same values to support the company towards ever greater innovation, technology and knowledge.

CRYOSTAR has equipped thousands of plants. Cryogenic pumps, expansion turbines, cryogenic compressors, small scale liquefaction plants, LNG vaporizers, cylinder filling stations, and natural gas fueling stations... these are at the heart of CRYOSTAR's products range.

To optimize your plant availability and consequent uptime, CRYOSTAR also offers full service solutions : on-site installation and commissioning based on strict safety standards (24/7 technical support, service contracts, on site training support), maintenance and repair (technology updates, factory and on-site maintenance agreements), as well as equipment lifelong recurrent and uptodate training sessions. Through our locations based on all continents, we make sure there is always a CRYOSTAR helper near you.

Headquarters in France



★ Innovate

★ Take up challenges

★ Have a passion for excellence

★ Be generous in what we do

★ Respect and empower our people

★ Act with integrity

VISION VALUES



We are a leading innovative company, sustainably providing proactive customer service, supported by a strong culture encompassing skilled and engaged personnel.

Samuel ZOUAGHI
President



WORLDWIDE PRESENCE

CRYOSTAR company ensures a local presence for sales and service through its business centres and business partners network.



CRYOSTAR offers solutions to minimise downtime for its machines such as maintenance contracts, spare parts management and remote maintenance.



Product specialists will give you technical assistance by phone, and can launch an urgent intervention where necessary.

CRYOSTAR
CUSTOMER CONTACT

+33 (0)3 89 700 700

welisten@cryostar.com



CRYOSTAR Business Centers

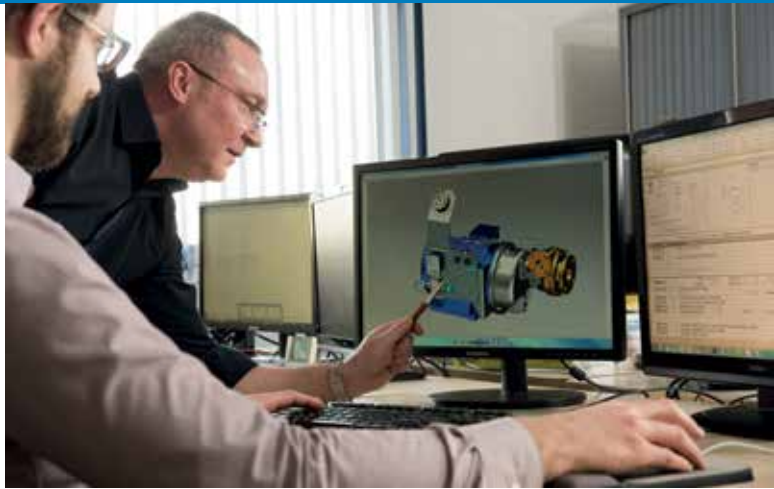


Certified service partner

*: service partners able to do service on road tanker could also modify the external piping to replace an existing type of pump with another one.

INNOVATION

At CRYOSTAR, innovation is at the heart of everything we do, not just for teams dedicated to Research & Development, but also for teams who work every day to design the equipment we sell. A community of Experts, Specialists and Referents also capitalizes on their own experience and the feedback received from customers to continue to innovate.



TESTING

Every product – be it fresh off the assembly line or recently refurbished – is subject to stringent testing on CRYOSTAR cryogenic test facility. The performance test with liquid nitrogen ensures guaranteed performance for CRYOSTAR customers. A copy of the performance test is systematically included in the instruction and operating manual delivered together with the equipment.

Test tank capacities	200 m ³ + 54 m ³ + 16m ²
Number of lines	10 + 2 (HP)
Flow rate	up to 20'000 l/min
Operating pressure	up to 700bar
Power	up to 2 MW



HEALTH, SAFETY, ENVIRONMENT

CRYOSTAR's HSE policy is based on a double certification: **OHSAS 18001** and **ISO 14001** (V2015).

This structuring approach made it possible to anchor continuous improvement in the company's culture. CRYOSTAR guarantees its machines' compliance with customer specifications and the regulations in the country where they are installed to enable customers to operate equipment with complete confidence. **Safety of both property and people is our priority.**

CRYOSTAR is committed to the social and societal area for its employees' well-being. Therefore, diversity, balance and well-being at work, are notions which CRYOSTAR views as being of vital importance through targeted actions at the heart of its human resources policy.



QUALITY

The Quality department features a large and highly qualified multi-disciplinary team, which is involved in implementing Quality strategy in areas of the utmost importance:

- ★ Metrology / Quality System
- ★ Supplier Quality
- ★ Operational Quality
- ★ Engineering Quality
- ★ Product Safety



TRAINING

CRYOSTAR Training Center offers training sessions adapted to all the equipment and solutions.



Theoretical courses can be combined with practical sessions, depending on the availability of the equipment on the customer's site or in CRYOSTAR's factory.

- ★ Get the best out of your equipments
- ★ Maintain the equipment safely & efficiently
- ★ Improve your awareness to increase the MTBF



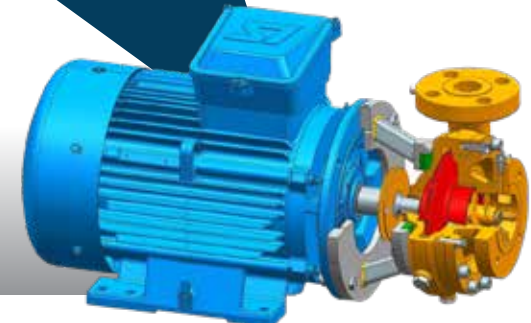
COMPREHENSIVE RANGE OF CENTRIFUGAL PUMPS

CRYOSTAR centrifugal pumps are suitable for any kind of installation and duty for cryogenic fluids such as liquid oxygen, nitrogen, argon, nitrous oxides, carbon dioxide, natural gas or ethylene.

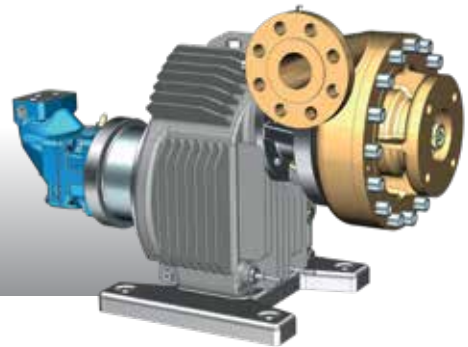
These pumps are available in different constructions and executions to comply with various applications:

- ★ Stationary transfer
- ★ Mobile tanker loading/unloading
- ★ LNG refueling
- ★ LNG bunkering

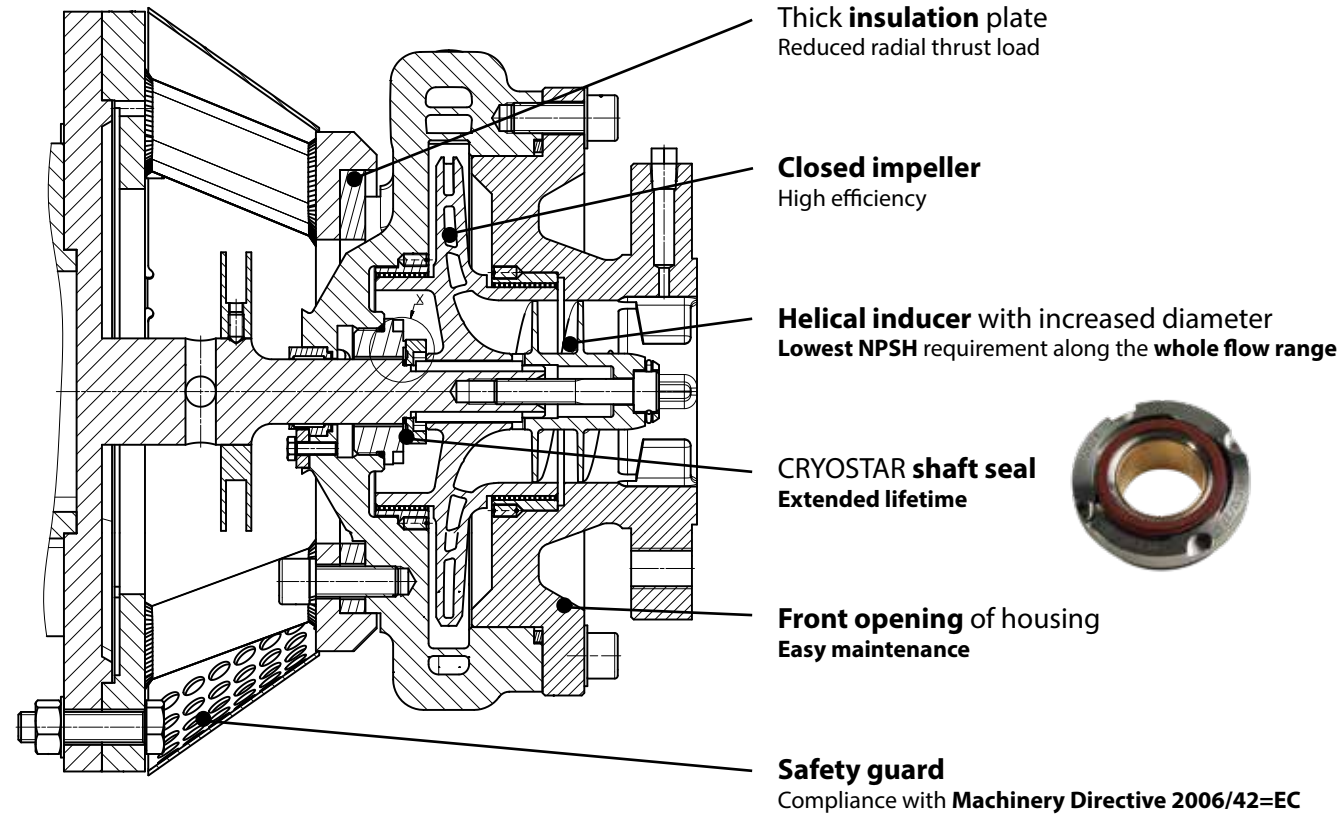
EXTERNAL WITH SHAFT SEAL



Electric driven

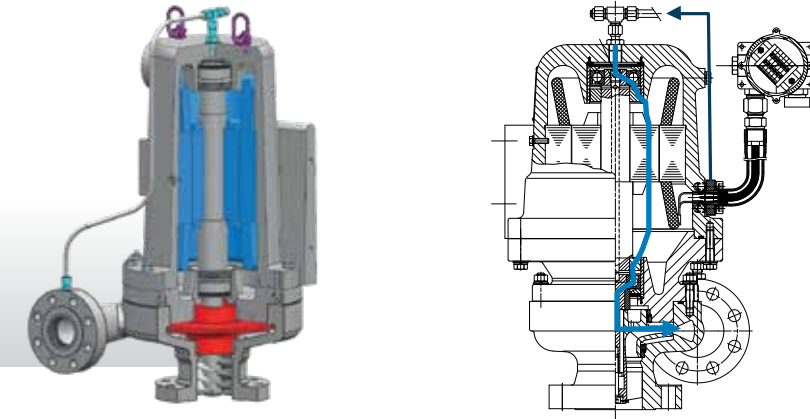


Hydraulic driven



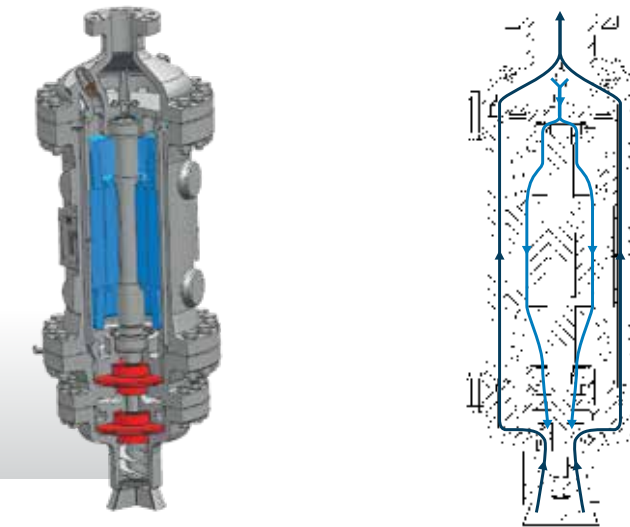
Flow rate Up to 130 m³/h
Differential head Up to 460m
Power Up to 90kW

EXTERNAL – SEALESS (NOT SUITABLE FOR O₂ OR N₂O)



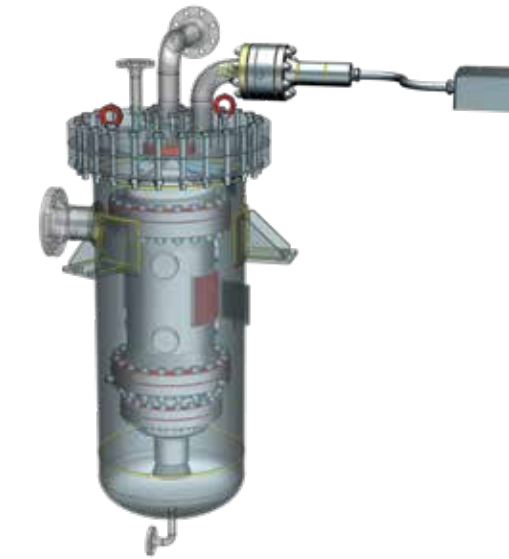
Flow rate Up to 90 m³/h
Differential head Up to 220m
Power Up to 30kW

SUBMERGED (NOT SUITABLE FOR O₂ OR N₂O)



Flow rate Up to 520 m³/h
Differential head Up to 500m
Power Up to 200kW

CRYOGENIC TRANSFER PUMPS FOR LIQUEFIED GASES



In sump



In tank

ELECTRIC DRIVEN PUMPS FOR MOBILE TANKER UNLOADING

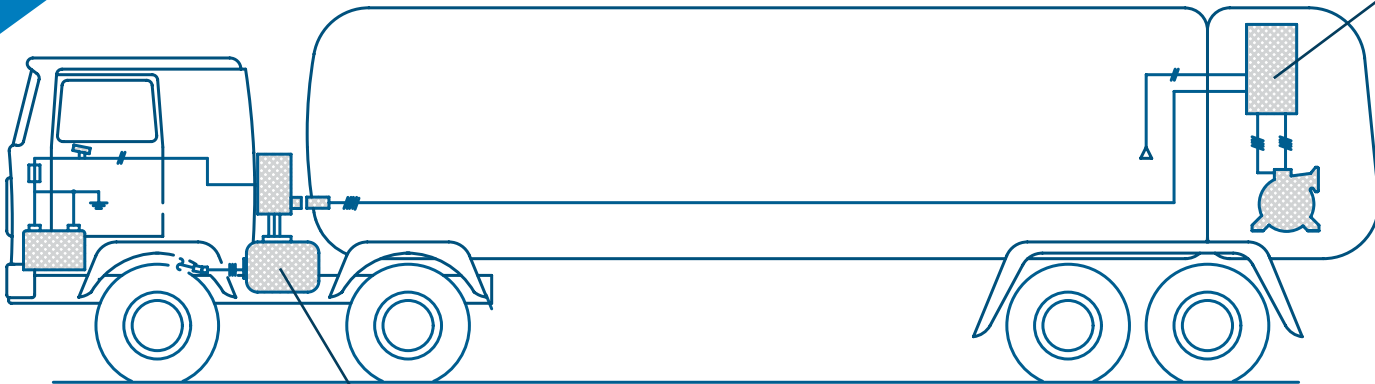
Electric driven pumps tailor-made for mobile applications:

- ★ Low weight to maximize the payload
- ★ Compact to fit into restricted space
- ★ Robust design for intensive use



The "Plug'in" system is powered through on site grid.

The "Mixtran" system consists of an additional alternator coupled to the truck Power Take Off (PTO) that is powering the pump in standalone mode.



FREQUENCY INVERTER
60-150 Hz



PLUG'IN
On site power supply
50-60 Hz



MIXTRAN
Alternator
driven by take off (PTO)
50-60 Hz

SAFETY

- ★ O2 compatible materials & lubricants
- ★ ATEX certified pumps for hazardous area
- ★ Dry running protection through motor loadloss or differential pressure monitoring



GBSD / CBSD
External pump
Variable speed

Duty	
Flow	<div><div></div><div></div><div></div></div>
Pressure	<div><div></div><div></div><div></div></div>
LO ₂ - LN ₂ O	<div><div></div></div>
LN ₂ - LAr - LCO ₂	<div><div></div></div>
LNG - LC ₂ H ₄	<div><div></div></div>



VS
Submerged motor
Variable speed

Duty	
Flow	<div><div></div><div></div><div></div></div>
Pressure	<div><div></div><div></div><div></div></div>
LO ₂ - LN ₂ O	<div><div></div></div>
LN ₂ - LAr - LCO ₂	<div><div></div></div>
LNG - LC ₂ H ₄	<div><div></div></div>



CO120
External pump
Variable speed

Duty	
Flow	<div><div></div><div></div><div></div></div>
Pressure	<div><div></div><div></div><div></div></div>
LO ₂ - LN ₂ O	<div><div></div></div>
LN ₂ - LAr - LCO ₂	<div><div></div></div>
LNG - LC ₂ H ₄	<div><div></div></div>



SUBTRAN 22
Submerged motor
Variable speed

Duty	
Flow	<div><div></div><div></div><div></div></div>
Pressure	<div><div></div><div></div><div></div></div>
LO ₂ - LN ₂ O	<div><div></div></div>
LN ₂ - LAr - LCO ₂	<div><div></div></div>
LNG - LC ₂ H ₄	<div><div></div></div>

Semi trailer / ISO tank



GBS / CBS
External pump
Fixed speed + gearbox

Duty	
Flow	<div><div></div><div></div><div></div></div>
Pressure	<div><div></div><div></div><div></div></div>
LO ₂ - LN ₂ O	<div><div></div></div>
LN ₂ - LAr - LCO ₂	<div><div></div></div>
LNG - LC ₂ H ₄	<div><div></div></div>



VS
Submerged motor
Fixed speed

Duty	
Flow	<div><div></div><div></div><div></div></div>
Pressure	<div><div></div><div></div><div></div></div>
LO ₂ - LN ₂ O	<div><div></div></div>
LN ₂ - LAr - LCO ₂	<div><div></div></div>
LNG - LC ₂ H ₄	<div><div></div></div>

Micro bulk

LEGEND

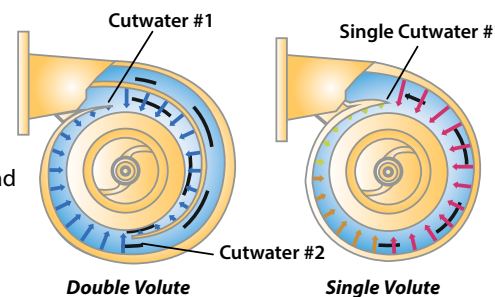
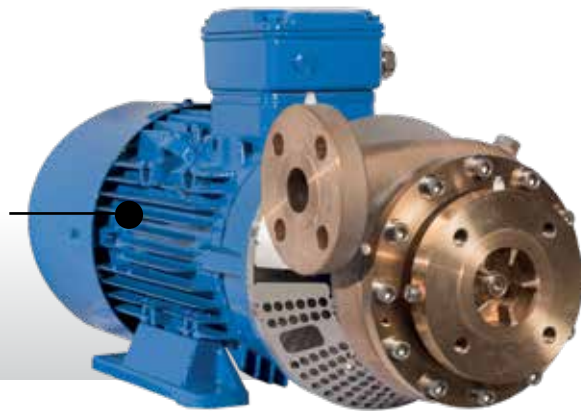
Flow	150 450 700 (l/min)
	40 120 185 (gpm)
Pressure	10 20 35 (bar)
	150 300 550 (psi)





GBSD

27kW (@125Hz)
40kW (@150Hz)



Double Volute
Reduced radial thrust load

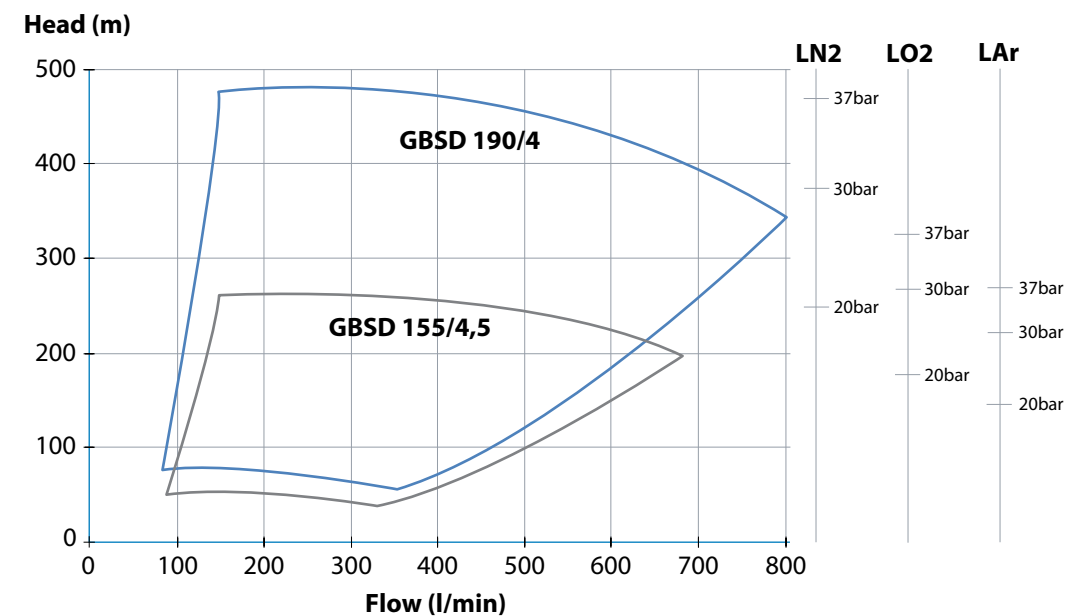
Single shaft configuration
Compact and robust (reduced length)
Higher margin against critical speed

Anti-vortex
Reduced turbulences

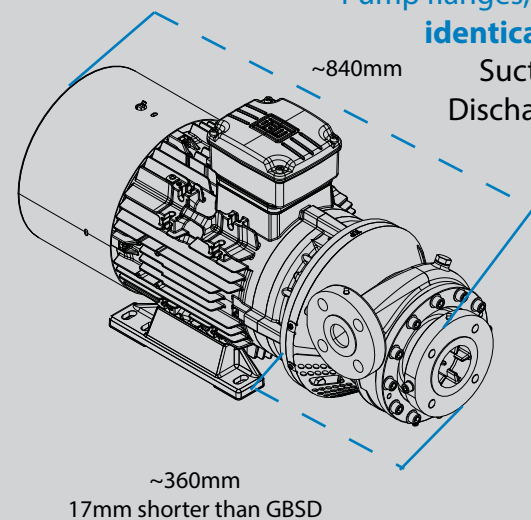
New impeller labyrinth design
Increased seal lubrication flow

Double slinger ring
Higher heat exchange surface

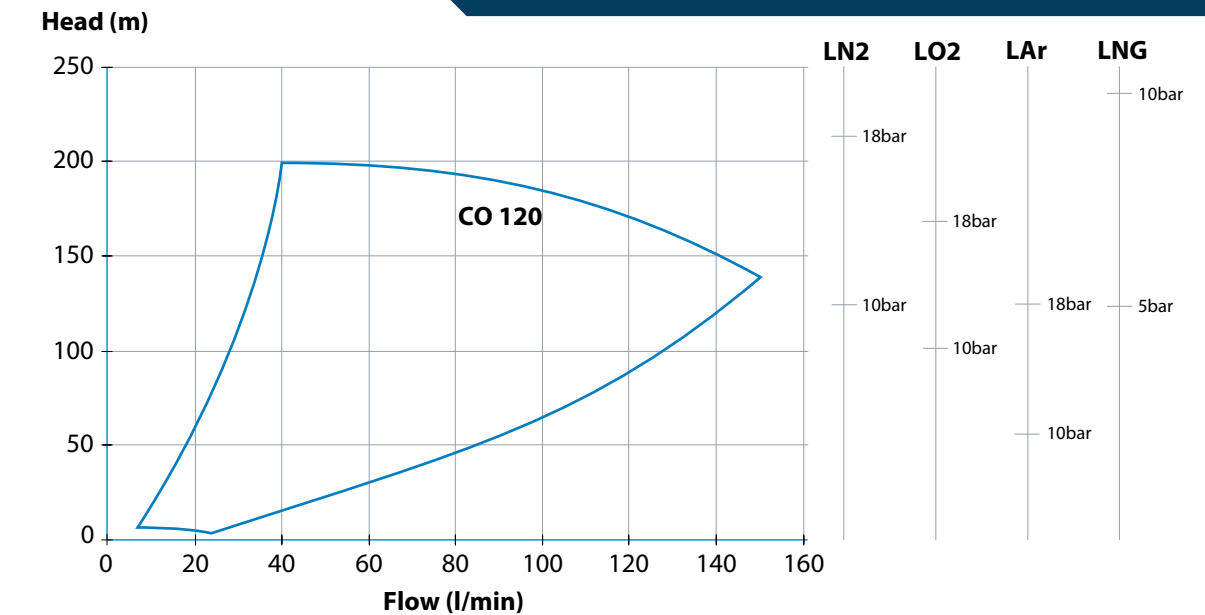
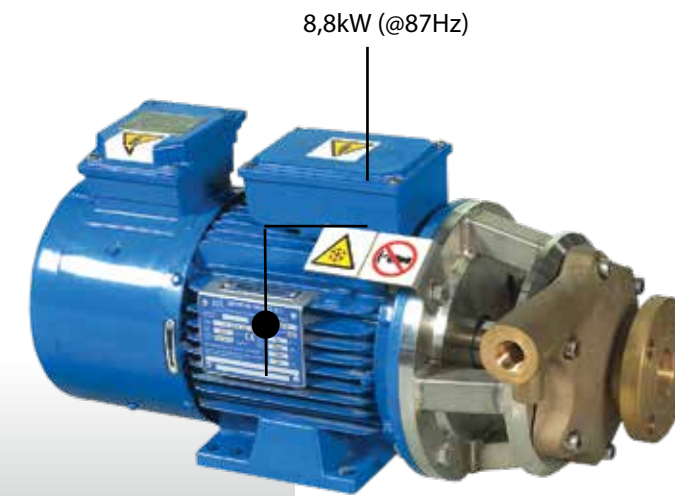
DIRECT COUPLED PUMPS – VARIABLE SPEED



Pump flanges, size and position
identical to GBSD 185/3
Suction: 2"1/2 150lbs
Discharge: 1"1/2 300lbs



CO (FOR MINIBULK)



FREQUENCY INVERTER & CONTROL BOX



Powered through electric network or alternator

IP 66 / Type 4x

Resistance to vibration up to 3G

Traceability with default codes record (up to 40)

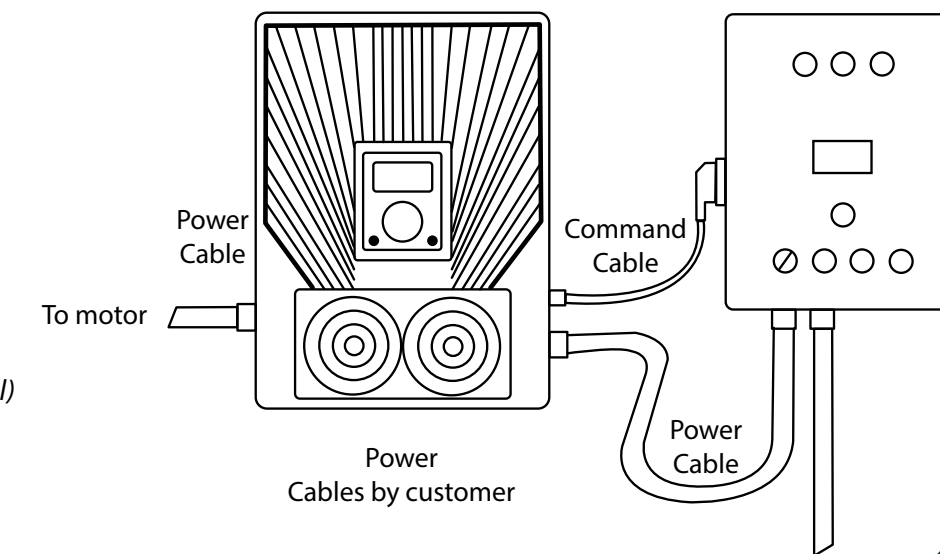
Instrumentation ready

Motor loadloss for **dry running** monitoring

PTC winding protection for **motor overloading** monitoring

PT100 temperature probe for cooling down monitoring (optional)

Relay and time lag for DPS monitoring (optional)

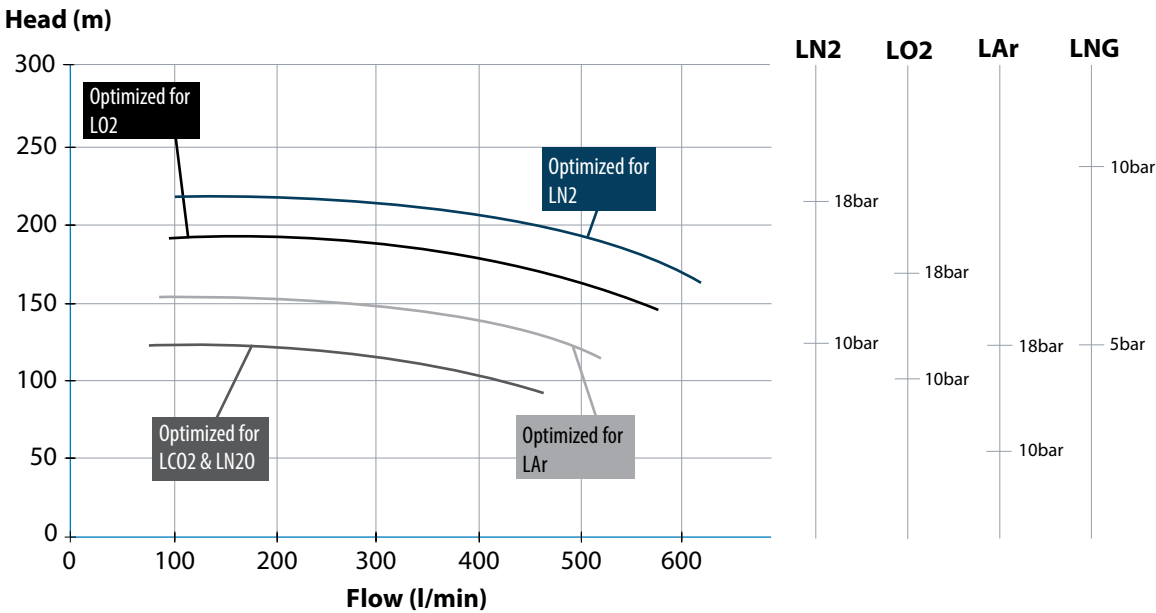




PUMPS WITH GEARBOX* - FIXED SPEED

GBS

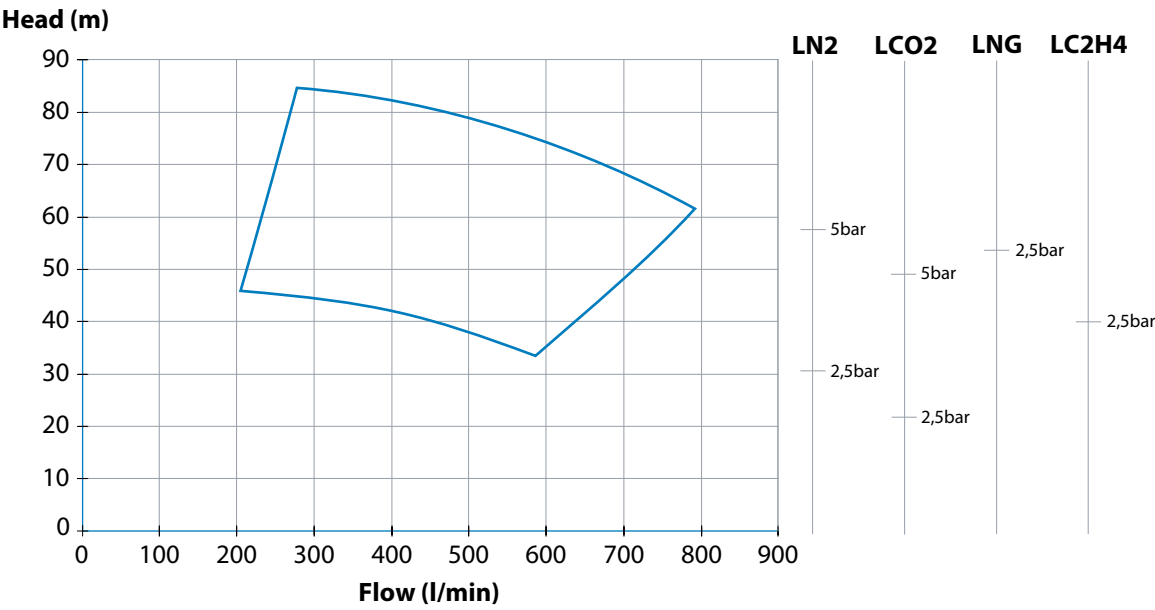
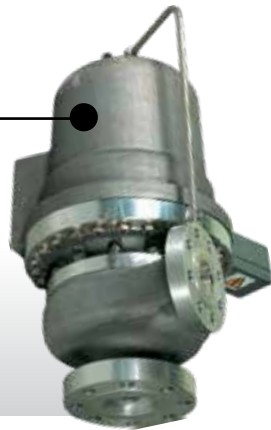
11 to 22kW



SEALESS PUMPS - FIXED OR VARIABLE SPEED

VS 3x2x7

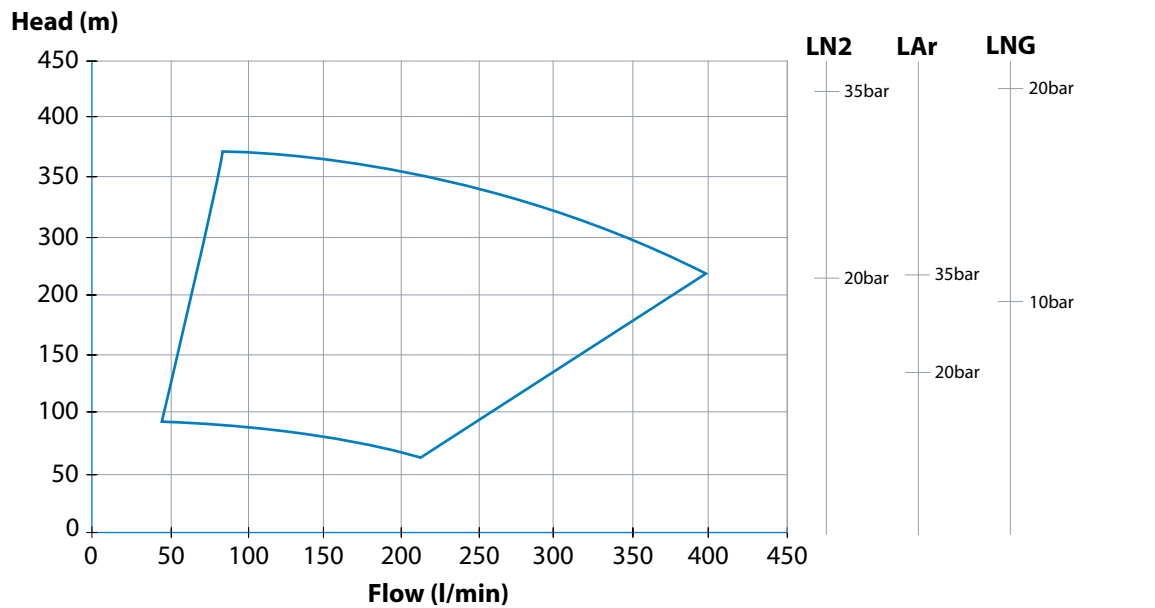
5,5 or 9kW



SUBMERGED PUMPS - VARIABLE SPEED

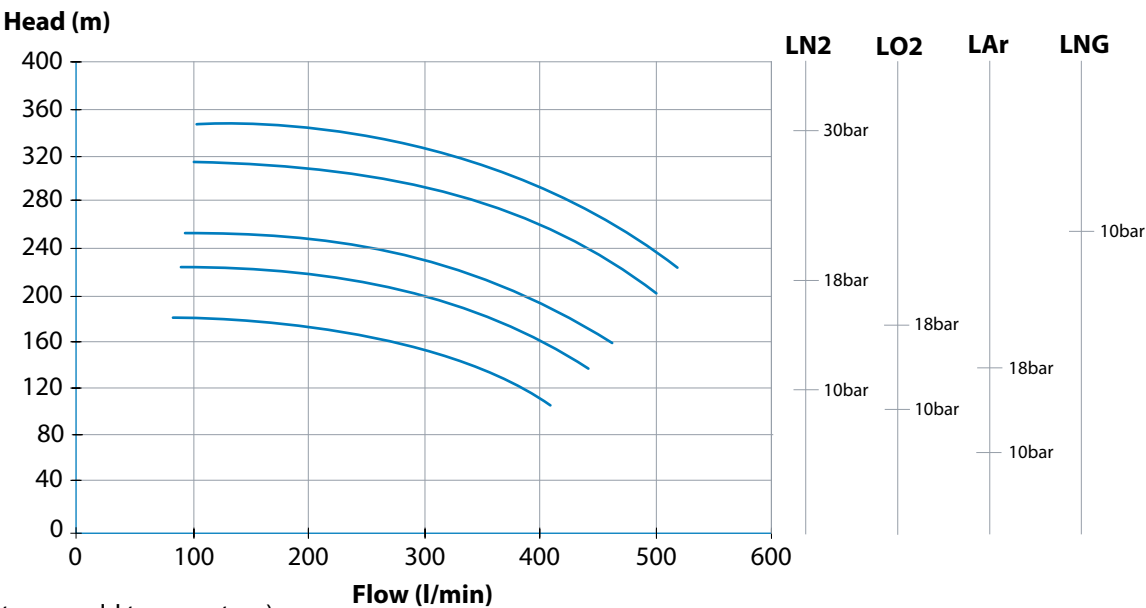
SUBTRAN

22kW



CBS

30 to 37kW



to be fitted into a sump
with top plate & cable lead through

*: gearbox with O2 compatible oil (optional: N2 purge ; oil heating cartridge for extreme cold temperature)

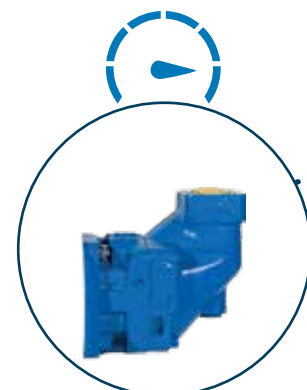
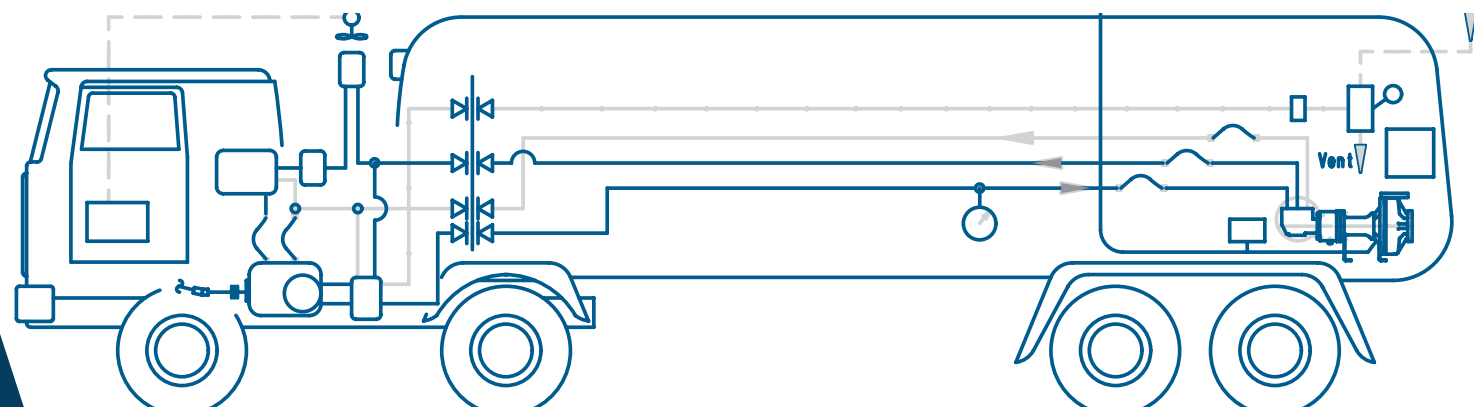


HYDRAULIC DRIVEN PUMPS FOR MOBILE TANKER UNLOADING

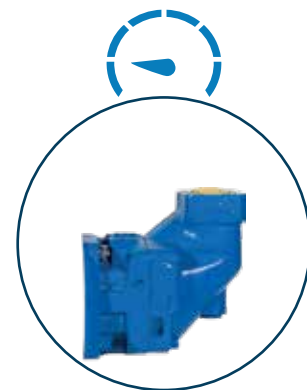
Hydraulic driven pumps tailor-made for mobile applications:

- ★ Low weight to maximize the payload
- ★ Compact to fit into restricted space
- ★ Robust design for intensive use

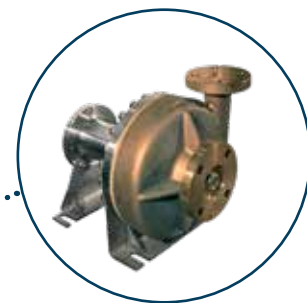
The "Hytran" system consists of a complete hydraulic package powered through truck Power Take Off (PTO) providing higher power than electric systems and offering a standalone operation.



HYTRAN-H
High speed hydraulic system
driven by power take off (PTO)
up to 8'000 rpm

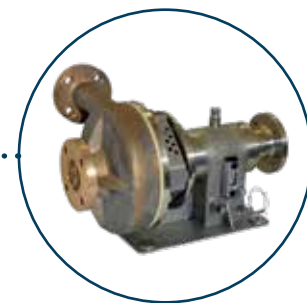


HYTRAN-L
Low speed hydraulic system
driven by power take off (PTO)
up to 2'500 rpm



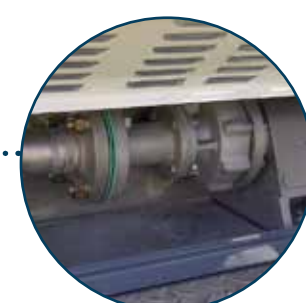
CSH
Grease lubricated
Variable speed

Duty	
Flow	<div><div></div><div></div><div></div></div>
Pressure	<div><div></div><div></div><div></div></div>
LO ₂ - LN ₂ O	<div><div></div></div>
LN ₂ - LAr - LCO ₂	<div><div></div></div>
LNG - LC ₂ H ₄	<div><div></div></div>



CSH OL
Oil lubricated
Variable speed

Duty	
Flow	<div><div></div><div></div><div></div></div>
Pressure	<div><div></div><div></div><div></div></div>
LO ₂ - LN ₂ O	<div><div></div></div>
LN ₂ - LAr - LCO ₂	<div><div></div></div>
LNG - LC ₂ H ₄	<div><div></div></div>



P4
Grease lubricated
Variable speed

Duty	
Flow	<div><div></div><div></div><div></div></div>
Pressure	<div><div></div><div></div><div></div></div>
LO ₂ - LN ₂ O	<div><div></div></div>
LN ₂ - LAr - LCO ₂	<div><div></div></div>
LNG - LC ₂ H ₄	<div><div></div></div>



CSH
Grease lubricated
Variable speed

Duty	
Flow	<div><div></div><div></div><div></div></div>
Pressure	<div><div></div><div></div><div></div></div>
LO ₂ - LN ₂ O	<div><div></div></div>
LN ₂ - LAr - LCO ₂	<div><div></div></div>
LNG - LC ₂ H ₄	<div><div></div></div>

Semi trailer / ISO tank

Micro bulk

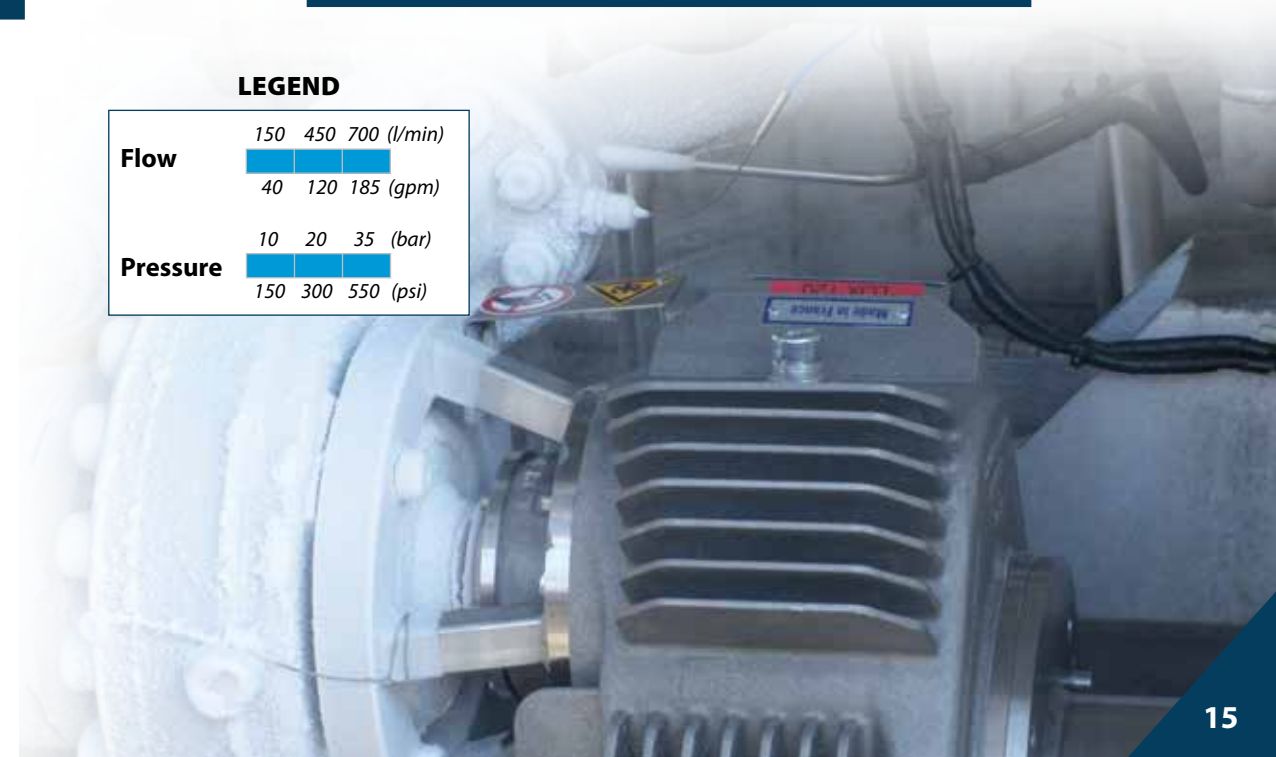


CBSH
Oil lubricated gearbox
Variable speed

Duty	
Flow	<div><div></div><div></div><div></div></div>
Pressure	<div><div></div><div></div><div></div></div>
LO ₂ - LN ₂ O	<div><div></div></div>
LN ₂ - LAr - LCO ₂	<div><div></div></div>
LNG - LC ₂ H ₄	<div><div></div></div>

LEGEND

Flow	<div><div></div><div></div><div></div></div>
Pressure	<div><div></div><div></div><div></div></div>

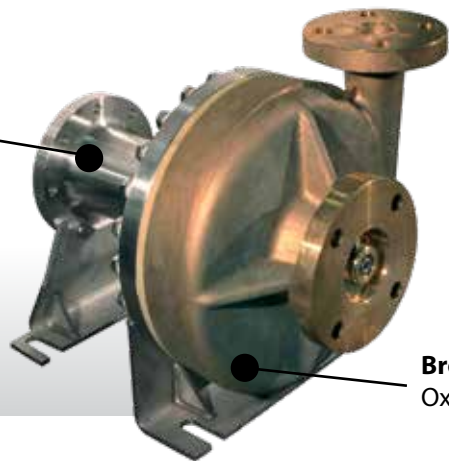




DIRECT COUPLED PUMPS – HIGH SPEED HYDRAULIC MOTOR

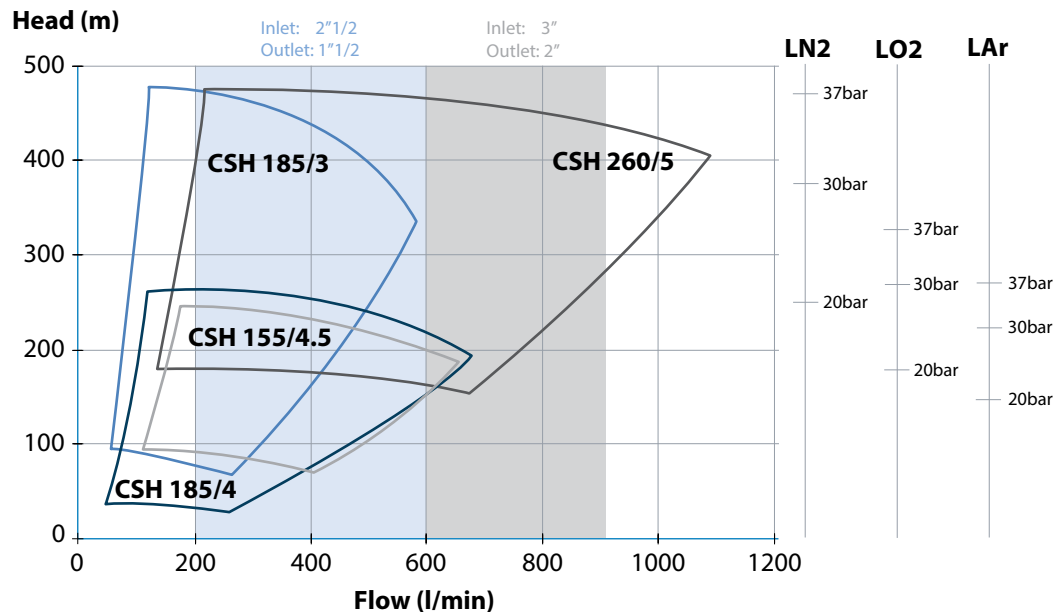
CSH

Grease lubricated bearing
Life lubricated



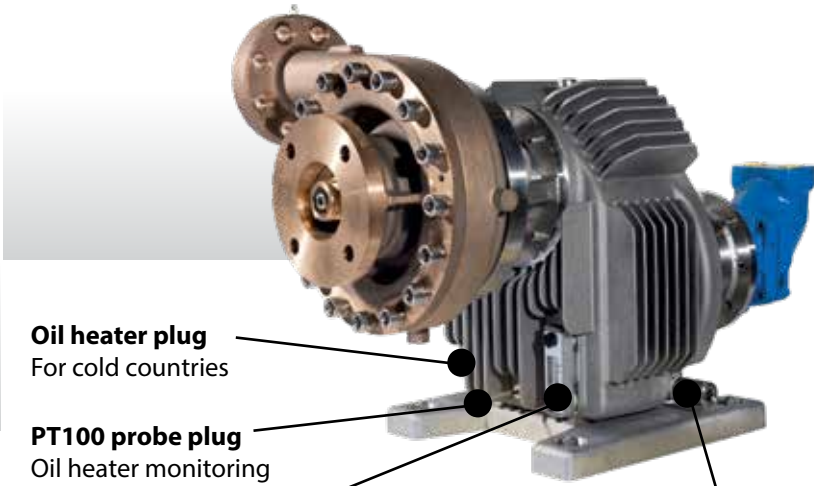
Bronze cold end
Oxygen safe

Elastic coupling
Absorbing torsion vibration



PUMPS WITH GEARBOX* – LOW SPEED HYDRAULIC MOTOR

CBSH



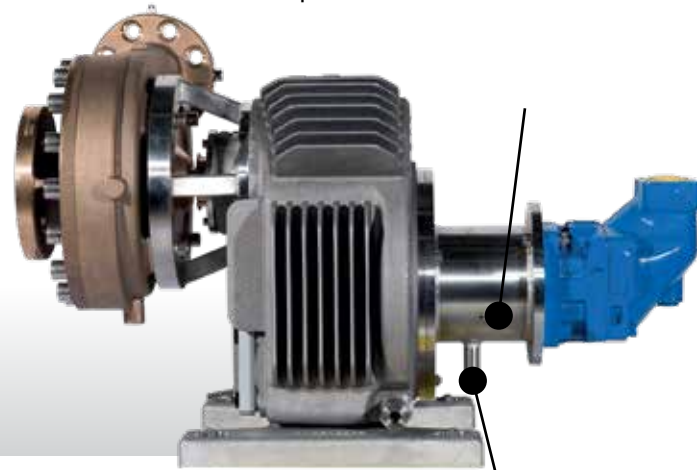
Oil heater plug
For cold countries

PT100 probe plug
Oil heater monitoring

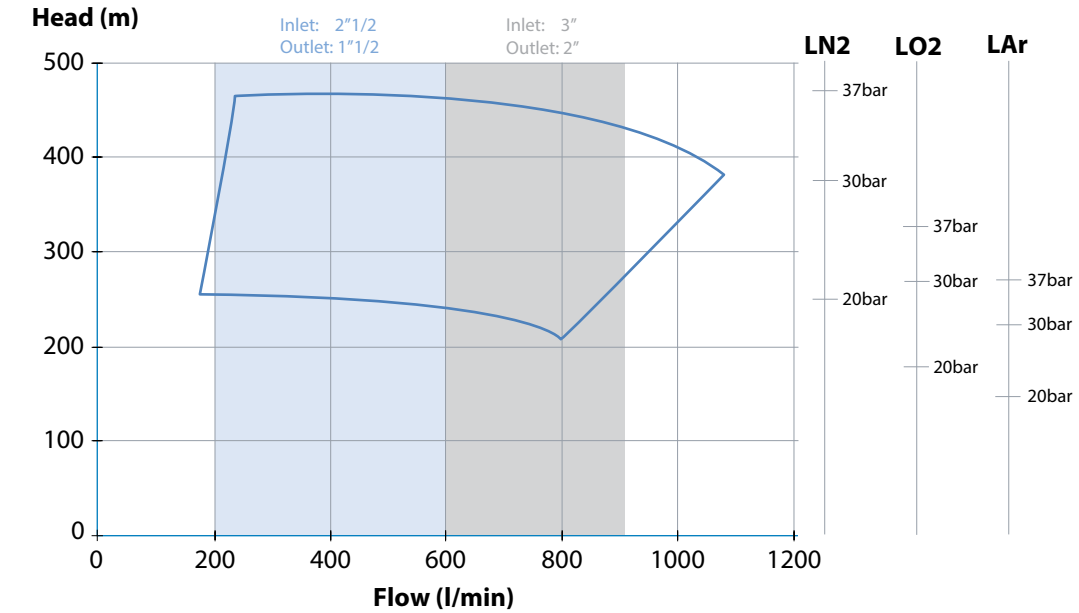
Oil level gauge
Oil quality check
Oil level indicator

Oil drain plug
Easy & clean oil drain

Elastic coupling
Available as an option



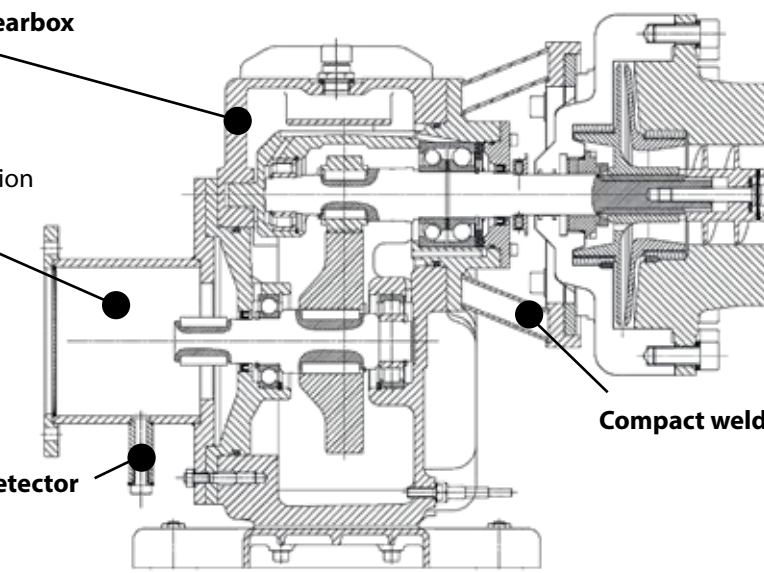
Connection for
Oil leak detector



Compact « G9 » gearbox
(up to 90kW)

Elastic coupling
Available as an option

Connection for oil leak detector
(optional)

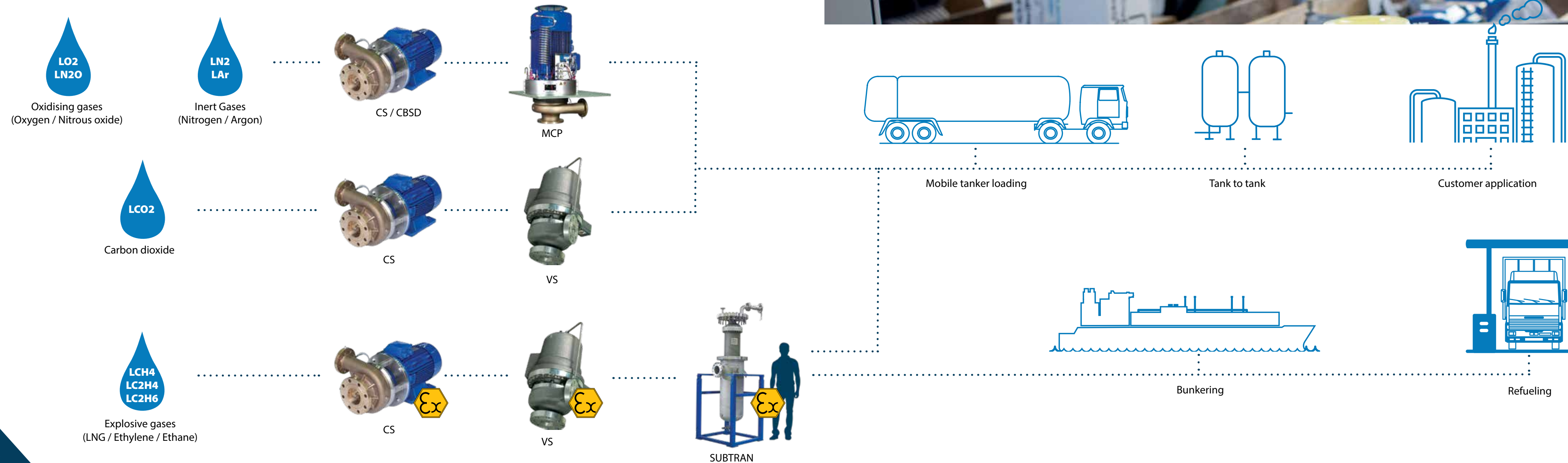


Compact welded supports

*: gearbox with O2 compatible oil (optional: N2 purge ; oil heating cartridge for extreme cold temperature)



LOADING & TRANSFER PUMPS



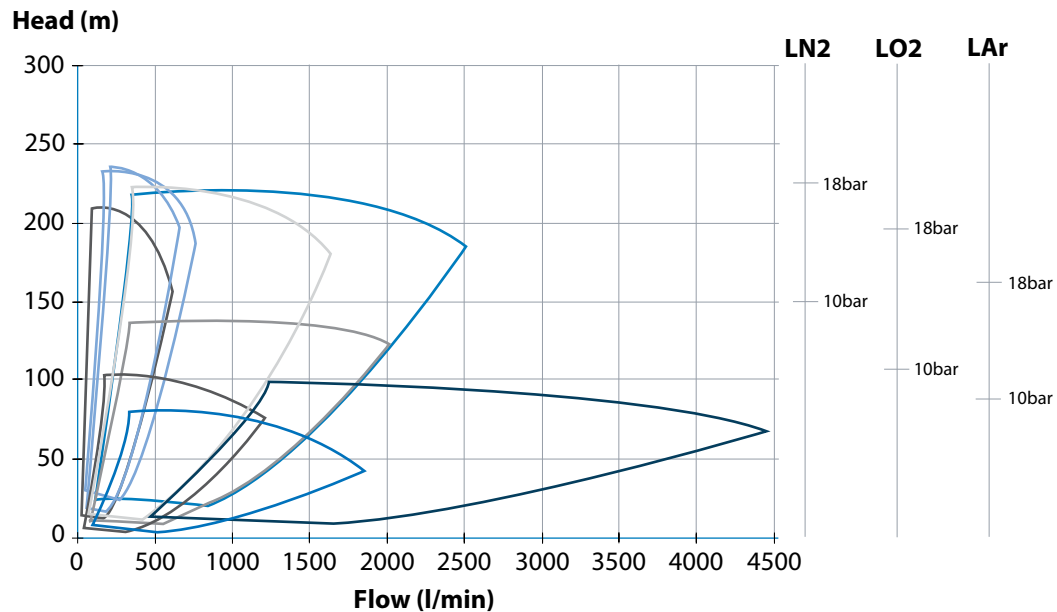


LOADING & TRANSFER PUMPS

CS & CBSD

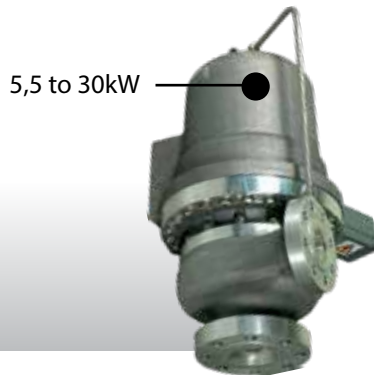


5,5 to 22kW

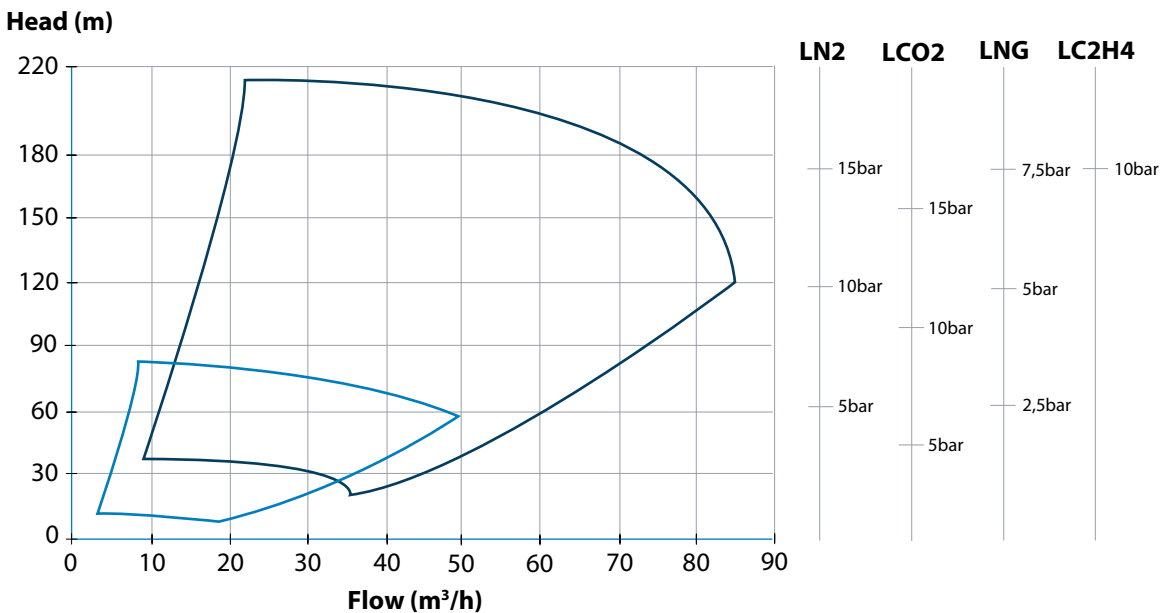


SEALESS PUMPS - FIXED OR VARIABLE SPEED

VS

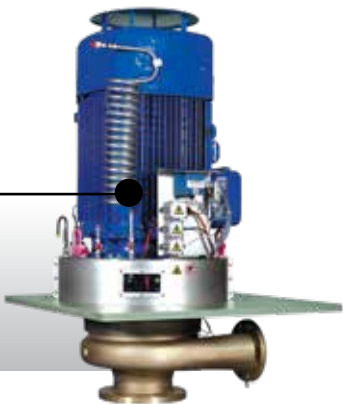


5,5 to 30kW

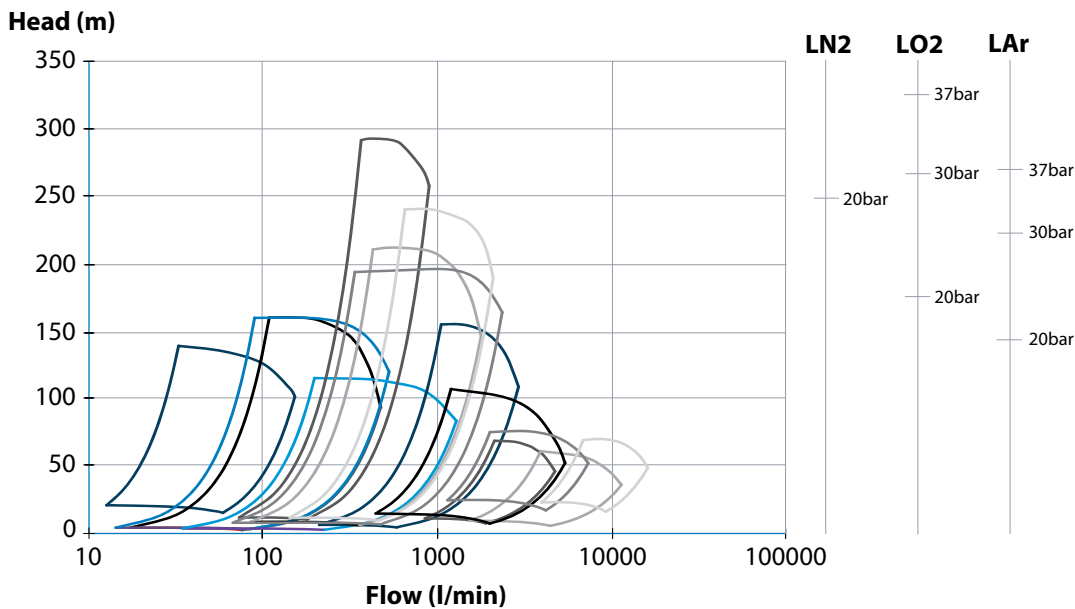


SUBMERGED PUMPS - VARIABLE SPEED

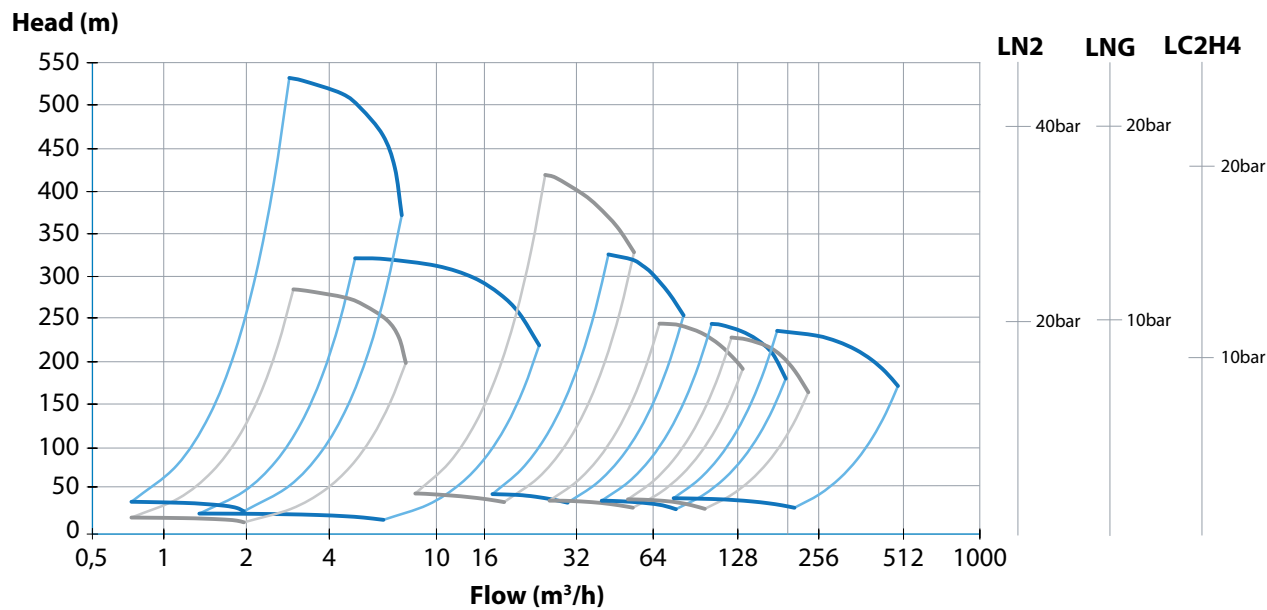
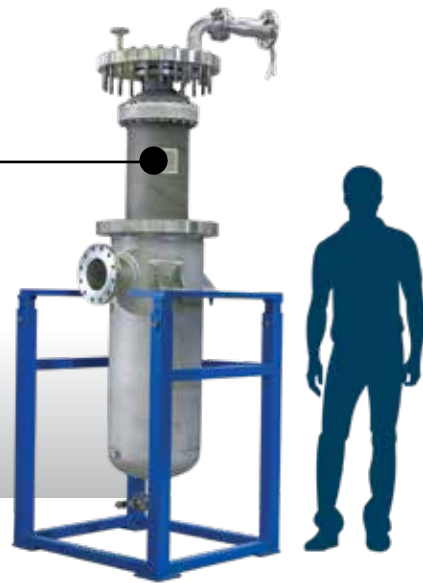
SUBTRAN



30 to 37kW



45 to 175kW





TURNKEY SKIDDED UNITS

CRYOSTAR offers standard or tailor made skidded units as a turnkey solution for any kind of process applications.

SAFE

- ★ Degreased for oxygen use
- ★ Safety valves
- ★ Compliance with pressure equipment directive
- ★ ATEX certified for installation in explosive area

MODULAR



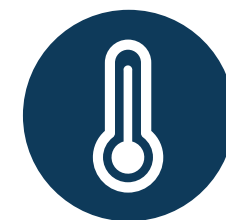
- ★ Manual or automatic execution
- ★ Movable
- ★ Wide range of options
- ★ Up to 3 pumps on one skid

TURNKEY



- ★ Pre-tested & pre-cabled => ready to be connected
- ★ Pre-setted control panel (when supplied)
- ★ Complete package for easy operation
- ★ Limited on site piping and welding work

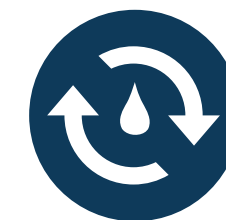
PROTECT YOUR PUMP



Cooling down monitoring



Soft start



Dry running protection



Leak detection



Single pump skid - Manual
Manual cryogenic valves
Ex « d » electric control panel
Dry Running Protection Panel



Dual pump skid – Full automatic
Manifold on suction, bypass and delivery
Pneumatic actuated cryogenic valves
Complete package suitable for cold climate



Submerged pump skid with sump
Vacuum insulated suction & discharge lines
Junction box
Dry Running Protection panel



Cold box pump skid for cold standby
Cold box with visit trap on base frame
Electric Control panel with Frequency
Inverter in remote location





BRAZIL

CHINA

FRANCE

INDIA

RUSSIA

SINGAPORE

UK

USA

For contact and address of the CRYOSTAR
locations worldwide, please go to
www.cryostar.com/locations



www.cryostar.com

