

Low-Temperature Reciprocating Pumps



KRYTEM



Krytem piston pumps for low-temperature fluids

Krytem low-temperature piston pumps have been designed especially to meet the physical demands expected during the discharge of low-boiling point liquids and have been used in numerous industrial gas-supply and bottling plants for nearly two decades.

Huge investment and maintenance costs are associated with the production of medium to high ultimate pressures when using industrial gases. The production of high operating pressures by gas compression requires an excessive amount of energy. In contrast to this, pressure production by displacing the low-temperature liquid phase of the gas to be delivered has significant technical and economic advantages. This, in any case, applies especially where the supply is taken from liquid-storage tanks for logistical reasons or for the purpose of guaranteeing the required gas purity. Using Krytem pumps helps to reduce the expense involved in setting up and operating industrial-gas delivery plants.

In addition to supplying reliable and mature products, Krytem also offers detailed advice on the shaping and planning of pumping plants as well as an extensive servicing and maintenance service.

Krytem pumps benefits:

- + High efficiency and low energy costs
- + High investment security due to a long service life and availability of spare parts for many years to come
- + Extensive guarantee for product and wearing parts
- + Low costs due to wear-and-tear: main cold end service intervals of 1,500 hrs (intermittent) or 4,000 hrs (continuous operation), main crank drive service interval ≥ 15,000 hrs.
- + Close-proximity-to-customer service:
 - Full project consultation
 - Staff training
 - Plant installation and commissioning
 - Servicing and maintenance service
 - Fast repairs and/or spare-part supplies



Krytem pump technology

Pump head

Low-boiling point liquids tend to form gas bubbles due to local evaporation caused by small differences in temperature and pressure. When conditions on the suction side are unfavourable, therefore, gas can enter the displacement chamber along with the liquid and reduce the degree of admission into the cylinder. This reduces also the effective discharge rate of the pump in comparison to geometric discharge volume. The collapse of the bubbles during the push stroke causes considerable noise and wear to the valves, piston and seals.

The Krytem pump head design minimises heat absorption and pressure loss of the medium flowing into the cylinder. Heated or evaporated medium is fed out of the pump head without entering the displacement chamber.

A vacuum mantle effectively isolates the cold pump components from the warmth of the environment. The cylinder is surrounded by the discharge medium to conduct away heat generated inside the pump by friction. The movement of the piston displaces the medium in the direction of discharge through the pressure valve and circulates the surrounding fluid at

the same time. Warmed medium can expand in the gas return feed and, in the case of a suitable tank installation, reach the tank under natural convection.

The piston rod seals consist of an active spring-loaded rod packing, which utilises the pressure of the gas-producing medium to increase its tightness. Heating the end of the packing on the side of the transmission makes it possible



for the pump to remain primed even for long periods of non-operation without leaks occurring due to ice forming on the piston rod or seals. The bright-chrome plated piston rod reduces friction and increases the working life of rod packing seal. An elastic gaiter made from PTFE protects the exposed end of the piston rod against contamination and moisture from the atmosphere.



Drives

Eccentric transmissions, F and DF

Krytem pumps for high pressures and/or high discharge rates are driven by 45 mm stroke Type F or 60 mm stroke Type DF eccentric drive units via a V-belt or toothed-belt transmission and an electric motor. Pumps with 2 or 3 pump heads connected to coupled Type DF drive units are available for large discharge volumes.



The standard V-belt transmission unit damps the hydraulic shock and pulsation pulses due to its elasticity thus protecting the electrical drive unit and - if applicable - the electronic control devices at the same time.

With high operating pressures large forces must be transmitted by the eccentric drive unit. Effective lubrication is necessary to achieve a reasonable service life. The spatial separation between the pump head and the oil-proof drive housing, due to an open space and the gaiter seal on the end of the rod packing, also facilitates the safe use of efficient standard hydrocarbon-based lubricants when delivering oxygen or other oxidising media.

A shear coupling (fracture ring) protects the transmission from unacceptable loading due to situations such as those caused by the maximum pressure being exceeded or the pump head being blocked mechanically by foreign objects or ice

When using F or DF Type drives, the whole pump unit, including the motor, transmission, belt safety cover, eccentric drive, pump head and connection accessories is mounted on a weather-resistant galvanised steel frame.



Short-stroke drive units H and LDE

Types H and LDE 30 mm stroke eccentric drive units with integrated reduction gears are available for smaller discharge volumes and/or lower operating pressures. H2 transmissions are available with stroke adjustment 0 to 30 mm.









Krytem high pressure pump plant; capacity 250 l/min liquid nitrogen against 200 bar



Twin head TLC-pump, explosion proof construction for LNG; capacity 3 to 25 l/min at 400 bar with frequency control



Pump control technology

The standard control unit includes an automatic starter for cold-running regulation via a temperature probe integrated in the pump head. This prevents the pump from starting above the permissible operating temperature. The pump-head temperature in the area of the packing is constantly monitored as a protection against the dispersion of cold resulting from unacceptable gaps and leaks. The medium discharge rate can be monitored by means of a flow sensor which must be installed on the pressure side.

In addition to this, an ultimate pressure monitor, operation of an automatic valve in the suction pipe and gas-return feed and, if necessary, the control of a electric evaporator can all be integrated in the control unit.



Krytem pump units can be integrated into higher

level automatic control circuits of large scale plants (e.g. automated process supplies of N₂ or O₂). However, part automation is usually the case via a Krytem control cabinet. Designs using dual speed motors (2 fixed discharge volumes) or stepless discharge-volume adjustment via speed control using a frequency converter are also available.

Pump accessories

- **Pulsation dampers** for all pressures (for reducing the feedback of pressure- and discharge-flow-pulsation to the pump unit)
- Flexible connection hoses for the gas return and feed line in noninsulated or vacuum insulated forms
- **High-pressure links** to take a flow meter and connect a pulsation damper
- Flow monitors for protection against dry running
- End-pressure switches for automated pressure-controlled pump operation
- Automatic valves in feed and gas return line
- · Safety, excess flow and high-pressure check valves



Krytem supply conditions

Guarantee

The guarantee period for the pump unit - excluding items subject to wear - is 24 months from the date of despatch, at the max. 6000 operating hours.

Service: Training – Servicing – Maintenance – Spares

For all pumps, Krytem offers a comprehensive Maintenance service. Beside servicing the pump head and overhaul based on individual orders, a service contract can be arranged for KRYTEM pumps requiring the pump head to be exchanged on site at regular intervals to be overhauled at our works. This will reduce down-times and maintenance to a minimum. Depending on load and application conditions the normal service interval is settled between 1,200 and 4,000 operating hours without further service requirements in the meantime.

Krytem offers comprehensive **personnel training** on pump maintenance and servicing for the customer's technical staff. In addition to this, the pump documentation contains detailed instructions on installation, commissioning, maintenance and servicing. All maintenance work can be carried out **without special tools**.

Layout and installation of low-temperature pumps

The operating and discharge problems of low-temperature piston-pump facilities can generally be avoided by thorough designing. For this reason, Krytem offers consultation with regard to specific **questions relating to the layout**. A **code of practice sheet** on the installation and layout of the pump plant can be obtained from our office.



TLC / TLA -High Pressure Pumps For Cylinder Filling









KRYTEM



Krytem-TLhigh pressure pumps

TL pumps are mainly used for high-pressure cylinder filling. A wide range of pump capacities is available corresponding to the usual filling pressures of 150, 200 and 300 bar and the most frequently required flow rates. Models for ultimate pressures up to 700 bar are available in the standard range. The non-insulated TLA models are intended for media such as CO_2 or N_2O with transfer temperatures above $-80^{\circ}C$; TLC pumps with fully effective vacuum insulation are used at low temperatures.



The inlet valve of TL pumps is located centrally in the direction of flow in front of the piston. The valve opens after the push stroke allowing the fluid standing behind it to flow into the cylinder. By carefully adjusting the inertial and reset forces on the pump components only slight pressure differences occur when the medium flows into the cylinder. Thus the danger of cavitation is reduced to a minimum.

The transfer medium, heated by the absorption of frictional energy inside the pump, is circulated back to the tank without hindrance via the gas return located at the back. The extremely robust and wear-resistant design of the pressure valves makes for low maintenance costs and high operational reliability.

In the standard pattern, TL pumps are equipped with 45 or 60 mm stroke Type F-01 and DF-01 belt-transmission eccentric-drive units and are mounted, with the accessories, ready for connection, on a galvanised



steel frame. The design, consisting of two or three headed pumps coupled to DF-02 or DF-03 drive units, makes it possible to pump very large flow volumes even in the face of high ultimate pressures. The 30 mm stroke Typ LDE integrated transmission units can be used for smaller flow rates and/or reduced ultimate pressures.

TLA pump head

TL pumps are available with speed controllers with or without explosion-protection construction for flammable or explosive discharge media.

Design features:

- Structural separation of the pump head from the drive prevents any unacceptable contact between lubricant and discharge medium.
- Shear-ring coupling between the pump head and the drive protects the pump against unacceptable mechanical loading.
- The piston-rod seals are heated (TLC-type only) thus making it possible to stop without having to relieve the pressure and heating the suction side.
- PTFE bellow acts as additional protection for the piston rods against contamination from the outside and moisture from the atmosphere.
- Temperature-controlled warning system integrated in the pump head to protect against the unacceptable dispersion of cold due to leaks.
- Supervision of flow by means of a flow monitor on the pressure side. *optional:*
- Pulsation damping on the pressure side

Complete pump control set including automatic start routine (automatic valve control on suction side), stuffing box temperature control and dry running protection.



Data sheet TLA / TLC

media		all cryogenic media			
temperature range	TLA: -80 .	TLA: -8010°C, TLC(M): -200°C50°C			
suction pressure		max. 25 bar			
NPSH _{req}	< 1 m	< 1 m @ 200 min ⁻¹ (N ₂ liquid, -196°C)			
crank drive gear type	LDE	F-01 DF-01			
transmission	integr. worm wheel	V-belt drive SPA / SPB			
stroke	30 mm	45 mm	60 mm		
max. piston force	20 kN	45 kN			
drive	squirrel cage	squirrel cage TEFC-motor, ex-protection available			
type	B5	B3			
pump head design	5	single acting piston pump			
pump head materials	1.4301, 1.4	1.4301, 1.4541, 1.4571, PTFE / 2.4360 (monel)			
bore	26 / 31 / 32 /	26 / 31 / 32 / 34 / 36 / 38 / 40 / 42 / 45 / 48 / 68 mm			
max. discharge pressure	60 300 bar	60 300 bar 60 700 bar			
capacity range	up to 5 l/min	5 20 l/min	7 27 l/min		





KRYTEM GmbH • Kryotechnischer Service Hans-Böckler-Str. 1 • D-47877 Willich Tel.: +49/ 2154/ 9407-20 • Fax: +49/ 2154/ 9407-28 erstellt am / durch 12-11-12 bearbeitet am / durch 12-11-12 Dateiname krytem cryogenic recip pumps



SA-Process Pumps



KRYTEM



Krytem SA / VSA -

Low- And Medium-Pressure Pumps

Krytem SA pumps are used for discharge pressures up to 100 bar and volumetric flows up to approx. 90 l/min. Typical applications are the transfer of cryogenic media in the face of higher discharge pressures and process supply in the chemical industry and process technology. The vacuum-insulated version (VSA) is designed for media at temperatures below -80°C.

SA pumps require an extremely low NPSH setting to ensure reliable delivery. The suction valve of SA pumps is integrated in the piston head. The inertial forces of the valve body and slip stream of the fluid are utilised with particular effect as follows: the suction valve is forced open during the return stroke of the piston, thus opening the way for the fluid standing behind it to flow into the cylinder. This design damps the cavitation effects and gives the cylinder a high degree of admission even under unfavourable conditions on the suction side. Both low level and horizontal tanks with low feeds can usually be completely emptied by Krytem SA pumps.



Different drive units are available according to application, flow rate and pressure range. Apart from the 45 and 60 mm stroke F-01 and DF-01 belt-transmission eccentric drive units, 30 mm stroke H and LDE (type H adjustable from 0 to 30 mm) eccentric-drive units with integrated transmission gear and directly flanged-on electric motor are used with these pumps.

SA pumps for larger discharge rates with a belt-transmission eccentric drive are mounted together with accessories on a galvanised steel frame



ready for connection. All SA pumps are available with speed controllers with or without explosion-protection construction.



VSA-pump with stroke adjustment eccentric drive type K

Design features:

- The suction valve integrated in the piston head means low cavitation even during unfavourable operating conditions.
- Structural separation of the pump head from the drive prevents any unacceptable contact between lubricant and discharge medium.
- Shear-ring coupling between the pump head and the drive protects the pump against unacceptable mechanical loading.
- The piston-rod seals are heated (vacuum-insulated types only) thus making it possible to stop without having to relieve the pressure and heating the suction side.
- PTFE bellow as additional protection for the piston rod against contamination from the outside and moisture from the atmosphere.
- Temperature-controlled warning system integrated in the pump head to protect against the unacceptable dispersion of cold due to leaks.
- Supervision of flow by means of a flow monitor on the pressure side.

optional:

- Pulsation damping on the pressure side
- Complete pump control set including automatic start routine (automatic valve control on suction side), stuffing box temperature control and dry running protection.



Data sheet SA / VSA



media	all cryogenic liquids			
operation temperature	VSA: -200°C80°C, SA: -80°C 0°C			
design pressure suction side	max. 25 bar			
NPSH _{requ}	0,5 m at 200 min ⁻¹ (N ₂ liquid, -196°C)			
gear type	H2	LDE	F-01	DF-01
transmission	integr. wheel gear		belt transmission SPA / SPB	
stroke	0 30 mm	30 mm	45 mm	60 mm
max. piston rod force	2,5 kN	20 kN	40 kN	
drive	TEFC-motor, if required explosion proof			
type	E	35	B3	
pump design	single stage "self-sucking" reciprocating piston pump			
pump head materials	1.4301, 1.4541, 1.4571, PTFE			
bore diam.	30 / 35 / 40 / 45 / 50 / 60 mm		50 / 60 / 70 / 80 / 90 mm	
max. design pressure	7 35 bar	60 100 bar	60 100 bar	
capacity (at 300 min ⁻¹)	up to 20 l/min	20 70 l/min	30 9	95 l/min

KRYTEM GmbH • Kryotechnischer Service Hans-Böckler-Str. 1 • D-47877 Willich Tel.: +49/ 2154/ 9407-20 • Fax: +49/ 2154/ 9407-28



SAH-High Pressure Process Pumps



KRYTEM



Krytem-SAH / VSAH -Low-temperature high-pressure pumps for process technology

Pressure production from the liquid phase has generally proved itself to be particularly economic for industrial gases in high-pressure processes. In most cases, the energy costs are significantly lower than the cost of compressing the gas phase. Furthermore reciprocating pumps facilitate high pressure application of high purity gases.

SAH pumps are used to provide reliable supplies of medium-to-high quantities of fluid for these types of processes even when the inlet conditions or tank connections are unfavourable. As is the case for SA series pumps, the suction valve is integrated in the piston head. The suction valve opens, helped by its own inertia, during the return stroke of the piston, and allows the fluid standing behind to flow freely into the cylinder. A high degree of admission is achieved for the cylinder even when conditions on the suction side are unfavourable. As a rule, low tanks and horizontal storage containers with low feeds can be emptied completely using Krytem SAH pumps.





SAH pumps are used for discharge pressures up to 500 bar and volumetric flows up to approx. 30 l/min in, for example, process and plastics technology. Their use in pressure gas bottling is also possible. The vacuum-insulated model (VSAH) is designed for media at temperatures below -80° C.

The 60 mm stroke DF-01 belt-transmission eccentric-drive unit is used as the drive. The whole pump unit including the pump head, eccentric drive, belt drive, electric motor, belt safety cover and accessories is mounted on a galvanised steel frame ready for connection.

SAH pumps are available with speed controllers with or without explosion-protection construction.

Design features:

- The suction valve integrated in the piston head provides for low cavitation even during unfavourable operating conditions.
- Easily demountable suction valve
- Pressure valve can be dismantled without disassembling the pump head
- Structural separation of the pump head from the drive prevents any unacceptable contact between lubricant and discharge medium
- Shear-ring coupling between the pump head and the drive protects the pump against unacceptable mechanical loading
- The piston-rod seals are heated (vacuum-insulated types only) thus making it possible to stop without having to relieve the pressure and heating the suction side.
- PTFE bellow acts as additional protection for the piston rods against contamination from the outside and moisture from the atmosphere.
- Temperature-controlled warning system integrated in the pump head to protect against the unacceptable dispersion of cold due to leaks.

optional:

- Supervision of flow by means of a flow monitor on the pressure side.
- Pulsation damping on the pressure side
- Complete pump control set including automatic start routine (automatic valve control on suction side), stuffing box temperature control and dry running protection.



Data sheet SAH / VSAH

media	cryogenic liquids			
temperature range	SAH	SAH: -8010°C, VSAH: -200°C50°C		
suction pressure		max. 2	25 bar	
NPSH _{req}	≤	0,5 m @ 200 min	¹ (N ₂ liquid, -196°	C)
pump head design	piston	pump with piston-	-integrated suctio	n valve
pump head materials	1.4301, 1.4541, 1.4571, PTFE			
bore	32 / 36 / 38 / 40 / 42 / 45 / 50 mm			
crank drive gear type	н	LDE	F-01	DF-01 / -02
transmission	integrated	worm wheel	V-bel	t drive
stroke	30 mm		45 mm	60 mm
max. piston force	2 kN	20 kN	40	kN
drive	squirrel cage TEFC-motor, ex-protection available			
motor design	B5 / B14		B3	
capacity range	1 10 l/min		5 30 l/min	
max. pressure increase	up to 40 bar	up to 330 bar	up to 5	550 bar





KRYTEM GmbH • Kryotechnischer Service Hans-Böckler-Str. 1 • D-47877 Willich Tel.: +49/ 2154/ 9407-20 • Fax: +49/ 2154/ 9407-28 erstell am / durch 12-11-12 bearbeitet am / durch 12-11-12 Dateiname krytem cryogenic recip pumps



VHV-Reciprocating Pumps With Pre-load Stage







Krytem-VHV -Pumps for Cryogenic Media Under Difficult Supply Conditions

Sometimes, for structural reasons, it is not possible to make a suitable tank connection for the operation of single-acting low-temperature pumps (such as the TL, SA or HK types). This especially affects the available *net positive suction head* (NPSH) value at the level of the piston in the pump when connected to horizontal tanks or tanks near to the ground and when the liquids which are delivered are already boiling due to heat absorption from the outside. The VHV series of pumps with forced push-action cylinder filling was developed with these types of installations in mind.



The medium which enters from below circulates in the pump head due to natural convection and the movement of the piston. During the return stroke of the piston rod, a larger volume of fluid is enclosed by the rear suction piston. As the piston moves towards bottom dead centre, this volume of liquid is propelled, gas-free, into the pressure cylinder through the suction valve integrated in the piston rod. An integrated relief valve prevents over-compression in the pressure cylinder while it is being filled. The medium is discharged via a pressure valve fitted centrally to the front.



The frictional heat being developed by the piston oscillation is withdrawn from the pump head by natural convection via the gas return feed fitted to the top.

The robust, non-wearing pressure-valve construction leads to low maintenance costs and high operating reliability.

VHV pumps can be used both for gas bottling and as process pumps. Ultimate pressures of up to 400 bar are reached in the standard version. VHV pumps are intended for use at temperatures down to -196°C with effective vacuum insulation. Power transmission is achieved via a type DF-01, 60 mm stroke, belt-transmission eccentric drive. VHV pumps are supplied with all accessories mounted on a galvanised steel frame. The twin or three-head pump designs with coupled DF-02 or DF-03 drives can deliver large discharge volumes even at high ultimate pressures.

VHV pumps are available with speed controllers with or without explosion-protection construction for flammable or explosive discharge media.

Design features:

- Pressure cylinder filled by forced action from a suction piston, thus also facilitating the delivery of boiling liquid or delivery when the NPSH ≈ 0.
- Structural separation of the pump head from the drive prevents any unacceptable contact between lubricant and discharge medium.
- Shear-ring coupling between the pump head and the drive protects the pump against unacceptable mechanical loading.
- The piston-rod seals are heated (vacuum-insulated types only) thus making it possible to stop without having to relieve the pressure and heating the suction side.
- PTFE bellow acts as additional protection for the piston rods against contamination from the outside and moisture from the atmosphere.
- Temperature-controlled warning system integrated in the pump head to protect against the unacceptable dispersion of cold due to leaks.
- Supervision of flow by means of a flow monitor on the pressure side.
- Pulsation damping on the pressure side optional:
- Complete pump control set including automatic start routine (automatic valve control on suction side), stuffing box temperature control and dry running protection.



Data sheet VHV

media		all cryogenic media		
temperature range		-200°C50°C		
suction pressure		max.	25 bar	
NPSH _{req}	S	0,1 m @ 200 min	⁻¹ (N ₂ liquid, -196°C)	
pump head design	double ad	double acting pump with piston-integrated suction valve		
pump head materials		1.4301, 1.4541, 1.4571, PTFE		
bore	:	26 / 31 / 32 / 36 / 38 / 42 / 45 / 50 mm		
crank drive gear type	Н	LDE	DF-01 / DF-02	
transmission	integrated	worm wheel	V-belt drive	
stroke	30	30 mm 60 mm		
max. piston force	2,5 kN	20 kN	40 kN	
drive	squirre	squirrel cage TEFC-motor, ex-protection available		
motor design	B5	B5 / B14 B3		
capacity range	up to	5 l/min	5 20 l/min	
max. pressure increase	0 to 25 bar	up to 250 bar	up to 500 bar	









HLEP

High Performance Cryogenic Reciprocating Pumps



KRYTEM



HLEP - designed for high pressure marine LNG injection systems

Tightened Emission Control Area regulations and increasing HFO / MGA prices force yards and ship holders to convert marine vessel propulsion systems for environmentally friendly low sulphur / low carbon fuels like LNG and methanol.

The new HLEP high performance pump series was developed specifically for this application in co-operation with the leading manufacturer high pressure pump **Wepuko Pahnke**. The innovative system delivers up to 400 l/min of cryogenic fuels (approx. 11 t/h ref. to LNG) for high pressure injection into dual fuel two-stroke diesel engines. It is also suitable for high capacity on- or off-shore nitrogen supplies.

The HLEP cold end is based on the long-term approved Krytem SAH pump design with a piston-integrated suction valve which supports a low NPSH requirement. The slow crank speed provides for low wear, consequentially long service life and low maintenance demand of the pump heads. A new service-friendly seal design facilitates the quick replacement of the piston rod seal packing at the end of its service life.

In order to allow for the wide flow capacity range - which is mandatory for marine propulsion systems - the Wepuko Pahnke high performance crank drive system is designed for a wide turn-down ratio. Depending on the particular load conditions a minimum crank speed of 20 rpm is possible.





HLEP Key Design Features:

- highly efficient pressurisation of cryogenic liquefied gases: low weight, low space, low vibration and up to 70 per cent lower energy consumption compared to compressors
- designed for explosion-hazardous environments according to marine / off-shore standards and ATEX no belt drives used
- standard design with electric motor hydraulic drive available per request
- suitable for on-deck or lower deck installation at ambient temp. -40°C to +40°C
- heavy duty, torsion-resistant skid-mounted machine design including drive lubrication system
- 40,000 hours main service interval
- hermetic separation of process fluids (no contact to lubricants)
- slow speed crank shaft for reduced wear, low noise and low NPSH requirement
- improved turn-down ratio for full range dual fuel ship engine operation
- advanced pulsation damping for adaptation to application requirements and specific interface conditions
- long-lasting, easy to maintain cold end seal-system with advanced protection and monitoring features for extended service life
- standard design up to 400 bar / 400 l/min flow rate, increased pressure / capacity available per request

optional:

• complete pump control including steady speed regulation.



Data Sheet HLEP



HLEP selection schematic:

basic data: 300 l/min (18 m³/h), 330 bar

- ➢ required motor power: approx. 250 kW
- suitable type: HLEP 88.125, stroke speed approx. 165 min⁻¹

pump design	skid-mounted triplex single stage reciprocating pump	
media	cryogenic fuels and liquefied gases	
perm. temp. process / ambient	-196 to -20°C / -40 to +50°C	
inlet pressure	1 to 15 bar g	
discharge pressure up to 400 bar (higher pressure available per request		
capacity	up to 400 l/min (24 m³/h)	
NPSP req.	50 to 500 mbar	
recip. gear type horizontal triplex crank drive		
transmission	wheel transmission gear, oil-lubricated	
stroke length 90 / 125 mm		
bore diameter	40 to 95 mm	
stroke speed	20 to 200 min ⁻¹ (min speed depending on type and load)	
drive	TEFC motor, explosion-proof, 75 to 315 kW	
materials	316, 321, galvanized steel, grey cast iron	
standards	ECMD, ATEX, PED, API, DNV, ABS, BV, LR	

KRYTEM GmbH • Kryotechnische Systeme Hans-Böckler-Str. 1 • D-47877 Willich Tel.: +49/ 2154/ 9407-0 • Fax: +49/ 2154/ 9407-29

erstellt am / durch
15-04-09
bearbeitet am / durch
15-04-09
Dateiname
hlep-pumps a4 r2.doc

	Pump Data Sheet Layout Questionnaire	Project ID	
Customer / Project			
(address, phone / fax)			
responsible technician			
project ID customer			
project description: deployment, site, environmental conditions			
Medium / Operation		igh purity	
capacity	^{min.} l/min ^{max.} l/min 🗌 d	liscontinuous	
capacity control	□ 2-step (on / off) □ 3 step (step 1 / step 2 / off) □ continuous (with frequency converter)		
max. discharge pressure	bar(g)		
test pressure	bar(g)		
Tank (manufacturer / type)			
design	vertical horizontal		
	 □ with thermosiphon		
operation pressure	bar(g)		
max. admissible pressure	bar(g)		
minimal height of inner vesse	above pump foundation	m	
vertical distance between tan	k and pump (min. feed line length)	m	
mean tank filling interval	days		
Electrical supply	VHz		
Miscellaneous / Specialities	explosion protection zone		
Accessories	 control cabinet high pressure connection with flow guard pulsation damper flexible connection hoses (feed / gas return line) high pressure non return valve automatic feed and gas return shut-off control (automated end pressure switch high pressure safety valve 	valves)	
т,	Iow pressure safety valve KRYTEM GmbH • Kryotechnischer Service Hans-Böckler-Str. 1 • D-47877 Willich	erstell am / durch 12-11-12 bearbeitet am / durch 12-11-12 Dateiname	