HOFER TECHNICAL PROPOSAL
of compressor for tube-trailers filling with hydrogen
for customer's option

Model: MKZ 600-10/400-25
Capacity: 500 Nm^3/h

PROPOSAL No. 18AN-1218

Item	Qty.	Description
1	1	**HOFER COMPRESSOR UNIT** **886-00-00** consisting of:
1.1	1	**HOFER DIAPHRAGM COMPRESSOR**

design	horizontal, DUPLEX-design
number of stages:	2
model:	MKZ 600-10 / 400-25
gas type	H_2
hydraulic medium	mineral oil, type ISO VG 68

technical data:

suction capacity: (-0 / +5% according to DIN), (VN) is based on dry gas at 1,013 bar abs and 0 °C	500	m^3/h (V_N)
at suction pressure:	20	bar abs, for design of capacity
suction pressure range:		
suction temperature:	30	°C, for design capacity
suction range temperature:	0 - 35	°C
discharge pressure:	200	bar (g)
speed:	420	min^{-1}
power demand: (at max. Hydraulic pressure)	51	kW
required motor power:	62	kW, incl. all losses for V-belt drive etc.
cooling water consumption:	6,9	m^3/h at min. 2 bar(g) supply pressure
inlet/outlet temperature:	20/25	°C
ambient air temperature:	-8 to +37	°C

Electrical motor:
TEFC design, protection IP 55,
with 3-phase current motor (SIEMENS-make),
for direct starting, as per DIN EN 50347
P = 68 kW, 400 V, 50 Hz
explosion-proof design in EEx-de IIC T4
without electric switching devices,
(if eletcrical control board is not in HOFER's scope of supply)

Power transmission (V-belt drive):
- flywheel, motor pulley, antistatic V-belts,

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USt-IdNr. DE191298912
Amtsgericht Duisburg, HRB-Nr. 15518
Geschäftsführer
Alexander Peters, Jörg Strizek

Item	Qty.	Description

slide rails (flywheel is dismantled during transport, reassembly at site is not included)
- belt guard non-sparking (aluminium)

Crank drive:
- crosshead and crosshead-run
- oil circuit with forced feed lubrication by an electrical motor driven pump
- oil overflow valve
- crankshaft driven compensation pump
- oil cooler
- oil pressure sustain valve
- oil filter, cartridge type
- strainer on lube oil pump suction side
- pressure transmitter for indicating low oil pressure
- local pressure gauge for oil pressure indication
- vibration transmitter

Diaphragm heads:
- with diaphragm failure indicator for immediate shut-down after diaphragm break, incl. pressure switch design of pressure switch in explosion-proof EEx d II C T6 (WIKA-make)
- with suction and discharge compressor valves, plate type, spring loaded.
- water cooling on hydraulic side,
- with oil overflow valve and check valve at oil inlet for adjustment of a constant oil pressure

Material of gas contacted parts:
stainless steel

Diaphragm heads, material of construction:
cover (gas plate): 1.4541 / 1.4571 / 1.4418 / 1.4401 (stainless steel)
flange (hydraulic side): 1.0570 / GGG 40.3 / 1.7220 / 1.7225 (carbon steel)
triple diaphragms: 1.4310 (stainless steel)
compressor valves: 1.4021 / 1.4310
sealing ring at gas side: stainless steel / brass
O-rings at hydraulic side: NBR

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Item	Qty.	Description

tightness:
on gas side according to a leakage rate of
approx. 1 x 10^{-4} mbar l/sec

Gas coolers:
after cooler and interstage cooler(s)
according to HOFER's standard
designed as bundle cooler
with bursting disc on shell side
material for gas tube: quality no. 1.4571 / 1.4580 (stainless steel)
material for shell (water-side): carbon steel

cooler design according to Pressure Equipment Directive
(PED) 2014/68/EU

1 SKID
with instruments, fittings and automatic
valves for automatic operation,
instruments, valves, filters etc. as per
HOFER PI-diagram 2FF0824-01
comprising:

gas suction line
- gas filter (cartridge type), < 5 µm, filter element in stainless steel, with differential pressure gauge for local indication
- pneumatically operated valve
- purging line with isolating valve
- pressure switch for suction pressure supervision, and set point PSL for start-up release and set point PSLL for compressor trip
- pressure transmitter for alarm at suction low gas pressure, and shutdown at too low gas pressure
- pressure gauge with isolating valve
- safety relief valve

gas interstage line (each)
- pressure transmitter for alarm at high gas pressure, and shutdown at too high gas pressure
- temperature gauge
- pressure gauge with isolating valve
- safety relief valve

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Item	Qty.	Description

- temperature transmitter for alarm and shut down at high gas temperatures upstream cooler
- temperature transmitter downstream cooler
- pressure transmitter for alarm at high gas pressure, and shutdown at too high gas pressure

gas discharge line:
- temperature gauge
- temperature transmitter for alarm and shut down at high gas temperatures upstream cooler
- temperature transmitter downstream cooler
- safety relief valve
- pressure transmitter for alarm at high gas pressure, and shutdown at too high gas pressure
- pressure with isolating valve
- pneumatically operated valve (gas outlet)
- non-return valve (gas outlet)
- pneumatically operated valve (exhaust)
- non-return valve (exhaust)
- common exhaust header
- pneumatically operated valve (bypass)

complete cooling water system:
- flow switch for alarm and shut down at lack of cooling water
- flow indicator in common line
- drains, vents (if necessary)
- safety valve without type test approval design pressure 1 MPa(g)
- adjustable choke valves for consumers (if necessary)
- with shutoff valves in common inlet line and outlet line

complete instrument air system:
for all pneumatically operated valves on compressor skid
- pressure transmitter for alarm and shutdown at low instrument air pressure
- pressure reducer (service unit)
- solenoid valve, explosion-proof in EEx-d II CT4 design

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Alexander Peters, Jörg Strizek

Model: MKZ 600-10/400-25
Capacity: 500 Nm^3/h

Item	Qty.	Description

electric instruments in EEx-proof design
(EEx-d and/or EEx-i intrinsically safe)
gas pipes in stainless steel

Compressor skid:
packaged with all accessories on a common skid
including:
- base frame in profile steel, welded, with foundation bolts, with levelling screws and lifting eyes, and with earthing screws
- compressor, drive and accessories, instrument panel / gauge board
- terminal boxes, incl. cabling of instruments
- local service panel in EEx-e design

incl.: cabling, laying of cables in channels
box material: aluminium resp. GRP

TERMINAL BOXES / LOCAL SERVICE PANEL:
in explosion-proof design,
protection: IP 65
sparking group: T4
mounted on compressor skid

1 terminal box for the EEx-e-proof measuring and regulating instruments

1 terminal box for the EEx-i intrinsically safe measuring and regulating instruments

local service panel with:
- START Button
- STOP Button
- emergency STOP Button (key-lockable)
- main motor running lamp

incl. cabling, laying cables in channels
boxes material: aluminium resp. GRP

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Geschäftsführer
Alexander Peters, Jörg Strizek

Model: MKZ 600-10/400-25
Capacity: 500 Nm^3/h

Item	Qty.	Description

SPECIAL TOOLS
- 1 hand pump for filling the diaphragm head(s) with oil, incl.: connection line
- 1 diaphragm failure indicator test device
- 1 set of torque wrench and its accessories
- 1 tool for taking triple diaphragms from each head when maintenance

PAINTING:
HOFER standard for indoor installation
according to procedure AAW035
colour RAL 5007 (blue)

PRESERVATION:
HOFER standard for max. 3 months storage

QUALITY PLAN PERFORMANCE TEST:
All tests according to HOFER's Quality Plan:
- test run and performance test in HOFER's workshop according to HOFER standard
- tightness test
- inspection after test run

1.2 **1** **ELECTRIC CONTROL BOARD**
with PLC-system for automatic control,
for installation outside the hazardous area,
control complete wired and ready for operation,
without assembly at site

1.3 **1** **ELECTRICAL OIL HEATING**
to warm up hydraulic oil at ambient temperatures of -20 °C up to +5 °C and a cooling water inlet temperature of above +6 °C,
consisting of:
1 multi-rod cartridge with installed thermostat and safety temperature limiter (ELMESS-make),

for voltage 380 V, 50 Hz
explosion-proof design in EEx de IIC T4

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Item	Qty.	Description

capacity: approx. 4,5 kW

1 level switch for oil level control
protection: EEx-i intrinsically safe
via protection relay
(HOFER's scope of supply)
contact function:
1 opener at falling level
1 precision pointer thermometer -30 °C up to +70 °C
in crankcase with
2 inductive contacts, EEx-i intrinsically safe circuit (1. and 2.
contact close at increasing indication),
without contact protection relay

completely mounted and tubed, however, without electric cabling

1.4 **1** **OIL PRESSURE DIAGNOSTIC SYSTEM**
(measurement of peak values)
for 2-stage diaphragm compressor,
consisting of:
2 LCD-indications
protection: EEx-i intrinsically safe
2 high-dynamic pressure transmitters
protection: EEx-i intrinsically safe
- 1 power part as >black box<
with inlets/outlets for transmitter/
LCD-indication as well as
potential-free contacts for pre-alarm/shut-down,
completely mounted
(oil pressure gauge in standard design will be deleted)

Main dimensions:
length x width x height:
approx. 3900 x 2200 x 2100 mm
weight: approx. 6100 kg
main dimensions:

Sound pressure level:
approx. 85 dB(A) in 1 m distance

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Model: MKZ 600-10/400-25
Capacity: 500 Nm^3/h

Item	Qty.	Description

Design:
based on EC-directive for machinery
2006/42/EC,
used standards: DIN EN 1012, part 1, part 3,
DIN EN ISO 12100:2011
DIN EN 60204, part 1,
DIN EN 60079-0

with manufacturer's certificate resp. CE-mark and attestation of conformity

Test run:
with helium

1.5 **1** **set of SPARE PARTS**
for commissioning (start-up)
as per separate attached

1.6 **1** **set of SPARE PARTS**
for 2-year operation under 8000 hours per year
as per separate attached

1.7 **1** **Seaworthy Packing**

1.8 **1** **Transport CIF China Main Seaport**
delivery time: approx. 9 months

1.9 **1** **Diem rate**
site service for start-up
for 1 HOFER specialist
daily allowance, lodging costs and
local travelling costs are included,
costs for flights are excluded

we expect 3 working days + 3 travelling days
for one mechanic and one electrician

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Model: MKZ 600-10/400-25
Capacity: 500 Nm^3/h

Item	Qty.	Description
1.10	**1**	**Set of OPERATION and MAINTENANCE MANUALS** according to HOFER standard in English language. 2 hard copies plus 1 CD in electronic copy

Modifications reserved without notice in case of technical improvement.

Packing:
Included

Warranty:
12 months from date of start-up, however, not later than
15 months from date of FOB European North Seaport resp. acceptance test in HOFER's workshop, whichever comes first.
This guarantee does not cover parts which are subject to normal wear.

Time of Delivery:
7.5 months European North Seaport, depend on concluded order time and payments

Yours faithfully

A N D R E A S H O F E R
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Amtsgericht Duisburg, HRB-Nr. 15518
Geschäftsführer
Alexander Peters, Jörg Strizek

HOFER TECHNICAL PROPOSAL
of compressor for tube-trailers filling with hydrogen
for customer's option

Model: MKZ 680-10/450-25
Capacity: 700 Nm^3/h

PROPOSAL No. 18AN-1218

Item	Qty.	Description
2	1	**HOFER COMPRESSOR UNIT** **886-00-00** consisting of:
2.1	1	**HOFER DIAPHRAGM COMPRESSOR**

design	horizontal, DUPLEX-design
number of stages:	2
model:	MKZ 680-10 / 450-25
gas type	H_2
hydraulic medium	mineral oil, type ISO VG 68

technical data:

suction capacity: (-0 / +5% according to DIN), (VN) is based on dry gas at 1,013 bar abs and 0 °C	700	m^3/h (V_N)
at suction pressure: suction pressure range:	20	bar abs, for design of capacity
suction temperature:	30	°C, for design capacity
suction range temperature:	0 - 35	°C
discharge pressure:	200	bar (g)
speed:	420	min^{-1}
power demand: (at max. Hydraulic pressure)	72	kW
required motor power:	90	kW, incl. all losses for V-belt drive etc.
cooling water consumption:	9,9	m^3/h at min. 2 bar(g) supply pressure
inlet/outlet temperature:	20/25	°C
ambient air temperature:	-8 to +37	°C

Electrical motor:
TEFC design, protection IP 55,
with 3-phase current motor (SIEMENS-make),
for direct starting, as per DIN EN 50347
P = 100 kW, 380 V, 50 Hz
explosion-proof design in EEx-de IIC T4
without electric switching devices,
(if eletcrical control board is not in HOFER's scope of supply)

Power transmission (V-belt drive):
- flywheel, motor pulley, antistatic V-belts,

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Item	Qty.	Description

slide rails (flywheel is dismantled during transport, reassembly at site is not included)
- belt guard non-sparking (aluminium)

Crank drive:
- crosshead and crosshead-run
- oil circuit with forced feed lubrication by an electrical motor driven pump
- oil overflow valve
- crankshaft driven compensation pump
- oil cooler
- oil pressure sustain valve
- oil filter, cartridge type
- strainer on lube oil pump suction side
- pressure transmitter for indicating low oil pressure
- local pressure gauge for oil pressure indication
- vibration transmitter

Diaphragm heads:
- with diaphragm failure indicator for immediate shut-down after diaphragm break, incl. pressure switch design of pressure switch in explosion-proof EEx d II C T6 (WIKA-make)
- with suction and discharge compressor valves, plate type, spring loaded.
- water cooling on hydraulic side,
- with oil overflow valve and check valve at oil inlet for adjustment of a constant oil pressure

Material of gas contacted parts:
stainless steel

Diaphragm heads, material of construction:
cover (gas plate): 1.4541 / 1.4571 / 1.4418 / 1.4401 (stainless steel)
flange (hydraulic side): 1.0570 / GGG 40.3 / 1.7220 / 1.7225 (carbon steel)
triple diaphragms: 1.4310 (stainless steel)
compressor valves: 1.4021 / 1.4310
sealing ring at gas side: stainless steel / brass
O-rings at hydraulic side: NBR

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Item	Qty.	Description

tightness:
on gas side according to a leakage rate of
approx. 1 x 10^{-4} mbar l/sec

Gas coolers:
after cooler and interstage cooler(s)
according to HOFER's standard
designed as bundle cooler
with bursting disc on shell side
material for gas tube: quality no. 1.4571 / 1.4580 (stainless steel)
material for shell (water-side): carbon steel

cooler design according to Pressure Equipment Directive
(PED) 2014/68/EU

1 SKID
with instruments, fittings and automatic
valves for automatic operation,
instruments, valves, filters etc. as per
HOFER PI-diagram 2FF0824-01
comprising:

gas suction line
- gas filter (cartridge type), 5 µm, filter element in stainless steel, with differential pressure gauge for local indication
- pneumatically operated valve
- purging line with isolating valve
- differential pressure gauge for local indicator for gas filter
- pressure switch for suction pressure supervision, and set point PSL for start-up release and set point PSLL for compressor trip
- pressure transmitter for alarm at suction low gas pressure, and shutdown at too low gas pressure
- pressure gauge with isolating valve
- safety relief valve

gas interstage line (each)
- pressure transmitter for alarm at high gas pressure, and shutdown at too high gas pressure
- temperature gauge
- pressure gauge with isolating valve

Item	Qty.	Description

- safety relief valve
- temperature transmitter for alarm and shut down at high gas temperatures upstream cooler
- temperature transmitter downstream cooler
- pressure transmitter for alarm at high gas pressure, and shutdown at too high gas pressure

gas discharge line:
- temperature gauge
- temperature transmitter for alarm and shut down at high gas temperatures upstream cooler
- temperature transmitter downstream cooler
- safety relief valve
- pressure transmitter for alarm at high gas pressure, and shutdown at too high gas pressure
- pressure with isolating valve
- pneumatically operated valve (gas outlet)
- non-return valve (gas outlet)
- pneumatically operated valve (exhaust)
- non-return valve (exhaust)
- common exhaust header
- pneumatically operated valve (bypass)

complete cooling water system:
- flow switch for alarm and shut down at lack of cooling water
- flow indicator in common line
- drains, vents (if necessary)
- safety valve without type test approval design pressure 1 MPa(g)
- adjustable choke valves for consumers (if necessary)
- with shutoff valves in common inlet line and outlet line

complete instrument air system:
for all pneumatically operated valves on compressor skid
- pressure transmitter for alarm and shutdown at low instrument air pressure
- pressure reducer (service unit)

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Item	Qty.	Description

- solenoid valve, explosion-proof in EEx-d II CT4 design

electric instruments in EEx-proof design
(EEx-d and/or EEx-i intrinsically safe)
gas pipes in stainless steel

Compressor skid:
packaged with all accessories on a common skid including:
- base frame in profile steel, welded, with foundation bolts, with levelling screws and lifting eyes, and with earthing screws
- compressor, drive and accessories, instrument panel / gauge board
- terminal boxes, incl. cabling of instruments
- local service panel in EEx-e design

incl.: cabling, laying of cables in channels
box material: aluminium resp. GRP

TERMINAL BOXES / LOCAL SERVICE PANEL:
in explosion-proof design,
protection: IP 65
sparking group: T4
mounted on compressor skid

1 terminal box for the EEx-e-proof measuring and regulating instruments

1 terminal box for the EEx-i intrinsically safe measuring and regulating instruments

local service panel with:
- START Button
- STOP Button
- emergency STOP Button (key-lockable)
- main motor running lamp

incl. cabling, laying cables in channels
boxes material: aluminium resp. GRP

Item	Qty.	Description

SPECIAL TOOLS
- 1 hand pump for filling the diaphragm head(s) with oil, incl.: connection line
- 1 diaphragm failure indicator test device
- 1 set of torque wrench and its accessories
- 1 tool for taking triple diaphragms from each head when maintenance

PAINTING:
HOFER standard for indoor installation
according to procedure AAW035
colour RAL 5007 (blue)

PRESERVATION:
HOFER standard for max. 3 months storage

QUALITY PLAN PERFORMANCE TEST:
all tests according to HOFER's Quality Plan:
- test run and performance test in HOFER's workshop according to HOFER standard
- tightness test
- inspection after test run

2.2 **1** **ELECTRIC CONTROL BOARD**
with PLC-system for automatic control,
for installation outside the hazardous area,
control complete wired and ready for operation,
without assembly at site

2.3 **1** **set of PULSATION DAMPENER**
(volume vessel without inserts)
in stainless steel
for suction- and discharge side

residual pulsation according to API 618, approach 2
pressures and temperatures as per compressor data

design according to pressure equipment directive 2014/68/EU

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National-Bank AG Mülheim an der Ruhr
IBAN DE57360200300009058427 **BIC** NBAGDE3E
Commerzbank AG Mülheim an der Ruhr
IBAN DE61362800710325910900 **BIC** COBADEFF

USt-IdNr. DE191298912
Amtsgericht Duisburg, HRB-Nr. 15518
Geschäftsführer
Alexander Peters, Jörg Strizek

Item	Qty.	Description

fluid group: 1
category: II / IV
module: A1 / G
regulation: AD-2000

2.4 **1** **ELECTRICAL OIL HEATING**

to warm up hydraulic oil at ambient temperatures of -20 °C up to +5 °C and a cooling water inlet temperature of above +6 °C,
consisting of:
1 multi-rod cartridge with installed thermostat and safety temperature limiter (ELMESS-make),

for voltage 400 V, 50 Hz
explosion-proof design in EEx de IIC T4
capacity: approx. 4,5 kW

1 level switch for oil level control
protection: EEx-i intrinsically safe
via protection relay
(HOFER's scope of supply)
contact function:
1 opener at falling level
1 precision pointer thermometer -30 °C up to +70 °C
in crankcase with
2 inductive contacts, EEx-i intrinsically safe circuit (1. and 2. contact close at increasing indication),
without contact protection relay

completely mounted and tubed, however, without electric cabling

2.5 **1** **OIL PRESSURE DIAGNOSTIC SYSTEM**

(measurement of peak values)
for 2-stage diaphragm compressor,
consisting of:
2 LCD-indications
protection: EEx-i intrinsically safe
2 high-dynamic pressure transmitters
protection: EEx-i intrinsically safe
- 1 power part as >black box<
with inlets/outlets for transmitter/
LCD-indication as well as

Item	Qty.	Description

potential-free contacts for pre-alarm/shut-down,
completely mounted
(oil pressure gauge in standard design will be deleted)

Main dimensions:
length x width x height:
approx. 4400 x 2500 x 2150 mm
weight: approx. 8500 kg
main dimensions:

Sound pressure level:
approx. 85 dB(A) in 1 m distance

Design:
based on EC-directive for machinery
2006/42/EC,
used standards: DIN EN 1012, part 1, part 3,
DIN EN ISO 12100:2011
DIN EN 60204, part 1,
DIN EN 60079-0

with manufacturer's certificate resp. CE-mark and attestation of conformity

Test run:
with helium

2.6 **1** **set of SPARE PARTS**
for commissioning (start-up)
as per separate attached

2.7 **1** **set of SPARE PARTS**
for 2-year operation under 8000 hours per year
as per separate attached

2.8 **1** **Seaworthy Packing**

Model: MKZ 680-10/450-25
Capacity: 700 Nm^3/h

Item	Qty.	Description
2.9	**1**	**Transport CIF China Main Seaport** delivery time: approx. 9 months
2.10	**1**	**Diem rate** site service for start-up for 1 HOFER specialist daily allowance, lodging costs and local travelling costs are included, costs for flights are excluded we expect 3 working days + 3 travelling days for one mechanic and one electrician
2.11	**1**	**Set of OPERATION and MAINTENANCE MANUALS** according to HOFER standard in English language. 2 hard copies plus 1 CD in electronic copy

Modifications reserved without notice in case of technical improvement.

Packing:
Included

Warranty:
12 months from date of start-up, however, not later than
15 months from date of FOB European North Seaport resp. acceptance test in HOFER's workshop, whichever comes first.
This guarantee does not cover parts which are subject to normal wear.

Time of Delivery:
7.5 months FOB European North Seaport, depend on concluded order time and payments

Yours faithfully

A N D R E A S H O F E R
Hochdrucktechnik GmbH

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HOFER TECHNICAL PROPOSAL
of compressor for tube-trailers filling with hydrogen
for customer's option

Model: MKZ 800-10/500-25
Capacity: 1000 Nm^3/h

PROPOSAL No. 18AN-1218

Item	Qty.	Description
3	1	**HOFER COMPRESSOR UNIT** **886-00-00** consisting of:
3.1	1	**HOFER DIAPHRAGM COMPRESSOR**

design	horizontal, DUPLEX-design
number of stages:	2
model:	MKZ 800-10 / 500-25
gas type	H_2
hydraulic medium	mineral oil, type ISO VG 68

technical data:

suction capacity: (-0 / +5% according to DIN), (VN) is based on dry gas at 1,013 bar abs and 0 °C	1000	m^3/h (V_N)
at suction pressure:	20	bar abs, for design of capacity
suction pressure range:		
suction temperature:	30	°C, for design capacity
suction range temperature:	0 - 35	°C
discharge pressure:	200	bar (g)
speed:	420	min^{-1}
power demand: (at max. Hydraulic pressure)	103	kW
required motor power:	127	kW, incl. all losses for V-belt drive etc.
cooling water consumption:	13,8	m^3/h at min. 2 bar(g) supply pressure
inlet/outlet temperature:	20/25	°C
ambient air temperature:	-8 to +37	°C

Electrical motor:
TEFC design, protection IP 55,
with 3-phase current motor (SIEMENS-make),
for direct starting, as per DIN EN 50347
P = 135 kW, 380 V, 50 Hz
explosion-proof design in EEx-de IIC T4
without electric switching devices,
(if eletcrical control board is not in HOFER's scope of supply)

Power transmission (V-belt drive):
- flywheel, motor pulley, antistatic V-belts,

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Item	Qty.	Description

slide rails (flywheel is dismantled during transport, reassembly at site is not included)
- belt guard non-sparking (aluminium)

Crank drive:
- crosshead and crosshead-run
- oil circuit with forced feed lubrication by an electrical motor driven pump
- oil overflow valve
- crankshaft driven compensation pump
- oil cooler
- oil pressure sustain valve
- oil filter, cartridge type
- strainer on lube oil pump suction side
- pressure transmitter for indicating low oil pressure
- local pressure gauge for oil pressure indication
- vibration transmitter

Diaphragm heads:
- with diaphragm failure indicator for immediate shut-down after diaphragm break, incl. pressure switch design of pressure switch in explosion-proof EEx d II C T6 (WIKA-make)
- with suction and discharge compressor valves, plate type, spring loaded.
- water cooling on hydraulic side,
- with oil overflow valve and check valve at oil inlet for adjustment of a constant oil pressure

Material of gas contacted parts:
stainless steel

Diaphragm heads, material of construction:
cover (gas plate): 1.4541 / 1.4571 / 1.4418 / 1.4401 (stainless steel)
flange (hydraulic side): 1.0570 / GGG 40.3 / 1.7220 / 1.7225 (carbon steel)
triple diaphragms: 1.4310 (stainless steel)
compressor valves: 1.4021 / 1.4310
sealing ring at gas side: stainless steel / brass
O-rings at hydraulic side: NBR

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Item	Qty.	Description

tightness:
on gas side according to a leakage rate of
approx. 1 x 10^{-4} mbar l/sec

Gas coolers:
after cooler and interstage cooler(s)
according to HOFER's standard
designed as bundle cooler
with bursting disc on shell side
material for gas tube: quality no. 1.4571 / 1.4580 (stainless steel)
material for shell (water-side): carbon steel

cooler design according to Pressure Equipment Directive
(PED) 2014/68/EU

1 SKID
with instruments, fittings and automatic
valves for automatic operation,
instruments, valves, filters etc. as per
HOFER PI-diagram 2FF0824-01
comprising:

gas suction line
- gas filter (cartridge type), < 5 µm, filter element in stainless steel, with differential pressure gauge for local indication
- pneumatically operated valve
- purging line with isolating valve
- pressure switch for suction pressure supervision, and set point PSL for start-up release and set point PSLL for compressor trip shutdown, which are hardwired to relay of main drive motor
- pressure transmitter for alarm at suction low gas pressure, and shutdown at too low gas pressure
- pressure gauge with isolating valve
- safety relief valve

gas interstage line (each)
- pressure transmitter for alarm at high gas pressure, and shutdown at too high gas pressure
- temperature gauge
- pressure gauge with isolating valve

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Item	Qty.	Description

- safety relief valve
- temperature transmitter for alarm and shut down at high gas temperatures upstream cooler
- temperature transmitter downstream cooler
- pressure transmitter for alarm at high gas pressure, and shutdown at too high gas pressure

gas discharge line:
- temperature gauge
- temperature transmitter for alarm and shut down at high gas temperatures upstream cooler
- temperature transmitter downstream cooler
- safety relief valve
- pressure transmitter for alarm at high gas pressure, and shutdown at too high gas pressure
- pressure with isolating valve
- pneumatically operated valve (gas outlet)
- non-return valve (gas outlet)
- pneumatically operated valve (exhaust)
- non-return valve (exhaust)
- common exhaust header
- pneumatically operated valve (bypass)

complete cooling water system:
- flow switch for alarm and shut down at lack of cooling water
- flow indicator in common line
- drains, vents (if necessary)
- safety valve without type test approval design pressure 1 MPa(g)
- adjustable choke valves for consumers (if necessary)
- with shutoff valves in common inlet line and outlet line

complete instrument air system:
for all pneumatically operated valves on compressor skid
- pressure transmitter for alarm and shutdown at low instrument air pressure
- pressure reducer (service unit)

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Item	Qty.	Description

- solenoid valve, explosion-proof in EEx-d II CT4 design

electric instruments in EEx-proof design
(EEx-d and/or EEx-i intrinsically safe)
gas pipes in stainless steel

Compressor skid:
packaged with all accessories on a common skid including:
- base frame in profile steel, welded, with foundation bolts, with levelling screws and lifting eyes, and with earthing screws
- compressor, drive and accessories, instrument panel / gauge board
- terminal boxes, incl. cabling of instruments
- local service panel in EEx-e design

incl.: cabling, laying of cables in channels
box material: aluminium resp. GRP

TERMINAL BOXES / LOCAL SERVICE PANEL:
in explosion-proof design,
protection: IP 65
sparking group: T4
mounted on compressor skid

1 terminal box for the EEx-e-proof measuring and regulating instruments

1 terminal box for the EEx-i intrinsically safe measuring and regulating instruments

local service panel with:
- START Button
- STOP Button
- emergency STOP Button (key-lockable)
- main motor running lamp

incl. cabling, laying cables in channels
boxes material: aluminium resp. GRP

Model: MKZ 800-10/500-25
Capacity: 1000 Nm^3/h

Item	Qty.	Description

SPECIAL TOOLS
- 1 hand pump for filling the diaphragm head(s) with oil, incl.: connection line
- 1 diaphragm failure indicator test device
- 1 set of torque wrench and its accessories
- 1 tool for taking triple diaphragms from each head when maintenance

PAINTING:
HOFER standard for indoor installation
according to procedure AAW035
colour RAL 5007 (blue)

PRESERVATION:
HOFER standard for max. 3 months storage

QUALITY PLAN PERFORMANCE TEST:
All tests according to HOFER's Quality Plan:
- test run and performance test in HOFER's workshop according to HOFER standard
- tightness test
- inspection after test run

3.2 **1** **ELECTRIC CONTROL BOARD**
with PLC-system for automatic control,
for installation outside the hazardous area,
control complete wired and ready for operation,
without assembly at site

3.3 **1** **set of PULSATION DAMPENER**
(volume vessel without inserts)
in stainless steel
for suction- and discharge side

residual pulsation according to API 618, approach 2
pressures and temperatures as per compressor data

design according to pressure equipment directive 2014/68/EU

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Item	Qty.	Description

fluid group: 1
category: II / IV
module: A1 / G
regulation: AD-2000

3.4 **1** **ELECTRICAL OIL HEATING**

to warm up hydraulic oil at ambient temperatures of -20 °C up to +5 °C and a cooling water inlet temperature of above +6 °C, consisting of:
1 multi-rod cartridge with installed thermostat and safety temperature limiter (ELMESS-make),

for voltage 380 V, 50 Hz
explosion-proof design in EEx de IIC T4
capacity: approx. 6,0 kW

1 level switch for oil level control
protection: EEx-i intrinsically safe
via protection relay
(HOFER's scope of supply)
contact function:
1 opener at falling level
1 precision pointer thermometer -30 °C up to +70 °C
in crankcase with
2 inductive contacts, EEx-i intrinsically safe circuit (1. and 2. contact close at increasing indication),
without contact protection relay

completely mounted and tubed, however, without electric cabling

3.5 **1** **OIL PRESSURE DIAGNOSTIC SYSTEM**

(measurement of peak values)
for 2-stage diaphragm compressor,
consisting of:
2 LCD-indications
protection: EEx-i intrinsically safe
2 high-dynamic pressure transmitters
protection: EEx-i intrinsically safe
- 1 power part as >black box<
with inlets/outlets for transmitter/
LCD-indication as well as

Item	Qty.	Description

potential-free contacts for pre-alarm/shut-down,
completely mounted
(oil pressure gauge in standard design will be deleted)

Main dimensions:
length x width x height:
approx. 4700 x 2450 x 2150 mm
weight: approx. 11000 kg
main dimensions:

Sound pressure level:
approx. 85 dB(A) in 1 m distance

Design:
based on EC-directive for machinery
2006/42/EC,
used standards: DIN EN 1012, part 1, part 3,
DIN EN ISO 12100:2011
DIN EN 60204, part 1,
DIN EN 60079-0

with manufacturer's certificate resp. CE-mark and attestation of conformity

Test run:
with helium

3.6 **1** **set of SPARE PARTS**
for commissioning (start-up)
as per separate attached

3.7 **1** **set of SPARE PARTS**
for 2-year operation under 8000 hours per year
as per separate attached

3.8 **1** **Seaworthy Packing**

Model: MKZ 800-10/500-25
Capacity: 1000 Nm^3/h

Item	Qty.	Description
3.9	**1**	**Transport CIF China Main Seaport** delivery time: approx. 9 months
3.10	**1**	**Diem rate** site service for start-up for 1 HOFER specialist daily allowance, lodging costs and local travelling costs are included, costs for flights are excluded we expect 3 working days + 3 travelling days for one mechanic and one electrician
3.11	**1**	**Set of OPERATION and MAINTENANCE MANUALS** according to HOFER standard in English language. 2 hard copies plus 1 CD in electronic copy

Modifications reserved without notice in case of technical improvement.

Packing:
Included

Warranty:
12 months from date of start-up, however, not later than
15 months from date of FOB European North Seaport resp. acceptance test in HOFER's workshop, whichever comes first.
This guarantee does not cover parts which are subject to normal wear.

Time of Delivery:
7.5 months FOB European North Seaport, depend on concluded order time and payments

Yours faithfully

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