VOITH

I/H Converter

Type DSG-BXX113

Instruction Manual

Version 3.2

Should you have any questions concerning the I/H converter, please contact the Service Department of the product group Electronic Drive Systems, Voith Turbo GmbH & Co. KG, Crailsheim, indicating article number and serial number of the I/H converter.

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This instruction manual describes the technical condition of the I/H converter on delivery from 2011/03.
Any modifications following the delivery are not considered in this operating manual.

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Contents

1. Technical Data

Ambient conditions:

Ambient temperature for storage	-40 °C ... +90 °C
Ambient temperature:	-20 °C …+85 °C
Protection	IP 65 to EN 60529

suitable for internal installation in industrial air

Electric Data:

Supply voltage	24 VDC ± 15%
Power consumption	approx. 0.7 A for DSG-B05.. DSG-B10 approx. 1 A for DSG-B30 max. 3 A, for t < 1 sec
Setpoint input	0/4...20 mA input resistor approx. 80 Ω with suppressor circuit.

Hydraulic data:

Input pressure P_{in} min	1.5 bar + P_A max for B05.. B10 5 bar + P_A max for B30
Input pressure P_{in} max	see table
Pressure fluid	mineral oil or hydraulic oil (hardly combustible fluids on request)
Viscosity pressure fluid	ISO VG 32... ISO VG 48 to DIN 51519
Temperature pressure fluid:	+10 °C...+70 °C
Oil purity	recommended purity class: To NAS1638 class 10 To ISO4406 class -/19/16
Leakage at P_{in}=10 bar	≤ 3 l/min for DSG-B05… DSG-B10
Leakage at P_{in}=40 bar	≤ 5 l/min for DSG-B30

Type	**DSG- BXX 113**			
	B05...	**B07...**	**B10...**	**B30...**
Output pressure regulating range P_A [bar]	0..5	1..7	0..10	0..30
Input pressure P_{in} max [bar]	40	40	40	70
Flow rate line P → A Q1 [l/min] at ΔP = 1 bar	24	24	23	24
Flow rate line A → T Q2 [l/min] at ΔP = 1 bar	30	30	28	30
Regul. range approx. P_A max [bar] at setpoint 20 mA	3..**5**	3,5..**7**	5..**10**	10..**30**
Regul. range approx. P_A min [bar] at setpoint 4 mA	0..1,5 **0..3**	0,5..3 **1..5**	0..2 **0..6**	0..5 **0..18**

The regulating range of P_A min depends on the set pressure P_A max.
The regulating range of P_A min indicated above refers to the minimum adjustable pressure P_A max.

Mechanical data:

Dimensions, fitting	see chapter 10
Hydraulic connection	see chapter 10
Type-depending installation position	see chapter 10
Mounting position	see chapter 10
Sealing material	FPM
Weight	approx. 12 kg

2. Safety Information

2.1 Definition of notes and symbols

Danger !
This symbol signals an imminent danger to the life and health of individuals.
If this note is not observed, injury to health and even most serious injuries may be the consequence.

Warning !
This symbol signals a harmful situation.
If this note is not observed, the product may be damaged.

Note !
This symbol refers to proper handling of the product. It does not refer to or indicate a dangerous situation.

2.2 Proper use

The I/H converter serves to transform an electric set signal into a related hydraulic output pressure reduced to feed-in pressure. This allows, for example, adjusting control pistons at hydraulic cylinders which are used to position the valves of steam turbines.

2.3 Important notes

The following notes refer to the entire instruction manual and have to be observed in addition to the individual notes.

Accident prevention

- Improper use may cause operating agent under pressure to leak at the sealing surfaces. There is a risk of fire around hot components.
- Isolate the hydraulic supply prior to working on the I/H converter.

- Failure of electric power or disturbance of the control electronics integrated in the I/H converter may cause strong variations of the output pressure when operating the I/H converter. Thus e.g. the piston rod of a hydraulic cylinder may move uncontrolled, causing danger to individuals or equipment.

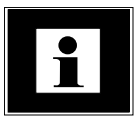
- During operation, the outer surfaces of the I/H converter may heat up due to the pressure fluid. Contact may cause skin burns. Make sure to cool down the I/H converter prior to working on it.

- Electrical components are installed in the I/H converter. These components can be destroyed by e.g. electric welding in its surrounding. Therefore make sure to disconnect all electric connections prior to electrical weldings in the surrounding of the I/H converter.

Environment protection

- During mounting, dismounting or improper use of the I/H converter pressure fluid may leak out. Operating agent reaching the sewage system or open soil, causes severe environmental damages. Leaking pressure fluid has to be collected and deposited in accordance with the national legal regulations.

Instruction manual



- The instruction manual contains important information for proper handling of the I/H converter. Prior to installation and commissioning of the I/H converter, read the manual carefully and make sure it is completely understood.

- Keep this manual in a location convenient to the operating staff.

- In addition to this operating manual: Have the relevant regulations for prevention of accidents and environmental protection available and observe these.

Staff qualification:

- Only trained and instructed staff is allowed to perform any work on the I/H converter. This personnel has to be trained and authorized to mount I/H converters professionally.
- Installation, commissioning and operation have to be effected by an electronic expert.

Constructional modifications:

- Mounting and constructional modifications are not permitted.

2.4 Warranty

The terms and conditions mentioned in the General Conditions of Sale of Voith Turbo GmbH & Co. KG, Crailsheim, are applicable. Warranty claims are excluded, if these are due to one or several of the following causes:

- Improper transportation, storage, mounting, set-up, commissioning and operation of the I/H converter.

- Not observing the safety instructions and guidelines included in this instruction manual.

- Use of spare parts not approved by Voith Turbo GmbH & Co. KG, Crailsheim.

Repair works on the I/H converter are to be performed or approved by Voith Turbo GmbH & Co. KG, Crailsheim.

3. Function

3.1 Design

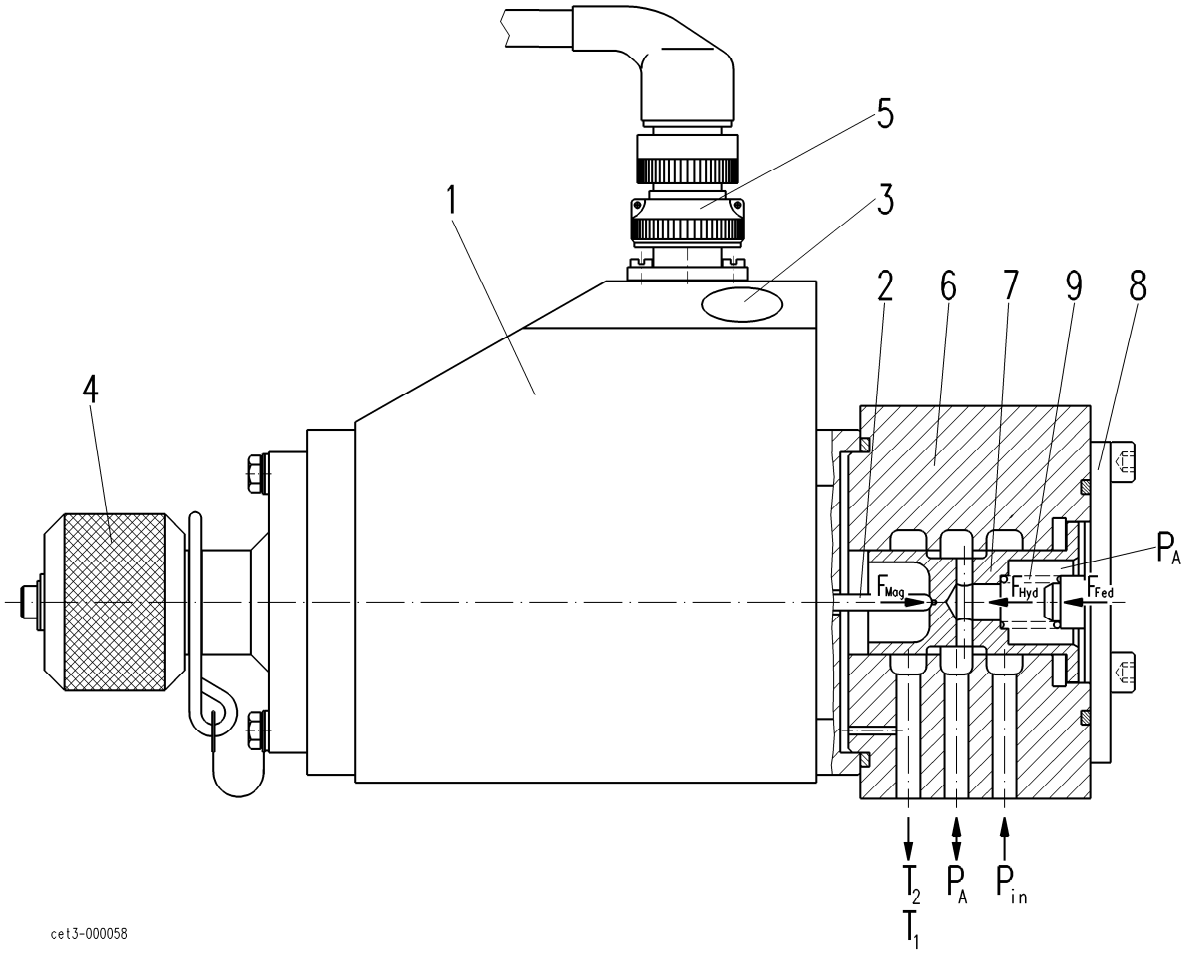


Fig.: 3.1.1

1 - Control magnet VRM
2 - Tappet for power transmission
3 - X0 and X1 potentiometers
4 - Manual operation knob
5 - Electric connection
6 - Control housing
7 - Control piston with damping piston
8 - Cover
9 - Control spring

P_{in} - Input pressure
P_A - Output signal pressure

T_1 - Tank return line
T_2 - Tank return line with int. leakage
F_{Mag} - Magnetic force
F_{Hyd} - Hydraulic force
F_{Fed} - Spring force

3.2 Operating characteristics

(see fig. 3.1.1)

A set signal w = 4...20 mA generates a magnetic force F_{Mag} in the VRM, the limits of which can be adjusted by means of the X0 and X1 potentiometers and which is then transmitted onto the control piston via tappet.
The hydraulic force F_{Hyd} being proportional to the output signal pressure P_A acts against this force.
In the case of the two forces being equal, the control piston is positioned in the “hydraulic center” as shown in fig. 3.1.1 and the output signal pressure P_A corresponds to the set signal. In the “hydraulic center“ position the control piston performs minimum oscillating movements in the area of the guiding edges $P \rightarrow P_A$ and $P_A \rightarrow T$, in order to keep the output pressure P_A on the value set by F_{Mag}.
When increasing the set signal and thus F_{Mag} from this condition, the control piston position changes and thus connects the output pressure P_A to the feed pressure P and blocks P_A towards the tank return line T1and T2. Now pressure P_A will increase until the same has returned the control piston to the “hydraulic center“ and P_A corresponds to the new set signal.
The spring force F_{Fed} of the control spring generates a force-offset in order to guarantee the I/H converter function for output pressures of approx. 0 bar, too.
The internal leakage is fed back into tank return line T2.

Function of manual operation knob:
The control magnet of I/H converter is provided with a manual operation knob, by means of which an adjustable spring force can be set instead of the magnetic force F_{Mag} . This spring force affects the control piston via magnet armature and tappet. The hydraulic force F_{Hyd} , being proportional to the output signal pressure P_A also acts against this spring force here. Thus adjustment of output pressure is possible without electric connection.

4. Packing, Storage and Transport

Packing

The I/H converter is delivered in a special packing.
The openings for the hydraulic connections are sealed with plugs to prevent penetration of impurities and humidity.

Storage and preserving

The outer surfaces of the I/H converter are protected by means of a preserving surface coat.
The internal parts are preserved by oil.
Within Europe the anticorrosion protection is sufficient for approx. 8 months in industrial air, presuming storage of the I/H converter in a dry location.

In case the I/H converter is supposed to be stored for a longer period of time, special precautions will have to be taken.
In each specific case, these precautions have to be agreed with Voith Turbo GmbH & Co, KG, Crailsheim.

The storage ambient conditions have to be within the limits as indicated in chapter 1.

Transport

Improper transport may cause personal injuries and damages to property. Pack the I/H converter in a way that prevents damages of housing and electric connection during transport.

5. Installation

- Improper installation of the I/H converter may cause malfunctions and premature failure of the operation of the I/H converter.
- Cleanliness is imperative during installation and connection. Prevent that any impurities (dust, metal chips etc.) can get into the I/H converter. These impurities impair its function and may cause damage to the I/H converter.

Cover and protect the I/H converter and in particular the electric lines during construction time.

5.1 Mounting

Perform any work on the I/H converter only when it is in deenergized condition and with switched off oil supply system.
Protect oil and power supply against unintentional switching-on during mounting.

Install the I/H converter in accordance with the permissible installation position as shown in chapter 10.

Recommended fastening bolts:
2 pieces hexagonal screws M10, strength category 8.8.
tightening torque MA=35 Nm, thread slightly oiled.
Select screw length according to mounting situation.

5.2 Hydraulic connection

The hydraulic connection on the I/H converter is made by means of connection bores at its bottom. The connecting flange is sealed with O-rings. Please refer to chapter 10 for position and dimensions of the connections.

Surface roughness of connecting flange:
Ra = 1.6 μm, Rmax = 6.3 μm

Only pressure-less return of the operating medium through return line T2 to the tank, ensures proper work of the I/H converter.
In practise the tank lines for the connections T1 and T2 are joined together and laid downgrade towards the tank in one common pipe line.
Requirements to this pipe line:
Nominal size 20 mm or bigger for I/H converters with an output pressure up to 10 bar.
Nominal size 30 mm or bigger for I/H converters with an output pressure of more than 10 bar.

Observe the correct pressure range when selecting pipes, hoses, screwings and flanges.
Immediately replace damaged pipes and hose lines.

When assembling the pipe lines, ensure that it is fastened to fixed structures, free from vibration and not to moving equipment. Temperature variations of the piping (thus alterations in length) must not apply constraining forces to the I/H converter.

Clean pipe lines from dirt, cinder, sand, chips etc. prior to installation.
Pickle or flush welded pipes.
Clean and flush carefully all pipe and hose lines prior to attaching the I/H converter.

=> For flushing, a flushing plate (Art. No. 43.8565.10) is available. See chapter 11.

=> To connect the I/H converter to the piping system an adapter (Art. no. 43.9300.11) is available. See chapter 11.

- Residual oil may leak when removing the plug (max. 0.1 l). Collect the oil in a suitable container and deposit it properly.
- Do not use fibrous or hardening sealing compounds, such as e.g. hemp or mastic to seal the connections and screwings.

5.3 Electric connection

The electric system has to be connected by an electric expert in accordance with electrical engineering standards and legal regulations of the manufacturing country

When connecting customer's lines, avoid parallel run of the I/H converter lines with the lines of current converter assemblies.
The customer's signals and supply lines running to the I/H converter must be screened.

=> A connecting cable with Art. No. 91876100XX can be supplied for electric connection.

Please refer to chapter 10 for the wiring diagram.

6. Commissioning

The I/H converter was adjusted and tested at Voith Turbo's works by means of the potentiometers X0 and X1. The test result is documented in an attached test certificate.
The potentiometers are provided with a protective cap to avoid unintentional maladjustment and impurities.

6.1 Test run

Make sure that pipe lines and hydraulic system are cleaned prior to performing a test run. The operating fluid has to be in accordance with the purity class as indicated in chapter 1. Do not flush or clean the pressure fluid with the I/H converter being hydraulically connected. Operation of the I/H converter with contaminated pressure fluid is not permitted, the I/H converter may be damaged.

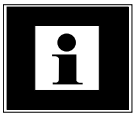
- Check the line mounting, connection and flow direction to and on the I/H converter.
- Check the electric connection.
- Switch on oil supply system and check input pressure.
- After waiting approx. 5min. switch on supply voltage 24VDC. (the waiting period is necessary for auto-ventilation of the system during first commissioning and after longer standtstill periods.)

The minimum input pressure has to be 1.5 bar more than the maximum output pressure required at 20 mA.

- Set the signal w = 4.. 20mA and check output pressure.

During the test run, check all hydraulic connections for leakages. In case of leakage, immediately switch off the hydraulic supply and eliminate leakages.

6.2 Parameter setting



Due to unintentional maladjustment of the parameters or changed operating conditions, new setting of one or both parameters may become necessary.
We recommend to document adjustment of the parameters as well as the set values.

The parameters are adjusted by means of potentiometers X0 and X1.
Please refer to chapter 10 for the position of the potentiometers.

Potentiometer effects:

X0 - With help of potentiometer X0 the minimum output pressure P_A min is adjusted at a setpoint of 4 mA.
Pressure increase by turning the potentiometer clockwise.

X1 - With help of potentiometer X1 the maximum output pressure P_A max is adjusted at a setpoint of 20 mA.
Pressure increase by turning the potentiometer clockwise

X1 should be adjusted before X0.
The X1- adjustment influences the adjustment of X0.

Manufacturer-provided adjustments:
At the works, the I/H converter has been adjusted as indicated in the order.

7. Operation

7.1 Operation with manual knob

Operation with manually controlled rotary knob is possible without electric energy.

On operation with manually actuated rotary knob, uncontrolled stroke movements of the hydraulic components controlled by the I/H converter output might occur due to the increase in the output signal pressure.

Manual operation is only possible when the circlip is removed from the manual operation knob.

On completion of operation with manual operation knob, move the manual operation knob in its final position by turning it counter clockwise and pushing in the circlip in its final position.

- Remove the circlip.
- Slowly turn the manual operation knob clockwise and observe the output pressure.

Effective direction: Output pressure increases by clockwise rotation.

7.2 Operation with set signal

When the supply voltage is switched on, the output signal pressure can be adjusted continuously by the set signal 4...20 mA within the limits set by the potentiometers X0 und X1.

7.3 Trouble shooting and remedial action

Prior to all works, make sure that the I/H converter was commissioned according to chapters 5 and 6.

Malfunction: Pressure variations

The output signal pressure P_A may vary now and then or periodically with low or high frequency and amplitude.

Cause:
1. air inclusions in the hydraulic component
2. low or considerably varying input pressure.
3. dirt particles in the hydraulic component
4. pressure on return line

Remedy:
1. On first commissioning or after longer periods of stand still air inclusions in the hydraulic component may cause pressure variations. Therefore, when setting into operation again, observe to first connect the input pressure and then, after waiting five minutes, the supply voltage. This supports the auto-ventilation of the system.
2. Under load and in particular in case of higher output signal pressure, low input pressure may lead to pressure variations.
   Increase and / or stabilize the input pressure by taking appropriate measures (e.g. accumulator).
3. Contaminated pressure fluid results in increased friction at the control piston, thus causing hysteresis and pressure variations.
   Open hydraulic component and clean the inner elements. In case of damaged surfaces and guiding edges replace the I/H converter.
4. The dimensions of the return line have to be sufficient.
   In case of additional consumers of the output pressure connected to this line, make sure they do not create any pressure in the return line. See also chapter 5.2.

Malfunction: Output pressure $P_A \rightarrow 0$ bar or $\rightarrow$ P (input pressure)

Due to a defective control valve VRM or blockage of the control piston the output pressure may fall to 0 bar or increase to the input pressure.

Remedy: The function of the component part can be checked using the manually controlled knob with the supply voltage being switched off. See chapter 7.1.
If the output pressure cannot be adjusted manually, the control piston, e.g., may be blocked by particles.
Open hydraulic component and clean inner parts.
If the surfaces and guiding lines are damaged, exchange the I/H converter.

Should output pressure adjustment be possible with manual operation knob, but not with the control magnet, the control magnet VRM is defective.

8. Maintenance and Repair

For trouble-free and reliable operation of the I/H converter, it is necessary to perform inspection, maintenance and repair work in certain intervals.

Routine inspection:

Check the pipes, screw connections and connections on the I/H converter for leakage, impurities and damage.
Eliminate any leakage, impurity and damage noticed, if required, during appropriate operating modes.

Monitor the control behavior of the I/H converter for any changes.
Analyse and eliminate the causes, if required, during appropriate operating modes.

Inspection after approx. 740 operating hours / max. 1 month:

Take an oil sample from the oil tank and analyse it for solid and suspended matters, water content, shadings and air bubbles. Analyse oil purity of the oil sample. Clean or exchange the oil, if required, in an appropriate operating mode.

Inspection after approx. 8000 operating hours / max. 1 year:

Take an oil sample from the oil tank and analyse it chemically.
If required, clean or change the oil during an appropriate operating mode.

Check and retighten, if necessary, the electric connections of the I/H converter.

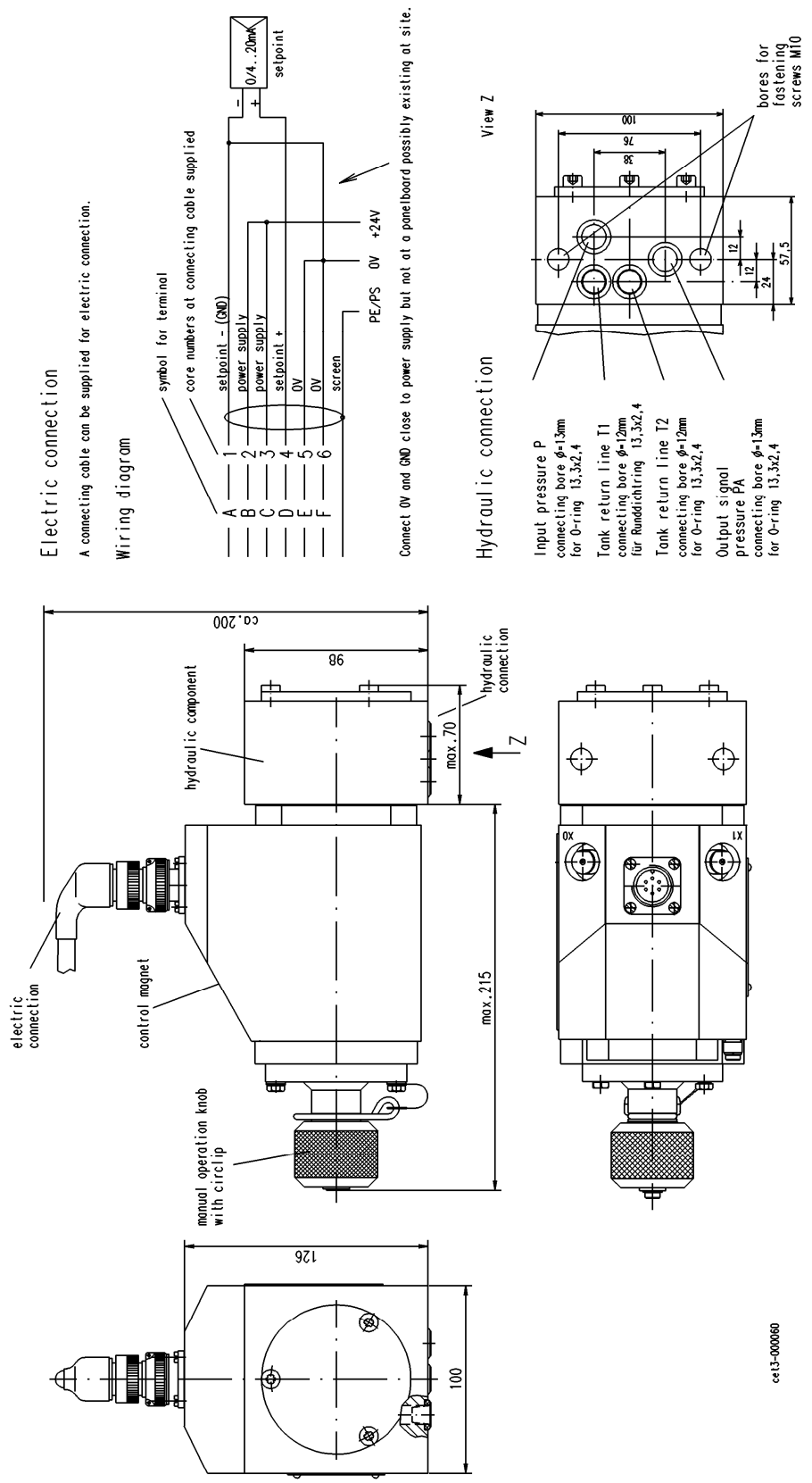
9. Shutdown

If the I/H converter is switched off for reasons of repair, inspection or unit shutdown, switch off the oil supply system and relieve all pressure reservoirs, if effective. Switch off the 24 VDC supply voltage and remove the lines as well as piping and hose connections. Doing so, a considerable oil quantity may leak out. Collect the oil in a suitable container and deposit it properly. Close all holes. Now clean and pack the I/H converter.

Disposal

In the event of disposal of the I/H converter, observe the local applicable regulations regarding the environmental protection. The I/H converter essentially contains steel, copper, synthetic materials, electronic components and residual oil.

10. Outline Drawing with Wiring Diagram



<u>Installation position</u> B05, B07 and B10 vertical
B30 vertical, control magnet on top

11. Annex

Flushing plate	43.8565.10
Adapter plate	43.9300.11
Connecting cable	91876100XX