VOITH

Overspeed Protector

Type: CTO-B45202

Translation of the Original version

Instruction and Operating Manual

Version 2.1

ATTENTION!
Please make sure to read this instruction manual prior to transport, installation, commissioning, operation, etc. and keep it for further use!

Should you have any questions concerning the overspeed protector, please contact J.M. Voith SE & Co. KG, Crailsheim, After-Sales Service of Product Group Division Digital Ventures in Crailsheim, indicating the article number and the serial number of the overspeed protector.

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This instruction manual describes the design standard of overspeed protector type SMR A45202 with delivery as of 2019 / 02.

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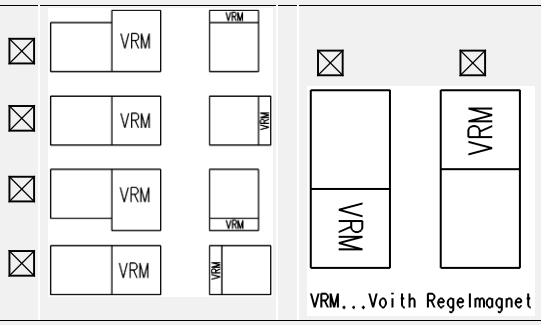
Contents
Instruction and Operating Manual

1 Technical Data

Overspeed protector type	CTO-B45202	
Article number	91868550	
Instruction Manual No.	918 3626018864	
Product identification	See nameplate	
EC Declaration of Conformity	See separate document	
EC marking	CE	
Protection	IP 65 as per EN 60529	
Explosion protection	CE Ex II 2G IIC T4	
Ambient temperature T_A (operation)	-30 ... +60	°C
Ambient temperature (storage)	-40 ... +90	
Installation conditions	☒ Indoor installation ☐ Outdoor installation ☐ Offshore ☒ Industr. atmosph.	
Hydraulic Data		
Supply pressure Pmax	25	bar
Operating medium		
Type	☒ Hydraulic oil as per DIN 51524 ☒ Turbine oil as per DIN 51515 ☐ High-flash point fluid[1)]	
Oil temperature during operation	+10 … +60	°C
Cleanliness grade (ISO VG 4406)	- / 16 / 13	
Viscosity (DIN 51519)	ISO VG 32 … ISO VG 46	
Leakage (T_{oil} = 50 °C and P=10 bar)	< 2	l/min
Mechanical Data		
Installation positions		
Dimensions, fastening	See Chapter 9	
Hydraulic connection	See Chapter 9	
Sealing material	☒ FPM[2)] ☐ Special design[4)] ☒ NBR[3)]	
Weight	approx. 14	kg

1) According to customer's request or especially for high-flash point fluids
2) Fluor-caoutchouc
3) Acrylnitril-Butadien-caoutchouc
4) according to the customer's specification and consultation with J.M. Voith SE & Co. KG │ Division Digital Ventures

Electrical Data		
Supply voltage (power) including residual ripple	24 (+10% / -15%) [5]	V DC
Current consumption	0.5 A±0.2A, max. 3 A for t < 1.5±0.5 sec	
Trip-stop frequency f_{ss}	4000…10000Hz adjustable in 256 steps, accuracy 0.25%[6] , nameplate, temperature error 120ppm/K	
Actual speed remote indication	4…20mA, for f=0… f_{ss}	
Speed input	Connect an inductive speed sensor, preferably sinusoidal voltage, permissible voltage range 0.5Vrms...18Vrms (when connected), permissible internal resistance range 600Ω…4500Ω[7]	
Other data		
Function - Trip Simulation (partial stroke check) Disconnecting time with Potentiometer T4	10ms…25ms	
Trip time of overspeed shutdown	40ms at T_{oil}<40°C[8]	
Trip criteria	See Chapter 3.4	

5) Permanent operation of CTO is allowed within this supply voltage range
6) The indication refers to the trip frequency re-measured after the adjustment, as shown on the nameplate.
7) Thei DC voltage resulting depends on the internal resistance of the speed sensor. For an internal resistance of 1000 Ω, the DC offset voltage is 1.65V ± 0.15V.
8) The tripping time is the time required by the control piston to move to its completely open position (end stop) after the shutdown incident occurred, including a dead time of approx. 10ms. On account of the damping of the movement caused by the pressure medium, the tripping time depends on the viscosity of the pressure medium. It can be determined by recording the stroke of the trip-stop valve. When the trip-stop valve moves with constant speed after a trip-top initiation, them the control piston of the CTO has reached its end position.

2 Safety information

2.1 Definition of symbols and warnings

Symbol	Damage/harm to ...	Signal word	Definition	Consequences
	Persons Property	EX- PROTECTION!	Notes to Ex-protection	Explosion hazard
	Persons	DANGER!	Imminent danger	Fatal or most serious injuries (crippling)
	Persons	WARNING!	Dangerous situation possible	Fatal or most serious injuries possible
	Material	ATTENTION!	Harmful situation possible	Possible damage to - the product - its environment
	–	Note! Information!	Application details and other useful information	Efficient in operation

2.2 Proper use

The overspeed protector is an electro-hydraulic turbine trip device to control the speed of steam turbines. If a trip criterion occurs, the magnetic force is switched off in the electronic component thus switching over the 3/2-way valve via a restoring spring designed with substantial power reserves. This procedure reliably connects the way valve outlet with the tank return line and the trip-stop valve will close. The overspeed protector is suitable for use in Zone 1 and Zone 2 in potentially explosive atmosphere. Allowable ambient temperature for operation is
-30°C…..+60°C.

The permissible temperature of the hydraulic oil is +10 °C … +60 °C.

- The max. surface of the device is significantly determined by the temperature of the hydraulic oil.

  For the operation it is therefore vital to ensure that the max. permissible oil temperature will not be exceeded!

2.3 Important information

The following information refers to the entire instruction manual and is to be observed in addition to the individual instructions.

Accident prevention

- It is imperative to observe the requirements of the relevant standards and regulations when connecting an overspeed protector in explosion-proof design.
- There must not be any potentially explosive atmosphere during all works performed, such as e.g. transportation, storage, installation, electrical connection, commissioning, test run, maintenance and servicing!

- On commissioning or operation of the overspeed protector, spraying hydraulic oil may get into the eyes causing blindness. Wear protective glasses for all works performed on the overspeed protector.
- The overspeed protector is a hydraulic unit. In case of improper use, operating medium being under pressure may leak out. Any improper use may lead to the leakage of operating medium under pressure, posing a risk to the health and life of the operating staff. Prior to performing any work on the overspeed protector, switch off the hydraulic supply system.
- During operation, the outer surfaces of the overspeed protector and the hydraulic connecting lines may become hot due to the operating medium. Any contact may cause injuries by burning. Prior to performing any work on the overspeed protector, let the overspeed protector cool down.
- On commissioning or operation of the overspeed protector, the end of the piston rod may move uncontrolled in case of failure of the hydraulic or electric energy, due to malfunctions in the master control or on the overspeed protector. This movement may pose a risk to both individuals and objects. Prior to performing any work on the overspeed protector, switch off the hydraulic and electric auxiliary energy.

- Electric components are integrated in the overspeed protector which may be destroyed, e.g. during electric welding near the overspeed protector. Prior to performing electric welding near the overspeed protector, remove all electric connecting lines.

Environmental protection

- On assembly, disassembly or improper use of the overspeed protector, operating medium may leak out. Operating medium getting into the sewage system or open soil causes severe environmental damages. Collect any leaking operating medium and dispose of it in accordance with the national statutory provisions.

Painting

- In case of repaints or mendings of the paint on a device, please ensure that the maximal permissible total film thickness will not be exceeded. For devices of Gas Groups IIA and IIB, it is 2 mm and for devices of Gas Group IIC it is 0.2 mm.

Instruction Manual

- The instruction manual contains important information regarding proper handling of the overspeed protector. Prior to installation and commissioning of the overspeed protector, carefully read the entire instruction manual and make sure you fully understood its content.
- Keep the instruction manual in a place constantly accessible to the operating staff.
- In addition to this instruction manual, have the rules governing accident prevention and environmental protection available and observe same.
- Please keep for later reference.

Staff qualification

- Only trained and instructed personnel are allowed to work on the overspeed protector. These personnel must be sufficiently trained, instructed and authorized to properly mount, operate and maintain the overspeed protector in accordance with the safety standards.

- Installation, commissioning and operation have to be performed by a certified electrician with experience and knowledge in the field of explosion protection.

Constructional modifications

- Mounting work and structural modifications are not permitted.
- The screw fitting of the cable entry on the control magnet (VRM) is secured against distortion. Do not distort or slacken the screw fitting.

2.4 Warranty

The terms and conditions mentioned in the General Terms and conditions for Sale of Industrial Engineering of J.M. Voith SE & Co. KG │ Division Digital Ventures, Crailsheim shall apply. Warranty claims are excluded if these are due to one or several of the following causes:

- Improper transportation, storage, installation, connection, commissioning, operation, maintenance and repair of products of the overspeed protector.
- Failure to observe the operational and product safety regulations included in this instruction manual.
- Use of spare parts not approved by J.M. Voith SE & Co. KG │ Division Digital Ventures, Crailsheim.

- During the warranty period, repair work on the overspeed protector may only be performed with the approval of J.M. Voith SE & Co. KG │ Division Digital Ventures, Crailsheim.

3 Function

3.1 Mechanical design

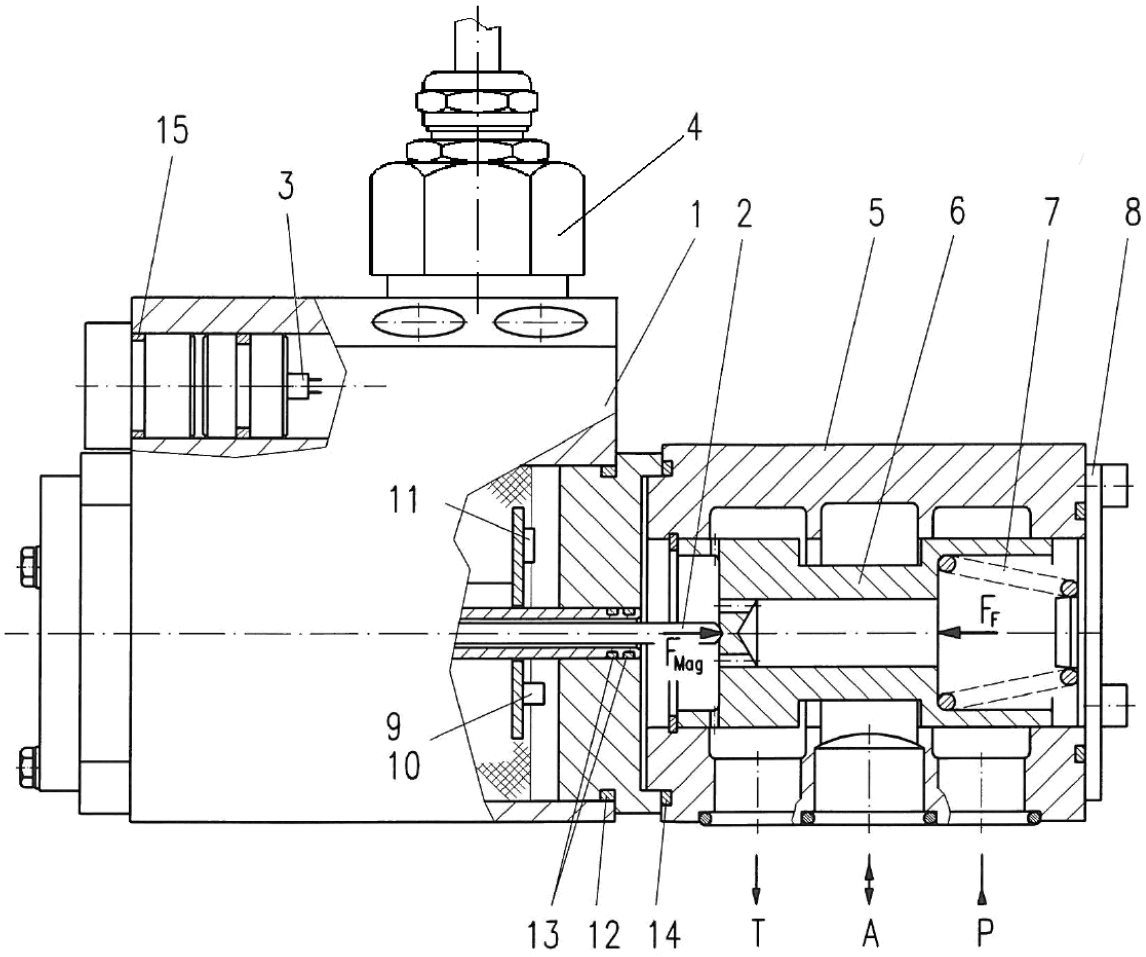


Fig. 1: Sectional view of overspeed protector

The overspeed protector consists of the main functional units:

(1) Control magnet VRM
(2) Tappet for power transmission
(3) Potentiometer T4
(4) Electrical connection
(5) Control housing
(6) Control piston
(7) Restoring spring
(8) Cover
(9) Potentiometer Uf
(10) Potentiometer If
(11) 8-fold coding switch
(12) Sealing - electronic compartment cover
(13) Sealing - pole pipe
(14) O-ring for the VRM
(15) O-ring in the potentiometer cover

P - supply pressure
A - output
T - Tank return line

F_{Mag} - Magnetic force
F_F - Federkraft

Block diagram - Overspeed Protector

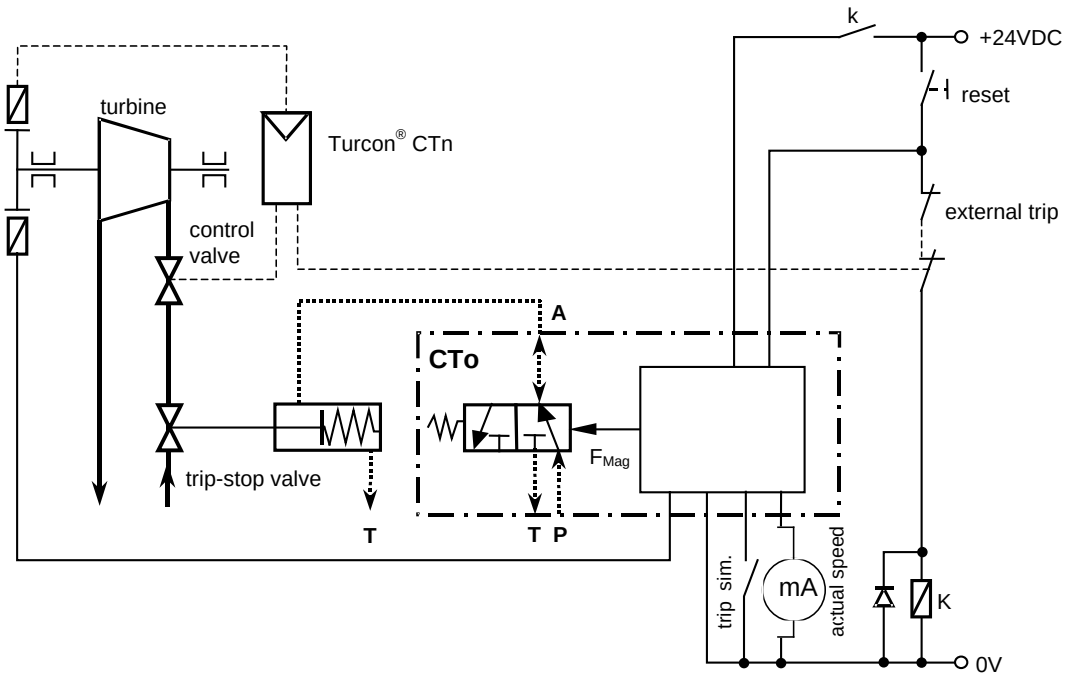


Fig. 2: Block diagram of the overspeed protector

3.2 Operation

A 3/2-way valve and the control magnet VRM with integrated electronics are the main components of the overspeed protector CTO.
If no trip criteria exist, the CTO can be switched on via a reset. On doing so, relay K is energized and thus contact k is closed. An inherently short-circuit-proof holding current from the VRM keeps relay K energized via the closed-circuit arrangement (e.g. external trip).
For a limited time (1.5 sec. ± 0.5 sec.), the reset actuates a maximum coil current which generates a magnetic force FMag and adjusts the piston of the 3/2-way valve against the progressively designed restoring spring. The coil current is then reduced and the control piston is kept in its position. Now the supply pressure is connected with outlet A and the trip-stop valve moves to the "OPEN" position.
In case of a trip criterion (e.g. reaching of the turbine trip frequency), the coil current in the VRM and the magnetic force FMag become zero. The spring force FF now moves the control piston in that position where outlet A is connected with the tank return line T.
The trip-stop valve moves into "CLOSED" position.

3.3 Trip criteria

- Wire breakage and / or short circuit on the speed sensor (for limit value, see Chapter 1, Electrical data, speed input)
- Exceeding the set trip frequency (see Chapter 9, Table 1, Adjusting values - trip frequency)
- Interruption of the closed-circuit arrangement (e.g. external trip) (see Fig. 2)
- Short circuit at the holding current output (+24 V towards relay)
- Temperature in the electronic compartment of the VRM ≥ 80 °C

- Power supply > 30 V (overvoltage triggering at 29.5V - 32V)
  (this criterion is omitted for Article No. TCR.9186855001)
- Power supply < 18 V (under voltage at 16-18V)
  (this criterion is omitted for Article No. TCR.9186855001)
- Trip simulation = partial stroke test - trip-stop valve

➢ The "trip simulation" does not cause a real turbine trip but the internal release frequency threshold is reduced for a short time whereas the CTO is released internally for this time, and thus a tiny movement of the trip-stop cylinder can be seen. The internal release is not signalled outwards and thus, no real shutdown is activated externally.

The trip simulation allows a functional test of the trip-stop valve during operation when the turbine speed is greater than/equal to 23% (+0%, -10%) of the set trip frequency. Only then the CTO can be released internally.

If a trip criterion causes a real turbine trip, the turbine speed has to fall below a reclosure limit equivalent to max. 55% of the set trip frequency. Only then the CTO can be restarted.

4 Packing, Storage, and Transportation

Packing

The overspeed protector is supplied in a special packaging. All hydraulic connections are sealed with protective plugs.

Storage and preservation

The outer surfaces of the overspeed protector are electro-plated. On delivery, the inner parts of the overspeed protector, which are not surface-coated, are moistened with preservation oil.

- Within Europe, this preservation is sufficient as corrosion protection for about 8 months, provided the overspeed protector is stored in a dry location.

If it is intended to store the overspeed protector for a longer period of time, special precautions have to be taken. Coordinate such precautions for each individual case with J.M. Voith SE & Co. KG │ Division Digital Ventures, Crailsheim.

- The ambient conditions for storage must be within the limits indicated in Chapter 1.

Transportation

- It is not allowed to transport the overspeed protector in an explosive atmosphere! This also applies to the transportation of spare parts!

- Improper transportation or lifting of the overspeed protector may cause damage to property and personal injuries.
- Observe, in particular, that constraining forces do not act on the cable entry of the control magnet (VRM) and that the connecting line is not damaged.
- For transportation purposes, it is not allowed to keep the overspeed protector connected to the connecting line.

5 Installation

- Installation and operation of the overspeed protector is only allowed for the conditions stated in Chapter 1.
- Do **not** install the overspeed protector in an explosive atmosphere!
- During operation, explosive atmosphere may get into the way valve via the tank. Therefore, the hydraulic tank must not be set up in zone 0.

- Only personnel satisfying the qualifications according to Chapter 2.3 are allowed to work on the overspeed protector.

- Improper installation of the overspeed protector may cause malfunctioning and premature failure of the overspeed protector.
- Cleanliness is imperative during both installation and connection. Prevent any impurities (dust, metal chips, etc.) from getting into the interior of the overspeed protector or into the piping system. Any such impurities may cause damage to the overspeed protector.

- During the installation period, cover and protect the overspeed protector and, in particular, the electric and hydraulic connections.

5.1 Mounting

- Any work on the overspeed protector may only be performed in de-energized condition and with the oil supply system switched off. During installation, the oil and power supply for the overspeed protector has to be secured against unintentional switching-on.

- Mount the overspeed protector according to the permissible installation position.

<u>Recommended fastening bolts</u>

- 2 socket head screws M12, ISO 4762, property class 8.8
  Tightening torque M_A = 60 Nm, thread oil-moistened.
  Select the screw length according to the installation situation.

5.2 Hydraulic connection

Flanging of the overspeed protector to a hydraulic consumer is effected via connecting bores at the overspeed protector bottom.
O-rings are used for sealing the connecting flange.

For position and dimensions of the connections, please see Chapter 9.

- Wear protective glasses when connecting the overspeed protector hydraulically.
- Pay attention to the correct pressure stage when selecting pipes, flexible tubes, unions, and flanges.
- Immediately replace any damaged pipes and flexible tubes.

When assembling the pipes, ensure that they are not fastened to any moving equipment, but rather to fixed structures free from vibration.
Alterations in length caused by temperature variations must not apply constraining forces to the overspeed protector.

- Fixing and hydraulic connection to a connecting flange is made via the hydraulic part. O-rings are used for sealing. The customer's connecting surface has to correspond to Ra ≤ 1.6 µm and Rmax ≤ 6.3 µm.
- Residual oil (up to 0.2 l) may leak out when removing the screw plugs. Collect the oil in a suitable container and dispose of it properly.
- Do not use fibrous or hardening sealing compounds, such as hemp or mastic, for sealing the connections and pipe unions.

5.3 Electrical Connection

- Only a certified electrician with experience and knowledge in the field of explosion protection is allowed to connect the way valve module electrically in accordance with the electro-technical rules and legal provisions of the country of manufacture. When connecting the overspeed protector within the explosion hazardous area, the electric feed-in lines have to be connected in housings according to a standard type of protection as per EN 60079-0, section 1.

- Work on the electrical system or with operational equipment is only to be completed by electrical technicians or by trained personnel under the guidance and supervision of an electrical technician according to technical electrical regulations and the legal regulations of the respective country.

- Signal and supply lines provided by the customer to the overspeed protector need to be screened and laid separately from each other.
- When connecting the customer's lines, please avoid parallel running of lines with the lines of the current converter assemblies.
- Poor connecting points do not guarantee a reliable operation of the overspeed protector.

For wiring diagram, see Chapter 9.

6 Adjustments and Commissioning

- Prior to delivery, the overspeed protector has been tested and adjusted at J.M. Voith SE & Co. KG │ Division Digital Ventures. The settings are documented in the supplied test report.

- Prior to commissioning, please ensure that the pipes and the hydraulic system have been cleaned. Cleanliness of the operating medium must correspond to the cleanliness grade stated in Chapter 1. Cleaning and flushing operations essential to the operating medium must not be performed with the overspeed protector connected. Operation of the overspeed protector with contaminated operating medium is not permitted and may damage the overspeed protector.

6.1 Adjustment of turbine trip frequency

- Any trip frequency adjustment represents a potentially dangerous manipulation of the equipment and only skilled personnel, authorized by the manufacturer or the supplier, is allowed to do it. Any maladjustment may cause imminent danger to life and severe damage to properties. In any case, any adjustment of the turbine trip frequency has to be documented. Confirmation of the new adjustment by means of a documented trip test is mandatory before operating the turbine.

For safety reasons, the overspeed protector is set to the minimum trip frequency possible of approx. 3800 Hz. For the exact value, please see the relevant test report submitted to you.

The turbine trip frequency is set by means of an 8-fold DIP coding switch which is protected on the electronics that is integrated in the control mangnet A (VRM) (see Fig. 5).

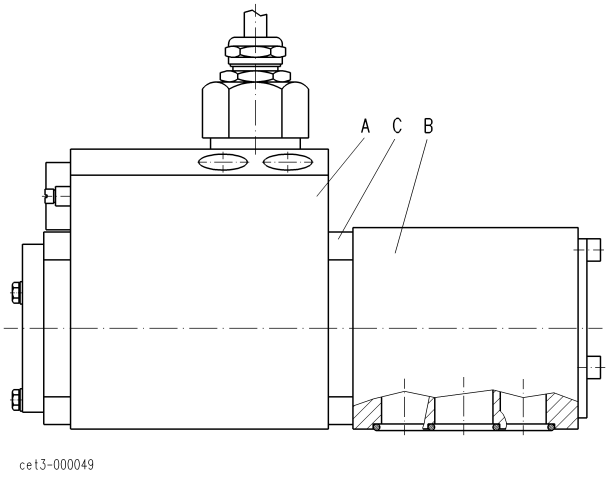


Fig. 3

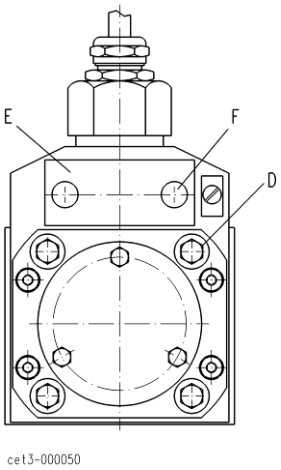


Fig.: 4

Disconnect the VRM from the hydraulic component B in order to get to the coding switch. To do so, loosen the 4 screw nuts D (10 mm width across flats) and pull off the VRM from the hydraulic component B.

- In the course of the further procedure described, the pressure-tight and explosion-protected enclosure of the VRM will be opened and explosion protection will no longer be effective. Therefore, make sure in advance that there is no explosive atmosphere or may form as long as cover C is not remounted and secured by the screws.

Unscrew the 4 Allan screws (5 mm width across flats) used to fix cover C (see Fig. 3) and remove the cover. On account of the seal in cover C, it is not easy to move. It may therefore be helpful to first turn the cover and then lift it using a screwdriver until some air can get into the electronic compartment underneath. Then it will be easy to remove the cover.

- The cylindrical component (diameter 80 mm) and the bore (diameter 12 mm) of cover C are part of the pressure-tight, explosion-protected enclosure and must not be damaged, as well as the bore and cylinder sections of the magnet housing belonging to these surfaces. Do not damage the anticorrosion protection of the relevant surfaces. In case of damaged surfaces or incomplete anticorrosion protection, the explosion protection is no longer granted and the overspeed protector has to be replaced.

Fig. 5 shows the top view onto the electronics installed underneath cover C with coding switch SS1 and UF- and If-potentiometers.

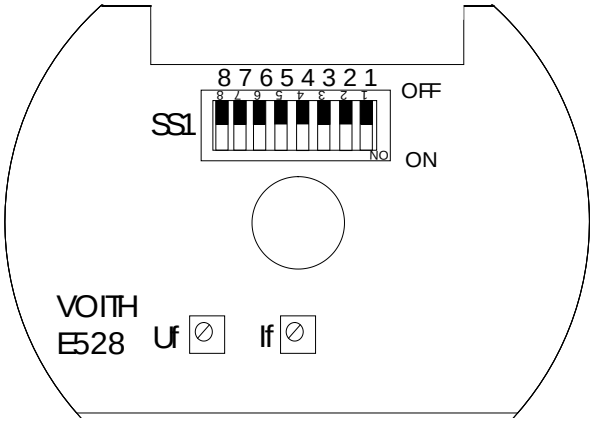


Fig.: 5

Shifting the respective individual switch 1 - 8 of SS1 adjusts the required turbine trip frequency whereas OFF position corresponds to 0 and ON position to 1.
The switch combination to be adjusted is an 8-bit binary number (finary number 0000 0000 to 1111 1111 = decimal number 0-255), calculated as follows, based on the required trip frequency:

$$\text{Decimal number SS1} = \frac{\text{trip frequency [Hz]} - 3800\ \text{Hz}}{27.333\ \text{Hz}}$$

Convert this decimal number into a binary number and set it directly as switch combination at SS1, whereas 1 = ON and 0 = OFF, and also set the least significant number on the right at switch 1 and the most significant on the left at switch 8.
A more convenient method is to enter into Table 1 attached with the desired trip frequency and to directly take from there the switch combination to be adjusted.

- If you use the actual speed remove indication, readjust the 4 mA value using the If-potentiometer for speed 0 after adjustment of the trip frequency. See Chapter 6.2, If-potentiometer.

After setting the coding switches at SS1, remount cover C and fix it using the 4 Allan screws. Make sure that the O-ring in the cover and the two small O-rings in the pole pipe are mounted, not damaged and greased (see Fig. 1). Relock the 4 Allan screws using the circlips.
Now push the VRM onto the hydraulic component, at the control housing of which the O-ring between the hydraulic component and the VRM has to be mounted correctly.

After the overspeed protector is again ready for operation, a test of the readjusted trip frequency is mandatory. On account of rounding errors and/or manufacturing tolerances, it may be necessary to increase or reduce the binary number set by 2. Should this be the case, please proceed again as outlined above. A trip frequency test has to be performed and documented at any rate after completion of the settings. This test should be performed in warm condition (CTO should be operated for about 30 min. at an oil temperature of approx. 50 °C).
After that, seal the overspeed protector, thus securing the setting.
See section A-A of the outline drawing in Chapter 9, Annex.

6.2 Adjustment of UF- and If-potentiometers

Uf-potentiometer (please see Fig. 5)
The Uf-potentiometer is provided to adjust the turbine trip frequency reference, it is set at the factory and sealed. Any adjustment is prohibited!

If-potentiometer (please see Fig. 5)
This potentiometer needs to be adjusted only if you want to use the actual speed remote indication. The limit of 20 mA actual speed remote indication is permenantly assigned to the turbine trip frequency and is corrected automatically on adjustment of the turbine trip frequency. The initial value of 4 mA is to be assigned to 0 Hz.

On adjustment of the turbine trip frequency (see Chapter 6.1), however, also the assignment of 4 mA initial value changes at the same time. It is possible to re-adjust this 4 mA initial value to 0 speed by means of the If-potentiometer. To do so, remove the locking compound of the If-potentiometer and renew it after the adjustment.

For this purpose, the output of the actual speed remote indication is put on an mA-meter. At 0 speed, the If-potentiometer is turned until the mA-meter indicated 4.0 mA. Turning the potentiometer clockwise will increase the mA-signal.

In case of a trip of the CTO, the actual speed remote indication returns to 0 mA due to the external switch-off of the 24V CTO supply. In case this external switch-off of the 24V supply is prevented erroneously, the actual speed indication increases to higher values and the allocation of the speed to the actual speed signal is no longer correct during this state. After a proper reconnection of the CTO, this state eliminates on its own.

T4-potentiometer (please see Fig. 6 and Fig. 4)
The T4-potentiometer is used to set the trip time of the trip simulation function (partial stroke test with trip-stop cylinder. The potentiometer is in the VRM and protected by a cover.

- Following the procedure described below, the pressure-tight, explosion protected enclosure of the VRM will be opened and the explosion protection will no longer be effective. Therefore, it has to be checked before that there is no explosive atmosphere or may form as long as cover E is not remounted and secured by screws F.

Loosen the 2 Allan screws F (5 mm width across flats, see Fig. 4) in order to get to the T4-potentiometer. The remove cover E. On account of the O-ring (see Fig. 1) in cover E it might be somewhat hard to remove it.

- The cylindrical part of the cover and the enclosure bore form part of the pressure-tight enclosure for explosion protection. The cylindrical surface of the cover and the associated surface of the enclosure bore must not be damaged. The corrosion protection of these surfaces needs to be completely preserved!

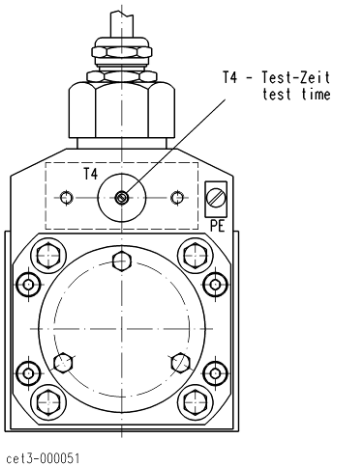
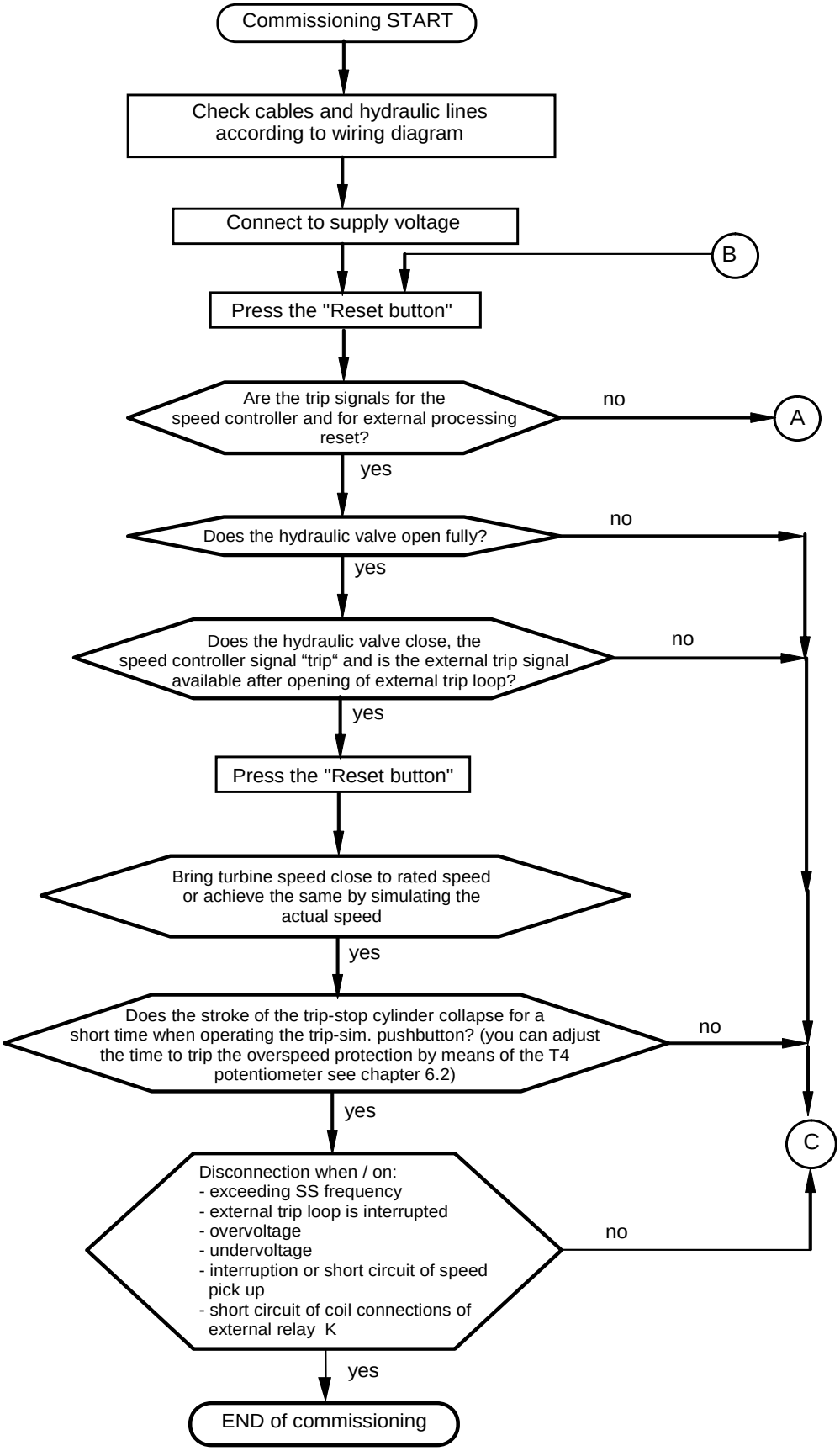


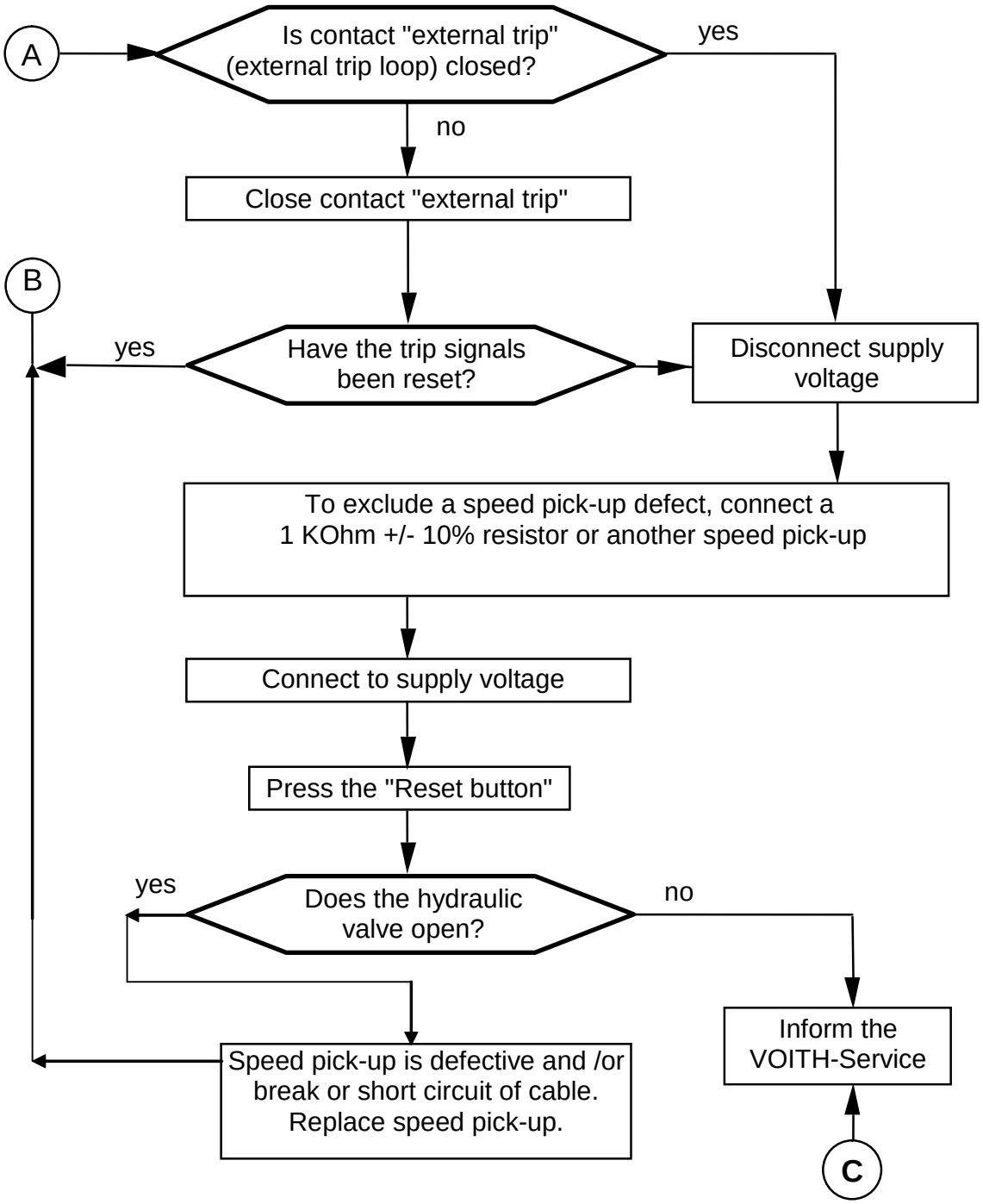
Fig.: 6

Turning the T4-potentiometer will adjust the trip time, elapsing after releasing the "trip simulation" pushbutton = partial stroke test - trip-stop valve (see Fig. 2, and for functional description, see Chapter 3.49. Thus, the trip time is adjustable.
The temporary trip time is extended by turning the potentiometer clockwise.
The potentiometer is factory-set to the minimum possible trip time. Repeated pushing and releasing the pushbutton "trip simulation" adjusts the potentiometer. The potentiometer is adjusted in steps clockwise and the trip-stop valve is observed. The trip time is set correctly when the trip-stop valve performs a little stroke towards the closing direction, but does not yet have a negative influence on the turbine operation.
Doing so, it is possible to check the function of the overspeed protector and trip-stop valve in intervals to be determined by pushing and releasing the "trip simulation" button during turbine operation.

After adjustment of the temporary trip time, remount cover E and fix it using the 2 Allan screws F. Observe that the O-ring is inserted in the cover, undamaged and greased. Lock the 2 Allan screws using the circlips.

6.3 Commissioning




A
Is contact "external trip" (external trip loop) closed?
yes
no
Close contact "external trip"
B
yes
Have the trip signals been reset?
Disconnect supply voltage
To exclude a speed pick-up defect, connect a 1 KOhm +/- 10% resistor or another speed pick-up
Connect to supply voltage
Press the "Reset button"
yes
Does the hydraulic valve open?
no
Inform the VOITH-Service
Speed pick-up is defective and /or break or short circuit of cable. Replace speed pick-up.
C

7 Maintenance and Repair

- For trouble-free and reliable operation of the overspeed protector, inspection, maintenance and servicing are necessary and need to be performed in certain intervals.

Routine inspection

Check pipes, pipe unions and connections on the overspeed protector for leaks, impurities and damage.
Remedy any leaks, impurities and damages detected , as required, during appropriate operating phases.

Monitor the overspeed protector operating behavior for any changes. Analyze and eliminate the causes, as required, during appropriate operating phases.

Inspection after approx. 740 operating hours or after max. 1 month

Take an oil sample from the oil tank and check it for solid and suspended matters, water content, change of color and air bubbles. Check the oil sample for impurities.
Check and change the oil, as required, during appropriate operating phases.

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

Take an oil sample from the oil tank and analyze it chemically.
Check and change the oil, as required, during appropriate operating phases.

Check the electrical connections of the overspeed protector and retighten them, if necessary.

8 Decommissioning

- If the overspeed protector is switched off for repair or inspection purposes, or for a system shutdown, switch off the oil supply system and release all pressure accumulators, if effective.
- Wear protective glasses when disassembling the hydraulic connection on the overspeed protector.

- Disconnect the 24 V DC power supply and remove the lines. Remove the piping. This may result in larger oil quantities leaking out. Collect the oil in a suitable container and dispose of it properly. Close all openings. Now the overspeed protector can be cleaned and packed.

Disposal

For overspeed protector disposal, please observe the local applicable provisions on protection of the environment. The servomotor essentially contains steel, copper, synthetic materials, electronic components, and residual oil.

9 Annex

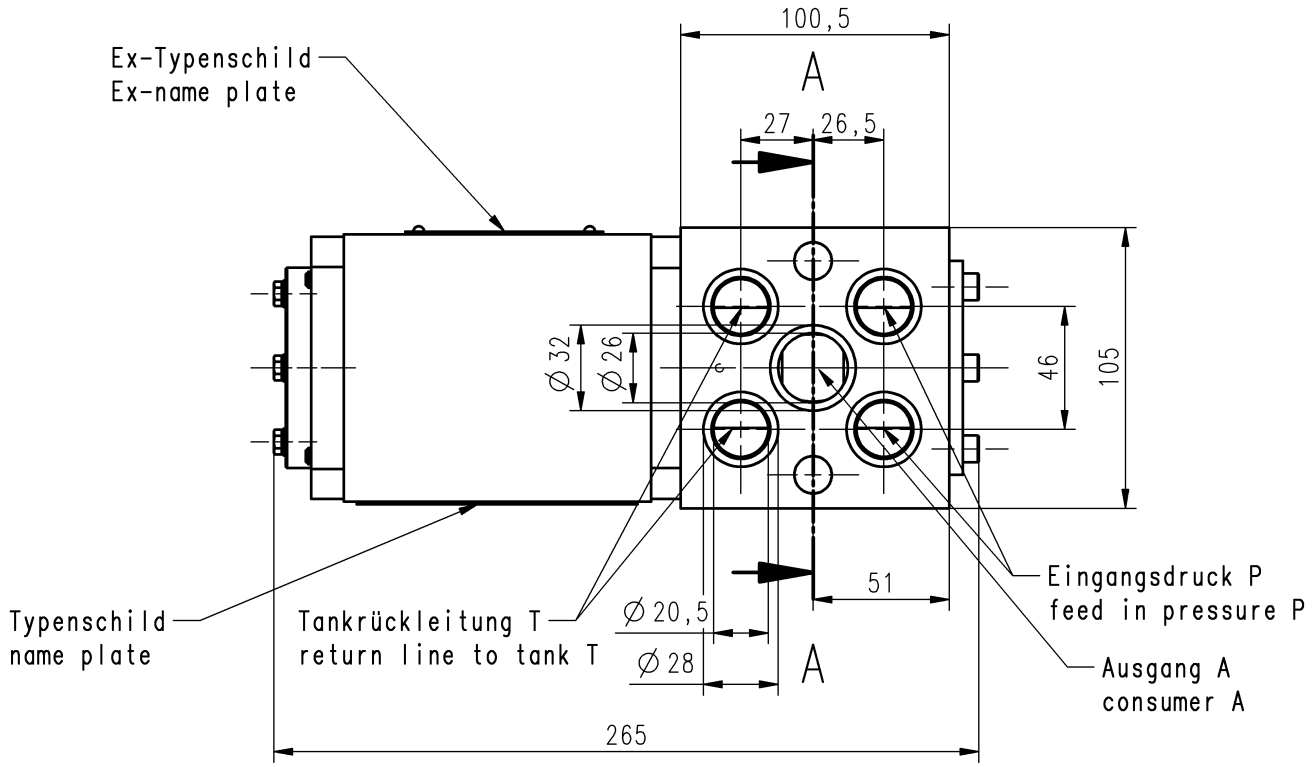
Table 1:	Adjusting values - turbine trip frequency
Outline Drawing	91868552
Wiring diagram	22000079112

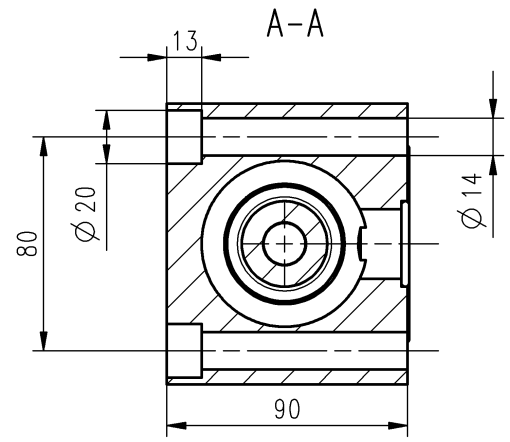
VOITH
Inspiring Technology for Generations

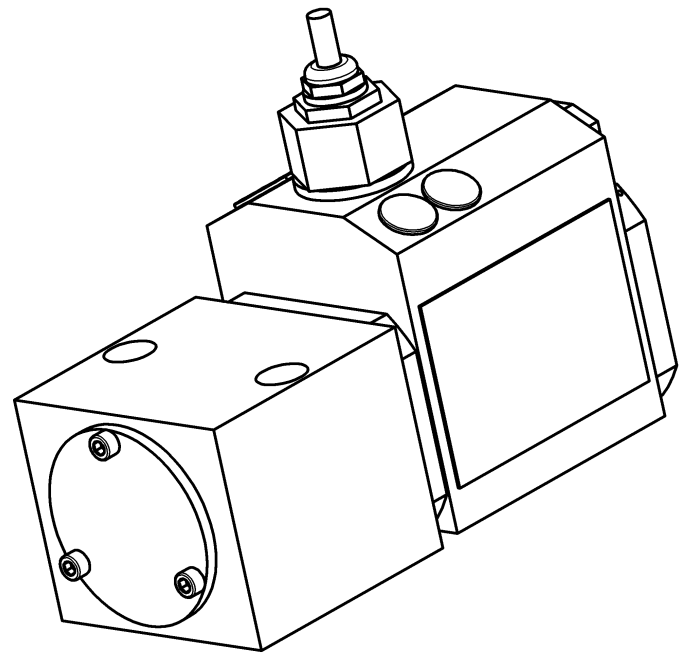
Table 1: Values for switch positions to adjust the turbine trip frequency
1 bit corresponds to 27.333 Hz; for calculation, see Chapter 6.1,
for tolerances, see Chapter 1

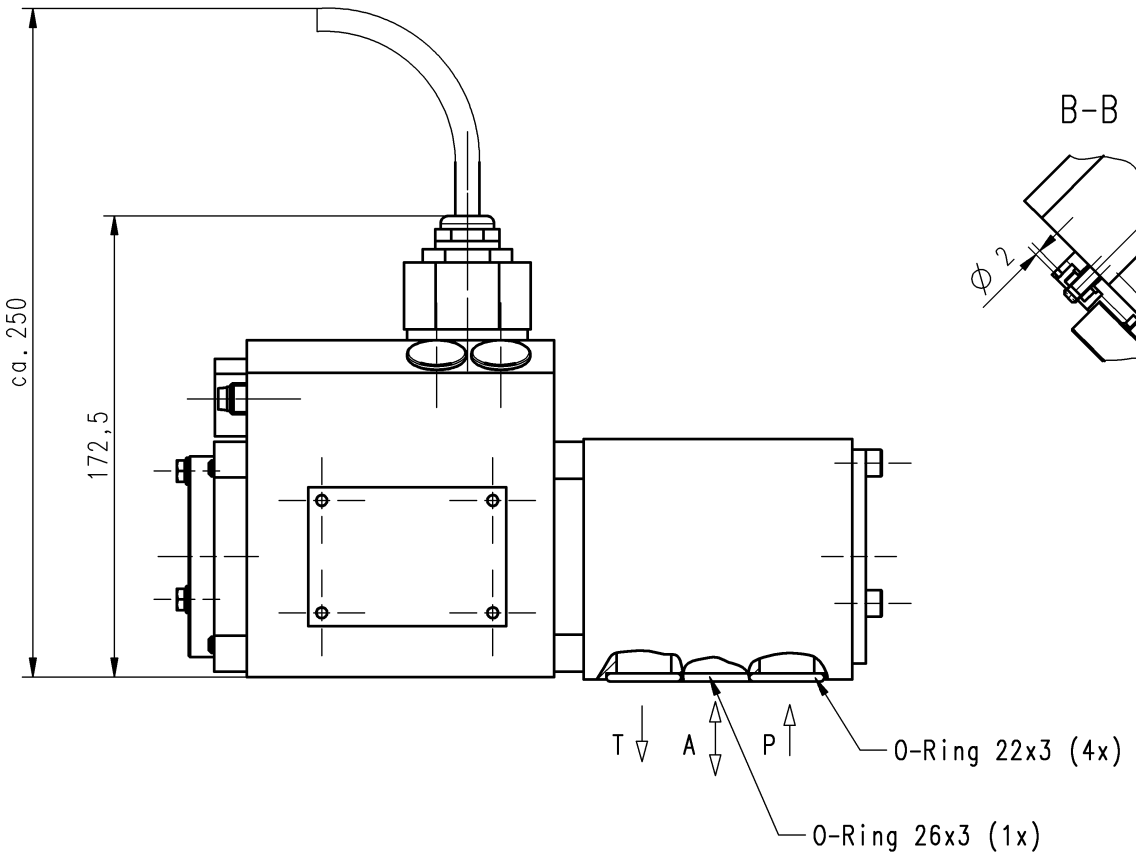
Format: / decimal number / turbine trip frequency / binary number/

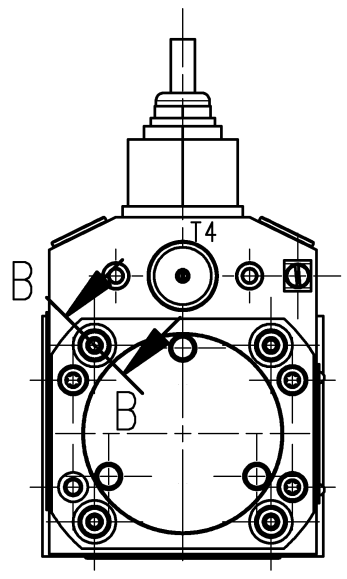
0	3800	00000000	64	5549	01000000	128	7299	10000000	192	9048	11000000
1	3827	00000001	65	5577	01000001	129	7326	10000001	193	9075	11000001
2	3855	00000010	66	5604	01000010	130	7353	10000010	194	9103	11000010
3	3882	00000011	67	5631	01000011	131	7381	10000011	195	9130	11000011
4	3909	00000100	68	5659	01000100	132	7408	10000100	196	9157	11000100
5	3937	00000101	69	5686	01000101	133	7435	10000101	197	9185	11000101
6	3964	00000110	70	5713	01000110	134	7463	10000110	198	9212	11000110
7	3991	00000111	71	5741	01000111	135	7490	10000111	199	9239	11000111
8	4019	00001000	72	5768	01001000	136	7517	10001000	200	9267	11001000
9	4046	00001001	73	5795	01001001	137	7545	10001001	201	9294	11001001
10	4073	00001010	74	5823	01001010	138	7572	10001010	202	9321	11001010
11	4101	00001011	75	5850	01001011	139	7599	10001011	203	9349	11001011
12	4128	00001100	76	5877	01001100	140	7627	10001100	204	9376	11001100
13	4155	00001101	77	5905	01001101	141	7654	10001101	205	9403	11001101
14	4183	00001110	78	5932	01001110	142	7681	10001110	206	9431	11001110
15	4210	00001111	79	5959	01001111	143	7709	10001111	207	9458	11001111
16	4237	00010000	80	5987	01010000	144	7736	10010000	208	9485	11010000
17	4265	00010001	81	6014	01010001	145	7763	10010001	209	9513	11010001
18	4292	00010010	82	6041	01010010	146	7791	10010010	210	9540	11010010
19	4319	00010011	83	6069	01010011	147	7818	10010011	211	9567	11010011
20	4347	00010100	84	6096	01010100	148	7845	10010100	212	9595	11010100
21	4374	00010101	85	6123	01010101	149	7873	10010101	213	9622	11010101
22	4401	00010110	86	6151	01010110	150	7900	10010110	214	9649	11010110
23	4429	00010111	87	6178	01010111	151	7927	10010111	215	9677	11010111
24	4456	00011000	88	6205	01011000	152	7955	10011000	216	9704	11011000
25	4483	00011001	89	6233	01011001	153	7982	10011001	217	9731	11011001
26	4511	00011010	90	6260	01011010	154	8009	10011010	218	9759	11011010
27	4538	00011011	91	6287	01011011	155	8037	10011011	219	9786	11011011
28	4565	00011100	92	6315	01011100	156	8064	10011100	220	9813	11011100
29	4593	00011101	93	6342	01011101	157	8091	10011101	221	9841	11011101
30	4620	00011110	94	6369	01011110	158	8119	10011110	222	9868	11011110
31	4647	00011111	95	6397	01011111	159	8146	10011111	223	9895	11011111
32	4675	00100000	96	6424	01100000	160	8173	10100000	224	9923	11100000
33	4702	00100001	97	6451	01100001	161	8201	10100001	225	9950	11100001
34	4729	00100010	98	6479	01100010	162	8228	10100010	226	9977	11100010
35	4757	00100011	99	6506	01100011	163	8255	10100011	227	10005	11100011
36	4784	00100100	100	6533	01100100	164	8283	10100100	228	10032	11100100
37	4811	00100101	101	6561	01100101	165	8310	10100101	229	10059	11100101
38	4839	00100110	102	6588	01100110	166	8337	10100110	230	10087	11100110
39	4866	00100111	103	6615	01100111	167	8365	10100111	231	10114	11100111
40	4893	00101000	104	6643	01101000	168	8392	10101000	232	10141	11101000
41	4921	00101001	105	6670	01101001	169	8419	10101001	233	10169	11101001
42	4948	00101010	106	6697	01101010	170	8447	10101010	234	10196	11101010
43	4975	00101011	107	6725	01101011	171	8474	10101011	235	10223	11101011
44	5003	00101100	108	6752	01101100	172	8501	10101100	236	10251	11101100
45	5030	00101101	109	6779	01101101	173	8529	10101101	237	10278	11101101
46	5057	00101110	110	6807	01101110	174	8556	10101110	238	10305	11101110
47	5085	00101111	111	6834	01101111	175	8583	10101111	239	10333	11101111
48	5112	00110000	112	6861	01110000	176	8611	10110000	240	10360	11110000
49	5139	00110001	113	6889	01110001	177	8638	10110001	241	10387	11110001
50	5167	00110010	114	6916	01110010	178	8665	10110010	242	10415	11110010
51	5194	00110011	115	6943	01110011	179	8693	10110011	243	10442	11110011
52	5221	00110100	116	6971	01110100	180	8720	10110100	244	10469	11110100
53	5249	00110101	117	6998	01110101	181	8747	10110101	245	10497	11110101
54	5276	00110110	118	7025	01110110	182	8775	10110110	246	10524	11110110
55	5303	00110111	119	7053	01110111	183	8802	10110111	247	10551	11110111
56	5331	00111000	120	7080	01111000	184	8829	10111000	248	10579	11111000
57	5358	00111001	121	7107	01111001	185	8857	10111001	249	10606	11111001
58	5385	00111010	122	7135	01111010	186	8884	10111010	250	10633	11111010
59	5413	00111011	123	7162	01111011	187	8911	10111011	251	10661	11111011
60	5440	00111100	124	7189	01111100	188	8939	10111100	252	10688	11111100
61	5467	00111101	125	7217	01111101	189	8966	10111101	253	10715	11111101
62	5495	00111110	126	7244	01111110	190	8993	10111110	254	10743	11111110
63	5522	00111111	127	7271	01111111	191	9021	10111111	255	10770	11111111











Aend.	Kommt vor	Aenderungs-Nr.	Aenderung	Index	Datum: Gez.	Name	Gepr.
02	--	140354	Russische Sprache hinzu, Übernahme in NX		12-03-20	zzokoc	mley

Sprache DE		CAD	Freigabevermerk F
Kanten ISO 13715	Allg. Toleranzen ISO 2768-mK-E	Oberflaechen R_a in µm	Massstab im Orig. 1:2 / Masse 15 kg
	Tolerierung DIN 7167	ISO 1302	Werkstoff
			Modell- / Gesenk-Nr. / Rohteil-Nr.

	Datum	Name
Gez.	2006-08-10	Ama
Gepr.	2006-08-10	Ochs
Abt.	aiet	Frei. met
Norm		

Doku-Art Z01

Benennung: Ueberdrehzahlschutz / overspeed protector

VOITH TURBO ANTRIEBSTECHNIK

Zeichnungs-Nr. / Doku-Nr.: 91868552

Blatt 1 v. 1 Bl.

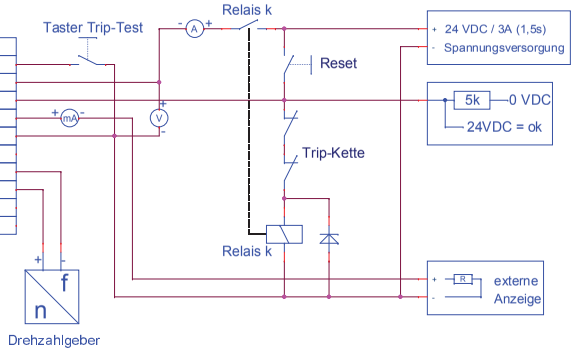
Passmass | Abmasse | Urspr. | Ers. f. | Ers. d.

DIN A2

Elektrische Daten

el. Anschlussplan mit Anschlussbeispiel

Bezeichnung		Ader Nr.
Teilhub-Test	Trip-Sim	1
24 VDC Versorgungsspannung (3A 1,5sek.)	+DC Power (24V)	2
OK-Meldung	OK	3
Istdrehzahlausgang (4...20mA)	+nOut	4
0 VDC Versorgungsspannung (3A 1,5sek.)	-DC Power (0V)	5
reserviert		6
Signal Drehzahlgeber - (0.5...18Vrms)	-nIn	7
Signal Drehzahlgeber + (0.5...18Vrms)	+nIn	8
reserviert		9
Masse-Anschluss	PE	gn/gb

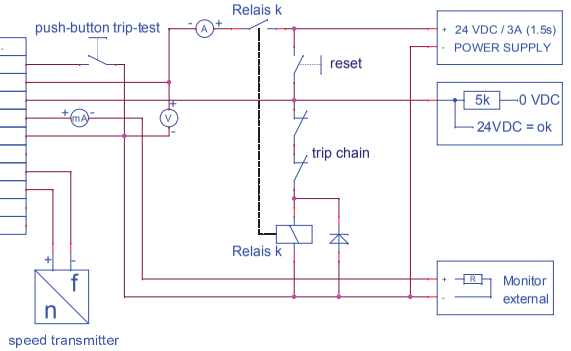


Hinweis:
PE ist nur mit dem Gehäuse verbunden. Der Kabelschirm ist mit dem Gehäuse des Gerätes verbunden.
Die eingezeichneten Volt- und Amperemeter sind nur zur Messung.

Electrical data

Wiring diagram with connection example

designation		wire no.
partial stroke test	Trip-Sim	1
24 VDC Power (3A 1.5sec.)	+DC Power (24V)	2
OK status signal	OK	3
actual revolution output (4...20mA)	+nOut	4
0 VDC Power (3A 1.5sec.)	-DC Power (0V)	5
reserved		6
signal speed transmitter - (0.5...18Vrms)	-nIn	7
signal speed transmitter + (0.5...18Vrms)	+nIn	8
reserved		9
ground connection	PE	gn/ye



Instruction:
PE is only connected to the housing of the device. The cable shielding is connected to the housing of the device.
The drawn volt- and amperemeters are only for measurement.

Aend.	Aenderungs-Nr.	Aenderung	Datum: Gez.	Name	Gepr.

Erstellt mit	Sprache	Doku-Art
OrCAD 16.5	DE, ENG	Z03

	Datum	Name
Gez.	2012-04-02	sleh
Gepr.	2012-04-02	Go
Abt.	aieg	

Benennung: Kunden-Anschlussplan / Customer connection diagram

VOITH

Zeichnungs-Nr. / Doku-Nr.: 220 000791 12

Blatt: 1 v. 1 Bl.

Urspr. TCR 91868552 | Ers. f. | Ers. d.