

Voith Turbo

VOITH

Installation and Operating Manual

3626-011500 en

BTS

Non-contacting Thermal Switch Unit

ATTENTION!

Please read this manual, at any rate, prior to installation and commissioning, and keep it for further use!

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1 Preface

1.1 General information

This manual will support you in using the non-contacting thermal switch unit (**BTS**) in a safe, proper and economical way. If you observe the information contained in this manual, you will

- increase the reliability and lifetime of the installation,
- avoid any risks,
- reduce repairs and downtimes.

This manual must

- **always be available at the BTS site,**
- **be read and used by every person who works on the unit.**

The non-contacting thermal switch unit is manufactured to the state of art and approved safety regulations. Nevertheless, the user's or third parties' life may be endangered or the machine or other material assets impaired in case of improper handling or use.

Spare parts:

Spare parts must comply with the requirements determined by Voith.

This is guaranteed when original spare parts are being used.

Installation and/or use of non-original spare parts may negatively change the mechanical properties of the BTS and thus have an adverse impact on the safety.

Voith is not liable for damages resulting from use of non-original spare parts.

Commissioning, maintenance and repair should only be effected by qualified and trained personnel.

This manual was issued with utmost care. However, in case you should need any further information, please contact:

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Voith Turbo reserves the right for modifications.

1.2 Proper use

- The non-contacting thermal switch unit (**BTS**) is provided to monitor the temperature of Voith turbo couplings in a non-contacting way. Use for another purpose, e.g. for operating conditions which were not agreed, is not is not considered as proper use.
- Proper use also includes observance of the installation and operating manual.
- The manufacturer is **not** liable for damages resulting from improper use. In this case, the risk lies solely with the user.

2 Safety

2.1 Notes and symbols

The safety notes included in this instruction manual are particularly marked with safety marks according to DIN 4844:










Damage/harm to...	Signal word	Definition	Consequences	Symbol
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	
Persons	CAUTION!	less dangerous situation	slight or minor injuries possible	
Persons Property		warning of combustible materials	fire hazard	
Persons		use goggles	risk of losing sight, risk of going blind	
Persons		Use ear protection	hearing damage	
Material	ATTENTION!	harmful situation possible	possible damage to <ul style="list-style-type: none"> – the product – its environment 	
–	Note! Information!	application hints and other useful information	efficient in operation	

Table 1

2.2 General information with regard to dangerous situations

WARNING!

- For all work performed on the non-contacting thermal switch unit, please observe the local regulations for prevention of accidents as well as the regulations for installation of electrical equipment!
- For the use of the non-contacting thermal switch unit in hazardous areas (initiator type NJ 10-22-N-E93) observe the local regulations applicable to electrical equipment in hazardous areas! Modifications on the initiator, including connecting cable, are not permitted.



DANGER!

Working on the non-contacting thermal switch unit:

- Touching uncovered terminals, lines and equipment parts may cause fatal or most serious injuries!
- In the event of a failure, even potential-free assemblies may carry a corresponding supply voltage during operation.



Working on the turbo coupling:

- For all work performed on the turbo coupling, ensure that both the drive motor/engine and the driven machine have stopped running and startup is absolutely impossible!
- Start to work only after the coupling has cooled down below 40°C, otherwise there is a risk of burns!
- In addition, observe the installation and operating manual of the turbo coupling!

Noise:

- The turbo coupling generates noise during operation. If the A-classified equivalent sound pressure level exceeds 80 dB(A) this may cause hearing damage!
Wear ear protection!



→ Sound pressure level see separate instruction manual

Sprayed-off and discharged operating fluid:

- In the event of thermal overload of the turbo coupling the fusible plugs respond. Operating fluid is discharged through these fusible plugs. This may happen only in case of improper use (e.g. design range has not been adhered to).
- If the fusible plugs spray off, immediately switch off drive!
- Electrical devices located near the coupling need to be protected against spraying!
- Please ensure that the sprayed-off operating fluid cannot get in contact with persons! Danger of burning!
- Please ensure that the sprayed-off operating fluid cannot get in contact with persons! Danger of burning! Persons being in the surround
- Make sure that spraying operating fluid cannot get into contact with hot machine parts, heaters, sparks or open flames! There is a risk of fire!
- In order to prevent danger (e.g. risk of skidding, risk of fire) caused by escaping oil, remove same immediately!
- Please provide a catch pan of sufficient size, if required!

→ For design range, please see coupling operating manual, Chapter 1, Technical Data



2.3 Staff qualification

The staff in charge of any work to be done on the non-contacting thermal switch unit must

- be reliable,
- have the legal minimum age,
- be trained, instructed and authorized with regard to the intended work.
- at use in potentially explosive atmosphere observe **EN 1127-1 Annex A** and **EN 1127-1 Section 7**. Only use tools admissible in potentially explosive areas. Only use tools admissible in potentially explosive areas. Avoid sparking.



2.4 Product observation

We are under legal obligation to observe our products, even after shipment.

Please therefore inform us about anything that might be of interest to us. For example:

- change in operating data,
- experience gained with the unit,
- recurring problems,
- problems experienced with this installation and operating manual.

→ You will find our
address on
page 3.

3 Possible Applications, BTS Characteristics

The non-contacting thermal switch unit (**BTS**) is a monitoring system for Voith turbo couplings.

- The BTS provides easy monitoring of turbo coupling temperature.
- **In the event of an excess temperature, dependent on the application,**
 - **the operator can be warned,**
 - **a drive motor/engine shutdown can be arranged,**
 - **the load on the driven machine can be reduced.**
- If the excess temperature is recognised in time, the discharge or loss of coupling fill through the fusible plugs can be avoided. Downtimes are reduced.
- The BTS automatically resets after the turbo coupling has cooled down.
- The BTS can be used for Voith turbo couplings from **size 206**.

EX-PROTECTION!

The control circuit of evaluator is not intrinsically safe! Should an intrinsically safe control circuit be required (e.g. for the use in potentially explosive areas), provide an appropriate isolating switch amplifier between evaluator and initiator!



The BTS must not be used as safety device to limit the maximum permissible surface temperature of the turbo coupling in potentially explosive areas!

4 Function of BTS

The non-contacting thermal switch unit (**BTS**) consists of three components:

- **switching element**
- **initiator** with mounting flange
- **evaluator**
- **isolating switch amplifier**, two channel for up to 2 initiators (if an intrinsically safe control circuit is required)

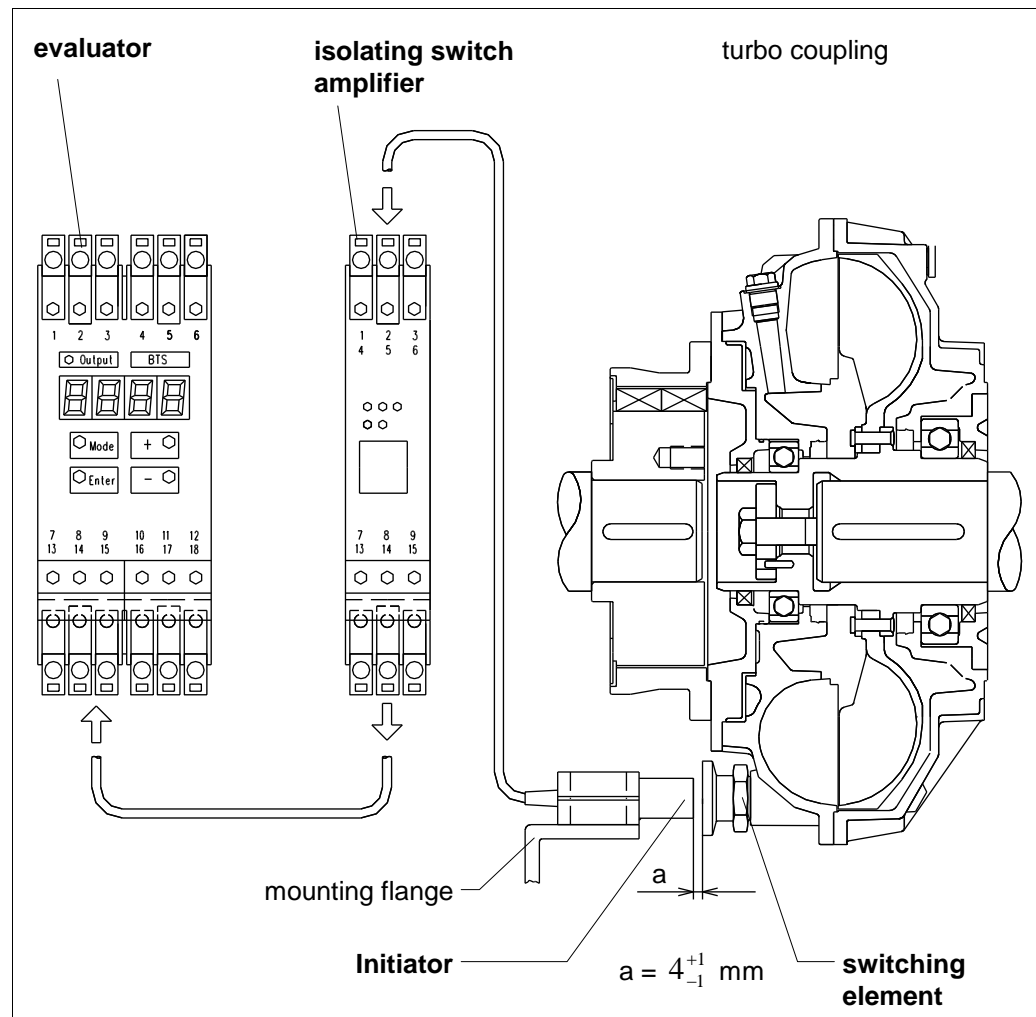


Fig. 1

4.1 Switching element

The switching element is a passive component (ordinary electrical utility to EN 60079-14 section 12.2.1). It is inserted the outer wheel or in the turbo coupling shell. This provides a thermal contact between switching element and turbo coupling inclusive operating fluid.

A coil and a thermostatic switch are integrated in the switching element. The switching point of the thermostatic switch corresponds to the response temperature of switching element.

Below the response temperature, the thermostatic switch is closed and bridges the coil. Above the response temperature, the thermostatic switch opens and interrupts the circuit. When the temperature decreases, the thermostatic switch closes the circuit again. The BTS resets automatically.

→ Table 2,
page 11

4.2 Initiator

The initiator is designed as polarised two-wire sensor to DIN EN 60947-5-6 (NAMUR). It works to the inductive sensor principle.

An electric oscillator is integrated in the initiator which produces a high-frequency oscillation. The oscillator has an oscillating circuit as element determining the frequency, comprising a coil and a capacitor.

The oscillating circuit coil is located in the sensor head. An electromagnetic alternating field leaves the sensor head via this coil.

4.3 Evaluator

The evaluator is an electronic unit recording the electric pulses and evaluating the period between the pulses.

The evaluation starts either by switching on the supply voltage or by an external trigger signal.

After evaluation start, monitoring of pulses must be interrupted for an adjustable period of time (start-up bypass time).

A relay with changeover contact will be released if the number of pulses per unit of time drops below a certain value.

The evaluator is equipped with a connection for NAMUR sensors to DIN EN 60947-5-6 (NAMUR).

4.4 Isolating switch amplifier

The isolating switch amplifier transmits digital signals from the potentially explosive area.

Sensors to DIN EN 60947-5-6 (NAMUR) or mechanical contacts may work as transducing sensor.

The intrinsically safe inputs are safely isolated from output and power system according to DIN EN 50020.

4.5 Interaction of BTS components

→ Fig. 1,
page 8

The switching element is screwed in the turbo coupling instead of a blind screw. The initiator with mounting flange is mounted parallel with the turbo coupling axis and is connected to the evaluator.

The coil inside the switching element is coupled inductively with the coil inside the initiator if the switching element is located in front of the initiator head. In the event of a closed thermostatic switch, energy is transmitted from the initiator to the switching element. The oscillator is attenuated and has a lower current consumption.

If the coupling temperature exceeds the response temperature of switching element, the thermostatic switch will interrupt the circuit in the switching element. The switching element can no longer attenuate the oscillator in the initiator.

The evaluator recognises the attenuation of initiator due to the initiator current consumption.

If the turbo coupling with screwed in switching element rotates, then the switching element will permanently pass the initiator, thus continuously creating attenuation pulses. The output relay in the evaluator is picked up.

In case of excess temperature, these attenuation pulses are not given, i.e. the limit frequency set on the evaluation is not reached. The evaluator recognises the missing pulses, the output relay is released.

On startup of the turbo coupling, a start-up bypass time is set at the evaluator. As long as the start-up bypass is active, the output relay remains picked up.

→ For max.
frequency,
see Table 5
page 17

After this set time, the speed of the turbo coupling with switching element must have exceeded the adjusted limit frequency (see **table 5**).



DANGER!

Following any shut-down the control system is to be locked in a way that prevents automatic re-start.

Shut-down must be acknowledged!

→ For max. permissible temperature, see operating manual of turbo coupling, Chapter 1, Technical Data

The coupling may only be restarted, if the coupling temperature is below maximum permissible temperature allowed during motor start!

5 Technical data

5.1 Switching element

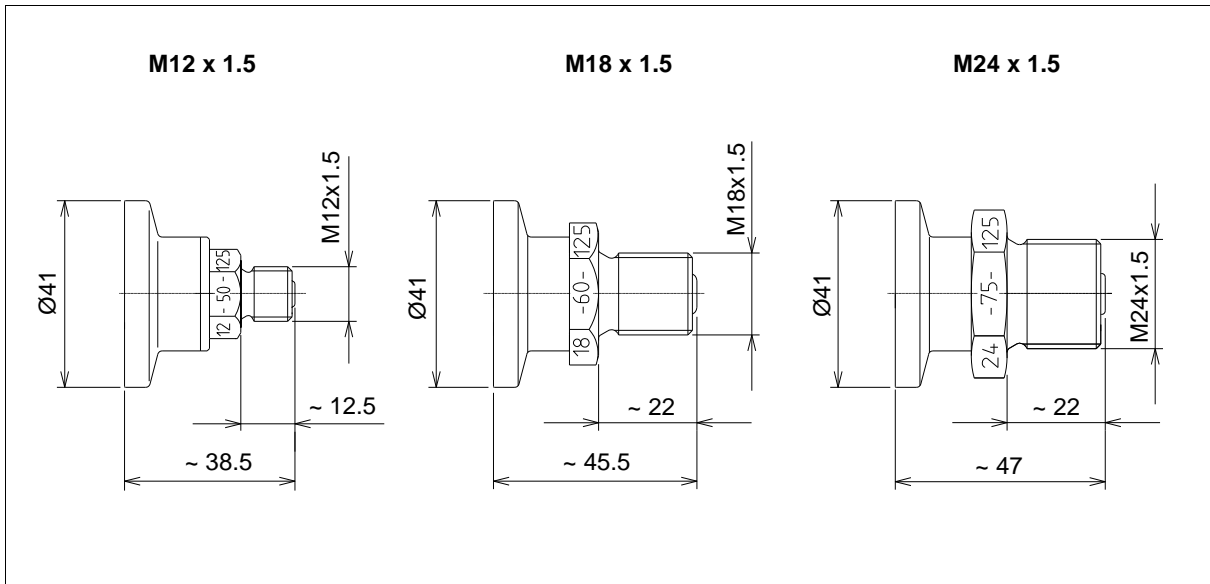


Fig. 2

The following switching elements are available for the different turbo coupling sizes:

Dimension of thread	M12 x 1.5	M18 x 1.5	M24 x 1.5
Nominal response temperature	125 °C	85 / 90 / 100 / 110 / 125 / 140 / 160 / 180 °C	85 / 125 / 140 / 160 / 180 °C
To suit coupling sizes...	206 – 274	366 – 650	750 – 1330
Response tolerance	± 5 °C		
Reset temperature	approx. 40 °C below the response temperature		
Peripheral speed	max. 50 ms ⁻¹	max. 60 ms ⁻¹	max. 75 ms ⁻¹
Wrench size across flats	17	27	32
Tightening torque	22 Nm	60 Nm	144 Nm

Table 2

Note!

- The type of switching element is stamped in on the housing containing:
 - thread dimension,
 - maximum peripheral speed
 - and the nominal response temperature.
- The response temperature of switching element is determined when designing the coupling.



5.2 Initiator, mounting flange

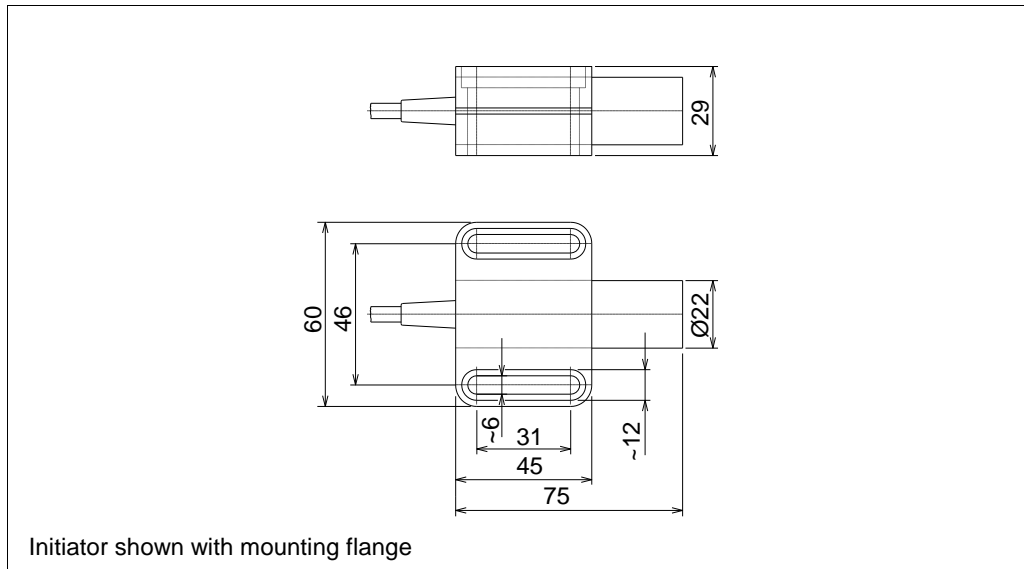


Fig. 3

Type of initiator	NJ 10-22-N-E93-Y30629	NJ 10-22-N-E93-Y30627	NJ10-22-N-E93 Y106925
Safe switching distance with Voith-switching element	5 mm		
Design	to DIN EN 60947-5-6 (NAMUR)		
Operating voltage	Nominal 8.2 V DC		
Current consumption	safe attenuation: ≥ 0.1 mA / ≤ 1.2 mA safe non-attenuation: ≥ 2.1 mA / ≤ 6.0 mA		
Reverse voltage protection	yes		
Permissible ambient temperature ¹⁾	-25 °C...+70 °C	-25 °C...+100 °C	-40 °C...+70 °C
Protection to EN 60529	IP 68		
Type of protection to DIN EN 50014 and DIN EN 50020	II 2G EEx ia IIC T6 (PTB 00 ATEX 2048 X) II 1D Ex iaD 20 T x°C (ZELM 03 ATEX 0128 X)		
	x: T 85 °C	T 108 °C	T 85 °C
EMC according to	IEC / EN 60947-5-2		
Stress due to shocks	a<30 g, t=11 ms, to IEC 68-2-27		
Stress due to vibration	f=55 Hz, s=1 mm, to IEC 68-2-6		
Connecting line	Y30629: 2 m, PVC 2 x 0.75 mm ² , free line ends	Y30627: 2 m, SIHF 2 x 0.75 mm ² , free line ends	2 m, SIHF 2 x 0.75 mm ² , free line ends
Certificates	CSA - 1007121 (LR 96321-2)		
Dimensions	Ø 22 x 75		
Wiring diagram	<p style="text-align: center;">(BN: brown / BU: blue)</p>		



¹⁾ For temperatures below -20°C, install initiators with mechanical protection.

Table 3

Manual electrical apparatus for hazardous areas

Device category 2G	for use in hazardous areas with gas, vapour and mist.
Directive conformity	94/9/EC
Standard conformity	EN 50014:1997, EN 50020:1994 Ignition protection "Intrinsic safety" Use is restricted to the following stated conditions.
CE symbol	CE 0102
Ex marking	Ex II 2G EEx ia IIC T6
EC-Type Examination Certificate Appropriate type	PTB 00 ATEX 2048 X NJ 10-22-N...
Effective internal capacitance Ci	≤ 130 nF ; a cable length of 10 m is considered.
Effective internal inductance Li	≤ 100 µH ; a cable length of 10 m is considered.
General	The equipment has to be operated according to the data given in this description. The EU type examination certificate must be observed. The special conditions must be adhered to! Directive 94/9/EC and hence also EU type examination certificates apply in general only to the use of electrical apparatus under atmospheric conditions. The use in ambient temperatures of > 60 °C was tested with regard to hot surfaces by the mentioned certification authority. If the equipment is not used under atmospheric conditions, a reduction of the permissible minimum ignition energies may have to be taken into consideration.
ambient temperature	The temperature ranges, according to temperature class, are given in the EU type examination certificate.
Installation, Commissioning	Laws and/or regulations and standards governing the use or intended usage goal must be observed. The intrinsic safety is only assured in connection with an appropriate related apparatus and according to the proof of intrinsic safety.
Repair and maintenance	No changes can be made to apparatus, which are operated in hazardous areas. Repairs to these apparatus are not possible.
Special conditions Protection from mechanical danger	The sensor must not be mechanically damaged. When used in the temperature range below -20 °C the sensor should be protected from knocks by the provision of an additional housing.

Table 4

Manual electrical apparatus for hazardous areas



Device category 1D	for use in hazardous areas with combustible dust.
Directive conformity	94/9/EC
Standard conformity	IEC 61241-11:2002 draft: prEN61241-0:2002 Ignition protection "iD" Use is restricted to the following stated conditions.
CE symbol	
Ex marking	 II 1D Ex iaD 20 T 85 °C or T 108 °C
EC-Type Examination Certificate Appropriate type	ZELM 03 ATEX 0128 X NJ 10-22-N-E93-Y30629
Effective internal capacitance Ci	≤ 130 nF ; a cable length of 10 m is considered.
Effective internal inductance Li	≤ 100 µH ; a cable length of 10 m is considered.
General	<p>The equipment has to be operated according to the data given in this description.</p> <p>The EU type examination certificate must be observed.</p> <p>The special conditions must be adhered to!</p> <p>Directive 94/9EC and hence also EU type examination certificates apply in general only to the use of electrical apparatus under atmospheric conditions.</p> <p>The use in ambient temperatures of > 60 °C was tested with regard to hot surfaces by the mentioned certification authority.</p> <p>If the equipment is not used under atmospheric conditions, a reduction of the permissible minimum ignition energies may have to be taken into consideration.</p>
Maximum housing surface temperature	For the maximum housing surface temperature please refer to the data indicated.
Installation, Commissioning	<p>The respective statutory regulations and directives governing the application or intended use should be observed. The intrinsic safety is only assured in connection with an appropriate related apparatus and according to the proof of intrinsic safety.</p> <p>The associated apparatus must satisfy at least the requirements of category ia IIB or iaD. Because of the possibility of the danger of ignition, which can arise due to faults and/or transient currents in the equipotential bonding system, galvanic isolation in the power supply and signal circuits is preferable. Associated apparatus without electrical isolation must only be used if the appropriate requirements of IEC 60079-14 are met.</p> <p>The intrinsically safe circuit has to be protected against influences due to lightning.</p> <p>When used in the isolating wall between Zone 20 and Zone 21 or Zone 21 and Zone 22 the sensor must not be exposed to any mechanical danger and must be sealed in such a way, that the protective function of the isolating wall is not impaired. The applicable directives and standards must be observed.</p>
Repair and maintenance	<p>No changes can be made to apparatus, which are operated in hazardous areas.</p> <p>Repairs to these apparatus are not possible.</p>
Special conditions Electrostatic charging	The connection cables are to be laid in accordance with EN 50281-1-2 and must not normally be subjected to chaffing during use.

Table 4

5.3 Evaluator and isolating switch amplifier

Proper use

- The respective statutory regulations and directives governing the application or intended use should be observed.
- Devices that were operated in general electric installations must not be used afterwards in electric installations that are in connection to explosive hazardous areas.
- Intrinsic safe circuits that were operated with circuits of other types of protection may not be used as intrinsic safe circuits afterwards.
- Circuits in type of protection "nL" that were operated with circuits of other types of protection (except intrinsic safe circuits) must not be used in type of protection "nL" afterwards.

Installation and commissioning in the safe area

Commissioning and installation must be carried out by specially trained qualified personnel only.

- The devices are designed to satisfy the IP20 protection classification according to EN 60529, and must be protected accordingly in case of adverse environmental conditions such as splash water or dirt exceeding Contamination Level 2.
- The devices must be installed outside the hazardous area!
- For devices with intrinsically safe circuits, the protected circuit (light blue identification on the device) can be located in the hazardous area. It is especially important to ensure that all non-intrinsically safe circuits are safely isolated.
- The installation of the intrinsically safe circuits is to be conducted in accordance with the relevant installation regulations.
- The respective peak values of the field device and the associated device with regard to explosion protection should be considered when connecting intrinsically safe field devices with the intrinsically safe circuits of K-system devices (demonstration of intrinsic safety). Here EN 60079-14 / IEC60079-14 is to be observed. The "National Foreword" of DIN EN 60079-14 / VDE 0165 Part 1 must also be observed for the Federal Republic of Germany.
- If more channels of one device are to be connected parallel it must be ensured that the parallel connection is made directly at the terminals. For the demonstration of intrinsic safety the maximum values of the parallel connection are to be regarded.
- When intrinsically safe circuits are used in areas made hazardous by dust (Ex zone "D") only appropriately certificated field devices must be used.
- The EU certificates of conformity or EC-Type Examination Certificates should be observed. It is especially important to observe the "special conditions" where these are contained in the certificates.



Installation of the interface devices in the safe area

Repair and maintenance

The transmission behaviour of the devices is stable also for longer time periods; thus a regular adjustment or similar is not necessary. Also, no other maintenance work is necessary.

Fault elimination

No changes can be made to devices which are operated in hazardous areas. Repairs on the device are also not allowed.

Isolation coordinates for devices with Ex-certificate according to EN 50020

The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

Isolation coordinates for installations for galvanic isolation according to EN 50178 and EN 61140

The devices of the K-system are installation devices respectively electronic equipment for the use in secluded electrical operating sites where only skilled personnel or electrically instructed personnel must have admission or access to. The devices are assessed for pollution degree 2 and overvoltage category II according to EN 50178.

Ambient conditions

- Ambient temperature: see data sheet
- Storage temperature: -40 °C ... +90 °C (233 K ... 363 K)
- Humidity: max. 75 % rel. humidity without moisture condensation.

Electrical connection

Connection via removable terminals

The removable terminals simplify considerably the connection and control cabinet construction. In case of service, they allow an easy and trouble-free replacement of the device.

These screwed, self-opening terminals allow space for the connection of leads with core cross sections of up to 2.5 mm². The connectors are coded, so that it is not possible to make an incorrect connection.



Intrinsically safe field circuits are connected to the **blue** terminals. These may be conducted using DIN EN 60079-14-compliant leads into the hazardous area. Non-intrinsically safe field circuits are connected to the **green** terminals.

5.3.1 Evaluator

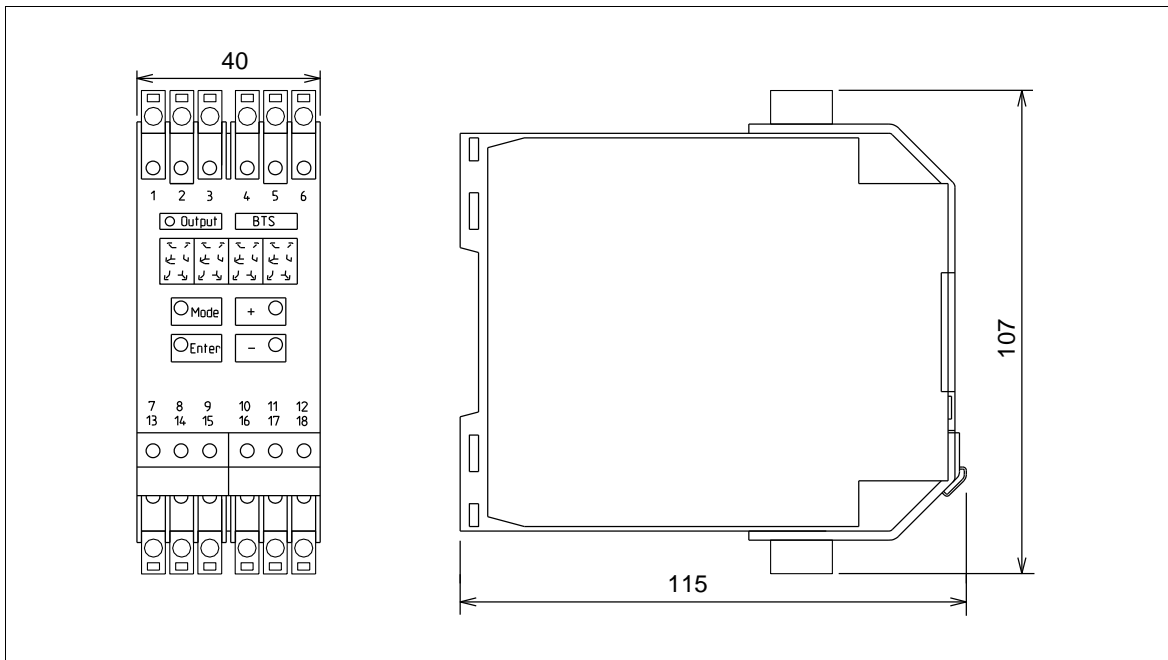


Fig. 4

	Evaluator type KFU8-DW-1.D-209869 ¹⁾
Supply voltages	230 V AC ± 10%, 47...63 Hz, < 5 VA or 115 V AC ± 10%, 47...63 Hz, < 5 VA or 24 V DC +15% / -10%, residual ripple $U_{ss} \leq 10\%$, < 5 W
Signal input	to DIN EN 60947-5-6 (NAMUR): – no load voltage: 8.2 V DC – short circuit current: 6.5 mA – switching points: ≥ 1.2 mA / ≤ 2.1 mA (terminals 8, 9)
Output relay	changeover contact, <u>switching capacity</u> : – 250 V AC, 2 A, $\cos\phi=0.7$ – 40 V DC, 2 A
Start-up bypass	triggering by switching on the supply voltage or by an external signal (16...30 V DC, signal duration > start-up bypass time)
Start-up bypass time	1...120 s in 1 s-steps, set at the factory: 10 s
Ready delay	≤ 400 ms
Limit frequency	– 1 Hz (corresponds to 60 rpm)
Displays	– 4-digit 7-segment display, red, height of characters: 7 mm – LED, yellow, for switching condition of output relay
Design	modular terminal housing
Mounting	– by clipping onto 35 mm standard rail acc. to DIN EN 50022 – or to be screwed by pull-out clips with 90 mm-grid
Stress due to shocks	as per EN 60028-2-27, 15 g, 11 ms, half sinus
Stress due to vibration	as per EN 60028-2-6, 10 Hz ... 150 Hz, 1 g, high transition frequency
Connecting terminals	coded plug, max. 2.5 mm ²
Permissible ambient temperature	-25 °C...+50 °C
Relative air humidity	max. 80%, without condensation
Protection to EN 60529	IP 20
EMC according to	EN 50081-2, EN 50082-2
Certificates	CSA 2137693
Weight	approx. 420 g

Table 5

¹⁾ Previous device KFU8-DW-1.D-Y128215 can be replaced by this device without any technical modifications.

5.3.2 Isolating switch amplifier 230 V AC

Explanation of
DIP switches
S1, S2, S3:
Chapter 5.3.4

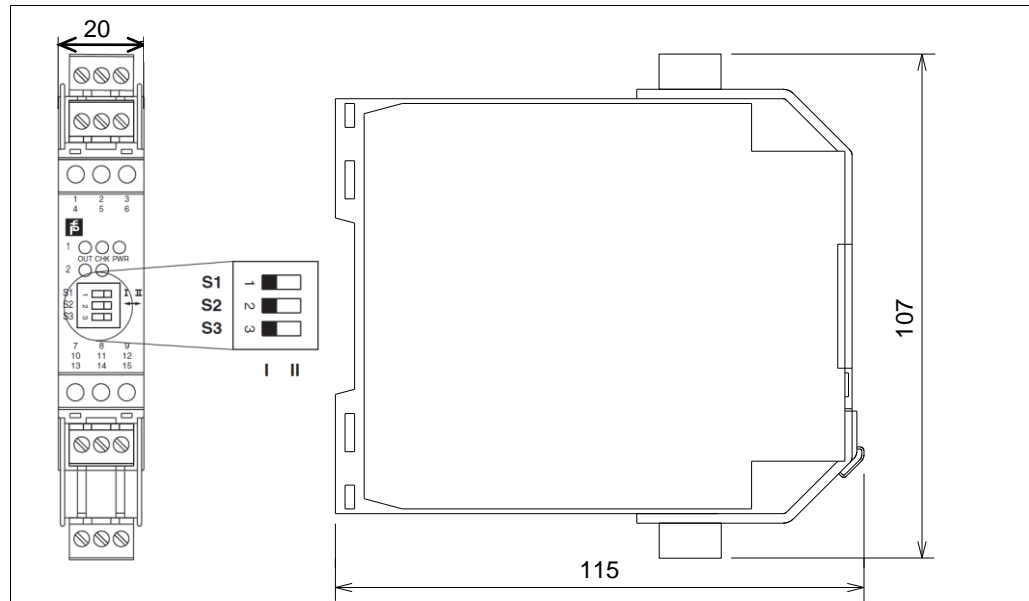


Fig. 5

		Isolating switch amplifier type KFA6-SOT2-Ex2		
Power system	Supply voltage	230 V AC $\pm 10\%$, 47...63 Hz, ≤ 1.5 W		
Signal input (intrinsically safe)	Nominal data	to DIN EN 60947-5-6 (NAMUR)		
	Open-circuit voltage / short-circuit current	approx. 8 V DC / approx. 8 mA		
	Switching point / hysteresis	1.2 ... 2.1 mA / approx. 0.2 mA		
	Power monitoring	Rupture $I \leq 0.1$ mA, short-circuit $I > 6$ mA		
Maximum values according to conformity and/or model inspection certificate	Certificate number	PTB 98 ATEX 2164		
	Group, class, fuse protection	Ex II (1) G D [EEx ia] IIC [circuit(s) in zone 0/1/2]		
	Voltage U_o	10.5 V		
	Current I_o	13 mA		
	Power P_o	34 mW (characteristic curve linear)		
	Fuse protection, class [EEx ia and EEx ib]			
	Explosion group	IIB	IIC	
Outer capacity	16.8 μF	2.41 μF		
Outer inductivity	730 mH	200 mH		
Output (not intrinsically safe)	Output	Signal; electronic output, passive		
	safety maximum voltage U_m	253 V AC (Attention! U_m is no rated voltage)		
	Signal level	1-Signal: 2.5 V max. for 10 mA (external voltage) or 3.0 V max. for 100 mA (100 mA, short-circuit-proof) 0-Signal: blocked output (residual current ≤ 10 μA)		
Transmission properties	Switching frequency	≤ 5 kHz		
Contact separation	Input / input	not available		
	Input / output	according to IEC 60079-11		
	Input / supply	according to IEC 60079-11		
Standards	Input	to DIN EN 60947-5-6 (NAMUR)		
	Transition category II	to DIN EN 50178		
	Climatic conditions	to DIN IEC 721		
	Electromagnetic compatibility RL 89/336/EG	to EN 50081-2 / EN 50082-2, NAMUR NE 21		
Ambient conditions	ambient temperature	-20 ... 60 °C (253 ... 333 K)		
Mechanical data	Weight	approx. 150 g		

Table 6

5.3.3 Isolating switch amplifier 20...30 V DC

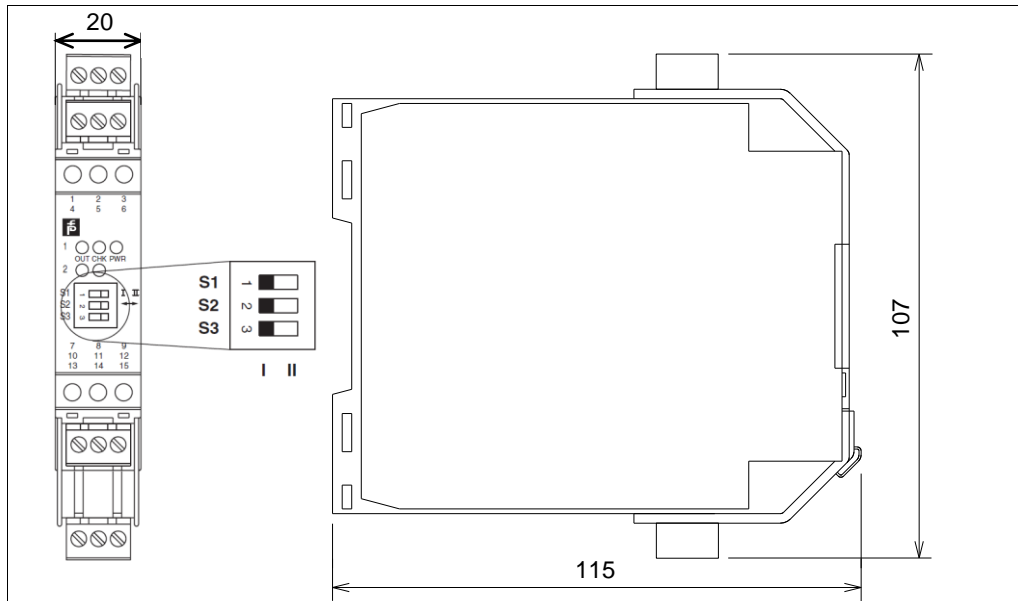


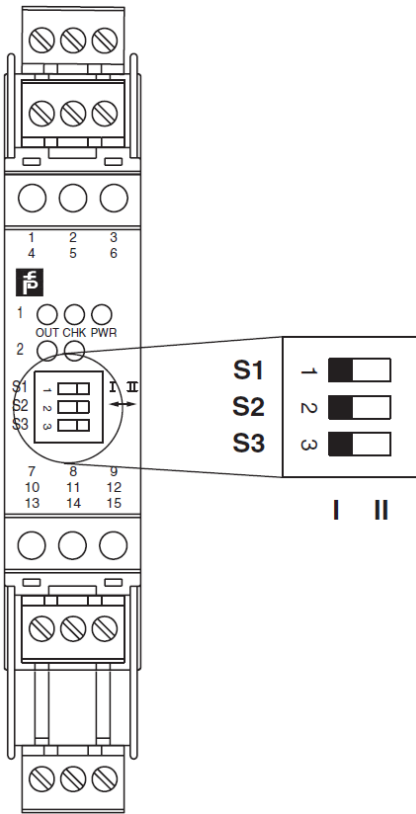
Fig. 6

Explanation of
DIP switches
S1, S2, S3:
Chapter 5.3.4

		Isolating switch amplifier type KFD2-SOT2-Ex2		
Power system	Supply voltage	20 ... 30 V DC , ripple $\pm 10\%$, rated current ≤ 50 mA		
Signal input (intrinsically safe)	Nominal data	to DIN EN 60947-5-6 (NAMUR)		
	Open-circuit voltage / short-circuit current	approx. 8 V DC / approx. 8 mA		
	Switching point / hysteresis	1.2 ... 2.1 mA / approx. 0.2 mA		
	Power monitoring	Rupture $I \leq 0.1$ mA , short-circuit $I > 6$ mA		
Maximum values according to conformity and/or model inspection certificate	Certificate number	PTB 00 ATEX 2035		
	Group, class, fuse protection	Ex II (1) G D [EEx ia] IIC [circuit(s) in zone 0/1/2]		
	Voltage U_o	10.5 V		
	Current I_o	13 mA		
	Power P_o	34 mW (characteristic curve linear)		
	Fuse protection, class [EEx ia and EEx ib]			
	Explosion group	IIA	IIB	IIC
Outer capacity	75 μ F	16.8 μ F	2.4 μ F	
Outer inductivity	1000 mH	740 mH	200 mH	
Output (not intrinsically safe)	Output	Signal; electronic output, passive		
	safety maximum voltage U_m	40 V DC (Attention! U_m is no rated voltage)		
	Signal level	1-Signal: 2.5 V max. for 10 mA (external voltage) or 3.0 V max. for 100 mA (100 mA, short-circuit-proof) 0-Signal: blocked output (residual current ≤ 10 μ A)		
Transmission properties	Switching frequency	≤ 5 kHz		
Contact separation	Input / input	not available		
	Input / output	to EN 50020, pak voltage value 375 V		
	Input / supply	to EN 50020, pak voltage value 375 V		
Standards	Input	to DIN EN 60947-5-6 (NAMUR)		
	Transition category II	to DIN EN 50178		
	Climatic conditions	to DIN IEC 721		
	Electromagnetic compatibility RL 89/336/EG	to EN 50081-2 / EN 50082-2, NAMUR NE 21		
Ambient conditions	ambient temperature	-20 ... 60 °C (253 ... 333 K)		
Mechanical data	Weight	approx. 150 g		

Table 7

5.3.4 Explanation of DIP switches in the isolating switch amplifier



Switch position

S	Function	Position
1	Direction of action	for high input current I
	Output I active	for low input current II
2	Direction of action	for high input current I
	Output II active	for low input current II
3	Line fault detection	ON I
		OFF II

Table 8

Operating modes

Control current circuits	Input signal
High-resistance initiator / contact open	low input current
Low-resistance initiator / contact closed	high input current
wire breakage, short-line fault	Line fault

Table 9

Factory-provided setting: switches 1, 2 and 3 on position I

6 Installation

DANGER!

- Please observe, in particular, chapter 2 (Safety)!
- During installation, please observe that all components are potential-free!
- **Fusible plugs**
Fusible plugs protect the turbo coupling against damages due to thermal overload.
Even when the BTS is used, the fusible plugs must not get replaced by blind screws or by fusible plugs with other rated response temperatures!



6.1 As delivered condition, scope of supply

- Switching element with sealing ring,
 - initiator with mounting flange and
 - evaluator
- are usually supplied as loose parts, together with the turbo coupling.

ATTENTION!

Please contact Voith in the event of subsequent installation of the BTS for the coupling sizes 206 and 274!



Note!

Standard combinations of switching elements and fusible plugs:

Response temperatures		
Switching element	Fusible plugs	Color coding
160 °C	180 °C	blue
140 °C	160 °C	green
125 °C	160 °C	green
110 °C	140 °C	red

Table 10



The correlation between switching element and fusible plug may vary according to the project design. Different response temperatures of the switching element (85°C, 90°C, 100°C, 110°C, 125°C, 140°C, 160°C and 180°C) are also available. Please contact Voith Turbo. Please also refer to order documents.

→ **Switching elements:**
Chapter 12.1,
page 36

6.2 Mounting — switching element and initiator



ATTENTION!

To avoid any damages, switching element and initiator should be mounted after installation and prior to filling the turbo coupling.

By no means modify any apparatus operated in potentially explosive atmospheres.

Repairs on these apparatus are not possible.

Avoid any impact effects on the initiator.

Working on the machine is only permitted in non-explosive atmospheres.

In order to prevent electrostatic charge, lay the connecting cables according to EN 50281-1-2. They must not be rubbed during operation.

- Replace the blind screw by the switching element with the sealing ring in the Turbo coupling outer wheel (item 0300) or shell (item 0190) ¹⁾.

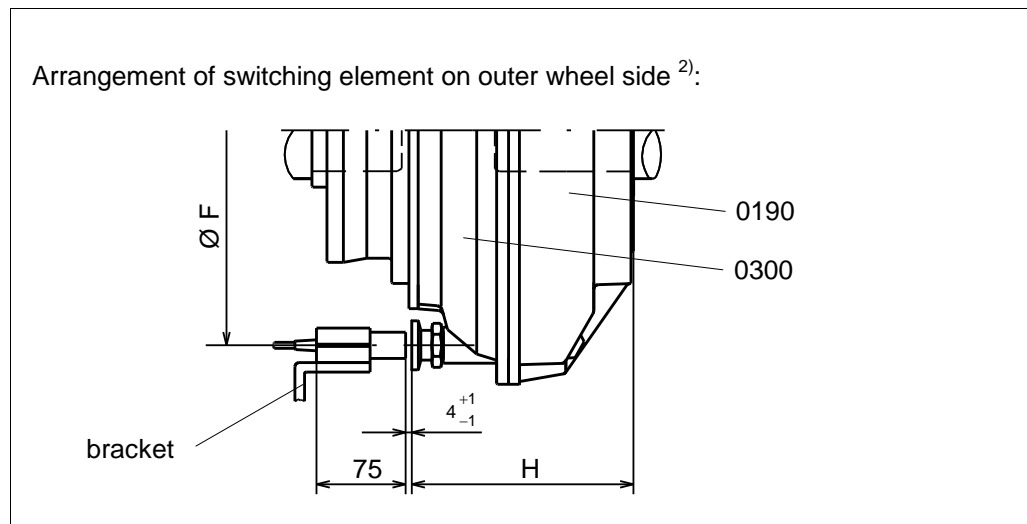


Fig. 7

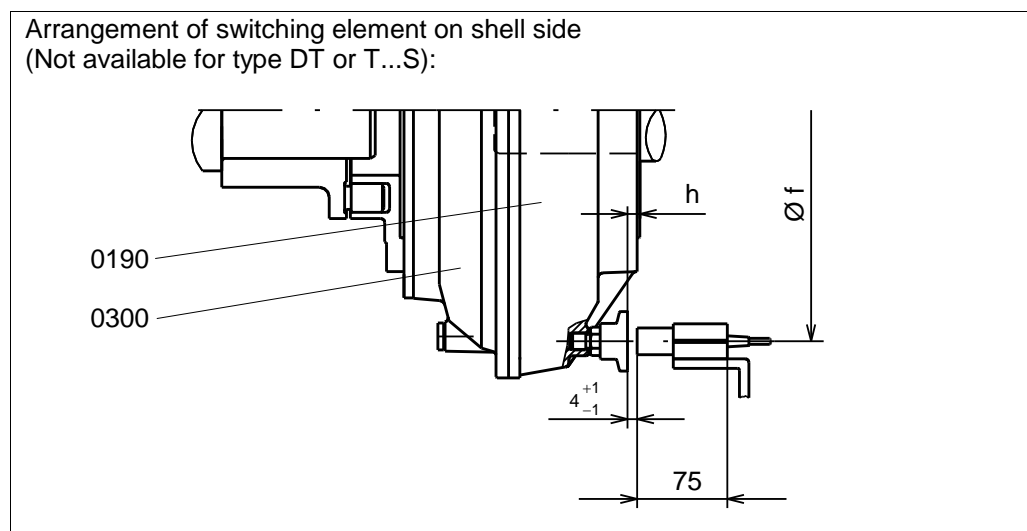


Fig. 8

¹⁾ Not available for types 366T, 422T and DT

²⁾ In case of type DT installation on the opposite outer wheel side is also possible.

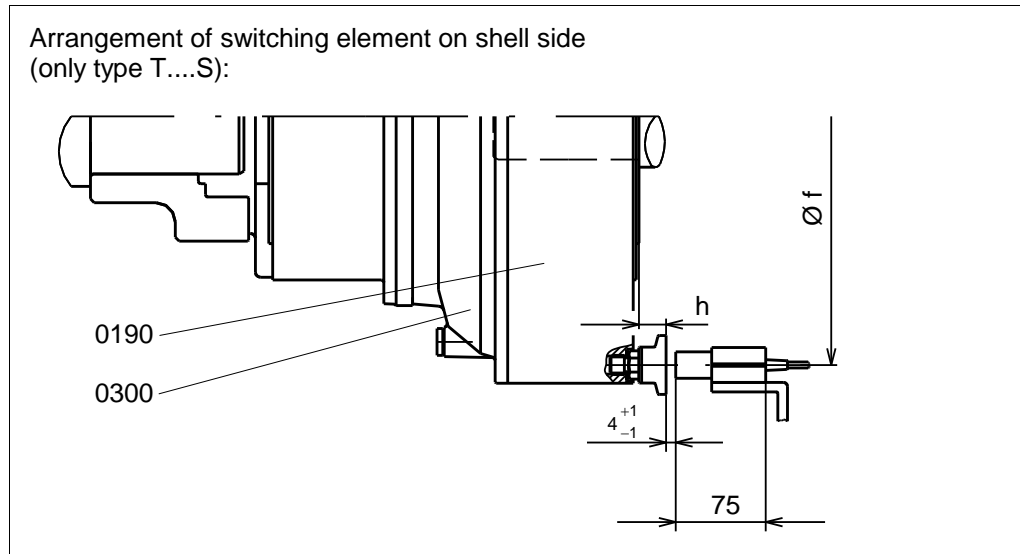


Fig. 9

Installation dimensions for switching element and initiator:

Turbo - coupling type	Outer wheel side		Shell side			
	Pitch circle diameter Ø F [mm]	Distance ~H [mm]	Not type DT or T...S:		Only type T...S:	
			Pitch circle diameter Ø f [mm]	Distance ~h [mm]	Pitch circle diameter Ø f [mm]	Distance ~h [mm]
206 T	196 ± 1	111.5	200 ± 1	-16	–	–
206 DT	196 ± 1	151.5	–	10	–	–
274 T	268 ± 1	152	264 ± 1	2.5	–	–
274 DT	268 ± 1	190	–	12	–	–
366 T	350 ± 1	193	355 ± 1	16	–	–
422 T	396 ± 1	206	398 ± 1	9	432 ± 1	15
487 T	470 ± 1	228	480 ± 1	29	518 ± 1	14
562 T	548 ± 1	248	556 ± 1	28.5	620 ± 1	17
650 T	630 ± 1	289	649 ± 1	51.5	714 ± 1	18
750 T	729 ± 1	318	742 ± 1	52.5	815 ± 1	25
866 T	840 ± 1	356	862 ± 1	65	954 ± 1	25
866 DT	840 ± 1	600	–	–	–	–
1000 T	972 ± 1	369	990 ± 1	54	1092 ± 1	25
1000 DT	972 ± 1	672	–	–	–	–
1150 T	1128 ± 1	458	1140 ± 1	86	1250 ± 1	25
1150 DT	1128 ± 1	783	–	–	–	–
1330 DT	1302 ± 1	912	–	–	–	–

Table 11

Please refer to assembly plan of the turbo coupling for installation dimensions of deviating arrangement.

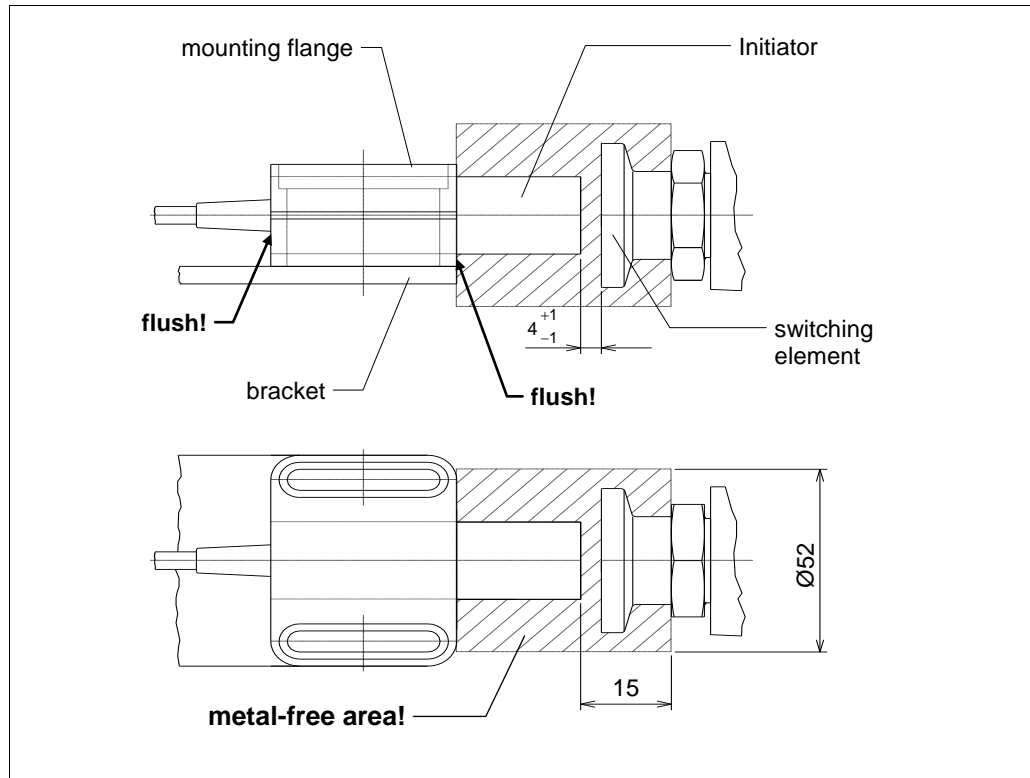


Fig. 10



ATTENTION!

- Ensure a sufficient brake stability (not included in Voith's scope of supply)!
- Avoid any vibration, which might create false signals!
- Observe the metal-free area (15mm) around the initiator head (→ Fig. 10)!

- Mount the initiator with mounting flange on the pitch circle diameter of switching element and on a bracket parallel with the turbo coupling axis.
- The initiator end is mounted flush with the mounting flange. The mounting flange front is mounted flush with the bracket.
- Set the distance between initiator head and switching element to 4^{+1}_{-1} mm !

6.3 Installation, connection — evaluator, isolating switch amplifier

Note!

- Wiring of the BTS is not included in Voith's scope of supply!
- In case of larger distances between initiator and evaluator, we recommend using a shielded cable for extension purposes.



ATTENTION!

Total resistance of an extension cable between initiator and evaluator to be less than 100 Ω.



- Install the evaluator and if necessary the isolating switch amplifier in an appropriate cubicle and connect it in accordance with the wiring diagram.

– **Wiring diagram:**

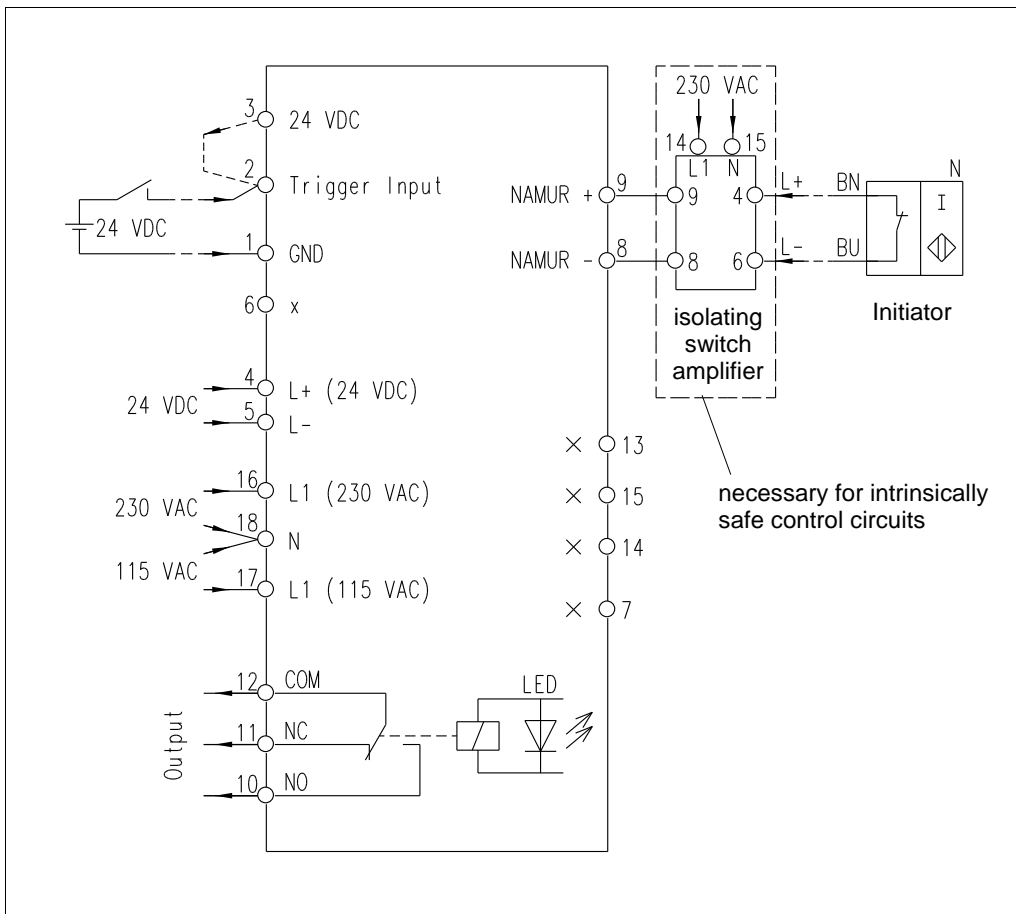


Fig. 11

– **Terminal assignment: Evaluator**

Terminal No.	Description
1	GND for trigger input
2	Trigger input for start-up bypass, +20...+28 V DC
3	Voltage supply for trigger input, when triggering by switching on the supply voltage, provide a bridge between the terminals 3 and 2 (as delivered condition!)
4	Supply voltage, +24 V DC
5	Supply voltage, GND
6	Do not connect!
7	Do not connect!
8	NAMUR input, L-
9	NAMUR input, L+
10	Output relay, make contact, NO
11	Output relay, break contact, NC
12	Output relay, root, COM
13	Do not connect!
14	Do not connect!
15	Do not connect!
16	Supply voltage, 230 V AC, L1
17	Supply voltage, 115 V AC, L1
18	Supply voltage, N

Table 12



EX-PROTECTION!

- The control circuit of the evaluator is not intrinsically safe!
- If an intrinsically safe control circuit is required, an appropriate isolating switch amplifier is to be provided between evaluator and initiator!

– **Terminal assignment: Isolating switch amplifier**

Terminal No.	Description
1+	NAMUR input 1, L+
2+	Do not connect!
3-	NAMUR input 1, L-
4+	NAMUR input 2, L+
5+	Do not connect!
6-	NAMUR input 2, L-
7	Output 1 +
8	Output 1/2 -
9	Output 2 +
14+	Supply voltage, 230 V AC, L1
15-	Supply voltage, N

Table 13

7 Display and Setting of Evaluator

7.1 Display — evaluator

– Operating mode:

	<ul style="list-style-type: none"> – <u>temperature okay</u> – normal operation
	<ul style="list-style-type: none"> – <u>Excess temperature</u> – speed of switching element < 60 rpm
	<ul style="list-style-type: none"> – <u>start-up bypass active</u> – no temperature monitoring!

Fig. 12

– Setting mode:

	– setting of start-up bypass time
	– No. of software version

Fig. 13

7.2 Setting — evaluator

- If required, set the start-up bypass time; factory setting: **10 s** !
Perform the setting via the front pushbuttons as per **Fig. 14** (page 28).



Note!

- The start-up bypass time begins with triggering the start-up bypass.
- After the start-up bypass time, the speed of turbo coupling with switching element must have clearly exceeded **60 rpm**!
- Factory setting of the start-up bypass time: **10 s**.



ATTENTION!

During start-up bypass time, no excessive temperature of the turbo coupling is recorded!

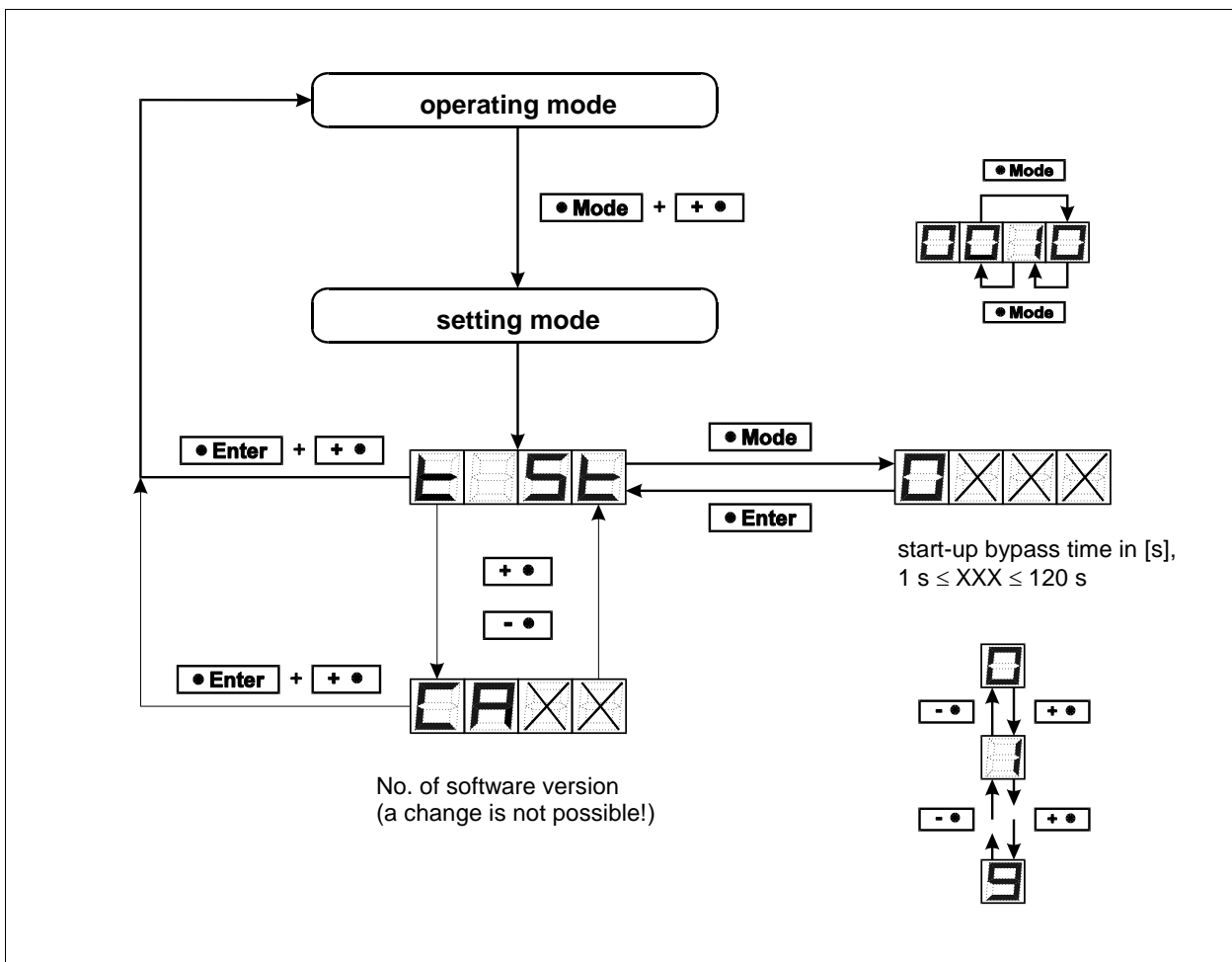






Fig. 14

8 Commissioning

DANGER!

Please observe, in particular, chapter 2 (Safety) when working on the BTS!



- Check the wiring according to **Fig. 11**.
Observe, in particular, proper wiring of supply voltage!
- Apply supply voltage to the evaluator, first without starting the turbo coupling. The device displays  when the start-up by-pass is active. The output relay is picked up and the front LED lights up.
- After the start-up bypass time, device displays . The output relay is released and the front LED extinguishes.
- If required, set the start-up bypass time to **chapter 7.2**.
- In case of external triggering, remove the factory-installed bridge between terminals 2 and 3 of the evaluator.
- Start the BTS with turbo coupling in a normal way. After the start-up bypass time, the speed of the turbo coupling with switching element must have clearly exceeded **60 rpm**. The evaluator will display  if there is no excessive temperature. The output relay remains in pick up position and the front LED lights up.
- Switch off the drive with the turbo coupling, leave the BTS in the mode ready for operation. If the speed of the turbo coupling with switching element drops below **60 rpm**, the evaluator displays . The output relay is released and the front LED extinguishes.
- Normal operation can start now. In case of malfunctions, see **chapter 10**.

→ **Fig. 11,**
page 25

→ **Chapter 7.2,**
page 28

9 Repair and maintenance

Definition according to IEC 60079:

Maintenance and Repair: A combination of all activities conducted in order to maintain an object in a condition or to re-condition the article in a way that satisfies the requirements of the respective specification and secures the required functions.

Inspection: An activity containing the careful examination of an object which aims to a reliable statement as to the condition of this object. This examination is performed without disassembly or, if required, with partly disassembly supplemented by measures, such as e.g. measurements.

Visual test: A visual test is an examination which detects visible defects, such as e.g. missing screws or bolts, without using accessive devices or tools.

Short-range examination: An examination, where, in addition to the visual test, also such defects, as e.g. loose screws or bolts, are detected which can only be seen when using accessive devices, such as e.g. mobile stair steps (if required) and tools. Usually short range examinations do not require to open the housing or to electrically disconnect the utility.

Detail test: An examination which, in addition to the aspects of the short range examination, detects such defects, as e.g. loose connections which can only be found by opening the housing and/or by using tools and test devices, if required.

- Only skilled, trained and authorized personnel or persons trained by Voith Turbo are allowed to execute repair measures.
- Components may only be replaced by original spare parts which are approved for use in potentially explosive atmospheres.
- Regularly clean devices used in explosion hazardous areas. The operator specifies the intervals according to ambient conditions at site, e.g. at dust deposit of approx. 0.2...0.5 mm.
- Following maintenance and/or repair re-attach all barriers and notes which have been removed in its original position.

DANGER!

Please observe, in particular, chapter 2 (Safety) when working on the BTS!



Maintenance schedule:

Maintenance intervals	Maintenance works
Every 1000 operating hours, every 6 months, at the latest.	Inspect unit for irregularities (visual test, dust deposits).
6months after commissioning, at the latest, then every 2 years	Check electric unit for sound condition (detail examination).
In case of impurities	Cleaning (see chapter 9.1)

Table 14

Record the maintenance work.

→ For report forms, please see the operating manual of the turbo coupling

9.1 Outside cleaning

ATTENTION!

- Observe compatibility of cleaning agent with plastic housing of BTS and rubber seal of cable connection!
 - Do not use high-pressure cleaning apparatus!
 - Handel rubber sealing of cable connection carefully. Avoid water and compressed-air jet!
-
- Clean BTS with grease solvent, if required.



10 Trouble Shooting



DANGER!

Please observe, in particular, chapter 2 (Safety) when working on the BTS!



EX-PROTECTION!

You must not change devices which are operated in hazardous areas. Repairs are not permitted – replace the unit.

The following table serves to find the cause of failures or problems quickly and to take remedial action, if necessary.


Malfunction	Possible cause(s)	Remedial action
Display of the evaluator does not work.	No supply voltage is applied to the evaluator.	Apply supply voltage, see Fig. 11 .
	The evaluator is defective.	Replace the evaluator.
Triggering of the start-up bypass by applying supply voltage does not work.	The bridge between terminals 3 and 2 of the evaluator was removed.	Insert the bridge, see Fig. 11 .
Triggering of the start-up by-pass by means of an external signal does not work.	The bridge between terminals 3 and 2 of the evaluator was not removed.	Remove the bridge, see Fig. 11 .
	The external triggering signal was too short.	The triggering signal should at least be applied during the start-up bypass time.
Display on the evaluator:  Display appears again after switching OFF or ON.	Electronic error.	Switch off and on the power supply.
	Evaluator defective.	Replace evaluator.

Table 15

Malfunction	Possible cause(s)	Remedial action
<p>After the start-up by-pass time, excessive temperature (E:U) is always displayed though there is no excessive temperature.</p>	<p>The start-up by-pass time was selected too short.</p>	<p>After the start-up bypass time, the speed of turbo coupling with switching element should have clearly exceeded 60rpm. Increase the start-up bypass time accordingly.</p>
	<p>The initiator poles are reversed.</p>	<p>Check the initiator connection, see Fig. 11.</p>
	<p>The distance between initiator head and switching element is too large.</p>	<p>Set the distance to 4^{+1}_{-1}mm , see Fig. 10.</p>
	<p>The initiator is defective.</p>	<p>Check the initiator, replace if required.</p>
	<p>The switching element is defective.</p>	<p>Check the switching element, replace if required.</p>
<p>After the start-up bypass time, excessive temperature (E:U) is occasionally displayed though there is no excessive temperature.</p>	<p>The distance between the initiator head and the switching element is too large.</p>	<p>Set the distance to 4^{+1}_{-1}mm , see Fig. 10.</p>
	<p>The bracket for the initiator is not rigid enough. There might be false signals due to vibration.</p>	<p>Ensure a sufficient bracket stability, see Fig. 10.</p>
<p>When the start-up by-pass is active, operating fluid is leaking through the fusible plugs.</p>	<p>The start-up bypass time was selected too high.</p>	<p>Set a shorter start-up bypass time so that the speed of turbo coupling with switching element will have clearly exceeded 60rpm after the start-up bypass time.</p>
<p>After the start-up by-pass time, operating fluid is leaking through the fusible plugs, the BTS did not display any excessive temperature.</p>	<p>The response temperatures of switching element and fusible plugs do not match.</p>	<p>Please consult Voith (see chapter 11).</p>
	<p>The switching element is defective.</p>	<p>Check the switching element, replace if required.</p>

Table 16

Please consult Voith Turbo (→ **chapter 11**), in case of a malfunction which is not included in this table.

In order to determine the cause of failure more precisely, the following measures should be taken in the corresponding order:

Measurement	Result	Probable cause of failure
<p>Apply supply voltage to the evaluator. Measure the no-load voltage and the short circuit current at the NAMUR input (terminals 9 and 8).</p>	<p>Clear deviation from the setpoints</p> <ul style="list-style-type: none"> – no load voltage 8.2 V DC – short circuit current 6.5 mA 	Defective evaluator
<p>Connect the initiator to the evaluator. Measure the current consumption of the initiator which is not attenuated.</p>	<p>Current consumption</p> <ul style="list-style-type: none"> > 6.0 mA or < 2.1 mA 	Defective initiator
<p>Connect the initiator to the evaluator. Measure the current consumption of the initiator which is attenuated.</p> <p>Note: The initiator can, for example, be attenuated with a metal plate which is held directly in front of the initiator head.</p>	<p>Current consumption</p> <ul style="list-style-type: none"> > 1.2 mA or < 0.1 mA 	Defective initiator
<p>Attenuate the initiator, after proper installation, with the switching element, with the coupling not being overheated.</p>	<p>Current consumption</p> <ul style="list-style-type: none"> > 1.2 mA and < 6.0 mA 	Defective switching element

Table 17

11 Queries, Orders placed for Service Engineers and Spare Parts

In case of

- queries,
- Order for a service engineer
- Spare part order

we need the **Serial No.** and type designation of the turbo coupling for which the BTS is used.

Type T

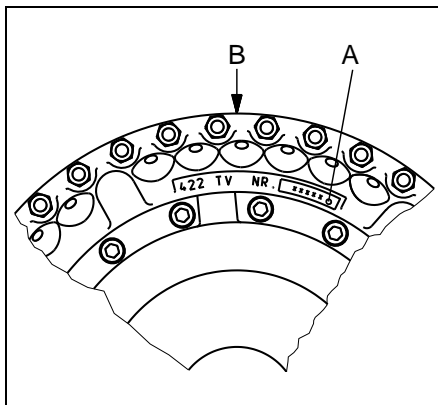


Fig. 15

Type TDM-SAE

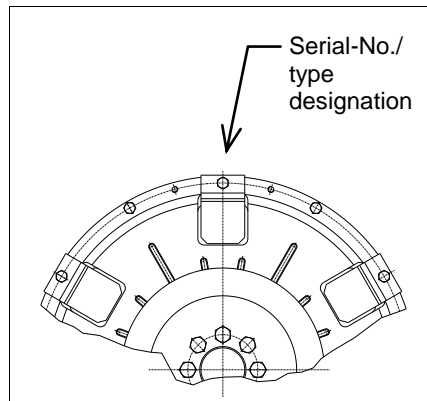


Fig. 16

- You will find the **serial number** and type designation either on the **outer wheel / shell (A)** or at the coupling **periphery (B)**.
- The **serial no.** is marked with figure stamps.
- for couplings to be used in potentially explosive atmospheres, you will find the **Ex-identification** at the coupling **periphery (B)**.

If an **order is placed for a service engineer**, we need, in addition,

- the coupling site,
- the address of a contact person,
- details of the occurred problem.

In the event of a **spare parts order**, we need, in addition:

- the destination of spare parts shipment.

Please contact:

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74564 Crailsheim, Germany

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Fax: +49 7951 32-480

startup.components@voith.com

Outside business hours:

Voith Turbo GmbH & Co. KG

Tel. +49 7951 32-1666

Fax. +49 7951 32-903

coupling-service@voith.com

www.voith-coupling-service.com

12 Spare Parts Information



ATTENTION!

Repair in a professional manner can only be guaranteed by the manufacturer!

12.1 Standard switching element

BTS-Switching elements					Sealing ring
Use for Turbo coupling size	Thread dimension	Nominal response temperature	Type of switching element	Material No.	Material No.
206 - 274	M12x1.5	125 °C	12-50-125	TCR.10498440	TCR.03658012
366 - 650	M18x1.5	85 °C	18-60-085	TCR.10672470	TCR.03658018
		90 °C	18-60-090	TCR.10642650	
		110 °C	18-60-110	TCR.10642630	
		125 °C	18-60-125	TCR.10499540	
		140 °C	18-60-140	TCR.10499550	
		160 °C	18-60-160	TCR.10499560	
750 - 1330	M24x1.5	180 °C	18-60-180	TCR.10499570	TCR.03658024
		85 °C	24-75-085	TCR.11973940	
		125 °C	24-75-125	TCR.10488230	
		140 °C	24-75-140	TCR.10653470	
		160 °C	24-75-160	TCR.10633550	
		180 °C	24-75-180	TCR.10488220	

Table 18

12.2 Initiator, mounting flange

Type of initiator	Material No.
NJ 10-22-N-E93-Y30629-70	TCR.10678650
NJ 10-22-N-E93-Y30627-100	TCR.10678670
NJ 10-22-N-E93-Y106925	TCR.11960550
Mounting flange BF22/4	TCR.03668170

Table 19

12.3 Evaluator

Type of evaluator	Material No.
Y209869	201.01630810

Table 20

12.4 Isolating switch amplifier

Type of isolating switch amplifier	Material No.
KFA6 – SOT2 / Ex2	TCR.11952640
KFD2 – SOT2 / Ex2	TCR.11975630

Table 21

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13 Representatives

Voith Turbo GmbH & Co. KG

West-Europe:

Germany (VTCR):
Voith Turbo GmbH & Co. KG
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