Installation and Operating Manual

(Translation of the original installation and operating manual)

MTS

Mechanical Thermal Switch Unit

including design in accordance with Directive 2014/34/EU (ATEX directive)

Version 9, 2017-01-31
3626-011800 en, Protection Class 0: public

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3626-011800 en

This document describes the state of design of the product at the time of the editorial deadline on 2017-01-31.

Installation and Operating Manual / Version 9 / 3626-011800
en / Protection Class 0: public / 2017-01-31

Contents

1	**Possible Applications, MTS Characteristics**	**5**
2	**MTS Functioning**	**6**
2.1	**Switching element**	**7**
2.2	**Switch**	**7**
2.3	**Interaction of MTS components**	**7**
3	**Technical Data**	**9**
3.1	**Switching element**	**9**
3.2	**Switch**	**10**
3.2.1	Switch ExM 61 D	11
4	**User information**	**12**
5	**Safety**	**14**
5.1	**Safety information**	**14**
5.1.1	Structure of safety information	14
5.1.2	Definition of safety symbols	15
5.2	**Intended use**	**15**
5.3	**Unintended use**	**15**
5.4	**General information as to dangerous situations**	**15**
5.5	**Remaining risks**	**19**
5.6	**What to do in case of accidents**	**19**
5.7	**Information with regard to operation**	**19**
5.8	**Qualification of staff**	**20**
5.9	**Product monitoring**	**20**
6	**Installation**	**21**
6.1	**As delivered condition**	**21**
6.2	**scope of supply**	**21**
6.3	**Mounting - switching element and switch**	**22**

6.4	**Connection**	**25**
6.4.1	Connection of the ExM 61 D switch (additional notes)	25
7	**Maintenance, Servicing**	**26**
8	**Disposal**	**27**
9	**Malfunctions - Remedial Actions, Troubleshooting**	**28**
10	**Queries, Orders Placed for Service Engineers and Spare Parts**	**29**
11	**Spare parts information**	**30**
11.1	**Switching elements**	**30**
11.2	**Intermediate piece**	**31**
11.3	**Switch**	**31**
12	**Representatives - Voith Turbo GmbH & Co. KG**	**32**
13	**Index**	**33**
14	**Annex**	**34**

1 Possible Applications, MTS Characteristics

The mechanical thermal switch unit (MTS) is a monitoring system for Voith turbo couplings.

- The MTS provides easy monitoring of the turbo coupling temperature.
- **In case of excess temperature, dependent on the application,**
  - the operator can be warned,
  - the drive motor shutdown can be initiated,
- If excess temperature is recognized in time, the discharge or loss of coupling filling through the fusible plugs can be avoided.
  Downtimes are reduced.
- After the switching element of the MTS has tripped, it has to be replaced.

⚠ WARNING

Explosion hazard
When the permissible surface temperature is exceeded, there is the risk of explosion.

- The thermal switch unit MTS can be used in potentially explosive atmospheres to monitor the temperature. The signals serve for pre-warning. The MTS does not limit the maximum surface temperature.

2 MTS Functioning

The mechanical thermal switch unit (MTS) consists of two components:

- **Switching element**
- **Switch**

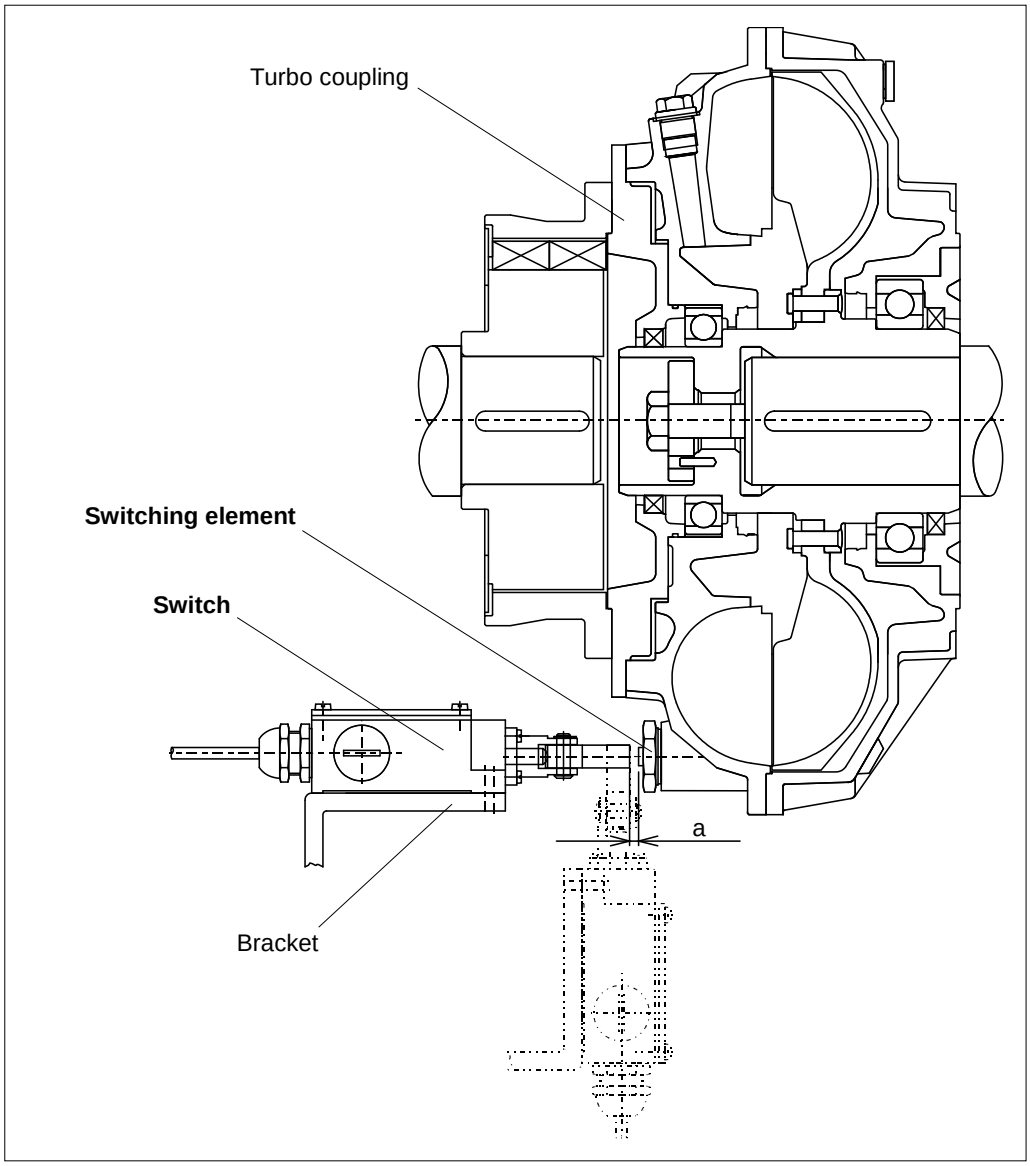

Fig. 1

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2.1 Switching element

Instead of a blind screw, the switching element is screwed into the outer wheel of the turbo coupling. The result is a thermal contact between the switching element and the operating fluid.
In rare exceptional cases, when space is limited, the installation of the switching element into the shell of the coupling is permissible. Please consult Voith Turbo.
A spring-loaded pin and a chamber filled with solder are integrated in the switching element. The response temperature of the switching element corresponds to the melting temperature of the solder.
Below the response temperature, the solder keeps the pin in its initial position. On reaching the nominal response temperature, the solder releases the pin, and a compression spring presses the pin toward the outside.
Once the MTS switching element has responded, it is no longer usable and needs to be replaced.

2.2 Switch

Dependent on the space available, the switch is fitted parallel or in radial position to the turbo coupling axis. The switch is provided with a pivotable switching finger.
The switch is wired as snap-action connection with a make-and-break contact.

2.3 Interaction of MTS components

If the turbo coupling with screwed in switching element rotates, the switching element will permanently pass the switch.
The pin of the released switching element actuates the switching finger when the coupling rotates causing the switch to switch over.

Maximum permissible temperature
→ Operating manual of turbo coupling

⚠ WARNING

Risk of personal injuries and damage to property
Following the shutdown, the control system has to be locked in a way that prevents automatic re-start.

- Switch off the unit in which the turbo coupling is installed and secure the switch against inadvertent switch-on.
- For all work performed on the turbo coupling and MTS ensure that both the drive motor and the driven machine have stopped running and that a re-start is absolutely impossible!
- The coupling may only be restarted if the triggered MTS switching element was replaced and the turbo coupling temperature is below the maximum permissible temperature allowed when switching on the motor!

SAFETY INFORMATION

- In case of inner wheel drive and blocking of driven machine, the MTS functioning is no longer guaranteed!

3 Technical Data

3.1 Switching element

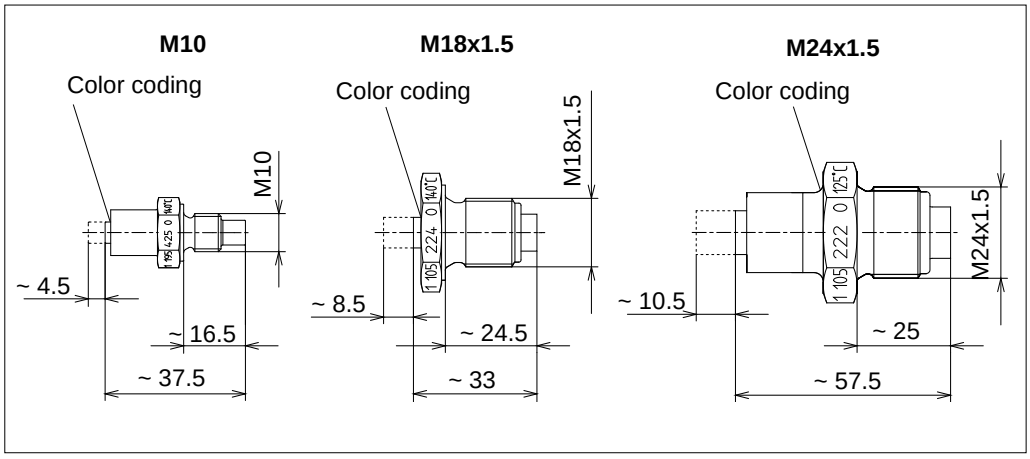

Fig. 2

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

Dimension of thread	M10	M18x1.5	M24x1.5
Nominal response temperature	140 °C	95 / 110 / 125 / 140 /160 °C	110 / 125 / 140 /160 °C
Suitable for coupling sizes ...	154 – 274	366 – 650	750 – 1330
Response tolerance	± 5 °C at 110 °C: -10 °C		
Peripheral speed	max. 50.5 ms^{-1}	max. 72 ms^{-1}	max. 72 ms^{-1}
Width across flats	16	27	32
Tightening torque	22 Nm	60 Nm	144 Nm

Table 1

SAFETY INFORMATION

- The switching element is marked with the article number and response temperature on the housing.
- The nominal response temperature of the switching element is determined in connection with the the coupling design.
- In addition, the response temperature can be identified by a color coding:

Response temperature	Color coding
95 °C	no color coding (tinned)
110 °C	yellow
125 °C	brown
140 °C	red
160 °C	green

Table 2

3.2 Switch

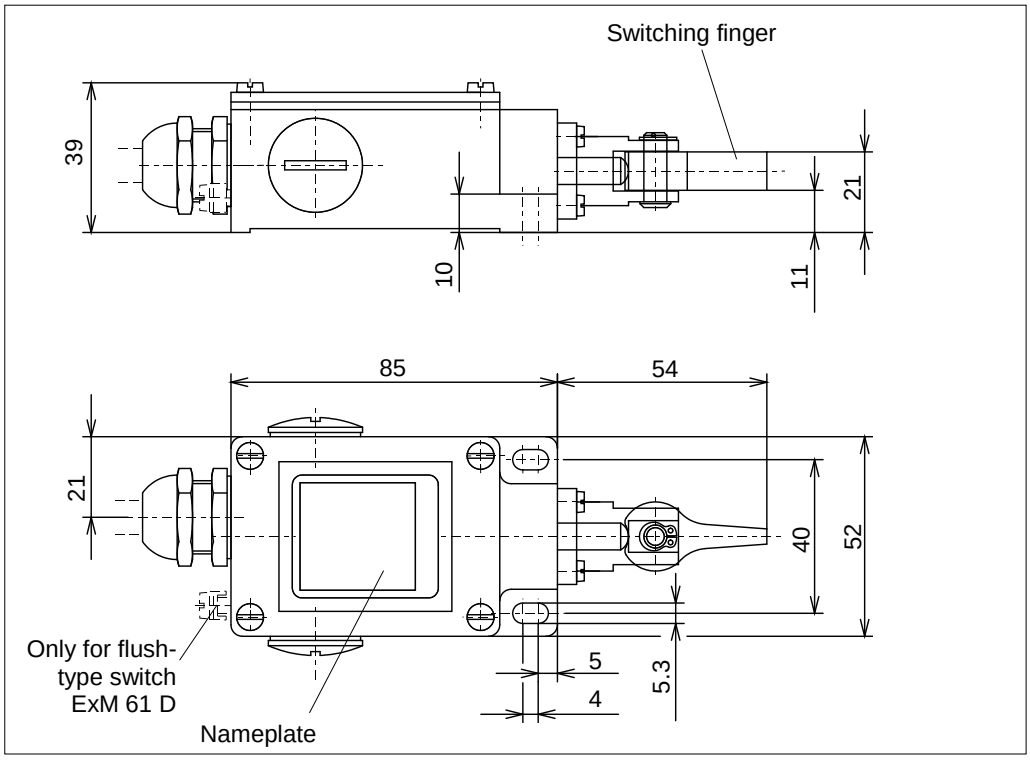

Fig. 3

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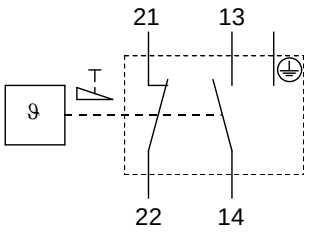
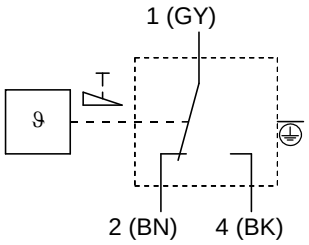
Switch, type	EM 61 D 1Ö/1S	ExM 61 D
Switching capacity	400 V AC, 6 A 230 V DC, 0.25 A 24 V DC, 4.5 A	250 V AC - 5 A (AC 15) 230 V DC - 0.16 A (DC 13)
Minimum load	24 V, 20 mA	20 V, 100 mA
Permissible ambient temperature	-40 °C…80 °C	-20 °C…60 °C
Protection to DIN EN 60529	IP65	IP65
Short-circuit protection	16 A gL/gG D-fuse	5 A (slow-blow)
Certificates / type of protection	CSA - LR 85005 - 6 UL File E 57648 A 300 P 300 Project 98 ME 41537 A 300 P 300 CCC-2010010305418204	Ex II 2G Ex d IIC T6 Gb (PTB 03 ATEX 1069 X). Ex II 2D Ex tb IIIC T80°C Db IP65 (PTB 03 ATEX 1069 X).
Connection	Cable entry: M20 x 1.5 (cable gland for cable diameter 5…13 mm and two plugs)	3-core PVC cable H05 VV-F 0.75 mm² length: 5 m
Wiring diagram		

BN: **brown**
BK: **black**
GY: **gray**

Table 3

3.2.1 Switch ExM 61 D

Application:
Switch ExM 61 D complies with the European standards for explosion protection EN 60079-0, EN 60079-1 and EN 60079-3 and is therefore suitable for use in potentially explosive atmospheres of Zones 1 and 2 as well as Zones 21 and 22 as per DIN EN 60079-14.

Design / functioning:
Switch ExM 61 D contains an explosion-proof contact unit (switch insert) of type: ExM 14.
The contact unit is provided with cast-in cable.
The contact unit contains a single-pole double-throw switch (SPDT switch).

4 User information

This manual will support you in using the mechanical thermal switch unit (**MTS**) 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 unit,
- avoid any risks
- reduce repairs and downtimes.

This manual must
- always be available at the MTS place of use,
- be read and used by every person who works on the unit or commissions the same.

The mechanical thermal switch unit has been manufactured to the latest design standard and approved safety regulations. Nevertheless, the user's or third party's life may be endangered or the unit or other property impaired in case of improper handling or unintended use.

Spare parts:
Spare parts must comply with the requirements determined by Voith. This is guaranteed when original spare parts are used.
Installation and/or use of non-original spare parts may negatively change the characteristics of the **MTS** and may thus impair safety.
Voith is not liable for any damages resulting from the use of non-original spare parts.

Use only appropriate workshop equipment for maintenance. Professional maintenance and/or repair can only be guaranteed by the manufacturer or an authorized specialist workshop.

This manual has been issued with the utmost care. However, should you need any further information, please contact:

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Voith Turbo reserves the right for modifications.

5 Safety

5.1 Safety information

Safety information indicating the descriptions and symbols as described in the following are used in the operating manual.

5.1.1 Structure of safety information

⚠ DANGER WORD
Hazard consequences Source of hazard • Warding off of danger

Danger word
The danger word divides the severity of the danger in several levels:

Danger word	Severity of danger
⚠ DANGER	Death or serious injury (irreversible personal injury)
⚠ WARNING	Death or serious injury possible
⚠ CAUTION	Minor or moderate injury possible
NOTICE	Possibly damage to property of - the product - its environment
SAFETY INFORMATION	General applications details, useful information, safe job procedure and proper safety measures

Table 4

Hazard consequences
Hazard consequences indicate the kind of hazard.

Source of hazard
The source of hazard indicates the cause of hazard.

Warding off of danger
Warding off of danger describes the measures to be taken to ward off a danger

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en / Protection Class 0: public / 2017-01-31

5.1.2 Definition of safety symbols

Symbol	Definition
	Danger of explosion Marking with the Ex-symbol indicates possible hazards which have to be observed for the use in potentially explosive atmospheres.

Table 5

5.2 Intended use

- The mechanical thermal switch units for pre-warning (**MTS**) serves for monitoring the temperature of Voith turbo couplings. Any use beyond that described herein, e.g. for operating or application conditions that have not been agreed upon, is deemed unintended.
- Intended use also includes observing this installation and operating manual.
- The manufacturer is **not** liable for any damages resulting from unintended use. The risk has to be borne solely by the user.

5.3 Unintended use

Design range
→ Operating manual of turbo coupling

- Design range is not met.
- Any use beyond that described herein, e.g. for higher powers, higher speeds, or operating conditions that have not been agreed upon, is deemed unintended.
- Moreover, it is not permitted to use MTS mechanical thermal switch units from third parties.

5.4 General information as to dangerous situations

For all work performed on the mechanical thermal switch unit, please observe the local regulations for the prevention of accidents as well as the regulations for installation of electrical equipment!

⚠ WARNING

Explosion hazard
In case of non-compliance with the regulations or impermissible change, there is the danger of explosion.

- When using the mechanical thermal switch unit in potentially explosive atmospheres (switch type ExM 61 D), observe the local regulations applicable to electrical equipment in potentially explosive atmospheres! It is not permitted to do any modifications on the switch, including the connecting line.

Hazards while working on the mechanical thermal switch unit.

DANGER

Electric shock
On account of incorrectly mounted or incorrectly connected electrical components, and disconnected electric connections, persons could get an electric shock and be severely injured, possibly with fatal consequences.
Incorrectly mounted or incorrectly connected electrical components and disconnected electric connections may cause damages to the machine.

- A qualified electrician has to properly carry out the connection to the electric supply network considering the system voltage and the maximum power consumption!
- The system voltage has to be in conformity with the system voltage indicated on the nameplate!
- There has to be a corresponding electrical protection by a fuse on the network side!

Electric shock:

DANGER

Electrostatic processes
Electrostatic charging may injure persons by an electric shock.

- Allow only a qualified electrician to install the equipment into which the turbo coupling is installed.
- Machine and electric installation are provided with grounding connections.

Working on the turbo coupling:

⚠ WARNING

Risk of injury
While working on the turbo coupling, there is the risk of injury through cutting, crushing, burns and cold burns in case of minus degrees.

- Please observe the installation and operating manual of the turbo coupling!
- Never touch the turbo coupling without wearing protective gloves.
- Start to work on the turbo coupling only after it has cooled down.
- Ensure that there is sufficient light, a sufficiently large working space and good ventilation when working on the turbo coupling.
- Switch off the unit in which the turbo coupling is installed and secure the switch against inadvertent switch-on.
- For all work performed on the turbo coupling ensure that both the drive motor and the driven machine have stopped running and that a re-start is absolutely impossible!

Noise:

⚠ WARNING

Hearing loss, permanent impairment of hearing
The turbo coupling generates noise during operation. If the A-classified equivalent sound pressure level $L_{PA,\ 1m}$ exceeds 80 dB(A), this may cause impairment of hearing!

- Wear ear protection.

Sound pressure level
→ cover sheet of operating manual of turbo coupling

Operating fluid which sprays off or leaks out:

Unintended use
→ Chapter 5.3

WARNING

Risk of losing sight due to operating fluid spraying off, risk of burning
In case of thermal overload of the turbo coupling, the fusible plugs respond. Operating fluid leaks out through these fusible plugs.
This may happen only in case of unintended use.

- Persons close to the turbo coupling must wear safety goggles.
- Please make sure that the spraying-off operating fluid cannot get in contact with persons.
- If the fusible plugs spray off, switch off the drive immediately.
- Electrical devices located near the turbo coupling need to be splash-guarded.

WARNING

Fire hazard
After the fusible plugs responded, spraying off oil may ignite on hot surfaces causing fire, as well as releasing toxic gases and vapor.

- Make sure that spraying off operating fluid cannot get into contact with hot machine parts, heaters, sparks or open flames.
- Immediately switch off the driving machine when the fusible plugs respond.
- Please pay attention to the information contained in the safety data sheets.

CAUTION

Danger of slipping
Slipping hazard due to spraying off solder of fusible plugs and leaking out operating fluid.

- Please provide a catch pan of sufficient size.
- Immediately remove any leaking out solder and operating fluid.
- Please pay attention to the information contained in the safety data sheets.

5.5 Remaining risks

⚠ WARNING

Risk of personal injuries and damage to property
Unintended use or incorrect operation may cause death, serious injuries or minor injuries as well as damage to property and the environment.

- Only persons who are sufficiently qualified, trained and authorized are allowed to work on or with the turbo coupling and the mechanical thermal switch unit.
- Please observe the warnings and safety information.

5.6 What to do in case of accidents

SAFETY INFORMATION

- In case of accidents, please observe the local regulations, the operating manuals and the operator's safety measures.

5.7 Information with regard to operation

SAFETY INFORMATION

- If irregularities are found during operation, immediately switch off the drive unit.

5.8 Qualification of staff

Only qualified and authorized professional staff are allowed to perform work, such as transportation, storage, installation, electrical connection, commissioning, operation, maintenance, servicing and repair.

Qualified professional staff in the sense of this operating manual are persons who are familiar with transportation, storage, installation, electrical connection, commissioning, maintenance, servicing and repair and who have got the necessary qualifications relevant to their job performed. Qualification has to be ensured by performing training and giving instructions.

This staff must be trained, instructed and authorized to:

- operate and service machines in a professional manner in accordance with the technical safety standards.
- use lifting appliances, slings (ropes, chains, etc.) and lifting points in a professional manner.
- properly dispose of media and their components, e.g. lubricating grease.
- service and use safety devices in a manner that ensures compliance with safety standards.
- prevent accidents and provide first aid.

Staff to be trained may only perform work on the turbo coupling and the mechanical thermal switch unit under the supervision of a qualified and authorized person.

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

- be reliable,
- have the legal age,
- be trained, instructed and authorized with regard to the intended work.
- observe **EN 1127-1 Annex A** and **EN 1127-1 Section 7** if the unit is installed in potentially explosive atmospheres. Use only tools which are approved for use in potentially explosive areas. Avoid formation of sparks.

5.9 Product monitoring

We are under legal obligation to keep the performance of our products under observation, even after shipment.
Therefore, please inform us about anything that might be of interest to us. For example:

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

Our address,
→ Page 2

6 Installation

⚠ WARNING

Risk of injury
Please observe, in particular, → Chapter 5 (Safety) when working on the mechanical thermal switch unit!

- Before beginning with the installation, ensure that an isolation of all components is guaranteed.
- The fusible plugs protect the turbo coupling against damage due to thermal overload.
  Even when the MTS is used, it is not allowed to replace the fusible plugs by blind screws or by fusible plugs with different nominal response temperatures!
- Never operate the turbo coupling without fusible plugs!

6.1 As delivered condition

– Normally, the switching element with sealing ring,
– the switch

are supplied as loose parts together with the turbo coupling.

6.2 scope of supply

Standard combinations of switching elements and fusible plugs:

Nominal 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 6

The correlation between switching element and fusible plug may vary dependent on the project design. Differing nominal response temperatures of the switching element (95 °C, 110 °C, 125 °C, 140 °C and 160 °C) are also available (→ Chapter 11).

Please consult Voith Turbo → order documents

6.3 Mounting - switching element and switch

NOTICE

Damage to property
Non-compliance with mounting instructions.
- To avoid any damages, switching element and switch should be mounted after installation and prior to filling the turbo coupling.

- Screw in the switching element with sealing ring into the outer wheel [1)] of the turbo coupling instead of a blind screw (→ for input side connecting coupling type **ERK** and sizes **206** and **274,** first screw in the **intermediate piece**).

1) In rare exceptional cases, in case of restricted space conditions, the installation of the switching element into the shell of the turbo coupling is permitted! Please consult Voith Turbo.

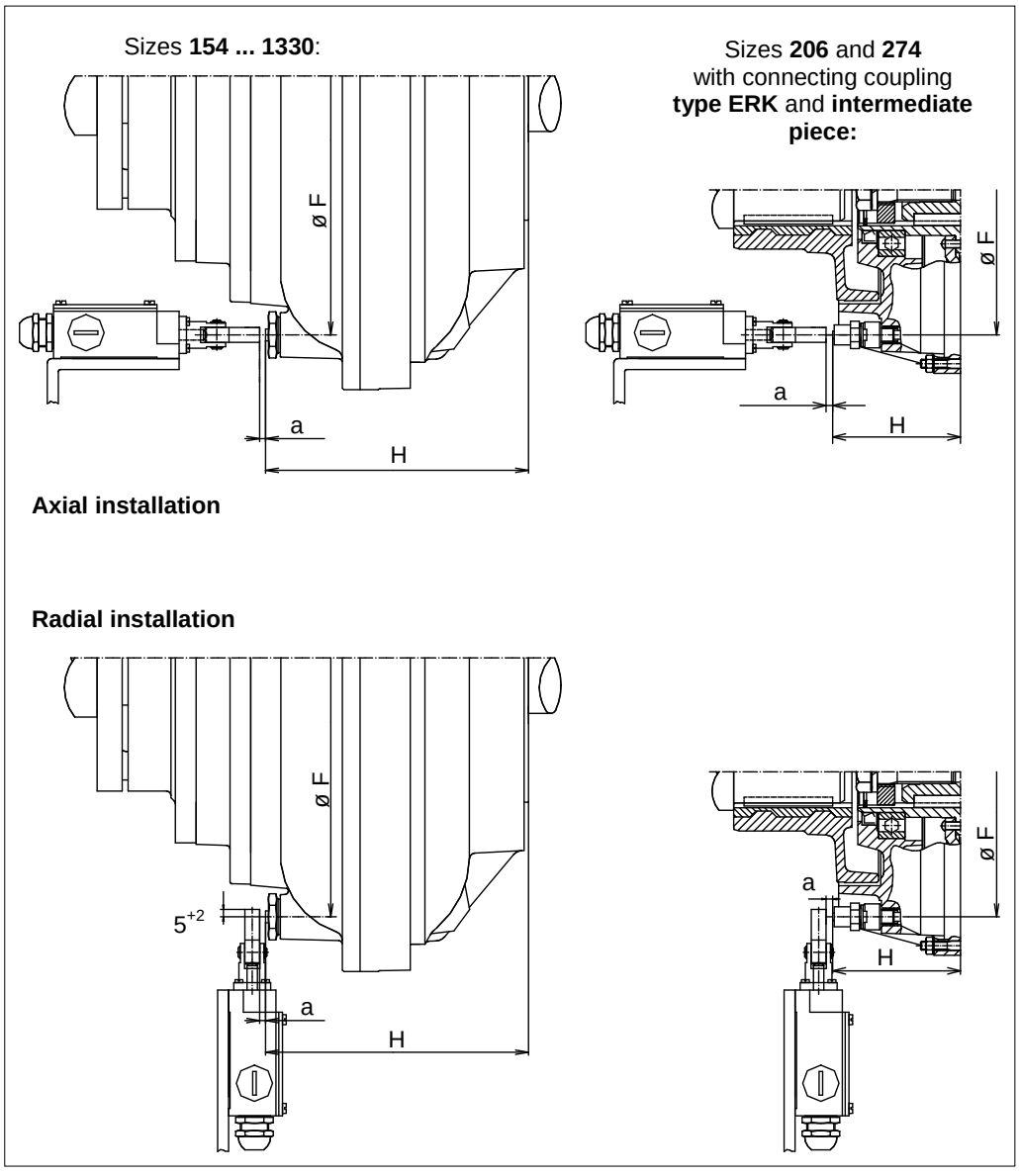

Fig. 4

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Installation dimensions for switching element and switch.

Turbo coupling type	Pitch circle diameter Ø F [mm]	Distance ~ H [mm]	Mounting distance a [mm]	Distance ~ H [mm] for connecting coupling type ERK
154 T	147	92.5	$2_{-0.5}$	92.5
154 DT	147	114.5	$2_{-0.5}$	114.5
206 T	196	106.0	$2_{-0.5}$	129.0
206 DT	196	146.0	$2_{-0.5}$	169.0
274 T	268	146.5	$2_{-0.5}$	169.5
274 DT	268	184.5	$2_{-0.5}$	207.5
366 T	350	178.0	4_{-1}	-
422 T	396	191.0	4_{-1}	-
487 T	470	213.0	4_{-1}	-
562 T	548	233.0	4_{-1}	-
650 T	630	274.0	4_{-1}	-
750 T	729	325.5	4_{-1}	-
866 T	840	363.5	4_{-1}	-
866 DT	840	607.5	4_{-1}	-
1000 T	972	376.5	4_{-1}	-
1000 DT	972	679.5	4_{-1}	-
1150 T	1128	465.5	4_{-1}	-
1150 DT	1128	790.5	4_{-1}	-
1330 DT	1302	919.5	4_{-1}	-

Table 7

NOTICE

Damage to property

Non-compliance with mounting instructions.

- Do not mount the switch with lateral or angular offset, neither in case of parallel mounting with the axis nor in case of radial mounting!
- Proper switching function is not guaranteed in case of faulty alignment!
- Ensure that the bracket is of sufficient stability (not included in Voith's scope of supply)!

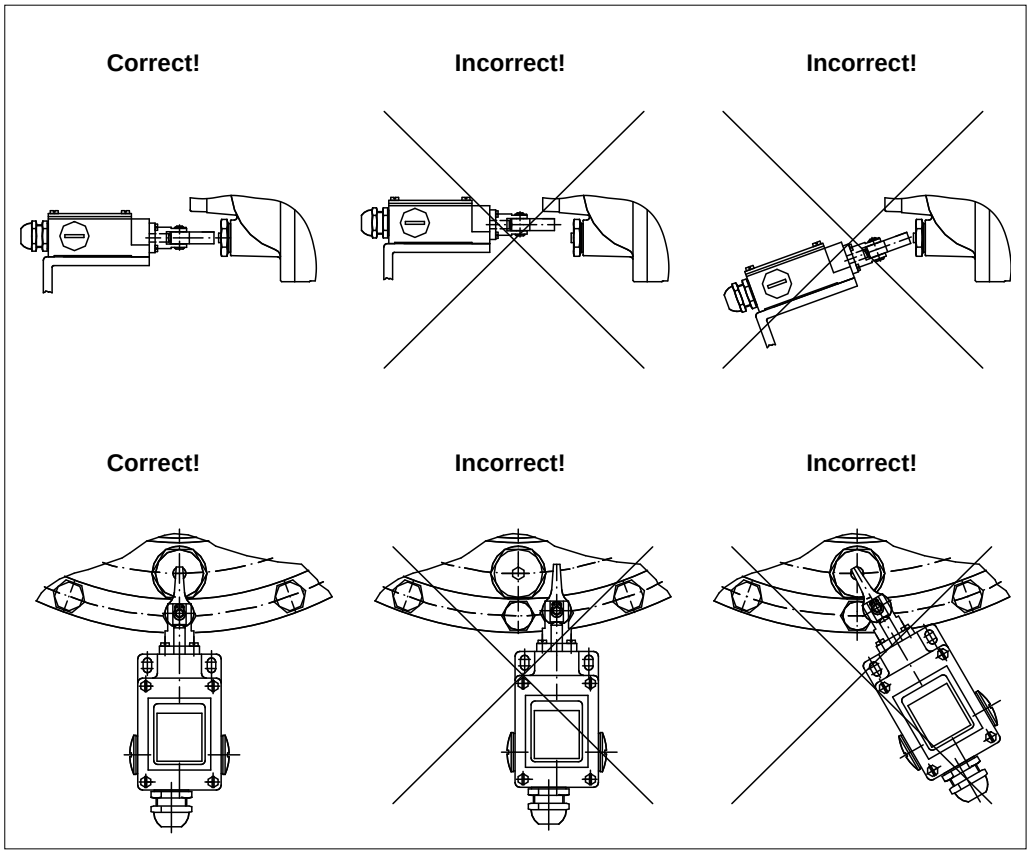

Fig. 5

- Mount the switch on the pitch-circle diameter of the switching element, on a bracket, parallel or radial to the turbo coupling axis.
- Set the distance between switching finger and switching element to mounting distance **a** (→ Table 7 installation dimensions)!
- Put the switching finger into the correct position.

6.4 Connection

NOTICE

Damage to property
Damage to the system by electric components not connected properly.

- Wiring of the MTS is not included in the scope of supply!
- Only authorized qualified staff is allowed to perform electrical connection.
- We recommend designing the switch connection so that excessive temperature as well as also cable break result in an excess temperature warning (connect break contact).
- In case that the switching element and the fusible plugs are installed in the same outer part, we basically recommend switching off the drive when the MTS responses!

- Connect the switch, observe the switching capacity. Protect the connecting lines against damage due to environmental influences!
- Fix and lay the connecting cable of the switch so that it is sufficiently protected against mechanical damage.

Switch
→ Chapter 3.2

6.4.1 Connection of the ExM 61 D switch (additional notes)

Switch ExM 61 D is insulated by a metal housing. The housing is provided with an outer protective earth terminal for max. 4 mm². Connection is made via a wire potted into the housing of the contact unit. Fix and lay the connecting cable of this switch so that it is protected against mechanical damage.
It is not allowed to do any conversions and alternations on the switch which might affect the explosion protection. Furthermore, **DIN EN 60079-14** apply to the installation of electrical equipment in potentially explosive areas.

For proper functioning, the switch is to be fixed so that that the contact travel necessary for switching can safely be reached. Please ensure that even in case of failure, the switch cannot be moved from its position. Under no circumstances must the switch be actuated beyond its inner mechanical stop as this may damage the switch. The switch housing must not be used as an end stop. The switch can be mounted in any desired position.

7 Maintenance, Servicing

⚠ WARNING

Risk of injury
Please observe, in particular, → Chapter 5 (Safety) when working on the mechanical thermal switch unit!

- Please always keep access paths free to the turbo coupling!

- Switch off the unit in which the turbo coupling is installed and secure the switch against inadvertent switch-on.
- For all work performed on the turbo coupling ensure that both the drive motor and the driven machine have stopped running and that a re-start is absolutely impossible!
- Components may only be replaced by original spare parts.

Re-mount all protective covers and safety devices in their original position immediately after completion of the maintenance work. Check them for proper functioning.

Maintenance schedule:

Time	Maintenance work
After response of switching element	Replace switching element and then put switching finger into correct position.
Regularly (maintenance interval depends on dust content in the ambient air of the switch)	We recommend performing maintenance in regular intervals as per the following steps: 1. Check the actuator for easy movement. 2. Remove all debris or particles. 3. Put the switching finger into correct position.

Table 8

- Record any maintenance work carried out in a maintenance log.

8 Disposal

Disposal of the packaging
Dispose of packaging material according to the local regulations.

How to dispose of operating fluids
On disposal, please observe the applicable laws and the producer's or supplier's instructions.

How to dispose of the MTS
Dispose of the MTS according to the local regulations.

For special information on the disposal of the substances and materials used, please see the following table:

	Kind of disposal		
Material / substance	**Reuse**	**Residual waste**	**Special waste**
Metals	x	-	-
Cables	x	-	-
Seals	-	x	-
Plastics	x [1)]	(x)	-
Operating media	-	-	x [1), 2)]
Packaging	x	-	-

Table 9

1) If possible
2) Disposal according to the safety data sheet or the manufacturer's instructions

9 Malfunctions - Remedial Actions, Troubleshooting

⚠ WARNING

Risk of injury
Please observe, in particular, → Chapter 5 (Safety) when working on the mechanical thermal switch unit!

⚠ WARNING

Explosion hazard
It is not allowed to modify anything on apparatus/devices which are operated in potentially explosive atmospheres.

- Repairs are not permitted; repair the device.

The following table is intended to help finding the cause of malfunctions or problems quickly and to take remedial action, if necessary.

Malfunction	Possible cause(s)	Remedial action	See
Operating fluid is lost through the fusible plug during operation; the MTS switching element did not respond.	Response temperatures of switching element and fusible plugs do not match.	Please consult Voith Turbo.	Chapter 6.1 and Chapter 10
	The switching finger was not in correct position.	Move the switching finger into correct position.	Chapter 6.2
	The switch is not properly connected.	Check the wiring, correct it, if necessary.	Chapter 6.3
Please consult Voith Turbo (→ Chapter 10), in case of a malfunction which is not included in this table.			

Table 10

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10 Queries, Orders Placed for Service Engineers and Spare Parts

For

- Queries
- Ordering a service engineer
- Spare parts orders
- Commissionings

we need:

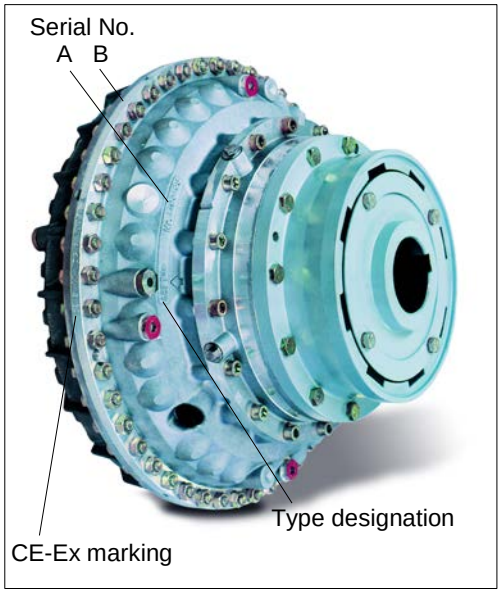

Fig. 6

the **Serial No.** and **type designation** of the turbo coupling on which the MTS is used.

→ You will find the serial number and type designation either on the outer wheel / coupling shell (A) or on the turbo coupling periphery (B).
→ The serial number is stamped in with figure stamps.
→ For turbo couplings, intended for the use in potentially explosive atmospheres, you will find the CE-Ex marking on the turbo coupling periphery.

When placing an order for a **service engineer**, **commissioning** or a **service**, we need, in addition

- the turbo coupling installation site,
- the name and address of a contact person,
- details of the malfunction/problem occurred.

When placing a **spare parts order**, we need, in addition,

- the destination for the spare parts shipment.

Please contact the local Voith representative
(outside business hours: the emergency hotline).

Representatives
→ Chapter 12

11 Spare parts information

NOTICE

Unauthorized changes or retrofits are not allowed to be performed on the coupling!
Do not retrofit accessories or equipment originating from other manufacturers!
Any changes or conversions performed without the prior written consent of Voith Turbo will result in the loss of any warranty! Any claims will forfeit!

- Professional maintenance or repair can only be guaranteed by the manufacturer!

11.1 Switching elements

MTS switching elements					Sealing ring
Use for turbo coupling size	**Dimension of thread**	**Nominal response temperature**	**Color**	**Material No.**	**Material No.**
154 – 274 T / DT	M10	140 °C	red	TCR.11954250	TCR.03658010
366 – 650 T	M18x1.5	95 °C	-	TCR.11978290	TCR.03658018
		110 °C	yellow	TCR.11052260	
		125 °C	brown	TCR.11052270	
		140 °C	red	TCR.11052240	
		160 °C	green	TCR.10671780	
750 – 1330 T / DT	M24x1.5	110 °C	yellow	TCR.12390160	TCR.03658024
		125 °C	brown	TCR.11052220	
		140 °C	red	TCR.10474190	
		160 °C	green	TCR.11952190	

Table 11

Installation and Operating Manual / Version 9 / 3626-011800
en / Protection Class 0: public / 2017-01-31

11.2 Intermediate piece

The intermediate piece is required only for connecting coupling type ERK and for sizes 206 and 274.

Material No. TCR.11959520

11.3 Switch

Switch type	Material No.
EM 61 D 1Ö/1S	TCR.11960720 (Ambient temperature -40 °C ... 80 °C) (Replacing TCR.10672530, ambient temperature -20 °C … 80 °C)
ExM 61 D	TCR.11974010 (Replacing TCR.10672540)

Table 12

12 Representatives - Voith Turbo GmbH & Co. KG

→ Annex (see List of Voith Representatives)

13 Index

A

Accident prevention 15
As delivered condition 21

C

Characteristics 5
Color coding 9
Connection 25

D

Dangers 14
Disposal 27

E

Electrical components 16
Excess temperature 5, 8

F

Fire hazard 18
Function 6
Fusible plugs 18

I

Information as to dangerous situations 15
Installation 21
Installation dimensions 23
Intended use 15

M

Maintenance schedule 26
Malfunctions - remedial actions 28
MTS 12

N

Noise 17

O

Order 29
Ordering a service engineer 29
Overload 18

P

Possible applications 5
Potentially explosive atmospheres 15
Product monitoring 20

Q

Qualification 20
Queries 29

R

Remaining risks 19
Representatives 32

S

Safety 14
Scope of supply 21
Selection and qualification of staff 20
Serial No. 29
Sound pressure level 17
Spare parts 12
Spare parts information 30
Spare parts orders 29
Switch 6
  Function 7
  Mounting 22
  Spare parts information 31
  Technical data 10
Switching element 6
  Function 7
  Mounting 22
  Spare parts information 30
  Technical data 9
Symbols 15

T

Technical data
  Switch 11
  Switching element 9
Troubleshooting 28
Type designation 29

U

Unintended use 15

W

What to do in case of accidents 19
Wiring 25
Working on the MTS 15

14 Annex

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Work Sheet ait394.9

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VOITH

Voith Turbo
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Work Sheet ait394.9

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