Combined operated solenoid valves

...(AX)

(version acc. to European Directive 2014/34/EU(ATEX))

Mounting and Operating Manuel for explosion proofed solenoids
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Dear customer, Dear assembler/user

these operation and installation manuals are intended to give you the knowledge which is necessary for you to be able to carry out the mounting and adjustment of a solenoid valve rapidly and correctly.

Please read these instructions carefully and pay particular attention to the advice and warning notes.

Only instructed and qualified mechanics should mount, adjust or maintain the solenoid valves.

The solenoid valves will be deliver in several versions relative to
- ways
- operations
- material
- type of voltage and rated voltage
- connection type and connection size

There are also several options available.

With accessories
- speed control
- electric position indication
- manual override

could take place.

If you have any question concerning to the solenoid valves we shall be pleased to answer them. The telephone number will be found on the inside cover of this operation and installation manual.

Yours

END-Armaturen GmbH & Co. KG
General advice

2 General advice

2.1 Valivity

These mounting and operating manual is valid for the explosion proofed version of the solenoid valves:

- MGMxZxxxxxxxxxx/AX..
- MEMG2Zxxxxxxxxxx/AX..
- MEMF2Zxxxxxxxxxx/AX..
- MBxxZxxxxxxxxxx/AX..

also before mentioned solenoid valves with welded connections and their variants:
- with X as a perface to the type
- and a appendage to the type (e.g. /A05).

Advice

The products descript in this documentation in the conditions of our delivery are partly completed machinery according to annex 2 paragraph g of the directive 2006/42/EC on machinery, which must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive 2006/42/EC on machinery, where appropriate.

Please take notice to the Declaration of incorporation and the assembly instruction.

2.2 Inward monitoring

Please check
- directly after delivery the solenoid valve for any transport damages and deficiencies.
- with reference to the accompanying delivery note the number of parts.

Do not leave any parts in the package.

2.3 Complaints

Claims for replacement or goods which relate to transport damage can only be considered valid if the parcel service / forwarder has notified without delay.

In case of returns (because of transport damage / repairs), please make a damage protocol and send the parts back to END-Armaturen, if possible in the original packaging.

In case of a return, please mention the following:
- Name and address of the consignee
- Order-/ article-number
- Description of the defect.
2.4 Guarantee

For our solenoid valve we give a guarantee period in accordance with the sales contract. The end of the normal duration of life of the wearing parts represents no defect.

The warrently and guarantee rules of END-Armaturen GmbH & Co. KG are applicable.

2.5 Symbols and their signification

STOP
Paragraphs which are identified with this symbol contain very important advices, this also includes advices for averting health risks. Observe these paragraphs without fail!

! Paragraphs which are identified with this symbol contain very important advices, this also includes how to avoid damage to property. Observe these paragraphs without fail!

This symbols indicates paragraphs which contain comments / advices or tips.

This spanner identifies the description of actions which you should carry out.
3 Safety advice

Depending on the technical circumstances and the time under and at which the solenoid valve is mounted, adjusted and commissioned, in each case you have to take into account particular safety aspects.

If, for example, the valve works in an operational chemical plant, the potential hazards of commissioning have another dimension in case this is carried out for test purposes on a „dry“ part of the plant in the assembly room.

Since we do not know the circumstances at the time of mounting / adjusting / commissioning you may find advice on hazards in the following description which are not relevant to you. Please observe (only) the advice which applies to your situation!

3.1 Personal protection

3.1.1 Safety advice for mounting

We wish to point out expressly that the mounting, the electrical installation and the adjustment of the solenoid valves and the accessories must be carried out only by trained specialised personnel having mechanical and electrical knowledge.

Don’t move off the coil from the tube by switched on power supply.

At first switch off all the devices / machines / plant affected by mounting or repair.
If appropriate, isolate the devices / machines / plant from the main.

Check (for example in chemical plants) whether the switching off of the devices / machines / plant will causes potential danger.

If appropriate, in case of a fault in the solenoid valve (in a system which is in operation) inform the shift foreman / safety engineer or the works manager without delay about the fault, in order, for example, to avoid an outflow / overflow of chemicals or the discharge of gases in good time by means of suitable measures!

Before mounting or repair, remove the pressure from pneumatic / hydraulic devices / machines / plant!

Drain the conduit from medium.

If necessary, set up warning signs in order to prevent the inadvertent starting up of the device / machine / plant.

Observe the respective relevant professional safety and accident prevention regulations when carrying out the mounting / repair.

Check the correct functioning of the safety equipment (for example the emergency push off buttons / safety valves, etc).
3.1.2 Safety advice for adjustment and initial starting

As a result of the starting a solenoid valve the flow of gases, stem. liquids, etc. may be enabled or interrupted!

By starting the device / machine observe that the solenoid valve may be in an undefinied operating position. By this uncontrollable movements could happen.

Assure yourself that, as the result of the starting or the test adjustment of the solenoid valve, no potential hazard will be produced for the personnel or the environment.

If necessary, set up warning signs in order to prevent the inadvertent starting up or shutting down of the devices / machine / plant!

By ending mounting check the correct function and the tightness of the solenoid valve.

Check the right position and correct function of perhaps mounted accessories.

Check the right function of all safety devices (for example emergency push off buttons; etc.)!

Carry out the starting and the adjustment only in accordance with the instructions discribed in this documentation.
3.2 Device safety

The solenoid valve
- is a quality product which is produced in accordance with the recognized industrial regulations.
- left the manufacturer’s work in a perfect condition!

*In order to maintain this condition, as installer / user you must carry out your task in accordance with the descriptions in these instructions, technically correctly and with the greatest possible precision!*

We assume that you have, as a trained specialist, sound mechanical and electrical knowledge.

The solenoid valve must be used only for a purpose corresponding to its construction.

The solenoid valve must be used within the values specified in the technical data.

Satisfy yourself that, as a result of the mounting, the commissioning or as a result of the test adjustments of the solenoid valve, no potential hazards will be produced for devices / machine / plant!

**Warning! Danger of burns.**

In case of the working conditions, an extrem heating up of the coils will be possible.

At explosion proofed solenoid valves the max. permitted surface temperature of the equipment is classified in temperature classes. The temperatures won’t be exceeded in the respective temperature class:

- T1: max. 450°C;
- T2: max. 300°C;
- T3: max. 200°C;
- T4: max. 135°C;
- T5: max. 100°C;
- T6: max. 85°C.

Open the solenoid valve only to such an extant as described in this documentation!

Don’t mount the solenoid valve, start the solenoid valve or carry out any adjustments on it, if the solenoid valve, the supply lines or the part of the plant on which it is mounted is damaged.

By ending mounting check the correct function and the tightness of the solenoid valve.

At installation in the open or moist ambient you have to take special measures to protect the solenoid valve against moisture.
4 Device variants

4.1 Device variants

The solenoid valves can be delivered in various applications.

The following table explains the composition of the article number to you. These article numbers will be mentioned on the name plate:

For example: MGMG2Z126247015/AX

Solenoid valve with B.S.P. thread acc. to DIN ISO 228T1, 2/2-ways, combied operated, body: brass, seals: NBR, explosion proofed solenoid, 24V DC, solenoid size 21 watts, connecting size G 1/2”

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>Type</td>
<td>Connection</td>
<td>Ways</td>
<td>Operation</td>
<td>Body material</td>
</tr>
<tr>
<td>ME</td>
<td>MG</td>
<td>M</td>
<td>2</td>
<td>Z</td>
<td>1 = brass</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 = stainless steel</td>
</tr>
</tbody>
</table>

8. Digit
Seals material

<table>
<thead>
<tr>
<th>9. Digit</th>
<th>Type of voltage</th>
<th>10. Digit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 = NBR</td>
<td>3 = FKM</td>
<td>4 = EPDM</td>
</tr>
<tr>
<td>5 = EEx me II T4 (AC)</td>
<td>6 = EEx me II T4 (DC)</td>
<td>7 = EEx md II T4 (AC)</td>
</tr>
</tbody>
</table>

11. - 12. Digit
Solenoid type

<table>
<thead>
<tr>
<th>13. - 15. Digit</th>
<th>Flanged and, welded connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art. Mxxxx / MExxxx</td>
<td>Threaded connection</td>
</tr>
<tr>
<td>82 = 10 watts</td>
<td>47 = 23 watts</td>
</tr>
<tr>
<td>51 = 30 watts</td>
<td>54 = 47 watts</td>
</tr>
<tr>
<td>65 = 22 watts</td>
<td></td>
</tr>
</tbody>
</table>

16. - 20. Digit
Options

AX = Version acc. to ATEX (obligatory)
CN = Chemical nickel-plated
HN = Manual override
NO = Normally open
OF = Free of oil and grease
SR = Speed control
4.2 Technical data

4.2.1 Technical data solenoid valve: ME(MB)..2Zxxxxxxxxx/AX

The below table shows the technical data of the solenoid for explosion proofed solenoid valves with explosion proof identification:

<table>
<thead>
<tr>
<th>Series</th>
<th>8336 ... 8345</th>
<th>8436 ... 8445</th>
<th>9236 ... 9245</th>
<th>9336 ... 9345</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage [V]</td>
<td>12 - 440 V DC</td>
<td>12 - 440 V DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated current [mA]</td>
<td>50 - 1830</td>
<td>90 - 3330</td>
<td>30 - 1000</td>
<td>41 - 1500</td>
</tr>
<tr>
<td>Rated power [W]</td>
<td>22</td>
<td>40</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20°C ... +40°C</td>
<td>-20°C ... +40°C</td>
<td>-20°C ... +40°C</td>
<td>-20°C ... +40°C</td>
</tr>
</tbody>
</table>

4.2.1 Technical data solenoid valve: MG..2Zxxxxxxxxx/AX

The below table shows the technical data of the solenoid for explosion proofed solenoid valves with explosion proof identification:

<table>
<thead>
<tr>
<th>Series</th>
<th>K05932..</th>
<th>K05924..</th>
<th>K05927..</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage [V]</td>
<td>12 - 230 V</td>
<td>12 - 230 V</td>
<td>24 - 230 V</td>
</tr>
<tr>
<td>Rated current [mA]</td>
<td>2000 - 100</td>
<td>2700 - 140</td>
<td>2100 - 220</td>
</tr>
<tr>
<td>Rated power [W]</td>
<td>23</td>
<td>30</td>
<td>47</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20°C ... +40°C</td>
<td>-20°C ... +40°C</td>
<td>-20°C ... +40°C</td>
</tr>
</tbody>
</table>

- Dimensioning current
  - Each solenoid operator has to be protected by a fuse according to the rated current (max. 3x rated current according DIN 41571 or IEC 127) resp. Motor protection switch with short-circuit and fast thermal tripping protection. The fuse can be accommodated in the associated device or must be added separately. The fuse voltage has to be equal or higher than the rated solenoid voltage. The shutdown capability has to be equal or higher than the max. assumed short-circuit current at the installation point.

4.3 Corresponding use

The solenoids are only licensend in connection with the supplied valves. The combination of valves and solenoid must be selected by the manufacturer or his representative.

The solenoid coil is an encapsulated safe electrical work equipment group II, designed for application in atmospheres according to category 2G (zone 1+ zone 2) / 2D (zone 21 + zone 22).

By using the described solenoid valve, observe, that the flow rate of explosive media inside the valve will be less than:

- $v \leq 2 \text{ m/s}$ for explosive liquid media and $v \leq 20 \text{ m/s}$ for explosive gases.
### 4.4 Name-plate

The solenoid valves will be provided with a name-plate, which permits a definite identification of the valve and shows the most important technical data to you. The name-plate should not be displaced or changed.

#### Fig. 4.1 - Name-plate

<table>
<thead>
<tr>
<th>Art.Nr.</th>
<th>article number of the valve (see also chapter 4 „device variants“)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serie</td>
<td>serial or production number</td>
</tr>
<tr>
<td>Betriebsdruck (PS)</td>
<td>max. pressure range of the valve [bar]</td>
</tr>
<tr>
<td>Temperatur (TS)</td>
<td>max. temperature range of the valve</td>
</tr>
<tr>
<td>Größe (DN)</td>
<td>connection size of the valve</td>
</tr>
<tr>
<td>Prüfdruck (PT)</td>
<td>testing pressure of the valve and the solenoid system</td>
</tr>
<tr>
<td>Fluidgruppe</td>
<td>allowed fluid group of the valve</td>
</tr>
<tr>
<td>Herstellung</td>
<td>date of manufacturing</td>
</tr>
</tbody>
</table>

#### Fig. 4.2 - Additional name-plate for explosion proofed solenoid valves

<table>
<thead>
<tr>
<th>Typ / NR.</th>
<th>description of the solenoid system</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN: 24 V:</td>
<td>rated voltage [V]</td>
</tr>
<tr>
<td>Hz.: DC:</td>
<td>direct current</td>
</tr>
<tr>
<td>IN: 0,94 A:</td>
<td>rated current [A]</td>
</tr>
<tr>
<td>PN: 23 W:</td>
<td>rated power [W]</td>
</tr>
<tr>
<td>PTB 03 ATEX 2095 X:</td>
<td>number of the certificate issued by a registration entity</td>
</tr>
<tr>
<td>II 2G EEx em II T4:</td>
<td>explosion proof identification</td>
</tr>
<tr>
<td>II 2D IP65 T130°C:</td>
<td>duty cycle</td>
</tr>
</tbody>
</table>

ACHTUNG: Betriebsanleitung beachten
Description of function

4.5 Description of function

4.5.1 Combined operated solenoid valve

This type of valves does not require any pressure difference for opening and shutting the main closing element. According to the indicated pressure diagrams they work from 0 bar upwards.

The plunger is connected to the diaphragm which is fitted with a pilot nozzle. The attraction of the plunger therefore causes the pilot nozzle to open, and the ensuing pressure lifts the diaphragm; this action is further reinforced by the opening stroke of the plunger. Thus a combination of direct (plunger) and indirect (diaphragm) operations ensure full passage even at low pressures, and operations and seal remain regular even at 0 bar pressure.

By taking advantage of the surface differences, this type of valves enables operating big-size valves with high pressure, the actuators being comparatively small as against direct-acting valves. The actuator stroke must be at least as high as the valve lift. The force must be sufficient for opening the pilot bore and the main closing element against the spring force.

Fig. 4.3 - Combined operated solenoid valve: standard-application
4.6 Options

4.6.1 Manual override

At the option „manual override“ the combined operated solenoid valve will be actuated by a hand wheel. The main closing element of the combined operated solenoid valve will be lift up by turning round a spindle with a hand wheel.
Options

4.6.2 Chemical nickel-plated

The body of the solenoid valve will be nickel-plated to protect the surface against aggressive media.

4.6.3 Normally open

STOP

In this case the de-energized solenoid valve will be hold in the open position by spring force, the energized solenoid closes the valve. These solenoid valves should only be used with DC - coils.

4.6.4 Free of oil and grease

All part of the solenoid valve which can come into contact with pure oxygen will be clean up of oil and grease to avoid the formation of explosive gases.

4.6.5 Speed control

With the speed control you can change the diameter of the pilot drilling at a combined operated solenoid valve. Therefore a control of the closing time will take place. This option isn’t available for solenoid valves with a connection size ½” and smaller sizes.

Fig. 4.5 - Description of function: speed control
4.6.6 Electrical position indicator (contactless)

The electrical position indicator is needed to show the operation condition of a solenoid valve over a great distance. It is also possible to indicate a signal to a control device. Therefore are different types of limit switches available: Reed contact or inductive proximity limit switches.

A separate Declaration of conformity and the user’s manual of the switch will be sent to you with the solenoid valve.
Mounting / disassembly

5 Mounting / disassembly

5.1 Mounting

The mounting of the solenoid valves restricts to
- the mechanical mounting into the prescribed pipes
- the electrical mounting of the solenoid valves and perhaps the mounting of accessories.

The installation of direct acting solenoid valves can be according your needs.
The installation with a vertical standing coil should be preferred.

In the following description we assume that you have read the former chapters attentive. We also assume that you will observe the safety advices and warnings from chapter 3 „Safety advices“ during the mounting / disassembly.

If you have not read chapter 3 „safety advices“ until now, read these important advices now and turn back to this page.

The mounting and the electrical installation must be carried out only by trained specialised personnel with mechanical and electrical knowledge.

The mechanical installation are the same by all applications. It differs only by the type of connection.

Observe the flow direction, specified on the valve body.

Before mounting the solenoid valve clean up the pipes. Pollution will reduce the safety and the duration of life of the valve. If necessary mount a Y-strainer upstream the valve.

Avoid strains of the body by non align pipes.

At installation in the open or moist ambient you have to take special measures to protect the solenoid valve against moisture.

5.1.1 Mounting of a solenoid valve with threaded connection

Before lay on sealing compounds, check the hardly screwing of the pipes into the valve body.

Lay on the correct sealing compounds on the pipes end. By using PTFE-ribbon or hemp sealings observe the screw direction . Don`t use sealing compounds which are not prescribed for your employment.

Screw the pipes into the connection ends of the valve body. Don`t use the solenoid as a lever.

Strike up the pipes with pressure after that time the manufacturer of the sealing compounds pretends for harden it.

Check the tightness of all connections.
5.1.2 Mounting of a solenoid valve with welded connection.

By welding the valve body with the pipes observe appropriate demands and guide lines. The safety demands by welding are depending on the place and the position of the point of weld. Welding the parts at a serviceable device / machine / plant the potential of danger is as higher as welding the parts in a welding room.

If appropriate, inform the shift foreman / safety engineer or the works manager and the fire brigade of your factory.

By welding observe your own national guide lines about safety and prevention of accidents.

Before welding the solenoid body between the pipes you have to take measures to prevent the damage of the sealings or diaphragm.

5.1.2.2 Protection of seals / diaphragm by disassembling

Clamp the valve between a vice carefully. By using guard plates you can prevent the damage of the ends of the body.

Loosen the screws of the cap by using a fit spanner.

Turn out the screws of the valve body and take the cap byside carefully. Remove the diaphragm from the valve body. If you should disassemble some solenoid valves, places marks on the body, diaphragm and the caps that you will be able to join the correct parts by a subsequent mounting of the solenoid valves.
5.2 Electrical installation

At the explosion proofed version the connecting cable is spilt with the solenoid body. It should not be open on no account.

If connecting the lead wires make ensure the wire ends or the leads are properly inserted to the electrical terminal.

Connecting cable and wires should be free of sharp bends in order to avoid short circuits and interruptions.

Before initial operation of the device make sure that the overall equipment or unit respectively meets the requirements of the EMC directive.

Each solenoid operator has to be protected by a fuse according to the rated current (max. 3x rated current accord. DIN 41571 or IEC 127) resp. Motor protection switch with short-circuit and fast thermal tripping protection. The fuse can be accommodated in the associated device or must be added separately.

The fuse voltage has to be equal or higher than the rated solenoid voltage. The shutdown capability has to be equal or higher than the max. assumed short-circuit current at the installation point.

5.2.1 Wiring

<table>
<thead>
<tr>
<th>Wiring - AC</th>
<th>Wiring - DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>blue</td>
<td>blue</td>
</tr>
<tr>
<td>brown</td>
<td>brown</td>
</tr>
<tr>
<td>yellow</td>
<td>yellow</td>
</tr>
</tbody>
</table>

Fig. 5.1 - Mounting / disassembly - wiring
5.3 Disassembly

The disassembly of a solenoid valve in the principle proceeds in the reverse sequence to the mounting; some essential points should be clarified!
- Will the solenoid valve to be disassembled be replaced immediately by another?
- If appropriate, does the production process of the plant need to be stopped?
- Is it necessary to inform specific personnel about the disassembly? etc.

Switch off the power supply of the device / machine / plant.

Stop the medium. Never remove the solenoid valve under pressure.

If necessary, set up warning sign in order to prevent
- the inadvertent starting up of the device / machine / plant or
- the switching on of the medium.

In case of the working conditions, heating up of the coils to high temperatures will be possible. Warning! Danger of burns.

Keep ready some fit tanks to catch up leaking liquids.

5.3.1 Electrical disassembly

Switch off the power supply and take care to prevent the inadvertent switching on.

Don’t move off the solenoid from the tube by switched on power supply.
5.3.2 Mechanical disassembly

Take care, that the device / machine / plant will be pressureless and take care to prevent the inadvertent switching on.

If the body of the solenoid valve have to been removed, loosen the flange connection, or loosen the pipes from the body of the solenoid valve.

Don’t use the tube and the plunger with the solenoid as a lever.

Close the pipes, if the pipes are not also being disassembled or are not be immediately reconnected to another solenoid valve.

6. Initial operation

Before starting the solenoid valve, you have to read the

→ Safety advice

If you have not done this until now, read these important advices now and return to this page.

The starting of the solenoid valve, which is mounted in a plant (e.g. in a refinery or in a chemical plant) should only happen in accordance with the instructions of the hole plant!

Switch on the power supply of the control device.

Check the tightness of all pipe connections.

Check the function of the accessories.
7. Faults

If during the test run or during the operation a functional fault of the solenoid valve should occur, inform the shift foreman / safety engineer or the work manager about the disturbance without delay in order for example, to avoid an outflow / overflow of chemicals or a discharge of gases in good time by means of suitable measures!

Next, using the following list, attempt to find the reason for the causes of the failure and if it lies within your capabilities, to correct this.

Do not try to repair the solenoid valve!

Don't move off the solenoid from the tube by switched on power supply.

In case of a defect in the solenoid valve make contact with the supplier. The telephone number will be found on the back cover of these mounting and installation manual.

7.1 Fail causes

- Is the power supply to the control device is switched on?
- Is the working pressure as higher as allowed?

8 Maintenance / Cleaning

8.1 Maintenance

On normal accounts the solenoid valve is maintenance free.

Check in regular turns the tightness of the solenoid valves.

In case of a defect in the solenoid valve make contact to the supplier. The telephone number will be found on the back cover of these operation and installation manual.

If you determinate that there is a damage to the solenoid valve, isolate it from the power supply. However before doing this, it is essential to refer the

Safety advice

8.2 Cleaning

By using the solenoid valve in dusty areas observe that the thickness of the dust will be less than 4 mm. To avoid the raising of dust use a slightly moistened duster to clean up the solenoid valve.

- Do not use any abrasive, corrosive or flammable cleaning agents.
- Do not use high pressure cleaning devices.
- Prevent moisture liquid penetrating into the interior of the device.
Declaration of conformity

We herewith declare, that the products mentioned below comply with the relevant safety requirements.

Name of product: Mxxx2Zxxxxxxxxxx/AX

The solenoid valves of the above series are electrical apparatus for use as intended hazardous areas of work equipment group II 2G and/or II 2GD. They are marked:

EEEx m II T3/T4 resp. EEx me II T3/T4
T = 140°C or T = 110°C

For the solenoid operator the homologation certificate is applicable:

TÜV 06 ATEX 553076 X TÜV 06 ATEX 553413 X
TÜV 06 ATEX 553414 X TÜV 06 ATEX 553415 X

Applied directives:

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Applied national standards, technical specifications:

- **EN 60079-0:2010**
  Explosive atmospheres - Part 0: Equipment - General requirement

- **EN 60079-7:7007**
  Explosive atmospheres - Part 7: Equipment protection by increased safety „e”

- **EN 60079-18:2009**
  Explosive atmospheres - Part 18: Equipment protection by encapsulation „m”

- **EN60529:2000**
  Degrees of protection provided by enclosures (IP Code)

- **DIN VDE 0580:2011**
  Electromagnetic devices and components - General specification

Important:
The bodies of valves DN65 and larger must also be reliably connected to the circuit breaker of the electrical system. The maximum surfaces temperature of the body depends on the fluid and the ambient temperatures and must be below the ignition temperature.

Bad Oeynhausen, 20. April 2016

Friedhelm König
Technischer Leiter