Martens
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Operating Manual

Clamp-on Temperature Sensor

GTL723

FDA

Table of contents

1 Proper use (application areas)

> Detailed information on the application area can be found in the Chapter "Product description".

The operating safety of the device is ensured only with proper use and observation of the information given in the operating instructions.

For safety and guarantee reasons, work above and beyond that described in the operating instructions may only be carried out by personnel authorized by the manufacturer. Unauthorized conversions or modifications are expressly prohibited.

In the event of improper use, this device can pose dangers, depending on the application.

> The device is **not** suitable for use in areas subject to the risk of explosion or system components relevant to safety in accordance with SIL.

General safety instructions, use

These operating instructions must be kept where they are immediately available to specialist personnel at all times.

All procedures described in these operating instructions must be carried out only by trained personnel authorized by the operator, while wearing the corresponding protective clothing.

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1.1 Safety signs and symbols

Warning instructions are designated in this document as described below in Table 1:

⚠ DANGER	Warning! This symbol warns against immediately threatening danger, death, severe physical injury or serious material damage if instructions are not followed.
☞	Attention! This symbol warns against possible dangers or dangerous situations which can cause damage to the device itself or to the environment if instructions are not followed.
ⓘ	Note! This symbol indicates procedures which have a direct influence on operation or can cause unforeseen reactions if instructions are not followed.

Table 1

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1.2 Safety instructions

Read the product description before bringing the device into operation. Ensure that the product is fully suitable for the applications in question.

The operator is responsible for the problem-free operation of the device. The operator is obliged throughout the complete usage time to establish and ensure that the required working and safety measures comply with the relevant applicable regulations.

1.3 Product liability and guarantee

Liability disclaimer:

The content of the operating instructions has been checked for compliance with the device described. Deviations cannot however be excluded, so that we offer no guarantee of full compliance. The information in these instructions is checked regularly, and necessary corrections incorporated into the following editions. We reserve the right to make technical amendments. All claims are also subject to the valid "General delivery conditions for products and services of the electronics industry".

Martens Elektronik cannot check or repair devices without the specified, fully completed form (see chapter 8, Returns).

1.4 Standards and directives

EMC Directive 2014/30/EU
Testing standard EN 61316-1: 2013

RoHS Directive 2011/65/EU
Testing standard EN50581: 2012

1.5 Approvals

No licenses are given currently

2 Product description

The GTL723 pipe clamp-on sensors are especially useful as an Alternative to invasive and inline measuring procedures for monitoring sterilization processes. Without disturbing the process, the special clamp-on mechanics make the systems flexible, absolutely dead spot-free, and usable without high installation costs. This measuring procedure permits high-precision results.

The pipe clamp-on sensor consists of a sensor insert with the Pt100 sensor, integrated transmitter and the pipeline adapter. With the aid of the microprocessor-controlled measurement, the user can adapt the parameter setting to the process environment using a PC.

2.1 Delivery contents

- Pipe sensor
- Pipe adapter
- Silicon insert
- this operating manual
- if necessary GTL Configuration tool

2.2 Operating principle

The GTL723 clamp-on sensor measures temperatures of liquids in metal pipelines without a process connector touching the fluid. For this purpose, the clamp-on sensor is mounted on the exterior of the pipe at a suitable site. The sensor plate is pressed to the exterior of the pipe wall by a spring. Constant pressure and shielding the silicone from the ambient air guarantee an optimal thermal transfer. The one-piece measuring insert, which is manufactured from premium-quality synthetic material prevents undesirable heat dissipation and reduces the response time. The sensor plate inside the measuring insert is in direct thermal contact with the Pt100 sensor.

2.3 Pipewall correction

A pipe clamp-on sensor causes a measuring error, since the pipe wall is between the fluid and the measuring point. This error is largely compensated by the pipe wall correction by means of an expansion, a polynomial determined through an elaborate series of tests. It is assumed that the pipes are stainless steel (any grade).

Pipe wall thicknesses of 1 to 4 mm for pipeline adapters of manufactured sizes #2 and #3, or of 1 to 2 mm for pipeline adapters of manufactured size #1, are considered. The pipe wall correction differentiates applications with and without heat-conductive paste. The necessary adjustment can be made with the GTL Configuration tool.

2.4 Design of the measurement system

Sensor insertion with
round plug M12
360° turnable

Pt100 / measuring in-
sertion with transmitter

Type plate
insertion

Type plate
adapter

Clamp-on adapter

Silicon
insertion

Pipe Ø DN10..DN80
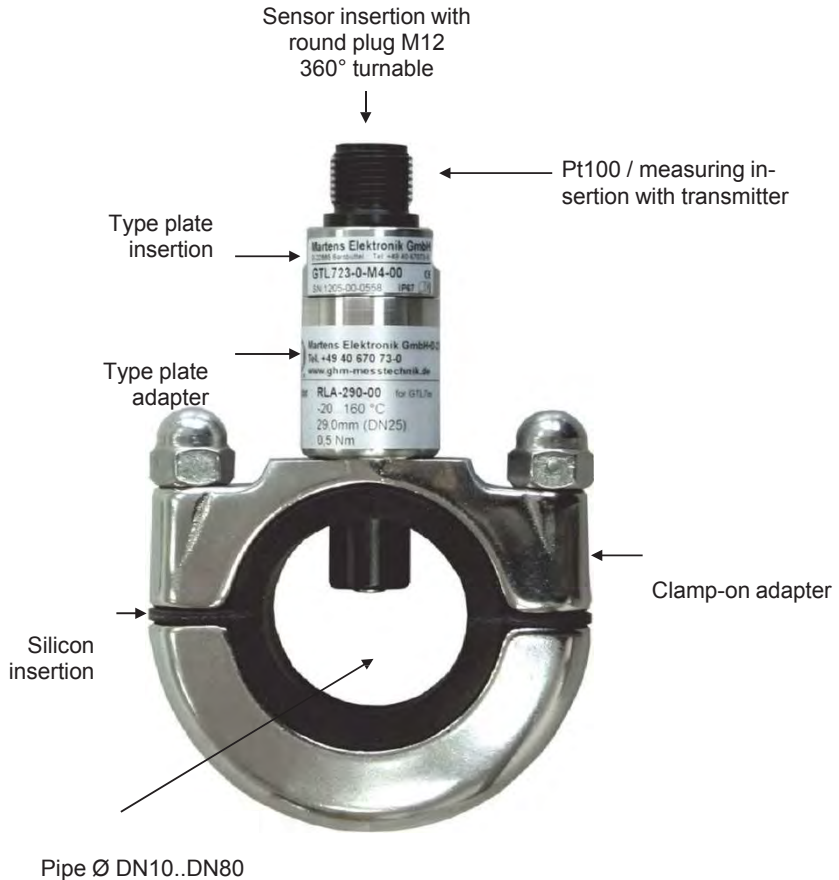
Figure 1

2.5 Response time of the GTL sensor without thermal compound
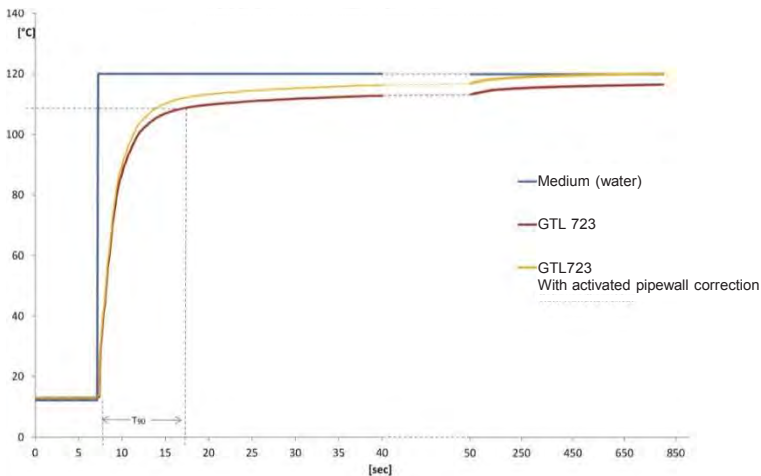
Figure 2

2.6 Response time of the GTL sensor with thermal compound
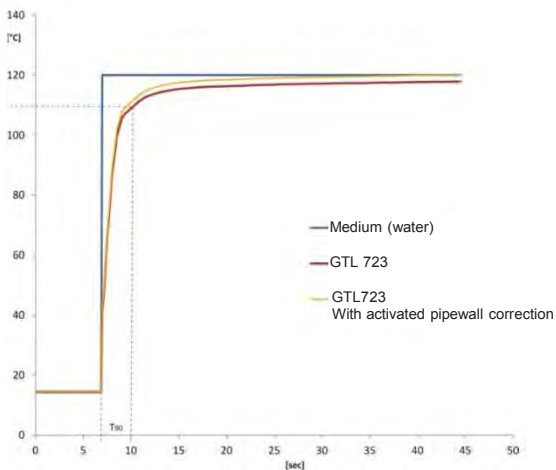
Figure 3

Reference conditions

Pipe diameter	29 mm
Pipe wall	1.5 mm
Pipe material	1.4404
Flow rate	0.5 ~ 1.5 m/s
Ambient temperature	30 °C
Medium	Water
Mounting direction	acc. Position 1 (3.3 Mounting notes, page 10)

Table 2

Block wiring diagram
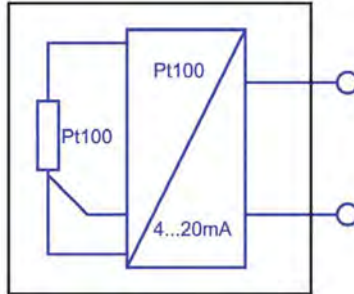
Figure 4

2.7 Type identification plate

The type designation plate (Figure 5, Figure 6) contains the main identification data.

- Type and article designation
- Technical data
- Serial number

Type plate sensor

Figure 5

Type plate clamp-on adapter

Figure 6

3 Mounting and electrical installation

3.1 Mechanical mounting

The RLA pipe clamp adapters are available in three sizes. The adapters are adjusted to the pipe diameter (DN10 to DN80) with different highly heat-resistant silicone inserts.

The cap nuts of the two adapter parts should be torqued to a value from 0.5 to 1 Nm (0.37 to 0.74 ft-lb) to avoid a deformation of the silicone insert, which would prevent a correct fitting of the pipes.

For the same reason, all cap nuts must be torqued equally. This is especially important for pipes with small diameters without the use of heat-conductive paste.

Available for the following pipe norms:
DIN 11850 r2 and DIN 11866 rB, rC.

| Frame size (Bg)	Tube Ø [mm]
1	13.0..19.9
2	20.0..33.9
3	34.0..53.0
4a	60.3..75.9
4b	76.0..88.9

Table 3

3.2 Mounting Guidelines

For mounting instructions, see Figure 7, page 10 to ensure secure functionality and the best measuring results, please follow these mounting steps:

1. The pipe diameter should not deviate more than ± 1 % from the nominal diameter of the silicone insert.
2. Clean the exterior of the pipe before installation. Be sure that no chips, swarf, or other particles are lodged between sensor and pipe because this would prevent the contact plate of the sensor from being flush against the pipe, which reduces accuracy.
3. The installation site should be at least 15 cm (6 inches) from pipe elbows, pipe reducers, and radial welded seams. The sensor must not be placed on welded seams of axially welded pipes. The sensor should be installed at a distance of at least15 cm (6 inches) from other installed sensors with fluid contact.
4. Behind pipe elbows, the sensor housing should be installed on the outside to prevent measuring errors due to bubble formation or flow characteristics.
5. If the pipes are not completely filled, the sensor should be installed in the fluid-covered area of the pipe.
6. Unilateral strain due to suspending heavy objects or taut connection wires should be avoided. **The sensor plate must be flush against the pipe.**

7. If thermal compound is used between pipe wall and measuring tip, it should be replaced in the maintenance interval according the maximum storage period of the paste.
8. The electrical installation must be made after the pipeline adapter is installed on the process line.

3.3 Mounting notes
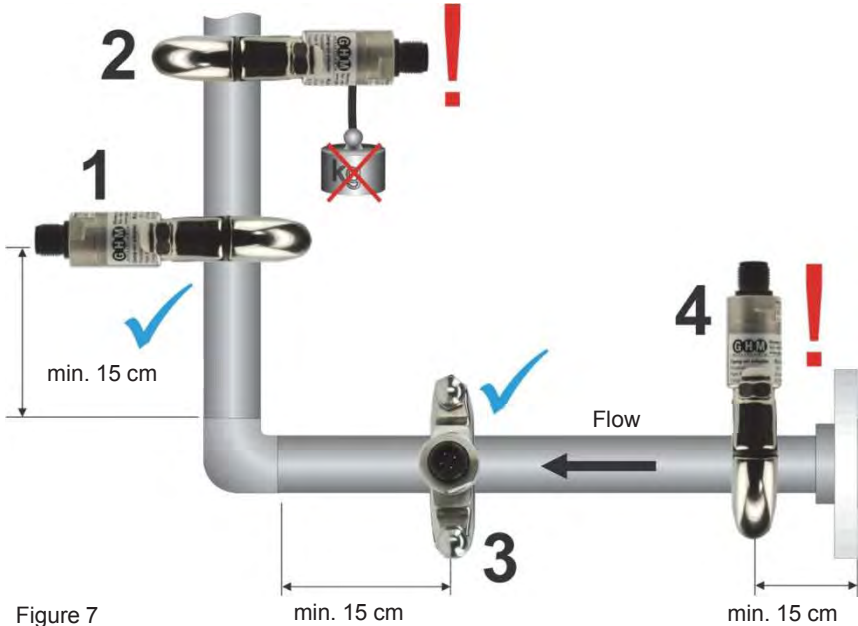
Figure 7

Position	Characteristics
1	*Ideal:* Achieves the best result, since there are no bubbles, deposits, or rising lost heat in the pipes to distort the measuring result.
2	*Questionable:* Lost heat and moving the contact area may lead to distorted measuring results.
3	*Ideal:* Good measuring result, if no air bubbles form. Minimum distance to pipe angle 15 cm (6 inches)
4	*Questionable:* Lost heat and too small a distance from the connection flange may lead to distorted measuring results.

Table 4

3.4 Instructions on Ordinance (EC) 1935/2004

The following components of the product are designed in accordance with
Ordinance (EC) 1935/2004 for permanent contact with foodstuffs:
- FDA certified materials

3.5 Electrical installation

The device must be installed only by a qualified electrician. The national and international regulations for the installation of electrical systems of the relevant operator country apply.

Danger

Power supply to DIN EN60664-1, SELV, PELV.

The switch function of opening or closing depends on the polarity of the
auxiliary voltage at connection pin 1 and 2(3) of the M12 connector.
See connection diagram.

Programming is possible with the GTL Configuration tool.

3.6 Connection diagram

View at the device plug

Figure 8

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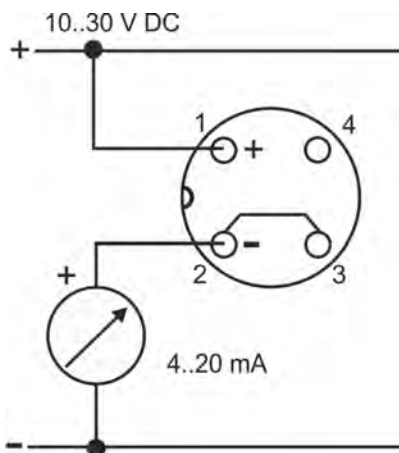◯ Member of GHM GROUP

4   Operating elements and functions

Figure 9

4.1   Parameter

The GTL configuration tool is needed for parameterization. The programming takes place via PC-USB interface.

After initializing the PC-software the parameter and operation structure are read out from the GTL (see separate manual). Following parameters (Table 5) are available:

Operating structure

1st Menu level	2nd Menu level	Parameter level				
		Editor type	**Format**	**Value range**	**Works setting**	
1 – Measuring range display	1.1 – Unit	Selection table		°C, °F	**°C**	
	1.2 – Solution	Selection table		Not active		
	1.3 – Measuring range	Selection table or Number input	-##.#..###.#	-10..+40°, 0..50°, 0..100°, 0..150° C, free programmable	**0.0..150.0**	
2 – Filter and Output	2.1 – Filter	Selection table		no Filter function, t90 = 0.7 s, t90 = 1.8 s, t90 = 3.5 s	**no Filter function**	
	2.2 – Fault detection	Selection table	##.##	>22.00 mA, < 3.75 mA	**22.00 mA**	
	2.3 – Temperature at 4 mA	Number input	#.# - ###.#	Values as MR 1.3	**0.0***	
	2.4 – Temperature at 20 mA	Number input	#.# - ###.#	Values as MR 1.3	**150.0***	
	2.5 – Pipewall correction	Selection table		Not active , Active without compound active, with compound	**Not active**	
3 – Offset- and Gradient correction	3.1 – Offset correction	Number input	#.# - #.#	-5.0..+5.0	**0.0 °C**	
	3.2 – Gradient correction	Number input	##.## - ##.##	-10.00..+10.00	**0.00 %**	

Table 5

* The free programmable measuring range must be in range -20.0..160 °C. The minimal span must be 50 °C.

5   Commissioning, maintenance and servicing

5.1   Commissioning

1. Check the integrity at the sleeve.
2. Ensure that the cable screw fitting is fitted tightly and that the M12 connector is correctly fitted.
3. After switching on the auxiliary power, check the correct switching function.

5.2   Maintenance

Housing:
When cleaning the device, make sure that its connections are firm and tight. The housing surface and gaskets must not be harmed by cleansers.
If the housing is cleaned with a high-pressure cleaning device, make sure the electric connection and the device are not sprayed directly. Avoid cleanser deposits on the thread and inside the guide of the interior part.

Sensor:
During cleaning, it is essential not to damage the sensor tip. If cleansers are used, make sure that they do not harm any materials.

5.3   Servicing

The device itself *cannot* be repaired. Replacement of the insertion is possible without process interruption.

5.4 Calibration/Adjustment

The series GTL723 and GTL737 sensors are calibrated in a way so that the measurement errors are within the target values of the calibration data below (specifications for the temperature sensor). Upon request, this sensor can also be delivered with a certificate of calibration. A recalibration in our facilities is also possible.

After recalibration, individual parameters may be changed for the series GTL723 and GTL737 with the GTL Configuration tool, which makes it pos- sible to readjust the sensor.

Please notice the following for external recalibration:
Depending on the purpose of the pipe clamp sensor, the test should be conducted by placing the evaluative silver plate in the sensor insert on a heat-controlled reference surface (dry calibration).
Wet calibration, e.g. in an oil bath, is possible in principle but not recommended, due to the submergence, which deviates from normal application. The utilization data limits (see technical specifications) for the device must be considered at all times.
For a wet calibration, the maximum temperatures, listed under measurement range, are only used for the underside of the sensor. During progressive submergences of the sensor tip, the calibration temperature is reduced to the valid ambient temperature.

Specially constructed inserts for customary block calibrators and suitable retaining pieces for housing the sensor and a reference thermometer with certificate of calibration are available from the manufacturer upon request.

Attention:

If "Pipe Wall Correction" is activated for the GTL723 sensors, it is absolutely necessary to switch off this parameter with the GTL configuration tool prior to calibrating.

Acceptable deviation data ± 0,3 °C

Proposed Calibrating System

Figure 10
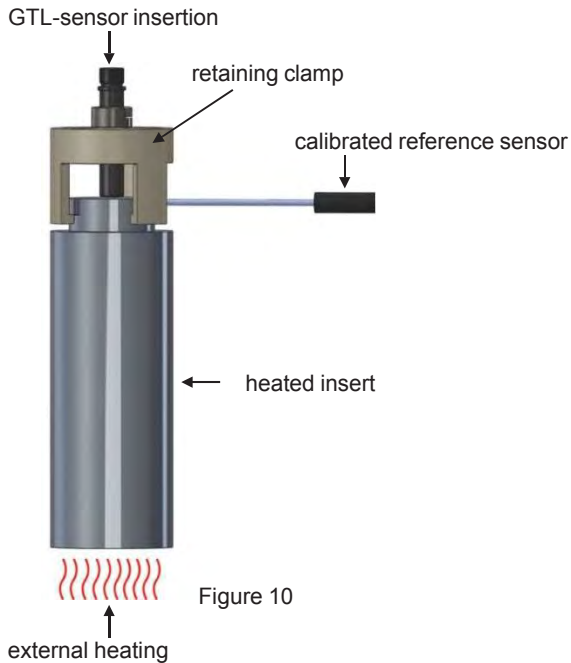
The insert is constructed in a way to position the calibrated reference sensor very closely under the active heating surface, so that it may be used as a reference meter or regulator of the application temperature.

The GTL sensor insert must at all times be guided in a way to ensure a totally flush position of the evaluative silver plate on the heating surface **(Placing the sensor by hand is not practicable)**.

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6   Technical data

Temperature sensor : Pt100, class A acc. to DIN EN 60751
Measuring range   : -20..+100 °C, temporary 160 °C < 30 min
                      programmable, minimal span 50 °C
Ambient temperature : -20..+60 °C
Protection class   : IP67, in connection with mounted round plug

Electrical connection
Loop voltage   : 10..30 V DC, 2-wire connection
Round plug   : 4-pole, M12x1

Response time/accuracy (see Figure 2, Figure 3 page 7) [1]
Data without thermal compound, medium temperature 120 °C
Response time T_{90} : approx. 10 s
Accuracy   : up to 2.5 %   f.s. without pipe wall adjustment
                    : up to 0.6 %   f.s. with pipe wall adjustment

Data with thermal compound, medium temperature 120 °C
Response time T_{90} : approx. 3 s
Accuracy   : up to 1 %   f.s. without pipe wall adjustment
                    : up to 0.2 %   f.s. with pipe wall adjustment

Temperature coefficient : 0.02 %/°C
Error indication   : < 3.7 mA or > 22 mA programmable,
Cause of error   : measured temperature out of range
                      -200..300 °C or internal error.
Current at:
$1.1 \times MR_{end}..300$ °C   : > 22 mA (no error)
-200 °C..$0.9 \times MR_{start}$: < 3.7 mA (no error)
                      Independent of the parameter set
                      "error indication"

[1] Measurement results depending to the mounting situation
  (see mounting guidelines chapter 3.2, consecutive)

Output   : 4..20 mA, 2-wire
Burden   : = (loop voltage – 10 V) ÷ 0.023 A

Case   : 18 mm round case

Sensor
Material:
Spring   : SS-type 1.4310 (spring power max. 21 N)
Sensor usage   : PEEK
Sensor tip   : silver 935
M12-plug   : PA / gold plated contacts
Weight   : 17 g

Clamp-on adapter
Adapter   : SS-type 1.4405
Case   : SS-type 1.4305
Adapter insertion   : Silicone HTV
Weight
Frame size Bg 1   : 120 g
Frame size Bg 2   : 170 g
Frame size Bg 3   : 395 g
Frame size Bg 4   : 955 g

6.1   Maximal ambient temperature
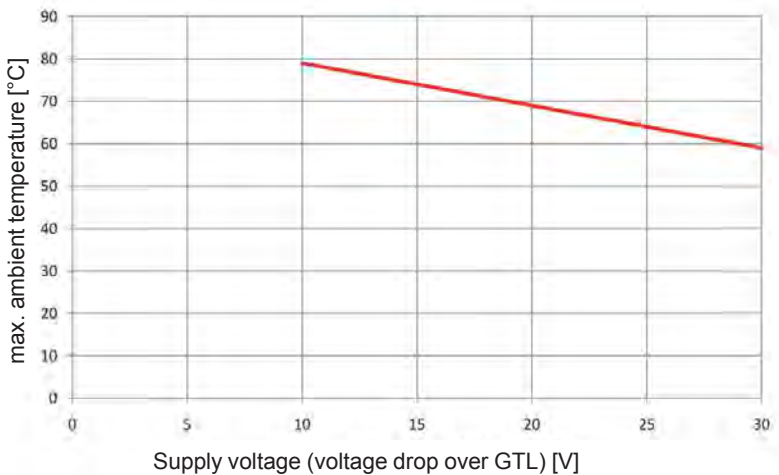
Figure 11

6.2 Mechanical design/dimensions

Clamp-on sensor
GTL

Clamp-on adapter
RLA
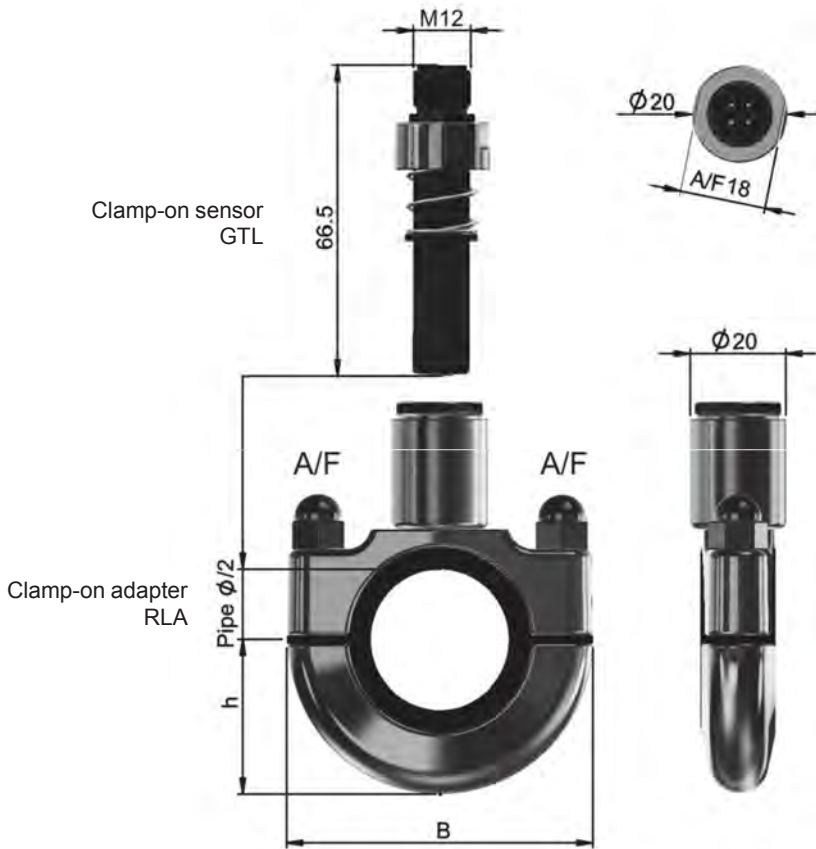
Figure 12

Frame size (Bg)	Pipe [mm]	B [mm]	h [mm]	A/F [mm]
1	13.0..19.9	51	26	11
2	20.0..33.9	64	32	11
3	34.0..53.0	92	46	14
4a	60.3..75.9	133	68	14
4b	60.3..75.9	133	68	14

Table 6

6.3   Ordering code

Note:
In place of order please specify the clamp-on sensor and clamp-on adapter.

Clamp-on Temperature sensor

GTL [1.] - [2.] - [3.] - [4.] - [5.]

1.	**Design**	
	723	transmitter with display and M12 plug
2.	**Electrical connection**	
	2	loop powered, 4..20 mA
3.	**Measuring ranges, factory settings** (programming via GTL-Configurator possible)	
	M1	measuring range -10..+40 °C
	M2	measuring range 0..50 °C
	M3	measuring range 0..100 °C
	M4	measuring range 0..150 °C, for temperatures > 100°C max. 30 min.
	MB	transmitter with customized range [°C] (please state in clear text e.g. 20..130 °C)
4.	**Pipe wall adjustment for SS-type pipes**	
	0	not active
	1	without thermal compound
	2	with thermal compound
5.	**Options**	
	00	without Option

Table 7

Clamp-on adapter see next page!

6.4 Clamp-on adapter

RLA ☐ - ☐
1.　2.

1.	Pipe diameter
120*)	12,0 mm: DN10 DIN 11850 r1
130*)	13,0 mm: DN10 DIN 11850 r2
	12,7 mm: ½" DIN 11866 rC / ASME-BPE
135*)	13,5 mm: DN8 DIN 11866 rB (ISO 1127)
172*)	17,2 mm: DN10 DIN 11866 rB (ISO 1127)
180*)	18,0 mm: DN15 DIN 11850 r1
190*)	19,0 mm: DN15 DIN 11850 r2
	19,0 mm: ¾" DIN 11866 rC / ASME-BPE
213	21,3 mm: DN15 DIN11866 rB
230	23,0 mm: DN20 DIN11850 r2
254	25,4 mm: 1 " DIN11866 rC / ASME-BPE
269	26,9 mm: DN20 DIN11866 rB
280	28,0 mm: DN25 DIN11850 r1
290	29,0 mm: DN25 DIN11850 r2
337	33,7 mm: DN25 DIN11866 rB
	34,0 mm: DN32 DIN11850 r1
350	35,0 mm: DN32 DIN11850 r2
381	38,1 mm: 1 ½ " DIN11866 rC / ASME-BPE
400	40,0 mm: DN40 DIN11850 r1
410	41,0 mm: DN40 DIN11850 r2
424	42,4 mm: DN32 DIN11866 rB
483	48,3 mm: DN40 DIN11866 rB
508	50,8 mm: 2 " DIN11866 rC / ASME-BPE
520	52,0 mm: DN50 DIN11850 r1
530	53,0 mm: DN50 DIN11850 r2
603	60,3 mm: DN50 DIN11866 rB
635	63,5 mm: 2 ½" DIN11866 rC / ASME-BPE
700	70,0 mm: DN65 DIN11850 r2
761	76,1 mm: DN65 DIN11866 rB
	76,2 mm: 3" DIN11866 rC / ASME-BPE
850	85,0 mm: DN80 DIN11850 r2
889	88,9 mm: DN80 DIN11866 rB
999	Customized diameter on request
2.	**Options**
00	none

6.5 Accessories

Type	Description
WLP10S	Thermal compound - Containing silicone - High thermal conductivity of 10.0 W/mK - Not drying out, silicone parts not fleeting - Storage time up to 12 month at normal ambient conditions at delivery - Syringe containing 3 ml+ pipette - Color silver grey
GTL Configuration tool	Programming of the GTL723/737 via PC
Calibration certificate	on request

Table 9

For the evaluation of Pt100 to signals we recommend our transmitter and temperature displays (PI-Transmitter, PI-Displays and PI-Temperature).

6.6 Fault finding

Fault	Cause	Remedy
Device fails to output signal or wrong value	Cable break	Check continuity of cables
	Supply voltage <10 V	Check supply voltage at PIN 1 and 3 of the cable socket directly over the GTL (without the burden of the evaluation device)
	Parameter set	Check programmed measuring range
Output signal exceeds the measuring range	Temperature to high	Check measuring point
	Parameter set	Check programmed measuring range

Table 10

7 Device transport and storage

The case must be packed carefully and stress-free for transport (no automatic binding of the packaging).
The device must be stored under the ambient conditions specified in the technical data.

8 Returns

Legal regulations for the protection of the environment and our personnel require that returned devices which have come into contact with fluid can be handled without risk to personnel and the environment.

If you send a device back to us for checking and repair, we must request that you pay strict attention to the following requirements:

The returns form can be downloaded from GHM-Messtechnik homepage under: "Downloads/Forms".
The repair can be carried out quickly and without further questions if:
1. A completed form is available for every device.
2. The device has been cleaned and returned in packaging which prevents any damage to the device.
3. The completed form and any possible safety data sheet on the measurement medium are attached to the outside of the packaging.

9 Disposal

The device components and packaging must be separated by materials for disposal. The legal regulations and guidelines applicable at the relevant time must be observed.

The device must not be disposed of as general waste. If a device is to be disposed of, send it back to us direct with the completed Returns form specified under Point 8, and we will then take care of proper disposal.

10   Imprint

GHM Messtechnik GmbH

Site Martens, Kiebitzhörn 18, 22885 Barsbüttel

Managing Director: Johannes Overhues

Place of fulfilment and jurisdiction: Barsbüttel

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11 EU-conformity certification

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MESSTECHNIK

(€   **EU-KONFORMITÄTSERKLÄRUNG**
EU-DECLARATION OF CONFORMITY

GHM Messtechnik GmbH Standort Martens, Kiebitzhörn 18, 22885 Barsbüttel, Germany

Dokument-Nr. / Monat.Jahr:
Document-No. / Month.Year: **3205 / 04.2016**

Wir erklären hiermit als Hersteller in alleiniger Verantwortung, dass die folgenden Produkte konform sind
mit den Schutzzielen der Richtlinie des Europäischen Parlaments:
We declare as manufacturer herewith under our sole responsibility that the following products are in compliance
with the protection requirements defined in the European Council directives:

Produktbezeichnung:
Product identifier: **GTL723**

Produktbeschreibung: **Rohranlegefühler**
Product description: *Clamp-on temperature sensor*

Die Produkte entsprechen den folgenden Europäischen Richtlinien:
The products conforms to following European Directives:

Richtlinien / Directives	
2014/30/EU	EMV Richtlinie / *EMC Directive*
2011/65/EU	RoHS / *RoHS*

Angewandte harmonisierte Normen oder angeführte technische Normen:
Applied harmonized standards or mentioned technical specifications:

Harmonisierte Normen / *harmonized standards*	
EN 61326-1:2013	Allgemeine EMV-Anforderungen / *General EMC requirements*
EN 50581:2012	Beschränkung der gefährlichen Stoffe / *Restriction of hazardous substances*

Diese Erklärung wird verantwortlich für den Hersteller abgegeben durch:
The manufacturer is responsible for the declaration released by:

Michael Wulf

Standortleiter
Business unit manager

Barsbüttel, 07. Juni 2016

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Harmonisierungs-
rechtsvorschriften, beinhaltet jedoch keine Zusicherung von Eigenschaften.
This declaration certifies the agreement with the harmonization legislation mentioned, contained however no
warranty of characteristics.