Differential pressure gauge with microswitches
With integrated working pressure indication (DELTA-comb)
Model DPGS40TA, with component testing

for further approvals, see page 6

DELTA-comb

Applications

Monitoring and control of filtration, flow and level for:
- Heat transfer oil plants
- Boilers and pressure vessels
- Marine boilers, bilge-water collection
- Water and wastewater treatment plants
- Pressure-boosting stations, heating technology, fire-extinguishing systems

Special features

- Differential pressure gauge with integrated working pressure indication and microswitch
- Shatterproof window and robust aluminium or stainless steel measuring chamber for increased requirements
- TÜV-certified functional safety through SIL certificate
- Flow monitor with safety function in accordance with VdTÜV code of practice “Flow 100”
- DNV approval

Fig. left: With aluminium measuring chamber
Fig. right: With stainless steel measuring chamber

Description

The differential pressure gauges of the DELTA-line product family are primarily used for the monitoring and control of low differential pressures where there are high requirements in terms of one-sided overload and static pressure.
Typical markets for the model DPGS40TA are the shipbuilding industry, process heating technology, the heating, ventilation and air-conditioning industries, the water/wastewater industry, and machine building and plant construction.

Wherever a differential pressure has to be indicated locally and, at the same time, circuits need to be switched safely dependent on a defined differential pressure, the DELTA-comb finds its use.
The differential pressure remains readable on the mechanical display, even if the voltage supply is lost.

The switch point is accessible from the front and can be set in the range of 10 ... 100 % of the end value of the measuring range by means of an assistant scale.
As a result of the low measuring range of 0 … 250 mbar or 0 ... 15 psi, the instrument can also be used for applications with low differential pressures.

The measuring chamber, depending on the requirement and application, can be made from aluminium or stainless steel. Through the increased stability, the stainless steel measuring chamber is also suitable for gaseous media.
The special feature of the DELTA-comb with component testing is shown by the variety of approvals and certificates. These ensure the suitability for operation in the respective application.

Data sheets showing similar products:
DELTA-plus, differential pressure gauge; model DPG40; see data sheet PM 07.20
DELTA-switch, differential pressure switch; model DPS40; see data sheet PV 27.21
DELTA-trans, differential pressure gauge with output signal; model DPGT40; see data sheet PV 17.19
DELTA-comb, differential pressure gauge with microswitches; model DPGS40; see data sheet PV 27.20

Functionality

The display case (1) is connected directly with the measuring chamber (2) and the process connections integrated in it.

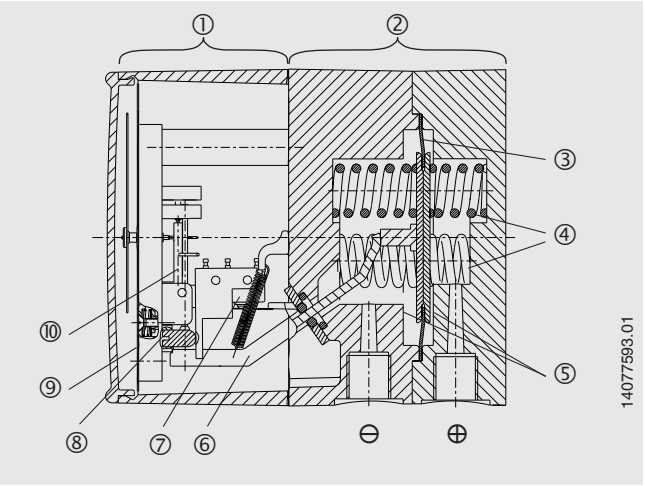
Pressures p1 and p2 act on the media chambers ⊕ and ⊖, which are separated by an elastic diaphragm (3).

The differential pressure (Δp = p1 - p2) leads to an axial deflection of the diaphragm against the measuring range springs (4).

The deflection, which is proportional to the differential pressure, is transmitted to the movement (10) in the indicator case and to the leaf springs of the microswitches (7) via a pressure-tight and low friction rocker arm (6).

Overload safety is provided by metal bolsters (5) resting against the elastic diaphragm.

With versions without Ex approval, the adjustment of the switch point is made by the adjustment screws accessible from the front (8). The assistant scales (9) simplify the setting of the switch point.
For versions with Ex approval, the switch point setting is made at the factory and cannot be carried out subsequently.



Overview of versions

Measuring chamber material		Working pressure indication		Ex approval
Aluminium	Stainless steel	Without	Ø 22 mm	
x		x		Option
x			x	Option
	x	x		Option

→ For information on approvals, see page 6

Specifications

Basic information	
Nominal size	
Differential pressure display	Ø 100 mm [4"]
Working pressure indication	■ Without ■ Ø 22 mm [0.9"]
Window	
Non-Ex version	Plastic, with plug screw for switch point setting
Ex version	Plastic (switch point setting can only be carried out at the factory)
Case version	Display case, aluminium, EN AC-Al Si9Cu3(Fe); black painted
	→ For measuring chamber, see table “Measuring element”

Measuring element	
Type of measuring element	
Differential pressure display	Measuring chamber with diaphragm and media chambers ⊕ and ⊖
Working pressure indication	■ Without ■ Bourdon tube
Material	
Measuring chamber	■ Aluminium, EN AC–Al Si9Cu3(Fe), black painted ■ Stainless steel 1.4571
Diaphragm, sealings	■ FPM/FKM ■ NBR
Bourdon tube (working pressure indication)	Copper alloy

Accuracy specifications	
Accuracy class	
Differential pressure display	■ 2.5 ■ 1.6 (only selectable for scale ranges from 0 ... 1 bar to 0 ... 10 bar)
Working pressure indication	4
Repeatability	≤ 1.6 % of measuring span
Temperature error	On deviation from the reference conditions at the measuring system: Max. ±0.8 %/10 K of end value of measuring range
Reference conditions	
Ambient temperature	+20 °C [+68 °F]

Differential pressure measuring ranges

Measuring range	
mbar	**psi**
0 ... 250	0 ... 15
0 ... 400	0 ... 25
0 ... 600	0 ... 40
0 ... 1,000	0 ... 60
bar	**kg/cm²**
0 ... 0.25	0 ... 0.25
0 ... 0.4	0 ... 0.4
0 ... 0.6	0 ... 0.6
0 ... 1	0 ... 1
0 ... 1.6	0 ... 1.6
0 ... 2.5	0 ... 2.5
0 ... 4	0 ... 4
0 ... 6	0 ... 6
0 ... 10	0 ... 10

Measuring range	
kPa	**MPa**
-12.5 ... +12.5	0 ... 0.025
0 ... 25	0 ... 0.04
0 ... 40	0 ... 0.06
0 ... 60	0 ... 0.1
0 ... 100	0 ... 0.16
0 ... 160	0 ... 0.25
0 ... 250	0 ... 0.4
0 ... 400	0 ... 0.6
0 ... 600	0 ... 1
0 ... 1,000	-

Scale ranges for working pressure

Scale range
bar
0 ... 10
0 ... 16
0 ... 25

Further details on: Measuring ranges	
Pressure type	Differential pressure
Special measuring ranges	Other measuring ranges on request
Unit	■ bar ■ psi ■ mbar ■ kg/cm² ■ MPa ■ kPa

Process connections	
Standard	■ EN 837 ■ DIN EN ISO 8434-1
Size	
EN 837	■ 2 x G ¼, female thread, centre distance 26 mm ■ 2 x G ¼ B, male thread, centre distance 26 mm
DIN EN ISO 8434-1	■ 2 x bite-type fitting for pipe Ø 6 mm ■ 2 x bite-type fitting for pipe Ø 8 mm ■ 2 x bite-type fitting for pipe Ø 10 mm
Materials (wetted)	
Measuring chamber	■ Aluminium, Al Si9Cu3(Fe), black painted ■ Stainless steel 1.4571
Process connection	■ Identical to measuring chamber (only 2 x G ¼ female thread) ■ Copper alloy ■ Stainless steel ■ Steel (only bite-type fittings)
Diaphragm, sealings	■ FPM/FKM ■ NBR

Output signal	
Connection method	Microswitch
Number of switches	■ Single contact, contact model 850.3 ■ Double contact, contact model 850.3.3
Switching function	Change-over contact
Switch point setting	From the outside at assistant scale by means of adjustment screw(s)
Non-Ex version	■ From the outside at assistant scale by means of adjustment screw(s)
Ex version	■ Factory set (subsequent switch point setting cannot be carried out)
Setting range	From 10 % to 100 % of measuring range
Switch hysteresis	■ Max. 2.5 % of end value of measuring range ■ Max. 5 % of end value of measuring range

Electrical connections	
Connection type	■ Cable gland M20 x 1.5 with 1 m cable, flying leads ■ Cable socket ■ Angular connector
Pin assignment	→ See drawings from page 8

Operating conditions	
Medium temperature	-10 ... +90 °C [14 ... 194 °F]
Ambient temperature	
Non-Ex instruments	-10 ... +70 °C [14 ... 150 °F]
Ex instruments	-10 ... +60 °C [14 ... 140 °F]
Storage temperature	-20 ... +60 °C [-4 ... +140 °F]
Pressure limitation	
Steady	End value of measuring range
Fluctuating	0.9 x end value of measuring range
Overload safety	Max. 25 bar On one, both and alternatingly on the ⊕ and ⊖ sides
Ingress protection per IEC/EN 60529	IP65

Approvals

Logo	Description	Region
CE	**EU declaration of conformity** ■ Pressure equipment directive ■ Low voltage directive ■ RoHS directive	European Union
-	**CRN** Safety (e.g. electr. safety, overpressure, ...)	Canada

Optional approvals

Logo	Description	Region
Ex	**EU declaration of conformity** ATEX directive Hazardous areas Gas II 2G Ex ia IIC T4/T5/T6 Gb Dust II 2D Ex ia IIIB T135°C Db	European Union
IEC IECEx	**IECEx** Hazardous areas Gas Ex ia IIC T4/T5/T6 Gb Dust Ex ia IIIB T135°C Db	International
EAC Ex	**EAC** ■ EMC directive ■ Low voltage directive ■ Hazardous areas	Eurasian Economic Community
	Ex Ukraine Hazardous areas	Ukraine
	PAC Kazakhstan Metrology, measurement technology	Kazakhstan
-	**MChS** Permission for commissioning	Kazakhstan
DNV	**DNV** Ships, shipbuilding (e.g. offshore)	International

Manufacturer's information and certificates (option)

Logo	Description
SIL PL	**SIL 3-capable** Functional safety per IEC 61508 Individually installed, the requirements of SIL 2 are fulfilled. For details, see certificate
VdTÜV	Flow monitor with safety function in accordance with VdTÜV code of practice “Flow 100” (BP STRO 100-RL)

Certificates (option)

Certificates	
Certificates	■ 2.2 test report per EN 10204 (e.g. state-of-the-art manufacturing, indication accuracy) ■ 3.1 inspection certificate per EN 10204 (e.g. indication accuracy)
Recommended calibration interval	1 year (dependent on conditions of use)

→ For approvals and certificates, see website

Safety-relevant characteristic values (explosion-protected version)

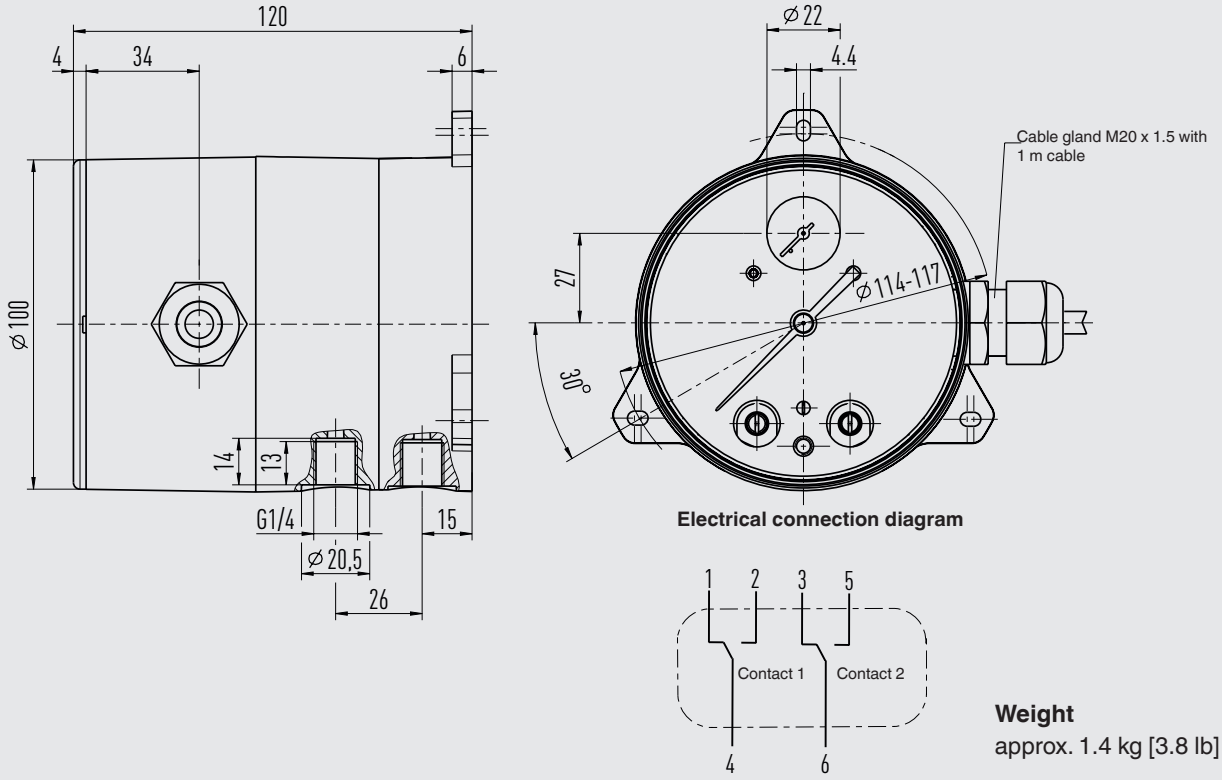
Safety-related characteristic values (Ex)	
Terminals	
Switch A	“1” / “4” / “2”
Switch B	“3” / “6” / “5”
Maximum voltage U_i	DC 30 V
Maximum current I_i	100 mA
Maximum power P_i (gas)	1 W
Maximum power Pi (dust)	
Ta ≤ +40 °C	≤ 750 mW
Ta ≤ +60 °C	≤ 650 mW
Effective internal capacitance C_i	Negligible
Effective internal inductance L_i	Negligible

Instruments with two microswitches

If more than one circuit is connected, all conditions for the separation of two intrinsically safe circuits must be observed.

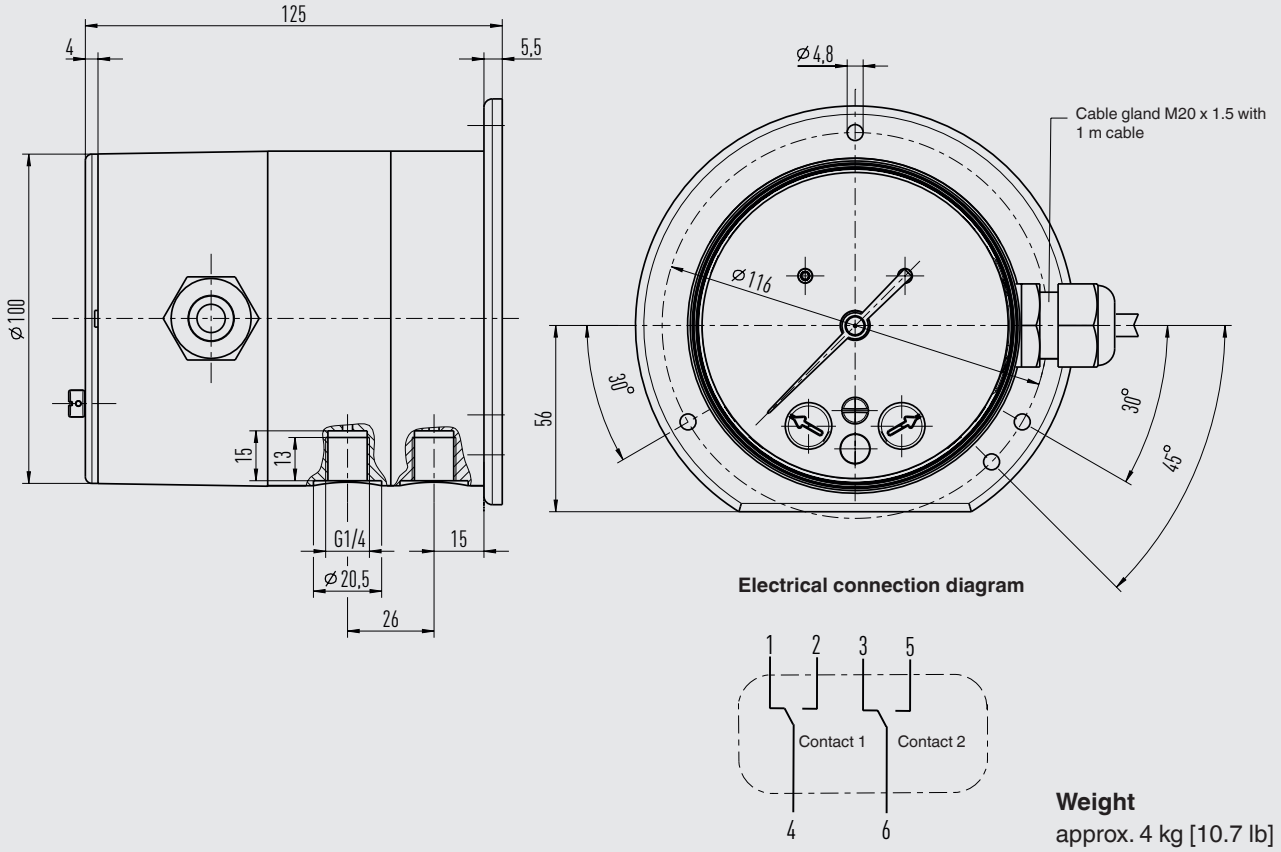
Dimensions in mm

Model DPGS40TA with aluminium measuring chamber, 2 x G ¼ female thread, centre distance 26 mm



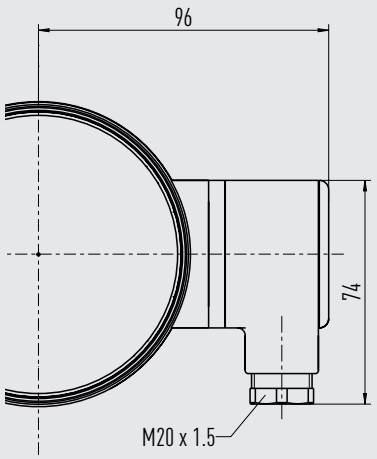
Weight
approx. 1.4 kg [3.8 lb]

Model DPGS40TA with stainless steel measuring chamber, 2 x G ¼ female thread, centre distance 26 mm

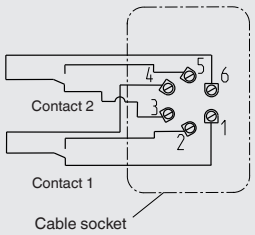


Weight
approx. 4 kg [10.7 lb]

With cable socket or angular connector



Electrical connection diagram



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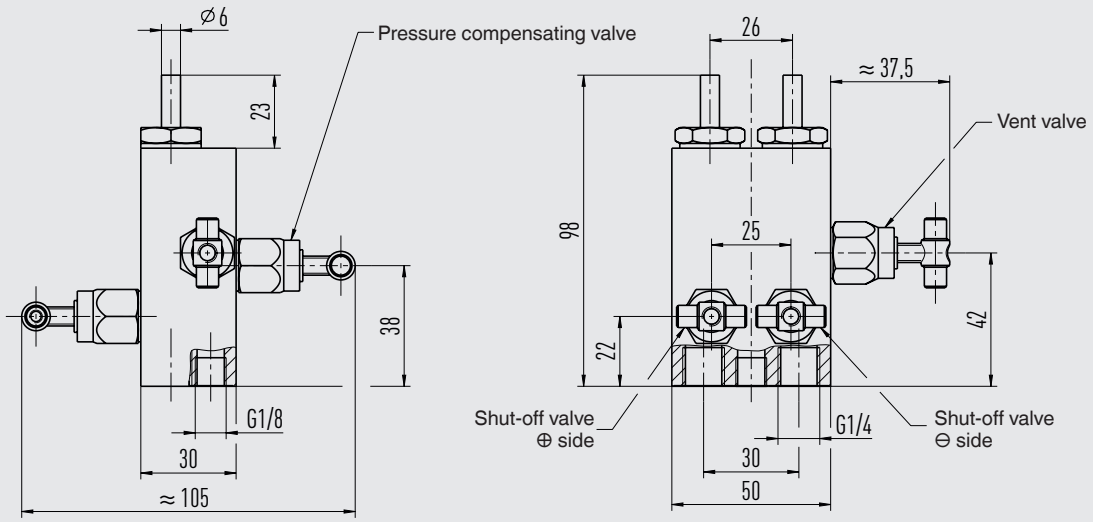
Accessories

Dimensions in mm

4-valve manifold



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Accessories

Model		Description	Order number
	-	Panel mounting flange, aluminium	14074004
		Panel mounting flange, stainless steel	14075088
		Sealings → see data sheet AC 09.08	-
		Syphons → see data sheet AC 09.06	-
	**IV3x**	4-valve manifold, stainless steel → For dimensions, see page 10	2043559
		4-valve manifold, brass → For dimensions, see page 10	2043567
	-	Bite-type fitting, steel, pipe Ø 6 mm	2122359
		Bite-type fitting, steel, pipe Ø 8 mm	2128217
		Bite-type fitting, steel, pipe Ø 10 mm	1351982
		Bite-type fitting, copper alloy, pipe Ø 6 mm	1550705
		Bite-type fitting, copper alloy, pipe Ø 8 mm	1550713
		Bite-type fitting, copper alloy, pipe Ø 10 mm	1561847
		Bite-type fitting, stainless steel, pipe Ø 6 mm	1581481
		Bite-type fitting, stainless steel, pipe Ø 8 mm	1429667
		Bite-type fitting, stainless steel, pipe Ø 10 mm	1518488

Ordering information

Model / Scale range / Process connection / Material of diaphragm, sealings / Number of switches / Options

WIKA Alexander Wiegand SE & Co. KG
Alexander-Wiegand-Straße 30
63911 Klingenberg/Germany
Tel. +49 9372 132-0
info@wika.de
www.wika.de