Honeywell



Installation Manual 954 SmartServo FlexLine

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About this manual

This manual provides information related to installation of the 954 SmartServo FlexLine.

For servicing of the device refer to the 954 SmartServo FlexLine Service Manual listed below in References.

For Safety instructions and procedures refer to the 954 SmartServo FlexLine Safety manual listed below in References.

Introduction

The 954 SmartServo FlexLines an automatic tank gauge measuring the surface or interface level of crude oil or derived products stored in a bulk storage tank. Typically those storage tanks are available on terminals, production plants and refineries in the petro chemical, oil and gas industry. The environment on those sites is typically explosion hazardous.

The end user will typically use the 954 SmartServo FlexLine together with a Terminal Inventory System for custody transfer operations, therefore Weights and Measures legislation is applicable.

The 954 SmartServo FlexLine is based on the modular FlexConn board architecture. Every FlexConn board supported in this device is described in detail.

Revision History

954 Installation Manual (This document)

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References

The following list identifies publications that may contain information relevant to the information in this document.

4417340	1	954 Service Manual
4417342	1	954 Safety Manual

Patents

The Honeywell 954 SmartServo FlexLine servo-based level gauge is covered by the following patents:

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WO2017062413 (A1) 2017-04-13, WO2018044518 (A1) 2018-03-18

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1. GENERAL

1.1. Using this Installation Guide

The 954 SmartServo FlexLine is used in measurement systems for inventory measurement and control. The 954 SmartServo FlexLine can integrate data from other measurement devices, such as temperature RTD sensors.

Data from 954 SmartServo FlexLine and connected sensors can be communicated to host computer systems via a variety of industry standard protocols.

1.2. Related Documents

- 954 SmartServo FlexLine Safety instructions for installation, commissioning, operation, and maintenance; shipped with the device
- CE Declaration of Conformity
- EC-Type Examination Certificate
- IEC-Ex Certificate of Conformity
- Control drawings for FM and CSA

1.3. Trademarks

HART® is a registered trademark of the HART Communication Foundation.

1.4. Contact

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2. SAFETY AND SECURITY

2.1. General

The 954 SmartServo FlexLine is a servo-based level gauge which is used in inventory measurement systems. It can also be used to interface with other systems and sensors such as pressure, density, or temperature sensors.

For the correct and safe servicing of this product, it is essential that all personnel follow the generally accepted safety procedures in addition to the safety precautions specified in this manual.

2.2. Safety Conventions

2.2.1.WARNINGS

The following warning symbol is used in this manual to urge attention in order to **prevent personal** injuries or **dangerous situations**, further described in this manual.

Symbol	Description	Remark
	General warning	<i>Will always be explained by text.</i>

2.2.2. CAUTIONS

The following caution mark is used in this manual to urge attention in order *to prevent damages to the equipment* further described in this manual.

Symbol	Description	Remark
CAUTION	General caution sign	

2.3. Safety Instructions

2.3.1. Safety Instructions

See the safety instructions shipped with the device for installation, commissioning, operation, and maintenance.

2.3.2. EC Declaration of Conformity (for EU)

Refer to the EC declaration of conformity shipped with the device.

2.3.3. Control Drawings for FM & CSA

Refer to the control drawings shipped with the device.

2.3.4. Users

The mechanical and electrical installation must be carried out only by trained personnel with knowledge of the requirements for installation of explosion-proof equipment in hazardous areas.

The entire installation procedure must be carried out in accordance with national, local, and company regulations.

The entire electrical installation shall be carried out in accordance with the national requirements for electrical equipment to be installed in hazardous areas.



NOTE:

See EN IEC 60079-14 or NEC (NFPA70).

2.3.5. Additional Information

If you require additional information, contact Honeywell or its representative.

2.3.6. Environmental Conditions

Observe the environmental conditions for the temperature and the pressure.

Ambient Operating Temperature Range from -40°C (-40°F) up to +65°C (149°F).

2.4. Liability

The information in this Installation Manual is the copyright property of Honeywell. Honeywell disclaims any responsibility for personal injury or damage to equipment caused by:

- Deviation from any of the prescribed procedures,
- Execution of activities that are not prescribed,
- Neglect of the safety regulations for handling tools and use of electricity.

The contents, descriptions and specifications in this Installation Manual are subject to change without notice. Honeywell accepts no responsibility for any errors that may appear in this Installation Manual.



WARNING!

Only certified technicians are authorized to make changes on the 954 SmartServo FlexLine configuration. All modifications must be in accordance to the guidelines as set forth by Honeywell. Modifications not authorized by Honeywell will invalidate the approval certificates.

2.5. Labels

NOTE:



Figure 1 Identification Label with Safety Note on the 954 SmartServo FlexLine



This is a conceptual view of the type plate and therefore subject to change.

2.6. Personal Safety



WARNING!

National, local and company regulations regarding personal safety must be followed.

Pay attention to the kind of product in the tank. If there is any danger for your health, wear a gas mask and take all the necessary precautions.

WARNING!

Take appropriate precautions when chemical or toxic product vapors are present (compressed air, chemical protection suit, and detection equipment).

2.7. Warnings and Cautions

2.7.1. General

2.7.1.1. Opening of the Instrument



WARNING!

DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE MAY BE PRESENT.

When it is required to open the instrument in an explosive hazardous environment, take care of the following:



WARNING!

Make sure that the power to the device is switched off before you open the covers of the device. Failure to do so may cause danger to persons or damage the equipment. All covers of the device must be closed before switching the power on again.



WARNING!

Treat the O-ring groove surfaces of the housing with care. Keep the screw threads of the lids free of dirt. Both O-rings must be present and undamaged.

2.7.1.2. Closing of the Instrument

Make sure that the O-rings are placed in the groves on the housing (main compartment and the terminal block compartment).

2.7.1.3. Tools



WARNING! Use non-sparking tools and explosion-proof testers. Use suitable explosion proof tools (for example, testing devices)!

2.7.1.4. Working Environment

2.7.1.4.1. Hazardous Area



WARNING! Potential Electrostatic Charging Hazard!

Avoid generation of static electricity.

2.7.1.4.2. Safe Area



WARNING!

WARNING!

Avoid generation of static electricity. Make sure no explosive gas mixtures are build up in the working area.



2.7.1.4.3. Required Skills

The technician must be trained and qualified to safely install equipment in hazardous areas. The technician must work in accordance with national, local and company regulations.

2.8. General Precautions



CAUTION!

During transport of the gauge the motor block should be locked. This is for protection of the weighing system.



Motor Locked



Motor Unlocked

Figure 2 Unlocking the 954 SmartServo FlexLine Motor



CAUTION!

The box in which the 954 SmartServo FlexLine arrives also contains the measuring drum. This is a precision measuring device and shall only be installed by a qualified commissioning engineer. Accurate measurement requires an undamaged and clean drum.



Treat this drum with care !

Figure 3 Measuring Drum

Special Tools:

Screw driver for Hex Allen-key screws M4 (length min. 22 mm)

Tommy bar

2.9. Accordance to Regulations

2.9.1. Explosion Safety

ATEX

II 1/2 G Ex db h IIB T6 Ga/Gb or II 1/2 G Ex db eb h IIB T6 Ga/Gb or II 1/2 G Ex db h [ia Ga] IIB T6 Ga/Gb or II 1/2 G Ex db eb h [ia Ga] IIB T6 Ga

Certificate no. ATEX: DEKRA 18ATEX0052 X

IP66/67

IECEx

Ex db h IIB T6 Ga/Gb or Ex db h eb IIB T6 Ga/Gb or Ex db h [ia Ga] IIB T6 Ga/Gb or Ex db eb h [ia Ga] IIB T6 Ga/Gb

Certificate no. IECEX: IECEx DEK 18.0033 X

IP66/67

• FM

XP, Class I, Division 1, Group C,D T6 AIS, Class I, Division 1, Group C,D Ta = -40°C to +65°C NEMA 4X Certificate no.: FM19US0012

CSA

Class I, Division 1, Group C,D Ex db eb h [ia Ga] IIB T6 Ga/Gb Ta = -40°C to +65°C Encl 4 Certificate no.: 70210644

3. PRINCIPAL OF SERVO MEASUREMENT

3.1. Principle of Measurement



Figure 4 Principle of Measurement

The principle is based on detection of variations in the buoyancy of a displacer. The displacer is suspended from a strong, flexible measuring wire which is stored on a precisely grooved measuring drum.

The shaft of the drum is connected to the stepper motor via a magnetic coupling.

The apparent weight of the displacer is measured by a force transducer. The actual output of the force transducer is compared with a desired value for the apparent weight of the displacer. If a discrepancy exists between measured and desired value, an advanced software control module adjusts the position of the stepper motor.

3.1.1. Level Measurement

A level variation of product, in which the displacer is partially immersed, causes a change in buoyancy, which will be detected by the force transducer. The resulting difference between measured and desired value will cause a variation in the position of the stepper motor and consequently raise or lower the position of the displacer until the measured value equals the desired value.

To avoid oscillations, a certain hysteresis and integration time is software adjustable. This results in a stable and accurate averaged level measurement.

The stepper motor turns one revolution for every 10 mm of vertical movement of the displacer.

One revolution is divided into 200 steps, therefore one step is equivalent to 0.05 mm. This resolution is a direct consequence of the stepper motor principle. The correct functioning of the stepper motor is continuously checked. This is achieved by decoding the unique pattern of an encoder disk mounted on the motor shaft.

3.1.2. Interface between two Products

Measurement of the interface between two products is achieved by sending an interface command to the gauge. This causes the stepper motor processor to move the displacer to a position where the apparent weight of the displacer matches a pre-programmed set point.

3.1.3. Relative Density

To measure the relative density, the displacer is positioned at specific heights and the apparent weight of the displacer at each height is measured. Knowing the volume of the displacer, its weight in air, and the measured apparent weight, the relative density of the product at each position of the displacer can be calculated. The software for the density measurement is available as an option.

4. MECHANICAL INSTALLATION

4.1. Preparation for Transportation of the Gauge



CAUTION!

Do not transport the instrument with the motor unlocked. Refer to Figure 2 for motor locking.

Drum should be transported in original protective box. Drum and displacer shall only be installed by a qualified commissioning engineer.

4.2. Process Connection

The 954 SmartServo FlexLine can be ordered with raised face or flat face flange. Select gasket that is suitable for flange type, maximum pressure and product to be stored. Mount instrument flange horizontally.



WARNING!

Verify that tank or drum compartment is depressurized before opening the tank or drum compartment cover of 954 SmartServo FlexLine.

The 954 SmartServo FlexLine can be adapted to various process connection flanges via adapters/calibration chambers as specified in Appendix B. Verify that maximum working pressure of adapter/calibration chamber complies with pressure in your tank.



WARNING!

954 SmartServo FlexLine gauge should be mounted as horizontal as possible. Installation under an angle might influence accuracy of the gauge.



NOTE:

When using 954 SmartServo FlexLine on pressurized tank, it is recommended to install a suitable valve between tank and 954 SmartServo FlexLine to isolate the instrument from the process when required.

The valve shall have an opening large enough to feed through the displacer.

4.3. Orientation of 954 SmartServo FlexLine Gauge on Tank

Mount the gauge in one of the following two ways:



Figure 5 Orientation of the Gauge on a Tank (top view)

On a stilling well or guide pole, the orientation of the gauge may be chosen freely.



NOTE:

The weight of the 954 SmartServo FlexLine for:

- medium pressure version is : 16 kg (35 lbs);
- chemical version is : 21 kg (46 lbs);
- high pressure version is 26 kg (57 lbs).



WARNING! Use the Hoisting Eye for lifting up the 954 SmartServo FlexLine versions above 18 kg (see picture Appendix A)

4.4. Bolts

Secure the gauge adapter by using appropriate bolts. *)

Flange type	Number of bolts	Diameter x minimum
NW50, ND6	4	M12 x 50
NW50, ND40	4	M16 x 60
2", 150 lbs	4	⁵ / ₈ " x 3" (M16 x 80)
2", 300 lbs	8	⁵ / ₈ " x 3" (M16 x 80)
6", 150 lbs	8	³ / ₄ " x 3 ¹ / ₄ " (M20 x 80)
6", 300 lbs	12	³ / ₄ " x 4" (M20 x 100)

*) Bolt dimensions (acc. to DIN 2527, ANSI B16.5) are given in the table.

4.5. Mounting a Pressure Gauge Set

- 1. Connect T-piece horizontally to drum house.
- 2. Check whether manometer is suitable for the maximum pressure in the tank.
- 3. Mount manometer and vent valve (Figure 6).
- 4. Close vent valve.
- 5. Gently open valve between tank and drum compartment and check for leakage on all connections.



Figure 6 Mounting a Pressure Gauge Set on a 954 SmartServo FlexLine Gauge

4.6. Grounding



WARNING!

For proper grounding of the 954 SmartServo FlexLine, install a copper strip under one of the flange bolts for each flange. Place shark rings between flange and strip (Figure 7).



Figure 7 Example of Flange Ground



NOTE:

Also in case of tanks with cathodic protection, the 954 SmartServo FlexLine must be grounded to the tank. Cathodic protection can be maintained by isolating the cable screen/armouring or conduit.

5. ELECTRICAL INSTALLATION

5.1. General

The entire installation procedure must be carried out in accordance with national, local, and company regulations. The entire electrical installation shall be carried out in accordance with the national requirements for electrical equipment to be installed in hazardous areas.

- All wiring entries must be closed such that the approvals are not invalidated.
- Use at least increased safety (Ex e) cable glands.
- Ex d cable glands are allowed to be used as well.
- For installations using conduits, each conduit must be sealed within 18 inches of the enclosure.
- Improper installation of cable glands, conduits or stopping plugs invalidates the Ex approval of this device.
- Make sure that the housing of the device is properly bonded to the Protective Earth (PE).



WARNING!

Cables and cable glands for at least 105 °C (221 °F) shall be used. When the ambient temperature is known to be always less than 50 °C (122 °F), cables and cable glands for at least 90 °C (194 °F) can be used.

5.2. Grounding



WARNING!

Make sure the housing of the device is properly connected to the ground reference! Make sure the electrical resistance of the ground connection is below the maximum prescribed by local requirements!



WARNING!

The instrument may not be opened when an explosion atmosphere may be present. Failure to do so may cause danger to persons or damage the equipment.



Figure 8 Optional Blocking Devices



CAUTION!

Before opening the electronic and terminal compartment cover, remove the optional blocking devices which locks the covers: "A": for electronic compartment cover and terminal compartment cover; "B": for drum compartment cover.



CAUTION!

Do not damage the thread of the covers and instrument and keep the thread free of dirt.

After opening, grease it lightly with anti-seize grease.

When closing, never tighten the covers before the threads are properly engaged. The covers should be turned counter-clockwise until the thread clicks in place, then turn clockwise until the covers are fully closed.

After closing the covers, do not forget to place the blocking devices.

5.3. Safety

5.3.1. General Relative Density



WARNING!

Make sure the power to the device is switched OFF, before you open the cover of the device.



CAUTION! Do not make any additional holes in the housing.



WARNING!

Make sure that no explosive gas mixtures build up in the working area.

5.4. Installing the Cable Glands and Stopping Plugs



WARNING! Only use Ex e or flameproof certified materials of an appropriate IP value.



CAUTION! Improper installation of cable glands or stopping plugs will invalidate the Ex approval of the 954 SmartServo FlexLine.

5.4.1. Cable Glands

Use Ex e or Ex d 3/4" NPT cable glands (or where applicable equivalent conduit connections) with an appropriate IP value. See the type plate on the device.



NOTE: Install the cable glands according to the instructions provided by the manufacturer.

5.4.2. Unused Cable Inlets

Seal unused cable inlets with approved ³/₄" NPT threaded stopping plugs.

5.5. Installing the Glands, Conduits and Stopping Plugs



CAUTION!

Improper installation of cable glands, conduits, or stopping plugs will invalidate the Ex approval of the 954 SmartServo FlexLine.

5.5.1. Conduits

Use explosion proof (Ex d) conduits with an appropriate IP value. See the type plate on the device.



WARNING!

If the 954 SmartServo FlexLine is installed in a hazardous area: Metal conduits must be used, size 3/4".

Stopper boxes must be installed within 45 cm (18") of the device to seal the cabling in the conduit.



NOTE: Install the conduits according to the instructions provided by the manufacturer.

5.5.2. Unused Cable Inlets

Seal unused cable inlets with approved ³/₄" NPT threaded stopping plugs.

5.6. Electrical Connections



CAUTION!

Cables must always comply with the defined cable specifications.

5.6.1. Grounding

The 954 SmartServo FlexLine housing must be properly grounded to the ground reference (generally the tank), according to local regulations. This is a safety grounding requirement.



WARNING!

When measuring the ground resistance, use a suitable instrument that is approved for use in hazardous areas.



WARNING!

Safety depends on proper grounding. Check the resistance of the ground connection directly after installation. The measured ground resistance must be below the maximum prescribed by local and/or national grounding requirements.

5.6.2. Connections



WARNING!

The intrinsically safe options have been certified for use in hazardous areas. Make sure that the certificate of approval is available on site and act in accordance with the instructions as given in the certificate.



WARNING!

Intrinsically safe wiring must be separated from all other wiring. The cable lay-out must be in accordance with local and/or national regulations.



NOTE: Connect the armoring of the cable externally in the cable gland at both ends of the cable The terminal compartment is located at the top of the device (see Figure 10) and it is divided into two zones:

- Blue terminals, for intrinsically safe connections, such as HART, VITO, RTD, MRT / MPT and HART SmartView.
- Grey terminals, for non-intrinsically safe connections.

The indices of the terminals are variable. They are specified in a label attached in front of the terminal row, as is schematically indicated in Figure 11.

5.6.2.1. General Procedure

Connect the wiring to the terminals with the numbers as shown in the tables in the following sections.

5.6.2.2. 954 SmartServo FlexLine Board Overview

CAN-Servo, CAN-PSS, CAN-HART, and CAN-LCD boards are part of each 954 SmartServo FlexLine device. All remaining boards mentioned in this Installation Manual are optional (see Figure 9).



Figure 9 954 SmartServo FlexLine Board Overview

5.6.2.3. Non-intrinsically Safe Connections

The non-intrinsically safe connections are connected to the grey wiring terminal.

If local and or national regulations allow, the power supply, Enraf fieldbus, and hardware relay outputs may be combined into one, unshielded, cable.

A separate cable may also be used for each.

5.6.2.4. Lay-out Terminal Compartment

The terminal compartment on top of the 954 SmartServo FlexLine is divided into a non-intrinsically safe and an intrinsically safe part. Cable entries are $\frac{3}{4}$ " NPT.



Figure 10 Intrinsically Safe and Non-Intrinsically Safe Cable Entries

The non-intrinsically safe cabling may only enter at the two right hand side cable entries (Figure 10).



WARNING!

The Instrument may not be opened when an explosive atmosphere may be present.

5.6.2.5. Non-intrinsically Safe Cabling

Mains cabling: Must be suitable for the 954 SmartServo FlexLine power rating and, moreover, approved for the use in hazardous areas.

Honeywell Enraf field bus lines may be interchanged. If local regulations allow, mains and Honeywell Enraf field bus lines may share one cable.

Mind the isolation voltage of the cores in the cable; refer to the International Standard IEC 61010-1.



NOTE:

If a quad cable is used and all four cores are twisted together, use two opposite cores for Honeywell Enraf field bus lines and the two others for mains.

Terminal information:

Solid / stranded	: 0.56 / 1.54
Flexible / stranded wire with end	: 0.54 / 0.52.5
Tightening torque range (clamping)	: 0.60.8 Nm (M 3)
Stripping length / Blade size	: 8 / 0.6 x 3.5 mm



Figure 11 Wiring Connection Descriptions

5.6.2.6. Power Supply (CAN-PSS)

Connect the power supply to either:

- DC: 24 65 Volt
- AC: 65 240 Volt



NOTE: The DC polarity is not critical.



NOTE:

Disconnection from the supply source needs to be performed externally with an easy accessible and clearly marked switch or circuit breaker as disconnecting device and shall disconnect all current carrying conductors.

5.6.2.7. Cable Specifications

Cable specifications		
Туре	Suitable for the 954 SmartServo FlexLine power rating, and approved for use in hazardous areas	

Label	Parameters
00. Vin-a/L	24-65 Vdc -15/+10%
01. Vin-b/N	65-240 Vac -15/+10%
	50/60 Hz ± 10% Automatic selection

5.6.2.8. Enraf Fieldbus (Bi Phase Mark) (CAN-BPM)

Cable specifications		
Туре	Twisted pair; $R_{max} = 200$ Ohm /line, $C_{max} = 1 \mu F$.	
Maximum length	10 km	

Label	Parameters
06.or 08 TL1	1200/2400/4800 bps
07.or 09 TL2	Selection by software

A maximum of 10 devices can be connected to the Enraf field bus line.

For short distances up to 20 devices can be connected. This number will be specific to every situation.

	5.6.2.9.	Emerson	TRL/2 F	Field Bus	(CAN-TRL2)
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Cable specifications		
Туре	18 AWG (minimum) with shielded twisted pair, with max 8 multi drop Gauge connections	
Maximum length	4 km	

Label	Parameters
06. or 08 TL1	4800 bps
07. or 09 TL2	

5.6.2.10. Alarm Relay Outputs (CAN-RELAIS)

The hardware relay outputs can be used as an alarm signal or to operate a remote device.

The signals corresponding with the terminal labels are programmed during commissioning.

Cable specifications			
Туре	Approved for use in hazardous areas and suitable for the specified power rating.		

Label	Parameters
14. Ry1_a	Vmax = 125 Vac, Imax = 0.5 A, via double isolated transformer
15. Ry1_b	Vmax = 110 Vdc, Imax = 0.3 A, Pmax = 30 W
	NO/NC by factory jumper
16. Ry2_a	Vmax = 125 Vac, Imax = 0.5 A, via double isolated transformer
17. Ry2_b	Vmax = 110 Vdc, Imax = 0.3 A, Pmax = 30 W
	NO/NC by factory jumper (default = NO)

Label	Parameters
18. Ry3_a	Vmax = 150 Vac, Imax = 3 A,
19. Ry3_b	Vmax = 40 Vdc, Imax = 3 A, Pmax = 450 W
	NO/NC by factory jumper
20. Ry4_a	Vmax = 150 Vac, Imax = 3 A,
21. Ry4_b	Vmax = 40 Vdc, Imax = 3 A, Pmax = 450 W
· –	NO/NC by factory jumper

5.6.2.11. SIL Overfill and Underfill Protection (CAN-SIL)

Label	Parameters
50. AO-PAS +	lin / lout = 124 mA
51. AO-COM	Vin / Vout = 10…24.5 V
52. AO-ACT -	

If the sensor powers the loop connect sensor between terminals 50 AO-Pas + and 51 AO-ACT –

If the Servo powers the loop connect sensor between terminals 51 AO-COM + and 52 AO-ACT –

Label	Parameters
54. DO1_a	Vmax = 250 Vac, Imax = 2 A
55. DO1_b	Vmax = 40 Vdc, Imax = 2 A
	Pmax = 500 W
56. DO2_a	Vmax = 250 Vac, Imax = 2 A
57. DO2_b	Vmax = 40 Vdc, Imax = 2 A
	Pmax = 500 W

5.6.2.12. HART and Analog Output (CAN-HART-SLAVE)

Cable specifications		
Туре	Shielded twisted pair	
Maximum length	1200 meter	

Label	Parameters
46 or 48 4-20 mA +	lloop 0 to 25 mA
47 or 49 4-20 mA -	Vmax 55 Volts

5.6.2.13. VITO Temperature, HART Slave and SmartView (CAN-HART)



NOTE:

Intrinsically Safe Connections

The intrinsically safe connections are connected to the blue wiring terminals.

VITO (for temperature and water bottom measurement)

Cable specifications		
Туре	Twisted pair, shielded. $R_{max} = 25 \Omega / line$	
Maximum length	1000 meter	

Label	Parameters
22. V_Loop	[Ex ia] IIB The I/O shall not be accessible or shall be isolated in the end use.
23. GND_Loop	Uo = 23.1 V Ensure the end user cannot touch these wires when energized.
	Uo = 23.1 V
	lo = 124 mA
	Po = 0.6 W
	Co = 1.0 µF

HART Transmitters

Cable specifications		
Туре	Twisted pair, shielded. $R_{max} = 25 \Omega / line$	
Maximum length	1000 meter	

Label	Parameters	
24. V_Loop	[Ex ia] IIB	The I/O shall not be accessible or shall be isolated in the end use.
25. GND_Loop	Uo = 23.1 V	Ensure the end user cannot touch these wires when energized.
	lo = 124 mA	
	Po = 0.6 W	
	Co = 1.0 µF	
	Lo = 9 mH	

Stand-alone HART SmartView Display

Cable specifications		
Туре	Twisted pair, shielded. $R_{max} = 25 \Omega / line$	
Maximum length	1000 meter	

Refer to HART Communication Foundation document number HCF_SPEC-54 (FSK Physical Layer Specification) for detailed length calculations.

Connection Table

Label 954 SmartServo FlexLine	Parameters 954 SmartServo FlexLine	Label HART SmartView	Parameters HART SmartView
24. V_loop	[ia Ga] IIB T6 Ga/ Gb	2. Loop +	[Ex ia] IIB T4 Gb
25. GND_Loop	Uo = 23.1 V	1. Loop -	Ui = 30 V
	lo = 124 mA		li = 200 mA
	Po = 0.6 W		Pi = 0.7 W
	Co = 1.0 µF		Ci = 10 nF
	Lo = 9 mH		Li = 16 µH

The I/O shall not be accessible or shall be isolated in the end use. Ensure the end user cannot touch these wires when energized.

5.6.2.14. Topology

Terminals for HART and VITO are combined. A maximum of 4 HART devices, or 2 HART devices if VITO is present, can be connected to the HART connection.



CAUTION!

Before connecting the HART devices:

Make sure the sum of the start-up currents fits the parameters.



Figure 12 Topology

5.6.2.15. RTD, MRT, MPT Temperature Measurement (CAN-RTD)

Cable specifications		
Туре	Shielded. $R_{max} = 100 \Omega / line$	
Maximum length	150 meter	

RTD, 4-Wire Connection

Label	Connections diagram	Parameters
30. RTD1_S-	R _{c1}	[Ex ia] IIB/IIC
31. RTD1_com		$U_0 = 8.61 V$ L ₀ = 58 mA
32. RTD1_pos		$P_0 = 0.13 W$
33. RTD1_S+		C _o = 1.0 μ Γ L _o = 10.5 mH
34. RTD2_S-	R c2	The I/O shall not be accessible or shall
35. RTD2_com		be isolated in the end use. Ensure the
36. RTD2_pos		when energized
37. RTD2_S+		

RTD, 3-Wire Connection

Label	Connections diagram	Parameters
30. RTD1_S-	R _{e1}	[Ex ia] IIB/IIC
31. RTD1_com		$U_0 = 8.61 V$
32. RTD1_pos	RTD1	$P_0 = 0.13 W$
		C _o = 1.0 μF
		$L_0 = 10.5 \text{ mH}$
34. RTD2_S-	R ₆₂	The I/O shall not be accessible or shall
35. RTD2_com		be isolated in the end use. Ensure the
36. RTD2_pos		end user cannot touch these wires when energized
	7	

Label	Connections diagram	Parameters
38. S-	R	[Ex ia] IIB/IIC
39. com		$U_{o} = 8.61 V$ $I_{o} = 58 mA$
40. R1		$P_{o} = 0.13 W$
41. R2	R2	C _o = 1.0 μF L _o = 10.5 mH
42. R3		The I/O shall not be accessible or shall
43. R4		be isolated in the end use. Ensure the
44. R5	R5	when energized
45. R6		

5.7. Finishing Installation



CAUTION!

Make sure the separation between intrinsic and non intrinsic cabling is sufficient and complies with any local and/or national regulations.

5.7.1. Assembling the Terminal Block and Board Compartment's Lids



WARNING!

Make sure the surface of the O-ring grooves of the housing are clean and the O-rings are not damaged before assembling the lids to the 954 SmartServo FlexLine housing.

Make sure that the both lids (used for terminal block and board compartments) do not squeeze any cables during the assembly.



NOTE: If existing installations have terminals 22 (V_Loop) and 23 (GND_Loop), VITO must be connected between them.

5.8. External Fusing

The 954 SmartServo FlexLine external fuses must be installed in the mains supply cable to each 954 SmartServo FlexLine.

mains voltage	fuse value (in accordance with IEC 127-2-3)
220 Vac or 230 Vac	315 mA slow
110 Vac or 130 Vac	630 mA slow
65 Vac	1 A slow

5.9. Cable Glands / Conduit

Explosion-proof (Ex d) or increased safe (Ex e) cable glands must be used, depending on local requirements. Refer to the Ex-marking on the identification label of the 954 SmartServo FlexLine to determine which type of cable glands is required.



NOTE: Mount the glands according to the supplier's instructions.

Conduit:

If the 954 SmartServo FlexLine is installed in a hazardous area, threaded rigid metal conduit or threaded steel intermediate metal conduit shall be used.



NOTE:

If the 954 SmartServo FlexLine is installed in a hazardous area, Ex d certified conduit seals must be applied directly at the wall of the 954 SmartServo FlexLine to seal the cabling in the conduit.

Depending on the wiring configuration, one to four ³/₄" NPT threaded cable glands (or rigid conduits) may be required with the 954 SmartServo FlexLine.



NOTE: Seal the unused cable inlets with an approved *¾*" NPT threaded stopping plug.



WARNING!

Improper installation of cable glands, conduit or stopping plugs will invalidate the Ex approval of your 954 SmartServo FlexLine.

5.10. Grounding

The 954 SmartServo FlexLine housing should be properly grounded to the ground reference (generally the tank).

This is a safety grounding requirement. Grounding can be performed by copper strips across the flanges (refer to section Grounding at mechanical installation), or by a ground wire.

With last mentioned method, use one of the external ground terminals of the 954 SmartServo FlexLine.



NOTE:

Grounding shall be performed in accordance with local regulations.



CAUTION!

Safety depends on proper grounding. Check the resistance of the ground connection directly after installation. The measured ground resistance shall be below the maximum prescribed by local grounding requirements.



WARNING! When measuring the ground resistance, use a suitable explosion-proof tester.

Appendix A







for the flanges available

a. Position of measuring wire with displacer in top position
b. 200 mm (7^{7/8"}) (space needed to remove cover)
c. 65 mm (2^{9/16"}) (space needed to remove measuring drum)
d. 100 mm (4") (free space for SmartView Connection)

Appendix A (Continuation)

Dimensions 954 SmartServo FlexLine (High Pressure Version)



a. Position of measuring wire with displacer in top position
b. 200 mm (7^{7/8"}) (space needed to remove cover)
c. 65 mm (2^{9/16"}) (space needed to remove measuring drum)
d. 100 mm (4") (free space for SmartView Connection)

Appendix B

Available Adapters & Calibration Chambers

Orientation	Specifications				
	Orientation of adapters, reducers and calibration chambers with respect to the 854 ATG as drawn.				
	Asymmetrical adapters must be mounted in the right way with respect to the 854 gauge in order to prevent malfunctioning of the gauge.				
H	For symmetrical adapters the orientation is insignificant.				
1000	Flange adapter				
\$	for medium pressure				
4-6-4	2" to 6", 150 lbs, ff (aluminium, 3.2371) NW50-ND6 to NW150-ND16, ff (aluminium, 3.2371)	Height: Height:	48 mm (1 ^{3/8*}) 48 mm (1 ^{3/8*})	Part no.: Part no.:	0815.092
	2" to 6", 150 lbs, ff (AISI 316, 1.4401)	Height:	48 mm (1 ^{7/8*})	Part no.	0815.095
	Calibration adapter				
	for medium pressure 0.6 MPa (88 psi)				
	2" to 6", 150 lbs (aluminium, 3.2371)	Height:	307 mm (12 """)	Part no.:	0815.091
	2" to 8", 150 lbs (aluminium, 3.2371)	Height:	307 mm (12 mm)	Part no.:	0815.096
	NW50-ND6 to NW150-ND16 (aluminium, 3.2371)	Height:	307 mm (12 """)	Part no.:	0815.094
	2" to 6", 150 lbs (stainless st. ASTM A 351 CF8M, 1.4408)	Height:	288 mm (11 38")	Part no.	0815.086
	Calibration adapter				
	for high pressure 4 MPa (590 psi)				
	2" to 6" 300 lbs (Stainless st. ASTM A351 CF8M, 1 4408)	Height	344 mm (13 918")	Part no	0815.534
- + Hrml	NW50-ND40 to NW150-ND40	a resident:	ortennin (10 /	1 9011 11971	0010.001
	(Stainless st. ASTM A351 CF8M, 1,4408)	Height:	344 mm (13 sne*)	Part no.:	0815.532
-	Adapter				
革	for medium pressure				
	2" to 4", 150 lbs	Height:	241 mm (912")		
	for high pressure				
	2" to 4", 300 lbs	Height:	257 mm (10 18")		
	Adapter				
Å	for medium pressure				
	2" to 6", 150 lbs	Height:	392 mm (15 7/16")		
	2" to 8", 150 lbs	Height:	417 mm (16 7/187)		
L L	for high pressure	10:005845			
	2" to 6", 300 lbs	Height:	410 mm (16 1#')		
	2" to 8", 300 lbs	Height:	435 mm (17 ser)		
and the	Adapter				
TH	for medium pressure				
	2" to 4" with 4" blind flange, 150 lbs	Height:	451 mm (17 34")		
	2" to 6" with 4" blind flange, 150 lbs	Height:	679 mm (26 34")		
m H	2" to 8" with 6" blind flange, 150 lbs	Height:	775 mm (30 147)		
1111	for high pressure				
111	2" to 4" with 4" blind flange, 300 lbs	Height:	467 mm (18 38')		
##	2" to 6" with 4" blind flange, 300 lbs	Height:	695 mm (27 38')		
	2" to 8" with 6" blind flange, 300 lbs	Height	791 mm (31 🕬)		
	* Mat.:Flanges ASTM A 105, Grade N Body : ASTM A 105, Grade N				

For service-related questions, contact:

Technical Assistance Centre Phone: +1 800 423 9883 or +1 215 641 3610 E-mail: HFS-TAC-SUPPORT@honeywell.com

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For more information To learn more about SmartLine Transmitters, visit <u>www.honeywellprocess.com</u> Or contact your Honeywell Account Manager

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