PIGGING SOLUTIONS FOR SAFE OPERATIONS

Installation Operation & Maintenance Manual

LS2- Bi-Directional Intrusive Pig Signaler

Model LS2 TQZ | Configuration LS2 TQZ BB010 2 in Class 150 RF



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Applicable to the mechanical flag and manual reset configuration described in the approved order documents

Important Product Limitation:

The supplied order-specific specification identifies removal under pressure as not applicable and lists no special removal tool. Therefore, the LS2-TQZ-BB010 described by this manual shall be installed, removed, adjusted at the process boundary, or internally serviced only after the pipeline has been positively isolated, fully depressurized, drained, purged and verified gas-free. Hot tapping, live insertion and live removal are outside the scope of this manual.

The datasheet and order-specific specification contain different family limits for maximum temperature and pressure. Until the approved nameplate, purchase order, certified drawing and material certificates resolve any difference, use the most conservative limit and obtain written engineering approval before commissioning.

Document Precedence

Priority	Document or requirement
1	Applicable law, permit conditions and pipeline code
2	Approved project datasheet, purchase order and certified dimensional drawing
3	Product nameplate and conformity certificate for the supplied serial number
4	This installation, operation and maintenance manual
5	General sales literature or non-project reference material

Intended Users

- Pipeline and mechanical engineers
- Construction and welding supervisors
- Qualified installation technicians
- Commissioning and operations personnel
- Inspection and maintenance personnel
- HSE and permit-to-work authorities

Competence requirement.
Only trained and authorized personnel who understand pigging operations, pressure systems, hazardous substances and the site permit-to-work system may perform the activities in this manual.

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1 Purpose and Scope

This manual defines the complete lifecycle requirements for safe receipt, engineering review, installation, commissioning, operation, inspection, maintenance, troubleshooting, removal and disposal of the LINESIG LS2 bi-directional intrusive pig signaller. It is written for the mechanical-flag, manual-reset LS2-TQZ-BB010 configuration with a DN50 ASME Class 150 raised-face flange.

The LS2 confirms passage of a sphere, steel-body pig or polyurethane pig by allowing the moving pig to deflect an intrusive bi-directional trigger. The trigger transfers motion to the local mechanical flag. The operator observes the raised flag, records the event and manually resets the flag after confirmation.

1.1 Scope Boundaries

- Covers installation on a new or existing pipeline during a controlled shutdown and zero-energy condition.
- Covers verification of the 21 mm target trigger protrusion and the project-specific stand-off dimension.
- Covers mechanical flag operation and manual reset.
- Provides conditional guidance for optional electrical switch or wireless output only when the supplied option has approved wiring drawings and hazardous-area certificates.
- Does not authorize hot tapping, live insertion, live removal, welding on a pressurized line, or modification of pressure-containing parts.
- Does not replace the pipeline operator procedures, welding procedure specification, flange management procedure or site emergency plan.

1.2 Source Documents

Source	Use in this manual
LINESIG LS2-TQZ datasheet	Product family description, features, family limits and general options
LS2-TQZ-BB010 technical specification	Order-specific configuration and materials
LINESIG stand-off length drawing	Stand-off definition and measurement basis

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2. Definitions and Abbreviations

Term	Definition
Pig	A pipeline tool propelled through the line for cleaning, batching, gauging, inspection or displacement.
Pig signaller	A device that provides local or remote indication when a pig passes a fixed point.
Intrusive trigger	The part that projects inside the pipe and is physically deflected by a passing pig.
Bi-directional	Capable of detecting pig movement in either pipeline direction.
Stand-off	The axial distance used to position the signaller relative to the pipe bore and achieve the approved insertion.
L1	Distance from the specified top of flange base reference to the external wall of the pipeline.
L2	Pipeline wall thickness at the installation point.
LOTO	Lockout and tagout of every energy source.
MAWP	Maximum allowable working pressure.
RF	Raised-face flange.
WPS PQR WPQ	Welding procedure, procedure qualification and welder qualification records.
NDE	Non-destructive examination.
PTW	Permit to work.
SDS	Safety data sheet.

3. Product Identification and Description



Figure 1 Typical LS2-TQZ-BB010 mechanical flag pig signaller

3.1 Main Functional Elements

Item	Function	Inspection focus
Mechanical flag	Provides local visual indication after trigger actuation.	Free movement, visibility, damage and secure attachment
Indicator mechanism	Converts trigger motion into flag release.	Smooth actuation, no binding, corrosion or contamination
Bi-directional trigger	Contacts pigs travelling in either direction.	Correct insertion, freedom of movement, wear or deformation
Insertion stem and internal mechanism	Transfers movement through the process boundary.	Straightness, cleanliness and approved length
DN50 flange	Connects signaller to the pipeline nozzle.	Rating, face condition, bolt holes, material and alignment
O-ring and secondary seals	Maintain the product pressure boundary.	Correct material, size, condition and compatibility
Nameplate	Identifies model, serial number and limits.	Legibility and match with project records

3.2 Operating Principle

Before a pig run, the operator confirms that the flag is reset. As the pig reaches the signaller, the pig body or cup deflects the trigger. The mechanism releases the flag, making pig passage visible locally. The trigger returns to its neutral position after the pig clears the device. The flag remains indicated until manually reset. Because the trigger is symmetrical for forward and reverse deflection, the device detects pig passage in either direction.

Operational independence. The mechanical flag is a passage indicator, not a protective trip device. Do not use it as the sole basis for emergency shutdown, overpressure protection, valve sequencing or proof that a pig has reached its final receiver.

3.3 Identification Before Use

- Confirm LINESIG brand, LS2-TQZ model family and order code LS2-TQZ-BB010.
- Record the serial number and nameplate limits.
- Verify process connection is DN50 2 in Class 150 RF for the covered configuration.
- Verify flange, wetted parts and seals against the approved material schedule.
- Confirm the supplied insertion length corresponds to the as-built stand-off and pipeline wall thickness.
- Check the hazardous-area certificate only if an electrical or wireless output is installed.

4 Technical Data and Configuration Limits

Parameter	Supplied information
Type	Intrusive, bi-directional
Detected element	Mechanical trigger
Local indication	Mechanical flag
Reset	Manual
Designed pig types	Spheres, steel-body pigs and polyurethane pigs
Order-specific process connection	Flanged DN50 2 in, ASME Class 150 RF
Target trigger insertion	21 mm inside the pipe bore for LS2-TQZ-BB010
Insertion body length	Manufactured to suit approved stand-off and pipe wall thickness
Flange material	Stainless steel 316
Internal wetted material	Stainless steel 316 or 316L
O-ring material	Viton FKM
Order-specific operating temperature	-20 °C to +150 °C stated in the supplied specification
Family datasheet temperature	-20 °C to +120 °C
Family datasheet pressure	Up to 25 bar; source also references ANSI Class 300
Removal under pressure	Not applicable
Extension length	Non-extension
Special tools	None stated for the order-specific configuration
Optional outputs	Electrical switch or wireless alert only when separately approved

Mandatory reconciliation. The project engineer shall reconcile the temperature and pressure differences before release. Never exceed the lowest applicable limit of the product nameplate, approved datasheet, flange pressure-temperature rating, seal capability and pipeline design condition.

5 Safety Requirements

Installation and service involve pressure containment, hazardous fluids, welding, lifting, confined work areas and pinch points. A task-specific risk assessment, approved method statement and permit to work are mandatory. The pipeline operator remains responsible for isolation, process safety, environmental control and emergency response.

5.1 Hazard Register

Hazard	Potential consequence	Required control
Stored pressure or trapped liquid	Fatal release, injection injury or chemical exposure	Double-block and bleed where practicable; isolate, depressurize, drain, vent, purge and prove zero energy.
Flammable or toxic atmosphere	Fire, explosion, asphyxiation or poisoning	Gas test before and during work; ventilation; suitable respiratory protection; ignition control.
Welding and hot work	Fire, burn, metallurgical damage or pipeline rupture	Approved hot-work permit, WPS/PQR, qualified welder, fire watch and line made safe.
Heavy or awkward parts	Crush, hand or back injury	Planned lift, certified equipment, correct lifting points and hands clear of suspended load.
Trigger and flag movement	Pinch or cut injury	Keep fingers clear; actuate with a suitable non-damaging tool during test.
Residual product in cavity	Chemical burn or uncontrolled discharge	Treat as contaminated; drain and decontaminate before opening.
Static electricity	Ignition in hazardous area	Bond and earth according to site requirements; use anti-static PPE and tools.
Incorrect insertion	Pig damage, trigger failure or pipeline obstruction	Verify as-built stand-off and 21 mm protrusion before commissioning.

5.2 Minimum Personal Protective Equipment

- Safety helmet
- Safety glasses plus face shield when opening process equipment
- Chemical-resistant gloves selected from the process SDS
- Flame-resistant coveralls in hydrocarbon service
- Safety footwear with non-slip soles
- Hearing protection where required
- Approved respiratory protection where gas testing or the SDS requires it

5.3 Mandatory Zero Energy Confirmation

1. Stop pigging and process transfer activities affecting the work location.
2. Identify every pressure, flow, electrical, pneumatic and hydraulic energy source.
3. Close, lock and tag isolation valves in accordance with the site LOTO procedure.
4. Open the approved drain and vent points to a safe disposal system.
5. Verify zero pressure on a calibrated instrument and independently prove the instrument.
6. Drain, flush or purge until the atmosphere and residue are acceptable for the planned work.
7. Obtain operations sign-off before loosening any flange fastener or process seal.

Never rely on a gauge alone. A blocked impulse line or defective gauge can show zero while pressure remains trapped. Use the site positive-isolation and zero-energy verification standard.

5.4 Prohibited Actions

- Do not install or remove the covered LS2 assembly while the pipeline is pressurized.
- Do not strike, heat, bend, machine or weld the supplied signaller.
- Do not substitute an O-ring, gasket or fastener without engineering approval.
- Do not use the flag as a lifting point, handle or step.
- Do not paint the trigger, moving joints, nameplate or flange sealing face.
- Do not force the trigger or reset flag if the mechanism binds.
- Do not claim ATEX or IECEx compliance unless the supplied serial number is covered by valid conformity documents.

6. Receipt Inspection Handling and Storage

6.1 Receipt Inspection

- Inspect packaging for impact, moisture or tampering before unpacking.
- Match the delivery note, purchase order, model, serial number, flange size and rating.
- Check the flange face, trigger, stem, flag, fasteners, seals and nameplate for damage.
- Operate the trigger gently in both directions and confirm the flag releases. Reset the flag.
- Verify the stand-off and insertion dimension on the certified drawing.
- Quarantine any discrepant or damaged unit and raise a nonconformance report.

6.2 Handling

Lift and carry the device by the flange or designated body support. Protect the long insertion stem from bending and do not allow the trigger to contact the floor. Keep the flange face covered until immediately before installation. For lifting above shoulder height or into restricted access, use a soft sling around the flange or a purpose-made support; never sling the flag mechanism.

6.3 Storage

Condition	Requirement
Location	Clean, dry, secure and protected from vibration, salt spray, chemicals and direct weather.
Orientation	Support the flange and stem so the trigger cannot be loaded or bent.
Flange face	Fit a non-metallic protective cover; do not use adhesive on the sealing surface.
Openings	Cap all electrical or process openings to prevent insects, dust and moisture.
Preservation	Use only seal-compatible corrosion protection approved by LINESIG or project engineering.
Periodic storage check	Every three months, inspect for corrosion and manually verify flag and trigger movement.

7. Installation Engineering and Site Planning

7.1 Required Project Information

- Pipeline outside diameter and nominal size
- Actual measured wall thickness at the installation point
- Pipe material grade, design code and corrosion allowance
- Design pressure and temperature and operating envelope
- Process fluid, contaminants and seal compatibility
- Pig type, minimum body diameter, cup geometry and travel direction
- Nozzle, flange and reinforcement details
- Hazardous-area classification and earthing requirements
- Accessibility for inspection, flag reset and future removal
- Approved stand-off and insertion dimensional drawing

7.2 Location Selection

Select a location where the trigger will be contacted reliably by every approved pig and where the flag is visible and accessible. The preferred arrangement is the top of a horizontal pipeline with the signaller axis radial to the pipe. Any side, bottom, inclined or vertical-pipe installation requires written approval based on pig geometry, debris accumulation, drainage and personnel access.

- Avoid installation where the trigger can interfere with a valve, reducer, tee, branch, internal weld bead or other obstruction.
- Avoid low points where sediment, wax or water can immobilize the trigger.
- Provide safe platform access and sufficient removal clearance equal to the full device length plus handling allowance.
- Protect the signaller from vehicle impact, dropped objects, vibration and unauthorized operation.
- Orient the flag so it is visible from the normal operating position without standing over the process connection.
- Confirm the location on the line list, P and ID, isometric and pigging philosophy before fabrication.

7.3 Installation Release Hold Points

Hold point	Acceptance requirement	Release by
HP1 Design review	Location, class, material, stand-off and insertion approved	Pipeline engineer
HP2 Nozzle fabrication	WPS, fit-up, welding and NDE accepted	Welding and QA
HP3 Pre-installation	Correct signaller, seals, gasket and zero-energy condition verified	Operations and QA
HP4 Final assembly	Flange joint completed and insertion independently checked	Mechanical supervisor
HP5 Pressure test	No leakage and test records accepted	QA and operations
HP6 Functional test	Bi-directional actuation and manual reset verified	Commissioning authority

8. Stand Off and Insertion Length

Correct stand-off is essential. Excessive insertion can damage the pig, bend the trigger or obstruct the bore. Insufficient insertion can cause missed detection. The supplied LS2-TQZ-BB010 specification requires the trigger tip to project 21 mm inside the finished pipe bore.

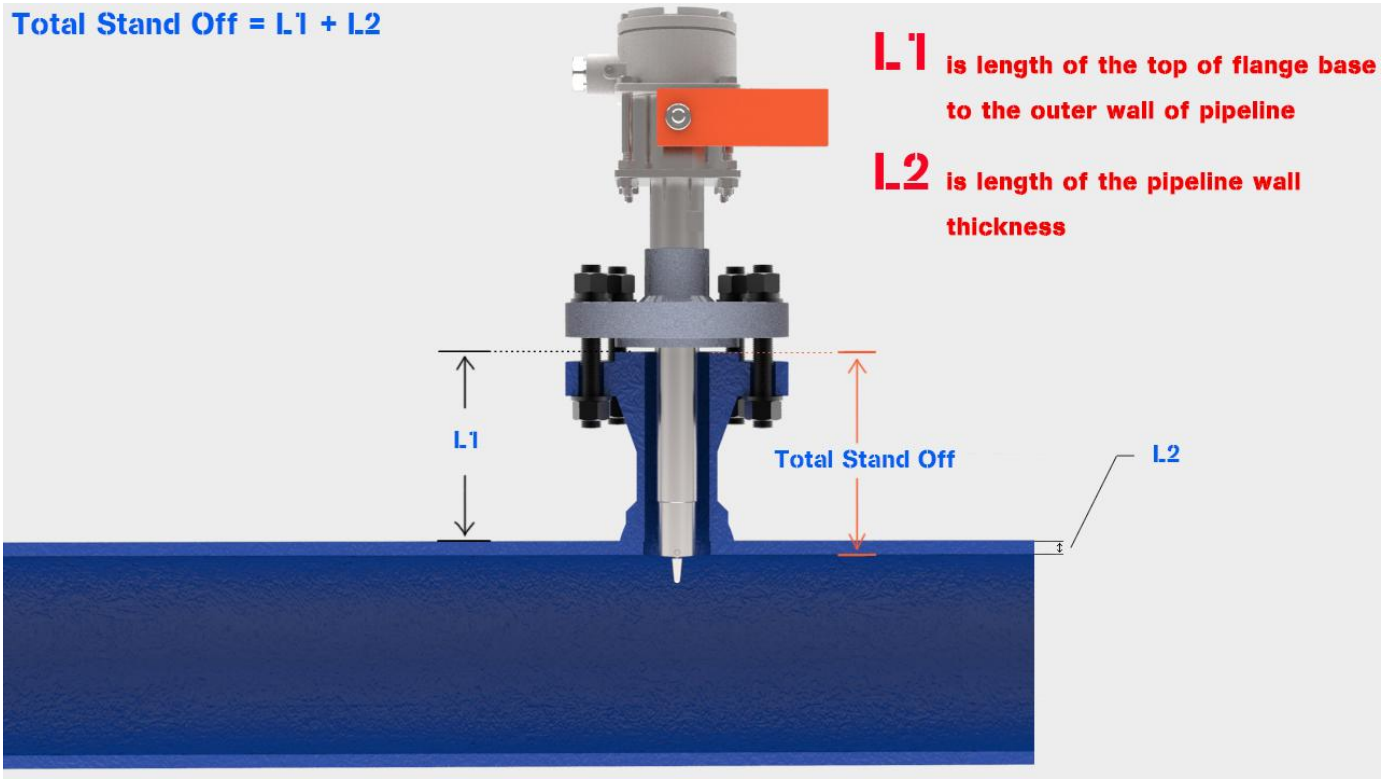


Figure 2 Stand-off measurement basis supplied for LINESIG LS2

8.1 Definitions and Equations

Symbol	Definition	Unit
L1	Distance from the stated top-of-flange-base reference to the external pipe wall	mm
L2	Actual pipe wall thickness at the installation point	mm
S	Total stand-off from the flange reference to the internal pipe wall; S = L1 + L2	mm
E	Actual assembled distance from the same flange reference to the trigger tip	mm
P	Trigger protrusion inside the bore; P = E - S	mm
Target P	21 mm for LS2-TQZ-BB010 unless the certified drawing states otherwise	mm

8.2 Measurement Procedure

1. Confirm the exact flange reference plane shown on the certified dimensional drawing.
2. Measure L1 after nozzle and flange welding, including reinforcement or branch fitting geometry.
3. Determine L2 by calibrated ultrasonic thickness measurement at the trigger centreline; do not rely only on nominal schedule.
4. Calculate S = L1 + L2 and record the result in Appendix B.
5. Measure E on the assembled signaller from the identical reference plane to the neutral trigger tip.
6. Calculate P = E - S. The acceptance value is 21 mm unless the certified project drawing specifies another value.
7. Perform an independent second-person check before releasing the nozzle for installation.
8. Where access allows, verify protrusion physically through the open pipe before closure.

Tolerance. Use the tolerance stated on the certified drawing. If no tolerance is shown, stop and obtain written engineering clarification; do not invent or assume an insertion tolerance.

8.3 Dimensional Acceptance

Check	Acceptance
Reference plane	Identical for L1, E and the certified drawing
Pipe wall	As-built value measured at the installation point
Trigger position	Radial and centred in the nozzle opening
Protrusion	21 mm target or certified drawing value
Clearance	No contact with nozzle bore, weld root or internal obstruction
Documentation	Measurements signed by installer and independent checker

9. Pipeline Nozzle and Flange Preparation

9.1 Engineering Requirements

- The branch/nozzle design, reinforcement and local stress evaluation shall comply with the governing pipeline code.
- The flange shall match the signaller connection size, rating, facing and material.
- The flange face shall be parallel to the intended mounting plane and the bore concentric with the radial trigger axis.
- The finished nozzle bore shall provide adequate clearance for the insertion stem and trigger movement.
- All fabrication dimensions shall account for actual pipe outside diameter, wall thickness and corrosion allowance.

9.2 Welding and Examination

1. Remove the signaller, gasket and all seals from the heat-affected area before welding.
2. Verify pipe identity and positive isolation before cutting or welding.
3. Use an approved WPS/PQR and qualified welder for the pipe and nozzle materials.
4. Control preheat, interpass temperature, filler metal and post-weld heat treatment as specified.
5. Prevent weld metal or spatter from reducing the nozzle bore or obstructing the trigger.
6. Perform visual examination and the specified surface or volumetric NDE.
7. Clean and protect the flange sealing face after fabrication.
8. Complete pressure testing under the project test pack before installing sensitive mechanism parts where practicable.

9.3 Nozzle Acceptance Checklist

Item	Acceptance criterion	Result
Flange	DN50 2 in, Class 150 RF or approved order value	Pass / Fail
Material	Matches approved material certificate	Pass / Fail
Orientation	Radial, accessible and approved	Pass / Fail
Face condition	Clean, undamaged and within flange standard limits	Pass / Fail
Concentricity	Nozzle bore centred on intended trigger axis	Pass / Fail
Stand-off	As-built L1 and L2 recorded and accepted	Pass / Fail
NDE	Required examinations accepted	Pass / Fail
Test	Pressure/leak test accepted	Pass / Fail

10. Mechanical Installation

10.1 Tools and Consumables

Item	Requirement
Hand tools	Correct-size, calibrated and non-damaging tools
Torque wrench	Calibrated; range suitable for project flange-bolt torque
Gasket	New gasket of approved type, size, class and process compatibility
Studs nuts washers	Approved material, grade, coating and condition
Lubricant	Project-approved bolt lubricant with known torque factor
Cleaning materials	Lint-free cloth and seal-compatible solvent
Measuring equipment	Caliper, depth gauge, steel rule and calibrated UT thickness meter
Leak test equipment	Approved medium, pressure gauge and exclusion controls

10.2 Pre Installation Checks

- Confirm pipeline identification and approved work location.
- Verify LOTO, zero pressure, drainage, purge and gas test.
- Confirm model, serial number, flange rating, material and approved insertion length.
- Inspect the flange face, gasket, studs and signaller for damage or contamination.
- Manually deflect the trigger in both directions and confirm flag release; reset the flag.
- Confirm the assembled stand-off calculation and 21 mm insertion.
- Orient the flag for visibility and access before tightening.

10.3 Flanged Installation Procedure

1. Clean the mating flange faces without scratching the serrations. Remove all temporary covers.
2. Install a new approved gasket, centred inside the bolt circle. Do not apply unapproved sealant.
3. Support the LS2 by its flange and body. Insert the stem through the nozzle without allowing the trigger to strike the nozzle bore.
4. Align bolt holes without using the studs to force the flanges into position. Verify the flag orientation and access clearance.
5. Install the approved studs, nuts and washers. Hand-tighten evenly.
6. Tighten in the project-approved cross pattern using staged passes. Apply only the torque calculated by the flange-management procedure for the actual stud material, gasket and lubricant.
7. Perform a final circular torque pass and record the values. Mark fasteners only if required by site procedure.
8. Verify that the body is not mechanically loaded by piping, supports or attached cables.
9. Repeat the trigger and flag functional test only when the line is confirmed safe and depressurized.
10. Complete leak testing and commissioning in accordance with Sections 12 and the approved test pack.

Bolt torque. No universal torque is stated in this manual. Torque depends on fastener grade, coating, lubricant, gasket type and flange standard. Use the approved flange-joint calculation and site procedure.

10.4 Installation Acceptance

Acceptance item	Required result
Orientation	Flag visible; mechanism protected and accessible
Flange joint	Correct gasket and hardware; completed torque record
Insertion	21 mm target or certified drawing value
Movement	Trigger operates in both directions without binding
Leak tightness	No visible or measured leakage at test condition
Identification	Nameplate legible and not painted
Housekeeping	Covers removed, tools cleared and worksite restored

11. Pre Commissioning and Commissioning:

11.1 Pre Commissioning Inspection

- Approved drawings and records available at site
- Correct LS2 model and serial number installed
- Stand-off and 21 mm insertion independently verified
- Flange joint and torque record accepted
- Nozzle welding, NDE and test records accepted
- Flag oriented and visible from the operating position
- Trigger and flag move freely under safe zero-pressure conditions
- Optional electrical loop tested and hazardous-area inspection complete
- Area clean, guards or impact protection installed and access safe

11.2 Zero Pressure Functional Test

1. Confirm the line is isolated and depressurized.
2. Reset the flag to the ready position.
3. Using a smooth non-metallic tool, deflect the trigger slowly in the forward direction until the flag releases.
4. Allow the trigger to return freely and check for binding.
5. Reset the flag and repeat in the reverse direction.
6. For an optional remote output, confirm the field state and control-system indication for both directions.
7. Record the result and restore the flag to ready.

11.3 Leak and Pressure Test

Leak or pressure testing shall follow the pipeline test pack and governing code. Increase pressure gradually, maintain an exclusion zone and inspect remotely where practicable. Never tighten the flange under pressure. If leakage is detected, depressurize fully, correct the cause and repeat the test. Do not expose the signaller above the lowest approved pressure or temperature limit.

11.4 First Live Pig Run

- Brief control room and field personnel on expected time, direction and response.
- Confirm the flag is reset and the worksite is clear.
- Verify upstream and downstream valve line-up according to the pigging procedure.
- Observe from a safe position outside any potential release path.
- Record the time when the flag indicates and compare with other tracking information.
- If the flag does not indicate, do not assume the pig has stopped at the signaller; follow the approved lost-pig procedure.
- After the operation is stable, inspect for leakage and mechanical damage.

12. Normal Operation and Pig Passage Response

12.1 Before Each Pig Run

- Review the pigging procedure and expected direction.
- Inspect the signaller and flange for leakage, corrosion or damage.
- Confirm the flag is fully reset and not obstructed.
- Verify the optional remote output if fitted.
- Remove temporary covers that could block the flag.
- Confirm communications between field and control room.

12.2 When the Flag Indicates

- Note the exact time and direction of operation.
- Communicate pig passage to the control room using the approved message format.
- Cross-check with pressure, flow, acoustic, magnetic or other tracking data where provided.
- Inspect the signaller from a safe position for leakage or abnormal vibration.
- Do not reset immediately if the operating procedure requires independent confirmation or investigation.
- Reset only after the event is logged and authorized.

12.3 Manual Reset

Approach only after confirming there is no visible leakage or unsafe condition. Keep hands clear of pinch points and move the flag through its intended reset travel without forcing it. Verify that it latches securely in the ready position. If it will not latch, treat the signaller as failed, mark it out of service and investigate under an approved isolation.

12.4 Abnormal Conditions

Condition	Immediate action
Leakage	Keep personnel clear, stop or isolate the line under the emergency procedure and depressurize before inspection.
Flag indicates without a scheduled pig	Verify pipeline condition and remote data; consider vibration, debris or unintended pig movement.
Expected pig but no indication	Do not reset or dismantle; initiate the approved lost-pig tracking procedure.
Repeated or chattering indication	Check for severe vibration, multiphase slugging or mechanism damage after safe isolation.
Bent or broken flag	Do not operate manually; isolate and replace damaged parts.

13. Inspection and Preventive Maintenance

13.1 Recommended Maintenance Intervals

Interval	Tasks
Before every pig run	Visual leak check, condition check, flag reset and optional remote-state check.
Monthly while in service	Check corrosion, coating damage, loose external fasteners, impact damage, access and nameplate.
Every 6 months	Safe functional test where operating conditions permit; verify both directions and manual reset.
Annually or site shutdown	Detailed inspection, flange condition, fastener condition, seal history, insertion check and full functional test.
After abnormal event	Inspect after pig damage, overpressure, fire, impact, severe vibration, missed signal or leakage.
Seal replacement	Condition-based and at project-defined overhaul interval; consider fluid, temperature and exposure history.

Intervals are starting recommendations. The operator shall shorten them for corrosive, sour, dirty, waxy, cyclic, high-temperature or high-vibration service and may extend them only through a documented reliability review.

13.2 External Inspection

- Check flange and pressure boundary for staining, weeping, frost or odor.
- Check the body, stem, flag and protective hardware for corrosion, cracks, bending and missing parts.
- Confirm flag movement and reset without excessive free play.
- Confirm fastener condition and any torque or tamper markings.
- Clean dirt, salt, wax and insect nests without pressure washing seals or bearings.
- Confirm identification and warning labels remain legible.

14. Removal Disassembly and Reinstallation

Zero pressure only. Removal under pressure is not available for the covered configuration. A separate hot-tap or retrieval manual from another product shall never be used to justify live removal of this LS2.

14.1 Removal Procedure

1. Obtain the approved permit, method statement, lift plan and environmental controls.
2. Stop affected operations and complete LOTO, depressurization, drainage, purge and gas testing.
3. Disconnect optional electrical or wireless equipment under the certified isolation procedure.
4. Support the signaller so that loosening flange fasteners cannot bend the stem or drop the device.
5. Confirm zero pressure at the flange joint, then loosen fasteners gradually in a controlled cross pattern.
6. Withdraw the stem axially without striking the nozzle bore. Fit a rated blind flange with a new gasket if the pipeline will return to service.
7. Move the signaller to a clean decontamination area and cap the nozzle and device.
8. Record the reason for removal and observed condition.

14.2 Workshop Inspection

- Decontaminate according to the process SDS.
- Inspect the trigger, stem and mechanism for bending, wear, scoring and corrosion.
- Inspect sealing surfaces and O-ring grooves under adequate lighting.
- Replace all disturbed pressure-boundary seals with approved new parts.
- Do not machine, weld or straighten pressure-containing components without LINESIG approval.
- Function-test in both directions before release.
- Record replaced parts and test results.

14.3 Reinstallation

Repeat the complete dimensional, gasket, flange assembly, leak-test and commissioning procedure. Do not treat reinstallation as a simple reversal of removal. Verify that pipeline wall changes, nozzle repair, gasket thickness or replacement parts have not altered the approved 21 mm insertion.

15.Troubleshooting

Symptom	Probable cause	Corrective action
Flag does not indicate	Flag not reset; insufficient insertion; trigger blocked; pig not contacting trigger; internal damage	Verify event using other trackers. Isolate and depressurize before functional or dimensional inspection.
Flag indicates but pig not scheduled	Vibration, debris, liquid slug, unauthorized pig movement or mechanism fault	Confirm process conditions and tracking data; inspect after safe isolation if repeated.
Flag will not reset	Mechanism not fully returned, contamination, bent linkage or latch damage	Do not force. Mark out of service and inspect under zero pressure.
Trigger does not return	Wax/debris, corrosion, mechanical deformation or incorrect nozzle clearance	Remove only under zero pressure; clean, inspect and replace damaged parts.
Flange leakage	Incorrect torque, damaged gasket, flange misalignment, damaged face or pressure beyond rating	Isolate and depressurize. Replace gasket, correct joint and repeat leak test.
Leakage from body or stem	Damaged, incompatible or aged seal; corrosion or mechanical damage	Emergency response as required. Remove under zero pressure and replace approved parts.
Remote output absent	Power or wiring fault, incorrect switch setting, failed sensor or control-system issue	Verify mechanical flag first, then troubleshoot using approved electrical drawing and hazardous-area procedure.
Remote output intermittent	Loose termination, cable damage, vibration, moisture or switch alignment	Inspect certified enclosure, cable and switch after electrical isolation.
Pig damaged near signaller	Excessive insertion, bent trigger or nozzle obstruction	Stop further pigging; inspect bore and verify stand-off and insertion.

RECOMMENDATION: It is recommended to contact **LINESIG,** local authorized partner for repair and service.

Appendix: Installation Checklist

No	Inspection item	Status	Initial Date
1	Approved datasheet, drawing and purchase order available		
2	Model, serial number and nameplate limits verified		
3	Line identity and installation location verified		
4	PTW, risk assessment, LOTO and gas test completed		
5	Pipeline fully depressurized, drained and purged		
6	Nozzle flange size, class, facing and material accepted		
7	Welding, NDE and pressure-test records accepted		
8	L1 and L2 measured and stand-off calculation approved		
9	21 mm trigger insertion verified independently		
10	New approved gasket and correct fasteners available		
11	Trigger and flag function tested in both directions		
12	Flange joint tightened under approved procedure		
13	Flag orientation and access accepted		
14	Leak test passed		
15	Optional electrical loop and Ex inspection completed		
16	Area restored and documentation updated		

Installer: _____ Checker: _____ Date: _____

Remarks: _____

Appendix. Stand Off Calculation Record

Field	Recorded value	Instrument or reference
Pipeline tag		
Nominal pipe size and OD		
Pipe material and schedule		
Installation location / chainage		
Flange reference plane		Certified drawing No. _____
L1 flange reference to outside pipe wall		
L2 measured pipe wall thickness		UT meter ID _____
S total stand-off L1 plus L2		
E flange reference to trigger tip		
P actual protrusion E minus S		
Required protrusion	21 mm or drawing value _____	
Tolerance		Certified drawing
Acceptance	Pass / Fail	

Measured by: _____ Signature: _____ Date: _____

Independent check: _____ Signature: _____ Date: _____

Appendix: Commissioning Record

Test	Acceptance criterion	Result / value	Witness
Document review	Approved current documents		
Visual inspection	No damage, corrosion or missing parts		
Forward trigger test	Smooth movement and flag release		
Reverse trigger test	Smooth movement and flag release		
Trigger return	Returns freely to neutral		
Manual flag reset	Latches securely		
Remote indication if fitted	Correct state at local and control system		
Leak test	No leakage at approved test condition		
First pig run	Indication recorded and cross-checked		
Final status	Accepted for service		

Commissioned by: _____ Date: _____

Operations acceptance: _____ Date: _____

Appendix: Maintenance and Inspection Log

Date	Operating hours or cycles	Inspection or work performed	Parts replaced	Condition / action	Technician

Appendix: Risk Review and Permit Checklist

Control question	Yes No NA	Evidence or permit reference
Has the exact line and work location been positively identified?		
Is the latest approved method statement available?		
Has a task-specific risk assessment been approved?		
Are isolations, locks and tags independently verified?		
Has the line been depressurized, drained and purged?		
Has gas testing been completed and is continuous monitoring required?		
Are fluid-specific SDS and exposure controls available?		
Is hot work controlled under a separate approved permit?		
Are lifting equipment and access arrangements certified?		
Are environmental containment and waste arrangements ready?		
Are emergency communications and rescue arrangements confirmed?		
Are all personnel competent, briefed and signed onto the permit?		

Final Authorization

Role	Name	Signature	Date Time
Performing authority			
Operations isolating authority			
Area authority			
Gas tester			
HSE witness if required			

Service and Technical Support

For engineering clarification, replacement parts or field support, provide the complete product model, serial number, purchase order, pipeline service, pressure and temperature, photographs and a description of the issue. Do not return contaminated equipment without an approved decontamination declaration and return authorization.

Required information	Customer entry
Company and site	
Contact name and details	
Product model	LS2-TQZ-BB010
Serial number	
Pipeline tag and service	
Operating pressure and temperature	
Date installed	
Description of issue	
Photographs and records attached	Yes / No

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End of controlled manual