JERGUSON®
A Division Of The Clark-Reliance Corporation

Specialists in Liquid Level Indication

Installation, Operation and Maintenance for

JMSC900 Non-Contact Liquid Level

Measurement and Control System

Section:	**JS100**
Bulletin:	**JS100.61**
Date:	**10/1/04**

OPERATION

The JMSC900 series of wall panel mounting control units provide comprehensive control functionality for any 4-20 mA or HART compatible transmitter. A back-lit display gives clear visual indication of the measured value and status of all inputs and outputs.

Mounted in a non-hazardous area, the main powered JMSC900 provides a protected 24V dc power supply to the transmitter, which may be installed in a hazardous area.

The input signal from the transmitter may be offset, damped, scaled, and linearized as required. A range of pre-programmed linearization algorithms are user selectable.

The 4-20 mA output signal may also be scaled to re-transmit all or just part of the input signal or calculated value.

5 relays are provided and are fully field programmable to perform a wide variety of control, fault indication or alarm duties.

FEATURES

- **IS Supply to transmitter**
- **4-20 mA / HART input**
- **Isolated 4-20 mA output**
- **5 Control relays**
- **Multi-function back-lit display**
- **Wall or panel mount**
- **Preprogrammed Linearisation**
  -Contents and Open Channel Flow

SPECIFICATIONS

- Tough polycarbonate weatherproof wall mount enclosure for internal and external mounting.
- Accepts any 4-20 mA or HART compatible input, allowind standardization of control room layout.
- Control units are 240/115V ac powered and provide an intrinsically Safe 24V dc power supply to the transmitter.
- Supports two voltage free contact closure inputs, allowing override of control functions on external triggers.
- Clear visual display of measured value with units and relay status. Also used to guide user through programming menu.
- 4-20 mA 12 bit isolated current output proportional to measured value.
- 5 voltage free SPDT relays for alarm and control duties.

ISO 9001 REGISTERED Clark-Reliance

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OPERATION

Ultrasonic transmitters send a pulse of ultrasound down to the liquid surface and detect the reflected echo. An internal microprocessor, which is pre-programmed with the speed of sound, can then translate the time taken for the pulse to be returned into the distance between the transmitter face and the liquid surface. An integral temparture sensor in the transmitter compensates for temparture change effects on the speed of sound in the ullage space.

Having established this basic distance, the transmitter calculates the depth of the liquid and sends this information back to the control unit as a 4-20mA signal proportional to level. Alternatively, a ceramic cell hydrostatic pressure transmitter can be used to sense the liquid level and provide the 4-20mA signal to the control unit.

The control unit uses this information to drive control relays which can be freely assigned by the operator. Alternatively, tank contents or volumetric flow in an open channel flow application can be calculated.

There are 5 built-in relays and a 4-20mA current output. A clear 4 line display on the unit shows the measured variable or may be programmed to show other operational information. A bar graph representation of the current output and relay status are also displayed.

Programming is simple and efficient using the integral membrane keypad on the face of the control unit. The menu structure is easy to navigate with the built in programming “Wizards” configuration is fast and error free.

TYPICAL APPLICATIONS

JMS PUMP CONTROL SYSTEM

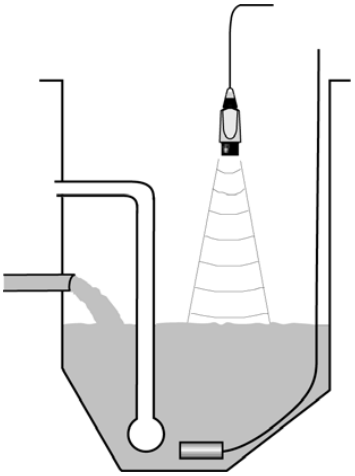
The transmitter is mounted over the liquid surface using the 1” threaded connection provided.

A locking backnut and bracket is supplied which facilitates mounting the transmitter from a spar or strut above the sump.

If a hydrostatic head pressure transmitter is used for level sensing, the transmitter is usually suspended in or clamped to the bottom of the sump.

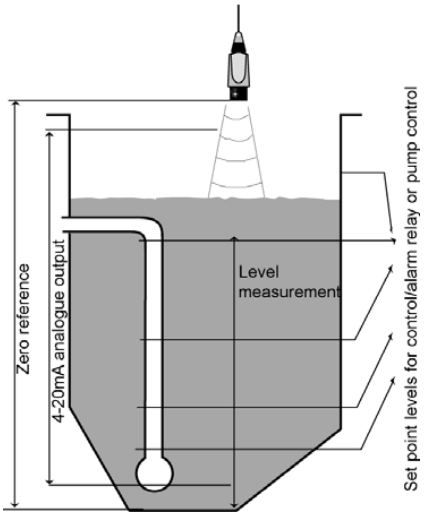
The cable provided is run back to the control unit, which may be mounted up to 165 ft. away either inside or outside. Having connected the two wire transmitter cable to the appropriate terminals in the control unit and connected the power supply, the system is ready for programming with the details of the application.

Programming is simple and efficien using the membrane keypad on the face of the control unit and the “Wet well wizard” in the menu.



PUMP CONTROL RELAYS AND FUNCTIONALITY

The JMSC pump control system has 5 relays which may be allocated to control or alarm duty, all programmed independently and all freely assignable.



To meet the needs of the water industry, the following features are provided as standard:

- All relays have an adjustable band with user defined on/off points
- Up to 4 pumps can be controlled using 4 of the relays, either in standard sequential mode or in one of the popular control routines:
  Duty / Standby
  Duty / Assist
- Pumps can have common or independent off levels w Choice of manual select or autosequence for the lead pump
- Scum line prevention routine to vary trip points and avoid scum build up
- Real time clock allows override of control routine to empty sump during low cost electricity periods
- Time delay between relay-on signals prevents electrical or hydraulic overload
- User defined periodic pump down routine and frequency to empty sump
- Relay energised or “run times” are logged and stored to enable monitoring of pump run times.
- Calculation of pumped volume allows pump efficiency to be monitored and reported should efficiency fall below a user defined value.

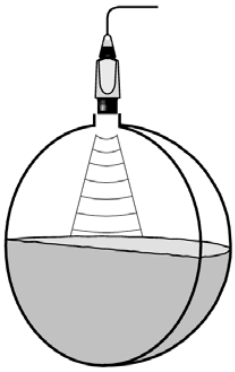
Other relay functions

5th relay is normally a failsafe alarm relay (loss of echo, mains failure or other system fault) but may be re•programmed as a standard alarm or control relay. Any relay can be programmed as a rate of rise or rate of fall alarm, temperature, level, contents or flow out of limits alarm or pump efficiency alarm.

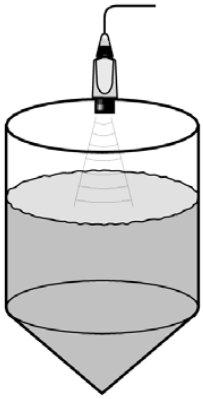
JMSC TANK CONTENTS SYSTEM

The JMS tank contents system has several of the most popular tank shapes pre-programmed so that the tank contents can be calculated. These include –

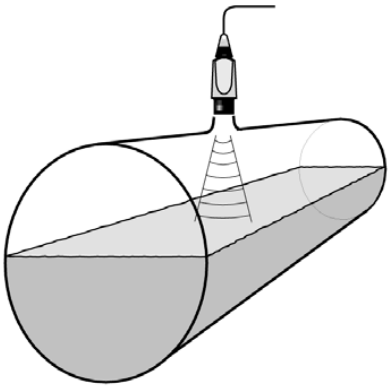
- Vertical cylinder
- Conical bottom cylinder
- Horizontal cylinder
- Horizontal cylinder with domed ends
- Spherical tank



Spherical tank



Conical bottom cylinder



Horizontal cylinder

A scaling factor may be entered to allow the display to show contents in any volumetric units chosen, many of which are pre-programmed. Units of measure are shown on the display.

Other special tank shapes are accommodated by using the 20 point look-up table. The user simply enters the volume at each of 20 user selectable points over the height of the tank and the system will interpolate to show volume at any level.

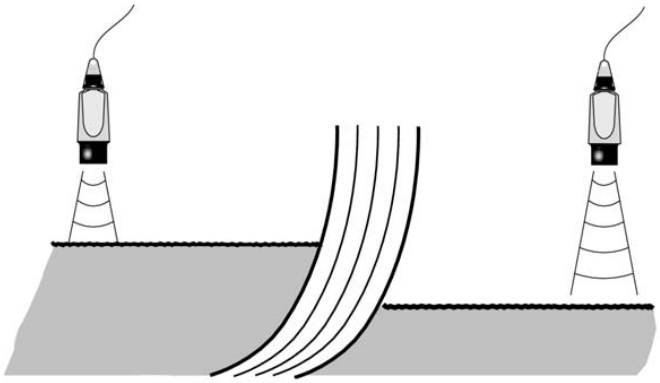
Control relays and the 4-20mA output may be driven by the level reading or volume calculation. The display can be configured to show both level and volume, or the ullage volume above the liquid in the tank.

JMSC DIFFERENTIAL LEVEL SYSTEM

It is sometimes necessary to know the difference in two levels, for example, across an inlet screen where the level difference is an indicator of the state of the screen.

The JMS differential level system is designed to operate with two HART level transmitters, and can be programmed to perform calculations on the two input signals –

- Level, contents or flow under transmitter 1
- Level, contents or flow under transmitter 2
- Level difference between transmitter 1 and 2
- Sum of the level, contents or flow under both transmitters

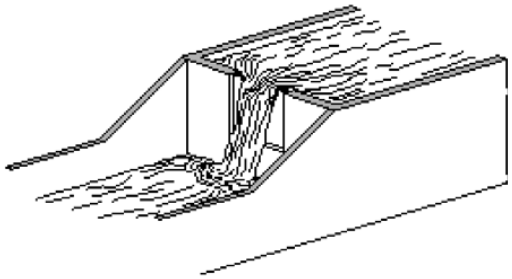


Differential level

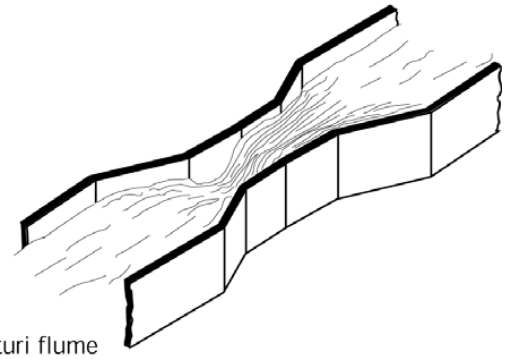
The control relays and current output can driven by any of these functions, and the display can be configured to show the reading of each transmitter plus either the difference or the sum of the readings. The JMSC transmitters used in this application are HART/SMART and are connected in series on a simple two wire bus.

JMSC OPEN CHANNEL FLOW MEASUREMENT

The flow in an open channel may be derived by measuring the liquid level upstream of a weir or flume of a standard design.



V notch weir
Typical 5/2 power law



Venturi flume
Typical 3/2 power law

In OCF applications, the level transmitter is mounted upstream of the channel restriction or obstruction in accordance with the recommended standards.

These standards also define the relationship between the liquid level at that point and the flow through the channel.

The popular V-notch weir (5/2) and Venturi flume (3/2) flow laws which have been used for many years are pre-programmed in the JMSC900 control unit, along with other popular flow laws.

Where flow measurement has to be in accordance with BS3680 or the Environmental Agency requirements (EA consented flows), the JMSC900 has a 20 point look-up table which can be programmed with a dedicated stage discharge curve for the flow structure.

If the user does not have the curve available, Jerguson offers to calculate the curve for certain structures based on dimensional and flow data provided by the user. A data sheet is produced detailing all of the JMSC900 parameters and their values which require programming, together with a projection of the uncertainty for the specific application.

Structures for which discharge curves can be provided include:-

- V-Notch
- Venturi flumes
  - – Rectangular
  - – Semi-circular
  - – Trapezoidal
- Triangular profile (Crump) weirs
- Broad crested weirs
- Flat V weirs
- Parshall flumes
- Manning formula
  - – Round pipe
  - – Rectangular channel

JMSCLOG system

In many instances, it is required that the flow and totalised flow be logged for download at a later date.

The JMSCLOG system has an on-board logger which can log up to 4800 samples at user definable intervals. In the event of flow exceeding a limit value, fast logging is automatically triggered until the flow reverts to normal.

In addition, 60 midnight totalised flow values are also logged along with the maximum instantaneous flow during each 24 hour period. All data is real time stamped and stored for download via an RS232 connection on the control unit.

Data can be collected using a portable PC, and is easily stored and manipulated using the LogView windows software.

Functionality

The JMSC900 control relays may be allocated as flow rate alarms or may be selected to operate as a pulse output to an external totaliser. There is also the facility to allocate a relay as a low-flow cut off so that totalisation errors are avoided in very low flow conditions.

The current output is proportional to flow rate and is used for remote monitoring, telemetry or local recorders.

The system will totalise flow and show both instantaneous flow and totalised flow on the display, in different units of measurement if required.

There is also the facility to connect up to two digital (voltage free contact) inputs to the system which may be used to inhibit measurement or force alarms or other routines to start upon external signals.

PROGRAMMING THE JMSC SYSTEM

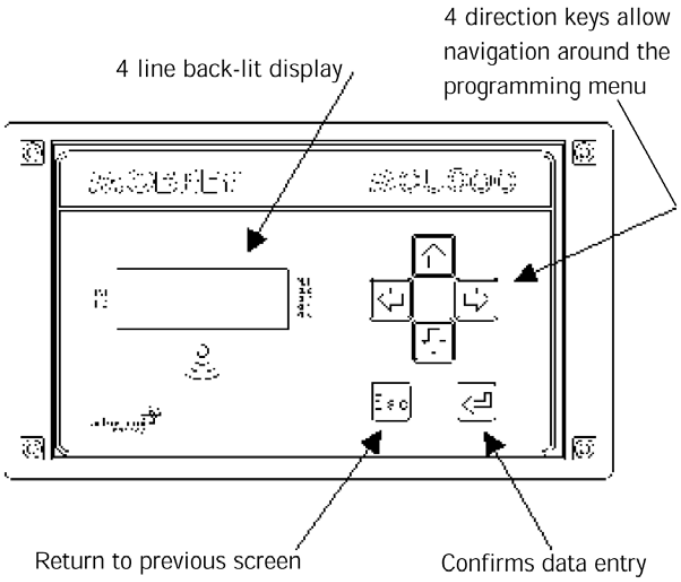
The system is easily programmed using the membrane keypad on the face of the control unit – no handheld programmer is necessary.

A user friendly menu structure is employed, guiding the user through the steps needed to ensure correct operation.

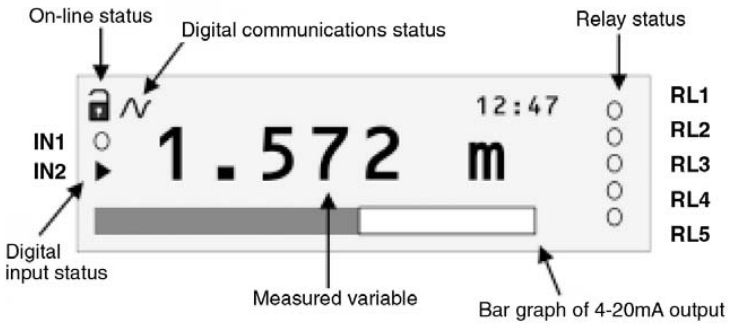
This Human Machine Interface (HMI) is provided, so the operator does not have to learn and remember a variety of programming techniques. When used with a Jerguson HART compatible ultrasonic level transmitter, the JMSC control unit keypad is also used to configure the transmitter and set the 4-20mA current input range.

With standard 4-20mA transmitters, the 4-20mA range is fixed and the JMSC control unit is simply programmed to operate over all or just a portion of the current input. For the more involved applications, such as pump control using control routines or open channel flow measurement, the control unit will offer "Wizard" assistance to ensure all of the necessary data is entered in the correct memory locations.

The control unit is fitted with a clear back-lit 4 line display which is used to present the operator with programming and set-up options. Once commissioning is complete, the display will show the measured variable such as level or flow, a bargraph representation of the current output and the status of all input and outputs. Alternatively, the display can be configured to show a multitude of other information as the operator chooses.



Display and keypad



4 line display

Front panel

JMSC900W SERIES WALL MOUNTING CONTROL UNITS
Housed in a tough IP65 Polycarbonate enclosure, the control unit can be mounted either inside or outside. All wiring terminals and mains selector switch (115 or 240V ac) are accessed by removing the lower terminal box lid, leaving the main electronics compartment undisturbed.

JMSC900P SERIES PANEL MOUNTING CONTROL UNITS
All of the MSC functionality is available in this small panel mounting format. Extending just 175 mm into the panel, connection is made to two part terminal blocks on the rear of the unit.

Please note that if several units are mounted in the same panel, allow room for air to circulate between units. An air circulation fan is recommended for installations of 3 or more units in the same panel.

JMSC900W Series wall mount

JMSC900P Series Panel mount

INPUTS
- Any 4-20mA signal from a transmitter. The MSC will power a 24V dc transmitter with a max load of 25mA, or can accept input from a separately powered transmitter. Transmitters may be located in a hazardous area as the power supply is fully protected. No additional safety barriers are required.
- Alternatively, the unit will accept a digital input from a HART/SMART transmitter and allow access to Universal and some Common Practice commands.
- 2 Voltage free contact closure digital inputs.
- Mains power, 115V ac or 230V ac

FEATURES
- Wizard assisted simple menu programming
- Clear visual output using back-lit LCD display
- Patented echo recognition software techniques to ensure reliable level tracking. Includes tools to deal with stirrers, agitated surfaces, false echoes and other common application problems.
- Pre-programmed linearisation functions, plus a 20 point DIY curve facility.
- Auto-test routine to simulate liquid level rising and falling such that all alarms and outputs are tested. Includes a set-current option to test other loop instrumentation.

OUTPUTS
- 4-20mA current output proportional to measured variable. May be scaled over the whole or part of the range, and can be profiled or scaled to suit.
- 4 control relays, user selectable as alarm, control or fault duty. Full range of pre-programmed pump control routines.
- 5th relay, normally a fail safe fault relay, but may be re-allocated to alarm duty.
- A relay may be allocated to give a pulsed output of flow through a channel.

TECHNICAL SPECIFICATIONS

ELECTRICAL	
Supply	115V or 230V ac +/- 15%, 50/60Hz, power consumption 10VA max.
Current input	4-20mA and/or HART Digital comms (Rev. 5) Will supply 23.5V dc at 25mA to transmitter
Trigger inputs	2 voltage free contact closures
Current output	4-20mA isolated into 1 Kohm (12 bit)
Relays	5 SPCO, 5A at 240V ac
Cable entry	5 positions pre-drilled. 2 glands and 3 blanking plugs provided
Cable connection	*Wall mount:* Cage clamp terminal blocks in separate terminal compartment *Panel mount:* 2 part cage clamp terminal blocks at rear
MECHANICAL	
Material	*Enclosure & keypad:* Polycarbonate
Size	*Wall mount:* 8 3/8” wide x 7 1/4” high x 3 5/16” deep *Panel mount:* Cut out 5 1/2” wide x 2 3/4” high. Allow 6 1/2”mm clearance behind panel
Enclosure rating	*Wall mount:* IP65 indoor/outdoor Panel mount:IP40 indoor mount
Environmental	Installation category: 115V: Cat.III, 230V: Cat.II Pollution degree: 2 Altitude: 2000m max. Relative humidity: 100%
Temperature	-40°F to +131°F. (Use of an air circulation fan is recommended if 3 or more panel mounting units are installed in the same cabinet)
Approvals	ATEX coding II (1) G CENELEC coding [EEx ia] IIC

JMST900 SERIES ULTRASONIC LEVEL TRANSMITTERS
These 24V dc loop powered transmitters are factory sealed and fitted with cable ready to install on aqueous applications. Manufactured from UPVC, the transmitter is designed to give a 4-20mA output proportional to liquid level (or distance to level). Power is supplied by the control unit, and the transmitter is configured with the application details using the control unit keypad.

9700 SERIES HYDROSTATIC LEVEL TRANSMITTERS
The 9700 range of hydrostatic level transmitters are manufactured in316Stainless Steel with a corrosion resistant flush fitting ceramicsensing face.The transmitters are 24V dc loop powered and are factory fitted withthe required length of vented cable, sealed IP68 to 120m.Options with remote Zero and Span are available to order.

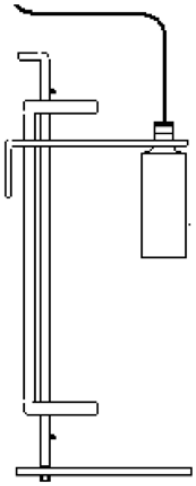
9700 Series *JMST900 Series*

TECHNICAL SPECIFICATIONS

	ULTRASONIC TRANSMITTER	HYDROSTATIC TRANSMITTER
Range	1 to 39 Ft.	394 Ft. (specify exact range on order)
Power supply	24V dc 2 wire loop powered	24V dc 2 wire loop powered
Output	4-20mA	4-20mA
Digital Comms.	HART / SMART	None
Ambient temperature	-40F to +140°F	-4F to +176°F
Maximum temperature	-40°F to +140°F	-4°F to +176°F
Operating pressure	0bar to +43PSI	Up to 394 Ft. water
Material of construction	UPVC (Stabilised)	316SS/Ceramic
Rating	IP68 (49FT.)	IP68 (393m)
Cable	2 core screened	2 core screened, vented.
Cable sheath	PVC	Polyurethane
Cable length	10, 65 or 165 ft. All cables may be shortened or extended on site.	To order
Mounting	1" NPT + bracket	Suspended or clamped
Certification	ATEX II (1) G EEx ia IIC T6	ATEX II 1 G EEx ia IIB T4
Technical data sheet	IP2032	0078

HVD (HEAD VERIFICATION DEVICE)

To ensure continued accuracy of instrumentation, the Jerguson Head Verification Device is available, and may be retro-fitted to most installations. Comprising a target on a Stainless Steel swivel arm, the device also supports the ultrasonic transmitter at a fixed distance above the target plate. When the instrument is to be checked for accuracy, the target is swung under the head and the flow reading checked against a certified value for that installation.



ORDERING INFORMATION

JMS SYSTEMS

Part number	Description
JMSC900W/T10	One mains powered wall mount pump control unit and one 39 ft. range ultrasonic transmitter with 10 ft. cable. Intrinsically Safe certified for use in Zone 0 areas. Also suitable for level, contents and OCF duty. Supplied complete with mounting bracket and back-nut.
JMSC900W/T65	One mains powered wall mount level and contents control unit and two 39 ft. range ultrasonic transmitters, each with 65 ft. cable. Intrinsically safe certified for use in Zone 0 areas. Also suitable for twin channel OCF duty. Supplied complete with mounting brackets and back-nuts.
JMSLOG/T10	One mains powered wall mount logging control unit plus Magne-Sonics Log-View software and one 39 ft. range ultrasonic transmitter with 10 ft. cable. Intrinsically safe certified for use in Zone 0 areas. Also suitable for level, contents and OCF duty. Supplied complete with mounting bracket and back-nut

All of the above systems are available with a panel mount control unit in place of the wall mount control unit.
Simply replace code W with code P : JMSC900P/T10
Systems are also available with 165 FT cable lengths. Simply replace code /T10 with code /T165.
All of the above systems are available with a hydrostatic head pressure transmitter in place of the ultrasonic transmitter.
Simply replace code T10 With 9700: JMSC900W/9700. State range and transmitter cable length required when ordering.

COMPONENTS

Component parts of the above systems are available individually for use with other control equipment or transmitters, or for field replacement. Order part numbers as follows:-

JMSC900W	One mains powered wall mount control unit for pump control, level, contents and OCF duty.
JMSC900P	One mains powered panel mount control unit for pump control, level, contents and OCF duty.
JMSC902W	One mains powered wall mount control unit for differential level, contents and OCF duty.
JMSC902P	One mains powered panel mount control unit for differential level, contents and OCF duty.
JMSLOGW	One mains powered wall mount control unit with on-board logging facility for OCF duty.
JMSLOGP	One mains powered panel mount control unit with on-board logging facility for OCF duty plus Log-View software.
JMST900/65	One ultrasonic transmitter, range 39 ft., with 65 ft. factory fitted cable. Intrinsically safe certified for use in Zone 0 areas.
9700 Series	One hydrostatic head pressure transmitter, submersible IP68 (120m), with factory fitted cable. State range and cable length when ordering. Full part number on request.
ACCESSORIES	
MS-BRK4	316 Stainless Steel bracket for mounting or suspending MST900 transmitter.
MS-FLG4	2” ANSI #150 / DN50 PN50 combined flange in PVC for mounting MSP900SH transmitter
MS-HVD	Head verification device for regular checking of OCF system performance.
MS-LogView	PC windows based software for data collection, concatonation and manipulation of logged data. Allows trending, graphical and tabular display of data.

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