Base Load Power Hub (BLPH)

MANUFACTURERS RECORD BOOK (FINAL DOSSIER)
VARIABLE AREA FLOWMETERS 3809G

Document Number: 1724000791-QC-DB-00009

Document Class: 2

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Rev.	Date	Description	Prepared	Reviewed	Approved

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Base Load Power Hub (BLPH)

MANUFACTURERS RECORD BOOK (FINAL DOSSIER) - INDEX
VARIABLE AREA FLOWMETERS 3809G

Document Number: 1724000791-QC-LIS-00010

ROSETTI MARINO

1	NO COMMENTS - APPROVED - WORK MAY PROCEED
2	MINOR COMMENTS - REVISE AND RESUBMIT - WORK MAY PROCEED
3	MAJOR COMMENTS – REJECTED – DO NOT PROCEED
4	APPROVAL NOT REQUIRED

NOTE: Approval doesn't relieve the supplier from mandatory compliance with contractual documents and specifications. Comments made do not imply acceptance of any cost or delivery impact.

Sign	Date
ROSETTI MARINO S.p.A. Shipbuilding Division Quality Control Dept.	19/10/2024

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BROOKS INSTRUMENT

MDB-Index Revision

1724000791-QC-LIS-00010_03

VARIABLE AREA FLOWMETERS

Customer: Rosetti Marino PO 1724000791

BROOKS INSTRUMENT CPQ numbers: SOJY007989

6032967/9018010, QMP2024-0052

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Section 1 DESIGN DOSSIER

1.1 List

1.1.1 SUPPLIER MASTER INDEX REGISTER (SMIR)

Base Load Power Hub (BLPH)

VARIABLE AREA FLOWMETER

SUPPLIER MASTER INFORMATION REGISTER

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Document Class: 3

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SMIR - *SUPPLIER MASTER INFORMATION REGISTER*

	Order nr.	*1724000791*		*Supplier:*	**Brooks Instrument**								
	Dated:	*15/7/2024*		*S. Code:*									
	Job:			*Address :*									
	Description	**VARIABLE AREA FLOWMETER**		*Contact person:*	**Paolo Rolando**								
	Phase												

Pos.	Document nr. Client (1)	Doc Client Rev. (1)	Document nr. Internal	Document nr. Internal Rev. (2)	Document nr. Supplier (3)	Doc Supplier Rev. (3)	*Document title* (4)	*Discipline* (5)	*Class Block* (6)	Docum. Format (7)	first issue date (8)	Third Party Approval (I/A)	KEY Document Ingegneria	Document Approval (I/A)
							CONTROL DOCUMENTS							
1	1724000791-MD-LIS-00001	00	1724000791-MD-LIS-00001	00	TBD	00	SUPPLIER MASTER INDEX REGISTER (SMIR)	INS		A3	5/10/2024			A
							QUALITY DOCUMENTS							
2	1724000791-QC-ITP-00002	00	1724000791-QC-ITP-00002	00	TBD	00	INSPECTION AND TEST PLAN	QUA		A4	5/17/2024			A
							ENGINEERING DOCUMENTS							
3	1724000791-IN-DA-00003	00	1724000791-IN-DA-00003	00	TBD	00	GENERAL ARRANGEMENT DRAWINGS	INS		A4	5/15/2024		X	A
4	1724000791-IN-DS-00004	00	1724000791-IN-DS-00004	00	IDS	00	INSTRUMENT DATA SHEETS and SIZING CALCULATION	INS		A4	5/10/2024			A
5	1724000791-NDT-PRO-00005	00	1724000791-NDT-PRO-00005	00	TBD	00	NDE PROCEDURE	QUA		A4	5/10/2024			I
6	1724000791-MAT-PRO-00006	00	1724000791-MAT-PRO-00006	00	TBD	00	PAINTING PROCEDURE	QUA		A4	5/25/2024			I
7	1724000791-QC-PRO-00007	00	1724000791-QC-PRO-00007	00	PRESS TST PROC 3809	00	PRESSURE TEST PROCEDURES	QUA		A4	5/10/2024			A
8	1724000791-QC-PRO-00008	00	1724000791-QC-PRO-00008	00	TBD	00	FAT PROCEDURES	QUA		A4	5/17/2024			
							CERTIFICATES							
9	1724000791-QC-DB-00009	00	1724000791-QC-DB-00009	00	MDRB-BIND	00	MANUFACTURERS RECORD BOOK (FINAL DOSSIER)	CERT		A4	9/20/2024			A
10	1724000791-QC-LIS-00010	00	1724000791-QC-LIS-00010	00	MDRB INDEX	00	MANUFACTURERS RECORD BOOK (FINAL DOSSIER) - INDEX	QUA		A4	5/25/2024			A
11	1724000791-IN-LIS-00012	00	1724000791-IN-LIS-00012	00	TBD	00	ATEX REGISTER	INS		A4	6/30/2024			A
							SPARES & MAINTENANCE DATA							
12	1724000791-IN-MAN-00013	00	1724000791-IN-MAN-00013	00	IOM	00	INSTALLATION OPERATING AND MAINTENANCE MANUAL	INS		A4	7/30/2024			A
							HANDLING, SHIPPING & SITE INSTALLATION							
13	1724000791-QC-PRO-00014	00	1724000791-QC-PRO-00014	00	PACK PROC	00	PREPARATION FOR SHIPPING WITH HANDLING AND STORAGE PROCEDURES	LOG		A4	7/30/2024			I

Notes:

(1) Document number assigned by final Client
(2) Document number internal
(3) Document number assigned by Supplier
(4) Fill in the document title (to be assigned by Vendor)
(5) Quality dep., Expediting. Dep., Commissioning dep., Engineering dep.
(6) Procedure, list, drawing, data sheet, etc. (to be filled by Rosetti)
(7) A4, A3, A1 (Supplier)
(8) Foreseen date for the first issue (Supplier)

1.1.2 ATEX REGISTER

Base Load Power Hub (BLPH)

ATEX REGISTER

Document Number:1724000791-IN-LIS-00012

Document Class: 2

ROSETTI MARINO	
1	NO COMMENTS - APPROVED - WORK MAY PROCEED
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4	APPROVAL NOT REQUIRED
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Sign	Date
V. Barratta	26-08-2024

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Rev.	Date	Description	Prepared	Reviewed	Approved

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5	Atex certificate	X	X	X	X				
8	EC declaration of conformity	X	X	X	X				

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No.	Revision	Tag Number	Description	Location	Manufacturer	Model Type Catalogue Number	Serial Number	ATEX Certification Marking	Reference Document	ATEX Certificate Number	Installation Zone	Notes / Comments	P.O.	Vendor	Skid / Package	Barrier Calculation Ref.	Non-Electrical Equipment	Special Conditions of safe use Applicable
1		25-FT-031	VA flowmeter	123A90-DDL-PR-PID-80015	Brooks Instrument	3809GCA10AGBC3D2C0AC	3809G-211095	II 2 G Ex db IIC T6…T1 Gb	3809g-atex-xp f	DEKRA 13ATEX0086 X	ATEX Zone2 - IIC (IIB+H2) T1	--	1724000791	Brooks Instrument	N.A.	N.A.	NO	YES
2		25-FT-032	VA flowmeter	123A90-DDL-PR-PID-80016	Brooks Instrument	3809GCA10AGBC3D2C0AC	3809G-211095	II 2 G Ex db IIC T6…T1 Gb	3809g-atex-xp f	DEKRA 13ATEX0086 X	ATEX Zone2 - IIC (IIB+H2) T1	--	1724000791	Brooks Instrument	N.A.	N.A.	NO	YES
3		25-FT-033	VA flowmeter	123A90-DDL-PR-PID-80017	Brooks Instrument	3809GCA10AGBC3D2C0AC	3809G-211095	II 2 G Ex db IIC T6…T1 Gb	3809g-atex-xp f	DEKRA 13ATEX0086 X	ATEX Zone2 - IIC (IIB+H2) T1	--	1724000791	Brooks Instrument	N.A.	N.A.	NO	YES
4		25-FT-034	VA flowmeter	123A90-DDL-PR-PID-80019	Brooks Instrument	3809GCA10AGBC3D2C0AC	3809G-211095	II 2 G Ex db IIC T6…T1 Gb	3809g-atex-xp f	DEKRA 13ATEX0086 X	ATEX Zone2 - IIC (IIB+H2) T1	--	1724000791	Brooks Instrument	N.A.	N.A.	NO	YES
5		25-FT-036	VA flowmeter	123A90-DDL-PR-PID-80018	Brooks Instrument	3809GCA10AGBC3D2C0AC	3809G-211095	II 2 G Ex db IIC T6…T1 Gb	3809g-atex-xp f	DEKRA 13ATEX0086 X	ATEX Zone2 - IIC (IIB+H2) T1	--	1724000791	Brooks Instrument	N.A.	N.A.	NO	YES
6		25-FT-038	VA flowmeter	123A90-DDL-PR-PID-80020	Brooks Instrument	3809GCA10AGBC3D2C0AC	3809G-211095	II 2 G Ex db IIC T6…T1 Gb	3809g-atex-xp f	DEKRA 13ATEX0086 X	ATEX Zone2 - IIC (IIB+H2) T1	--	1724000791	Brooks Instrument	N.A.	N.A.	NO	YES
7		64-FG-001	VA flowmeter	123A90-DDL-PR-PID-80028	Brooks Instrument	3809GCC08BFBC9A0V0AC	3809G-211096	II 2 G Ex h IIC T6…T3 Gb	MBID 022 Rev. A	MBID 022 Rev. A	ATEX -ZONE 1/ZONE 2 - NO ELEC	--	1724000791	Brooks Instrument	N.A.	N.A.	YES	YES

CERTIFICATE

(1) EU-Type Examination

(2) **Equipment or protective systems intended for use in potentially explosive atmospheres - Directive 2014/34/EU**

(3) EU-Type Examination Certificate Number: **DEKRA 13ATEX0086 X** Issue Number: **6**

(4) Product: **Variable Area Flowmeter MT3809G Series**

(5) Manufacturer: **Brooks Instrument, LLC.**

(6) Address: **407 West Vine Street, Hatfield, PA 19440, USA**

(7) This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) DEKRA Certification B.V., Notified Body number 0344 in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential test report number NL/DEK/ExTR13.0026/05.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN IEC 60079-0 : 2018 **EN 60079-1 : 2014** **EN 60079-11 : 2012**
EN 60079-31 : 2014

except in respect of those requirements listed at item 18 of the Schedule.

(10) If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

(12) The marking of the product shall include the following:

II 1 G Ex ia IIC T6...T2 Ga
II 2 G Ex ia IIC T6...T2 Gb
II 2 G Ex db IIC T6...T1 Gb
II 2 D Ex ia IIIC T85 °C...T300 °C Db
II 2 D Ex tb IIIC T85 °C...T450 °C Db

Date of certification: 25 May 2023

DEKRA Certification B.V.

R. Schuller
Certification Manager

PRODUCTS RvAC 001

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T +31 88 96 83000 F +31 88 96 83100 www.dekra-product-safety.com Registered Arnhem 09085396

(13) # SCHEDULE

(14) **to EU-Type Examination Certificate DEKRA 13ATEX0086 X** Issue No. **6**

(15) **Description**

Variable Area Flowmeters of the MT3809G Series measure flow, based on the variable area principle. The flow meter consists of a stainless enclosure with windowed cover in type of protection Ex db, Ex ia, or Ex tb or alternatively of an aluminium enclosure with windowed cover in type of protection Ex ia.

The flow raises a float in a tapered tube increasing the area for the passage of flow. The float assumes distinct positions for every constant rate flow. Flow rate indication is provided by means of magnetic coupling. A magnet encapsulated in the float is coupled to a rotatable magnet located in the rear of the indicator, turning the dial indicator mounted on the meter.

A flow transmitter with communication interfaces and/or optional limit switches in may be mounted with the flow meter in the same enclosure.

For nomenclature, thermal data, product ratings and electrical data see Annex 1 to report NL/DEK/ExTR13.0026/05.

Installation instructions

The instructions provided with the product shall be followed in detail to assure safe operation.

(16) **Report Number**

No. NL/DEK/ExTR13.0026/05.

(17) **Specific conditions of use**

For approval type A and B (Ex ia):
For applications requiring EPL Gb (Category 2 G), the transparent cover must be installed such, that ignition sources due to electrostatic discharge sparks are prevented.

For application in environments requiring EPL Ga and the enclosure is made of aluminum, it shall be installed in such a way that sparking as a result of impact or friction is excluded.

For applications requiring EPL Db (Category 2 D), the transparent cover and the painted parts must be installed such, that danger of ignition due to propagating brush discharges is prevented.

For models marked with material code M, Titanium Grade II, the installation instructions contain the specification of the alloy, allowing the user determine the suitability of the equipment for the particular application.

From the safety point of view the circuits shall be assumed to be connected to earth.

On units with a digital display, the programming function shall only be performed in a non-hazardous area.

(13) **SCHEDULE**

(14) **to EU-Type Examination Certificate DEKRA 13ATEX0086 X** Issue No. **6**

(17) For approval type C (Ex db and Ex tb):
For applications requiring EPL Gb (Category 2 G), the threaded entries of the enclosure shall be sealed with plugs, cable entry devices such as glands or conduit entry devices which are Ex db IIC Gb approved.

For applications requiring EPL Db (Category 2 D), the threaded entries of the enclosure shall be sealed with plugs, cable entry devices such as glands or conduit entry devices which are Ex tb IIIC Db approved.

For information regarding the dimensions of the flameproof joints the manufacturer shall be contacted.

(18) **Essential Health and Safety Requirements**

Covered by the standards listed at item (9).

(19) **Test documentation**

As listed in Report No. NL/DEK/ExTR13.0026/05.

(20) **Certificate history**

Issue 1 -	215864200	Initial certificate;
Issue 2 -	218494200	Assessment to the latest editions of the standards, Addition of Type of Protection Ex ia and tc, Addition of a transmitter model
Issue 3 -	218494200	Add type of protection Ex ic, Specific Conditions of Use updated, Corrected terminal no's in Annex 1
Issue 4 -	328890200	Assessment to latest EN IEC 60079-0, Category 3 removed, Specific Conditions of Use updated and minor constructional changes
Issue 5 -	383146800	Update of barrier entity parameters for 4-20mA option only.
Issue 6 -	383404800	Minor changes to the construction

BROOKS INSTRUMENT
Beyond Measure

CE

Declaration of Conformity
No: MBID 022 Rev. D

Equipment and protective systems intended for use in potentially explosive atmospheres - Directive 2014/34/EU

Equipment: Non-Electrical Variable Area Flow Meter MT3809G series, MT3750 Series

As per Directive 2014/34/EU, Annex VIII, Module A "Internal production control", the product and quality system assessment procedure can be carried out by the manufacturer. In this module there is no involvement of a notified body in the conformity assessment activities. As per Chapter 3, Article 13 (1) (b) (ii) of the directive for equipment – group II, equipment categories 2 and non-electrical equipment, communication/deposit of the technical documentation to a notified body, and retention of such documentation by the notified body, are required.

In accordance with the requirements the technical documentation is deposited at DEKRA Certification B.V under technical construction file number 203104000-1604.

We certify that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the directive.

Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN ISO 80079-36:2016 and **EN ISO 80079-37:2016**

The marking of the equipment shall include the following:

MT3809 Equipment:	**MT3750 Equipment:**
II2G Ex h IIC T6...T3 Gb	**II2G Ex h IIC T6...T3 Gb**
II2D Ex h IIIC T200°C Db	**II2D Ex h IIIC T200°C Db**
-20°C ≤ Ta ≤ 70°C	**-30°C ≤ Ta ≤ 70°C**

Special Conditions:
Enclosure contains glass & painted aluminum parts. If it is mounted in an area where the use of category 2G or 2D apparatus is required, it must be installed such that ignition source due to propagating brush discharge sparks are excluded.

The actual maximum surface temperature of the equipment depends not on the equipment itself, but on operating conditions of the process fluid/gas flowing through the equipment. The equipment by itself does not generate heat. Due to this reason the temperature class is marked as a range. The maximum permitted ambient and process temperature limits can be found in the operating instructions.

At start up especially for gas applications, ensure that the pressure is gradually increased through the piping system. A sudden pressure spike situation may result in a fast movement of the float within the VA flowmeter & the float may hit hard against the float stop.

Supply grounding connection by the process connections or earthing terminal.

June 10th, 2024
(Date of issue)

JP. Prego
VA Engineering Manager

Brooks Instrument | 407 West Vine Street | Hatfield, PA 19440 | USA | T : 1-215-362-3500 | F : 1-215-362-3745
www.BrooksInstrument.com

BROOKS INSTRUMENT
Beyond Measure

CE

Declaration of Conformity
No: MBID 022 Rev. D

Annex 1

Description
Variable Area Flowmeter Models MT3809G & MT3750 measure flow based on the variable area principle. The flow meter consists of an aluminium enclosure or stainless enclosure with windowed cover in type of protection constructional safety 'c'. The flow raises a float in a tapered tube increasing the area for the passage of flow. The float assumes distinct position for every constant rate flow. Flow rate indication is provided by means of magnetic coupling. A magnet encapsulated in the float is coupled to a rotatable magnet located in the rear of the indicator, turning the dial indicator mounted on the meter.

Nomenclature and Type Designation

Brooks Model 3809G series Variable Area Flow Meter

MT3809	G	M	...	6	...	V	...
I-IV	V	VI		XIV		XVII	XX

Mode Code Position	Explanation	Value	Explanation
I-IV	Model	MT3809	Variable Area Flowmeter (Metal Tube)
V	Model Revision	G	
VI	Material	A-Q	Material of construction of flow body
XIV	Indicator configuration	1,8 2,5,9	Aluminium housing * Stainless steel housing * (Both GP as well XP)
			NOTE * optionally painted in which case special conditions for safe use apply
XVII	Certs	V	ATEX – Zone 1/Zone 2, Non- Electrical

Brooks Model 3750 series Variable Area Flow Meter

MT3750	C	M	...	U	A	...
I-IV	V	VI		XV	XIII	XVIII

Mode Code Position	Explanation	Value	Explanation
I-IV	Model	MT3750	Variable Area Flowmeter (Metal Tube)
V	Model Revision	C	
VI	Material	1-H	Material of construction of flow body
XV	Approvals	U	ATEX – Zone 1/Zone 2, Non- Electrical
XIII	Electrical Output	A	Aluminum Indicator only (no Electronics)

Brooks Instrument | 407 West Vine Street | Hatfield, PA 19440 | USA | T : 1-215-362-3500 | F : 1-215-362-3745
www.BrooksInstrument.com

1.2 Drawings

1.2.1 GENERAL ARRANGEMENT DRAWINGS – TGPL, NMPL

Base Load Power Hub (BLPH)

GENERAL ARRANGEMENT DRAWINGS

Document Number: 1724000791-IN-DA-00003

Document Class: 2

ROSETTI MARINO

1	NO COMMENTS - APPROVED - WORK MAY PROCEED
2	MINOR COMMENTS - REVISE AND RESUBMIT - WORK MAY PROCEED
3	MAJOR COMMENTS – REJECTED – DO NOT PROCEED
4	APPROVAL NOT REQUIRED

NOTE: Approval doesn't relieve the supplier from mandatory compliance with contractual documents and specifications. Comments made do not imply acceptance of any cost or delivery impact.

Sign	Date
V. Barratta	03-10-2024

Rev.	Date	Description	Prepared	Reviewed	Approved
04	3/10/2024	ACCEPTED FOR CONSTRUCTION (AFC)	László Szalai	Mária Poór	Zsanett Molnár
03	20/9/2024	ACCEPTED FOR CONSTRUCTION (AFC)	László Szalai	Mária Poór	Zsanett Molnár
02	19/7/2024	ACCEPTED FOR CONSTRUCTION (AFC)	László Szalai	Mária Poór	Zsanett Molnár
01	5/6/2024	ACCEPTED FOR CONSTRUCTION (AFC)	László Szalai	Mária Poór	Zsanett Molnár
00	16/5/2024	ISSUE FOR REVIEW (IFR)	László Szalai	Mária Poór	Zsanett Molnár

BROOKS INSTRUMENT
Beyond Measure

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Table of Contents

SH.	DESCRIPTION	REVISIONS							
		00	01	02	03	04			
1	Cover	X	X	X	X	X			
2	Table of Contents	X	X	X	X	X			
3	Revision / Change Log	X	X	X	X	X			
4	GENERAL ARRANGEMENT DRAWINGS	X	X	X	X	X			
6	Nameplate - tagplate sketch			X	X	X			

File: Cover_GAD

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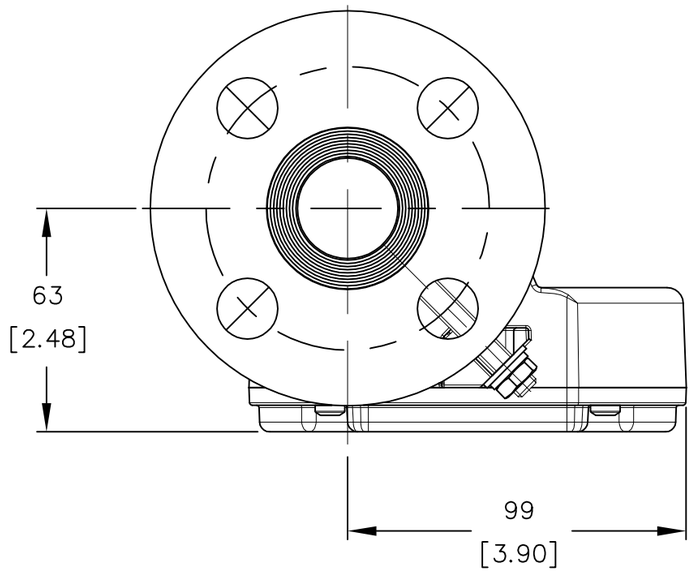
Revision / Change Log

Rev.	Description
00	ISSUE FOR REVIEW (IFR)
01	ACCEPTED FOR CONSTRUCTION (AFC)
02	ACCEPTED FOR CONSTRUCTION (AFC)
03	ACCEPTED FOR CONSTRUCTION (AFC)
04	ACCEPTED FOR CONSTRUCTION (AFC)

HOLDS LIST

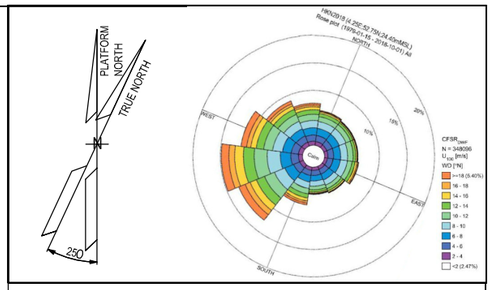
No.	Description
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3.	
4.	

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NO	DESCRIPTION	MATERIAL
1	BODY	316/316L SS
2	INDICATOR ASSY	316 SS
3	FLOAT ASSY	316L SS
4	FLANGE	316/316L SS
5	TAG PLATE / WIRE	316 SS
6	NAME PLATE	316L SS

METERSIZE: SIZE 8
FLANGE TYPE: 1" ANSI 150 Lbs RF WN
TAG NO: 64-FG-001
MODEL NO.: 3809GCC08BFBC9A0V0AC
METER RANGE: 1.5 – 15 NM3/H
WEIGHT: APPROX. 4.5 kg



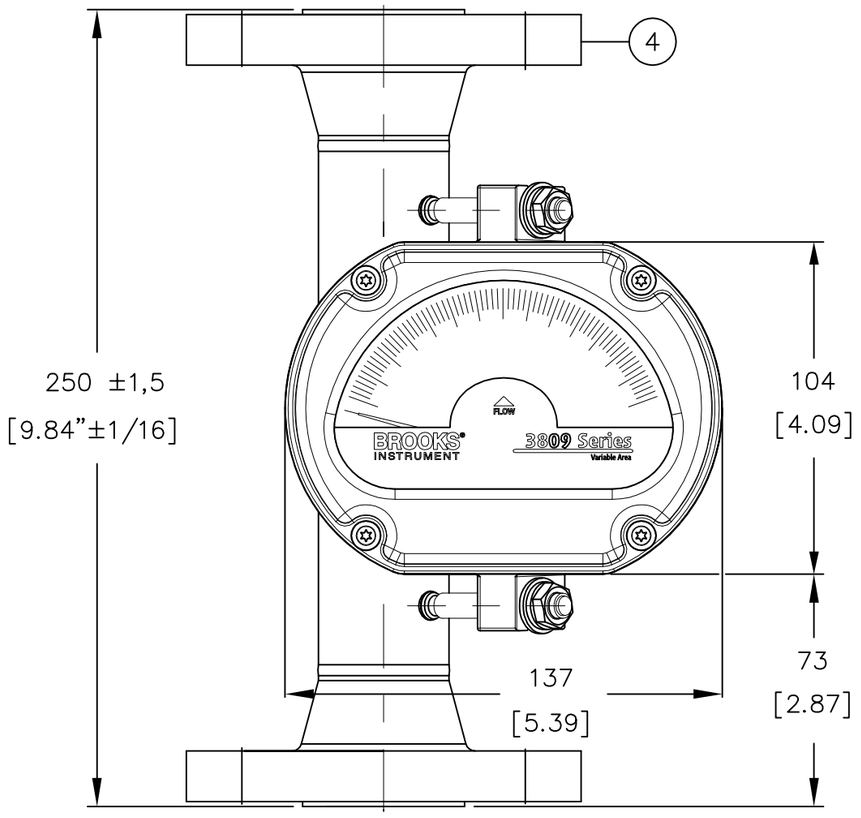
NOTES

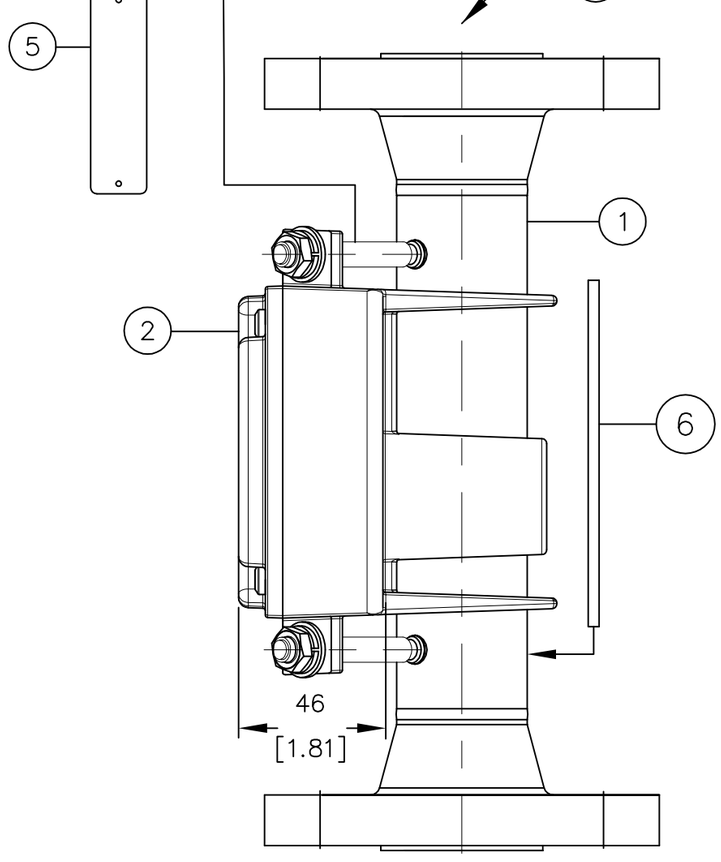
Straight run of pipe requirements:
There is no straight run of pipe needed. The meter can be installed immediately before and after a valve or elbow.
The recommended tube inside dia is 20mm.

Install the flowmeter with the inlet at the bottom and the outlet at the top within 5° of true vertical.

LEGEND

HOLDS





NOTE: DIMENSIONS IN mm [inch]

INSERT SUBCONTRACTOR / VENDOR LOGO HERE

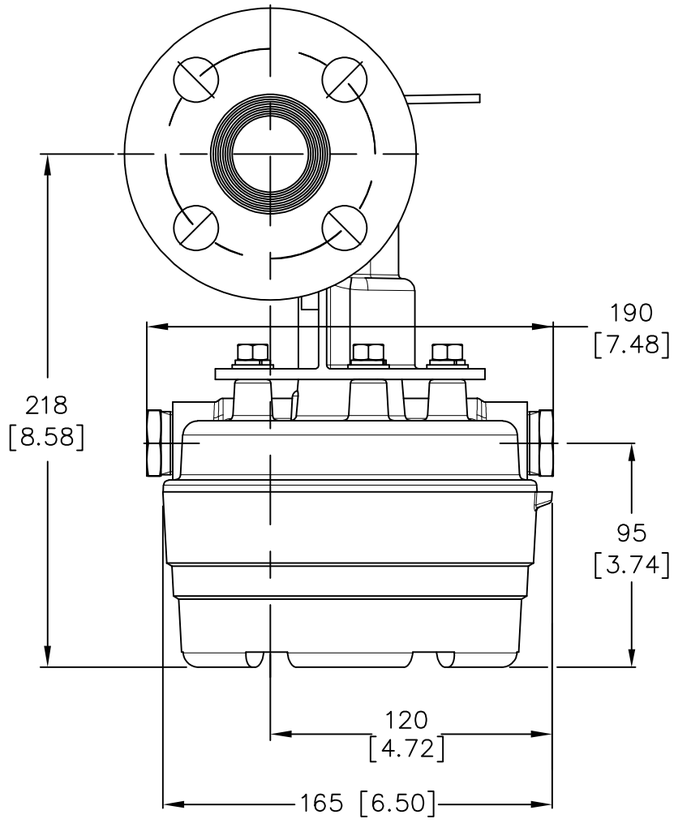
REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
03	19/09/'24	LSZ	KP	KP	ACCEPTED FOR CONSTRUCTION (AFC)
02	19/07/'24	LSZ	KP	KP	ACCEPTED FOR CONSTRUCTION (AFC)
01	05/06/'24	LSZ	KP	KP	ACCEPTED FOR CONSTRUCTION (AFC)
00	15/05/'24	LSZ	KP	KP	ISSUE FOR REVIEW (IFR)

CROSSWIND

ROSETTI MARINO

TITLE : GENERAL ARRANGEMENT DRAWING
VARIABLE AREA
FLOWMETER

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK | SCALE NTS
DRAWN LSZ | CHECKED KP | APPROVED KP | DATE 15/05/'24
A1 | DRAWING NO. 1724000791-IN-DA-00003 | SHEET 005 | REV. 03



NO	DESCRIPTION	MATERIAL
1	BODY	316/316L SS
2	INDICATOR ASSY	316 SS
3	FLOAT ASSY	316L SS
4	FLANGE	316/316L SS
5	ELECTRICAL CONNECTION	316 SS
6	TAG PLATE / WIRE	316 SS
7	NAMEPLATE	316 SS

METERSIZE: SIZE 10

FLANGE TYPE: 1" ANSI 300 Lbs RF WN

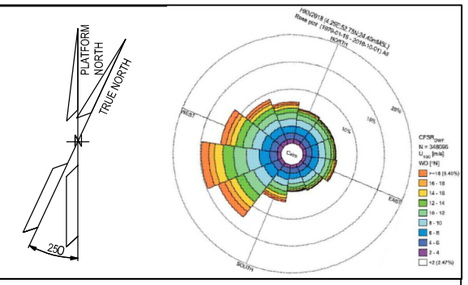
ELECTRICAL CONN.: M20x1.5 (2x)

TAG NO: 25-FT-031 25-FT-038
25-FT-032
25-FT-033
25-FT-034
25-FT-036

MODEL NO.: 3809GCA10AGBC3D2C0AC

METER RANGE: 6.2 – 62 NM3/H

WEIGHT: APPROX. 12 kg



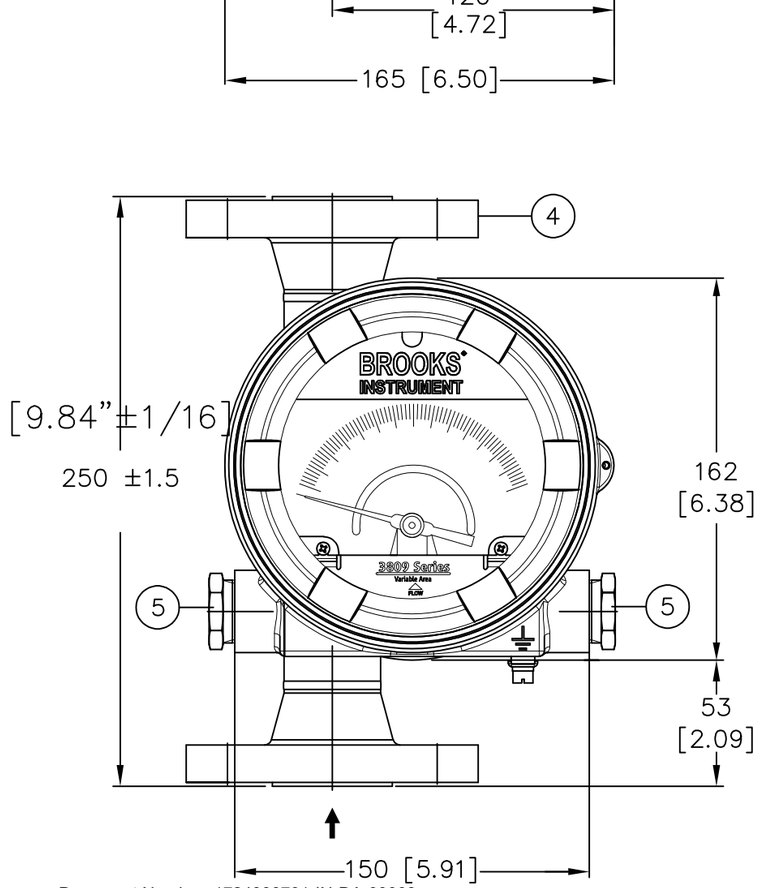
NOTES

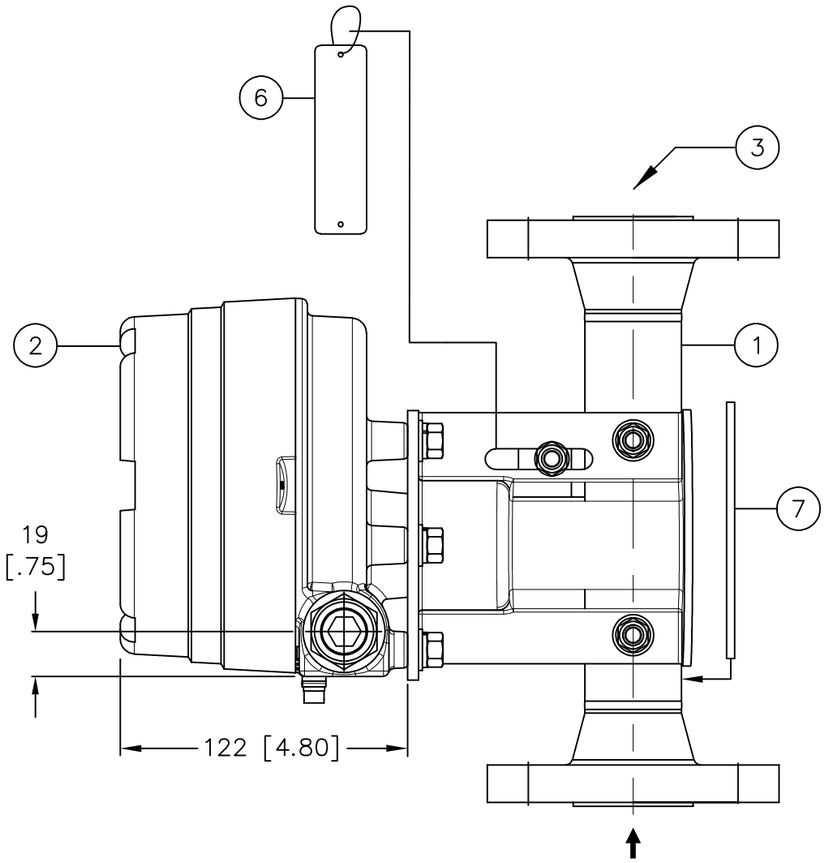
Straight run of pipe requirements:
There is no straight run of pipe needed.
The meter can be installed immediately before and after a valve or elbow.The recommended tube inside dia is 25.4mm.

Install the flowmeter with the inlet at the bottom and the outlet at the top within 5° of true vertical.

LEGEND

HOLDS





NOTE: DIMENSIONS IN mm [inch]

INSERT SUBCONTRACTOR / VENDOR LOGO HERE

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
03	19/09/'24	LSZ	KP	KP	ACCEPTED FOR CONSTRUCTION (AFC)
02	19/07/'24	LSZ	KP	KP	ACCEPTED FOR CONSTRUCTION (AFC)
01	05/06/'24	LSZ	KP	KP	ACCEPTED FOR CONSTRUCTION (AFC)
00	15/05/'24	LSZ	KP	KP	ISSUE FOR REVIEW (IFR)

CROSSWIND

ROSETTI MARINO

TITLE : GENERAL ARRANGEMENT DRAWING
VARIABLE AREA
FLOWMETER

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

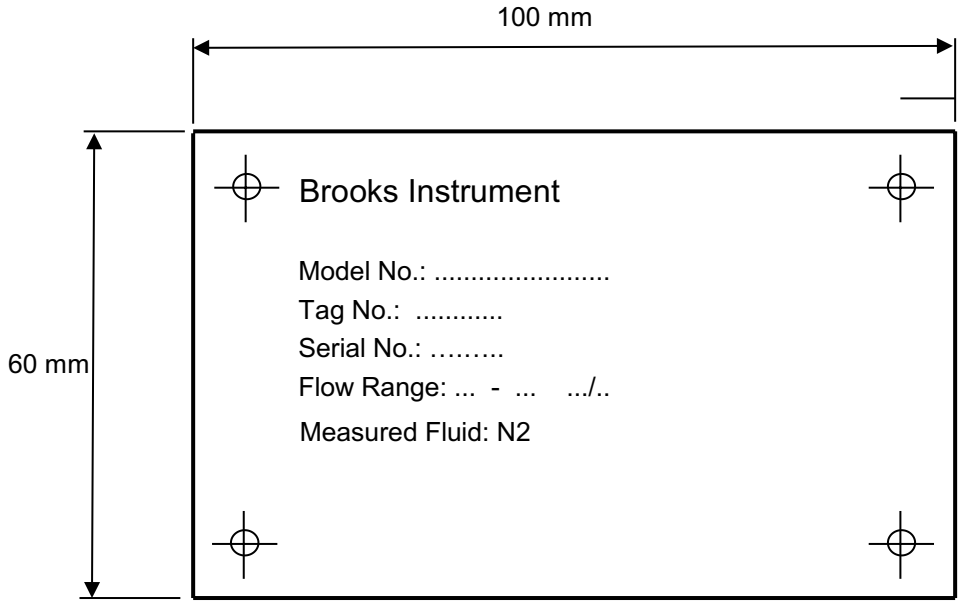
SCALE NTS

DRAWN LSZ | CHECKED KP | APPROVED KP | DATE 15/05/'24

A1 | DRAWING NO. 1724000791-IN-DA-00003 | SHEET 004 | REV. 03

Nameplate Sketch

QMP 2024-0052, Brooks ref.: 6032967/9018010
CPQ: SOJY007989

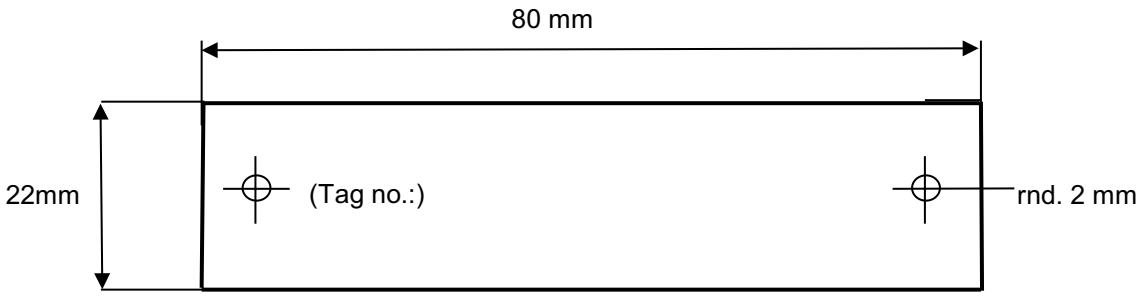


Nameplate material 316LSS
SS wired to instrument.

Font size: Manufacturing Standard
Font type: Manufacturing Standard

Tagplate Sketch

QMP 2024-0052, 6032967/9018010
CPQ ref.: SOJY007989



Tagplate material 316LSS
Securely fixed by Stainless Steel wire

Font height: 6.5mm
Font type & width: Manufacturing Standard

Data Sheets

1.2.2 INSTRUMENT DATA SHEETS and SIZING CALCULATION

Base Load Power Hub (BLPH)

INSTRUMENT DATA SHEETS and SIZING CALCULATION

Document Number: 1724000791-IN-DS-00004

Document Class: 2

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4	APPROVAL NOT REQUIRED
NOTE: Approval doesn't relieve the supplier from mandatory compliance with contractual documents and specifications. Comments made do not imply acceptance of any cost or delivery impact.	
Sign	Date
V. Barratta	29-11-2024

Rev.	Date	Description	Prepared	Reviewed	Approved
04	12/11/2024	ACCEPTED FOR CONSTRUCTION (AFC)	Krisztián Pohorlyák	Mária Poór	Zsanett Molnár
03	20/9/2024	ACCEPTED FOR CONSTRUCTION (AFC)	Krisztián Pohorlyák	Mária Poór	Zsanett Molnár
02	19/7/2024	ACCEPTED FOR CONSTRUCTION (AFC)	Krisztián Pohorlyák	Mária Poór	Zsanett Molnár
01	3/7/2024	ACCEPTED FOR CONSTRUCTION (AFC)	Krisztián Pohorlyák	Mária Poór	Zsanett Molnár
00	5/6/2024	ISSUE FOR REVIEW (IFR)	Krisztián Pohorlyák	Mária Poór	Zsanett Molnár

BROOKS INSTRUMENT Beyond Measure

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Table of Contents

SH.	DESCRIPTION	REVISIONS							
		00	01	02	03	04			
1	Cover	X	X	X	X	X			
2	Table of Contents	X	X	X	X	X			
3	Revision / Change Log	X	X	X	X	X			
4	INSTRUMENT DATA SHEETS	X	X	X	X	X			
11	SIZING Calculation	X	X	X	X	X			

File: Cover_IDS-Sizing
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Revision / Change Log

Rev.	Description
00	ISSUE FOR REVIEW (IFR)
01	ACCEPTED FOR CONSTRUCTION (AFC)
02	ACCEPTED FOR CONSTRUCTION (AFC)
03	ACCEPTED FOR CONSTRUCTION (AFC)
04	ACCEPTED FOR CONSTRUCTION (AFC)

HOLDS LIST

No.	Description
1.	
2.	
3.	
4.	

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General Data	1	Tag Number					25-FT-031			
	2	Service					NITROGEN TO HYDROGEN STORAGE VESSEL (V-25001A)			
	3	Area Classification					ATEX Zone2 - IIC (IIB+H2) T1			
	4	Line No.		Line Class			1"-HY-153-03HSS-N			
	5	Line Size		Line Schedule			1"		Thk (mm) = 3.38	
	6	P&ID No.					123A90-DDL-PR-PID-80015			
	7									
Process Data	8	Fluid		State			NITROGEN		GAS	
	9	Ambient Temperature (min/norm/max)					-8.4 / 10.5 / 25			°C
	10	Design Pressure								bar (G)
	11	Flow Rate	Min.	Nor.	Max.	Units		40		NM3/H
	12	Press.	Min.	Nor.	Max.	Units		0 - 3		bar (G)
	13	Temp.	Min.	Nor.	Max.	Units		15		°C
	14	Density	Min.	Nor.	Max.	Units				
	15	Molecular Weight	Min.	Nor.	Max.	Units				
	16	Viscosity	Min.	Nor.	Max.	Units				cP
	17	Pressure Drop					60			mbar
	18									
Meter	19	Type					Armoured Metal Tube Variable Area Flowmeters - Magnetic			
	20	Connection Size & Type					1" ANSI 300# RF Flange			
	21	Tube Material					316SS/316L SS Dual Cert.			
	22	Float Material					316L SS			
	23	Connection Material					316SS/316L SS Dual Cert.			
	24	Meter Scale Range					6.2 - 62			NM3/H
	25	Accuracy					1% F.S. / Direct Reading Scale			
	26	Inlet Direction		Outlet Direction			Bottom		Top	
	27									
Indicator / Transmitter	28	Output Signal					Local Indicator with 4-20mA / Hart 7			
	29	Calibration Range					6.2 - 62			NM3/H
	30	Power Supply					24 VDC Loop Power / 2 wired			
	31	Elect. Connection		Elect. Material			M20 x 1.5			N/A
	32	Elect. Protect Class					Div 1 ABCD / Zone 1 IIC, Flame-proof XP - ATEX/IECEX/CSA			
	33	Surge Protection Device					3809 Transmitter designed as per IEC61000-4.5			
	34	Indicator Housing					X-proof SS Housing, IP66/67			
	35									
Accessories / Special Service	36	Adjustable Valve					N/A			
	37	Valve Connection Size & Type					N/A			
	38	Pressure Gauge		Pressure Regulator			N/A		N/A	
	39	Painting					N/A			
	40	Tag Plate (316SS wired)					Included			
	41	Name Plate (316SS wired)					Included			
	42									
Purchase	43	Manufacturer					Brooks Instrument			
	44	Model No.					3809GCA10AGBC3D2C0AC			
	45	Serial No.								
	46	Purchase Order Number					PO 1724000791			
	47									

Notes :

No.	By	Date	Revision
D	KP	08/11/2024	Issued for Approval
C	KP	19/09/2024	Issued for Approval
B	KP	01/07/2024	Issued for Approval
A	KP	05/06/2024	Issued for Review

INSTRUMENT DATA SHEET FOR ROTAMETER

BROOKS® INSTRUMENT *Beyond Measure*

Doc. No.	Instrument Data Sheet	Rev.	D
		Sheet	1 of 7

General Data	1	Tag Number					25-FT-032			
	2	Service					NITROGEN TO HYDROGEN STORAGE VESSEL (V-25001B)			
	3	Area Classification					ATEX Zone2 - IIC (IIB+H2) T1			
	4	Line No.		Line Class			1"-HY-186-03HSS-N			
	5	Line Size		Line Schedule			1"		Thk (mm) = 3.38	
	6	P&ID No.					123A90-DDL-PR-PID-80016			
	7									
Process Data	8	Fluid		State			NITROGEN		GAS	
	9	Ambient Temperature (min/norm/max)					-8.4 / 10.5 / 25			°C
	10	Design Pressure								bar (G)
	11	Flow Rate	Min.	Nor.	Max.	Units		40		NM3/H
	12	Press.	Min.	Nor.	Max.	Units		0 - 3		bar (G)
	13	Temp.	Min.	Nor.	Max.	Units		15		°C
	14	Density	Min.	Nor.	Max.	Units				
	15	Molecular Weight	Min.	Nor.	Max.	Units				
	16	Viscosity	Min.	Nor.	Max.	Units				cP
	17	Pressure Drop					60			mbar
	18									
Meter	19	Type					Armoured Metal Tube Variable Area Flowmeters - Magnetic			
	20	Connection Size & Type					1" ANSI 300# RF Flange			
	21	Tube Material					316SS/316L SS Dual Cert.			
	22	Float Material					316L SS			
	23	Connection Material					316SS/316L SS Dual Cert.			
	24	Meter Scale Range					6.2 - 62			NM3/H
	25	Accuracy					1% F.S. / Direct Reading Scale			
	26	Inlet Direction		Outlet Direction			Bottom		Top	
	27									
Indicator / Transmitter	28	Output Signal					Local Indicator with 4-20mA / Hart 7			
	29	Calibration Range					6.2 - 62			NM3/H
	30	Power Supply					24 VDC Loop Power / 2 wired			
	31	Elect. Connection		Elect. Material			M20 x 1.5			N/A
	32	Elect. Protect Class					Div 1 ABCD / Zone 1 IIC, Flame-proof XP - ATEX/IECEX/CSA			
	33	Surge Protection Device					3809 Transmitter designed as per IEC61000-4.5			
	34	Indicator Housing					X-proof SS Housing, IP66/67			
	35									
Accessories / Special Service	36	Adjustable Valve					N/A			
	37	Valve Connection Size & Type					N/A			
	38	Pressure Gauge		Pressure Regulator			N/A		N/A	
	39	Painting					N/A			
	40	Tag Plate (316SS wired)					Included			
	41	Name Plate (316SS wired)					Included			
	42									
Purchase	43	Manufacturer					Brooks Instrument			
	44	Model No.					3809GCA10AGBC3D2C0AC			
	45	Serial No.								
	46	Purchase Order Number					PO 1724000791			
	47									

Notes :

No.	By	Date	Revision
D	KP	08/11/2024	Issued for Approval
C	KP	19/09/2024	Issued for Approval
B	KP	01/07/2024	Issued for Approval
A	KP	05/06/2024	Issued for Review

INSTRUMENT DATA SHEET FOR ROTAMETER

BROOKS® INSTRUMENT *Beyond Measure*

Doc. No.	Instrument Data Sheet	Rev.	D
		Sheet	2 of 7

General Data	1	Tag Number					25-FT-033				
	2	Service					NITROGEN TO HYDROGEN STORAGE VESSEL (V-25001C)				
	3	Area Classification					ATEX Zone2 - IIC (IIB+H2) T1				
	4	Line No.		Line Class			1"-HY-187-03HSS-N				
	5	Line Size		Line Schedule			1"		Thk (mm) = 3.38		
	6	P&ID No.					123A90-DDL-PR-PID-80017				
	7										
Process Data	8	Fluid		State			NITROGEN		GAS		
	9	Ambient Temperature (min/norm/max)					-8.4 / 10.5 / 25			°C	
	10	Design Pressure								bar (G)	
	11	Flow Rate	Min.	Nor.	Max.	Units		40		NM3/H	
	12	Press.	Min.	Nor.	Max.	Units		0 - 3		bar (G)	
	13	Temp.	Min.	Nor.	Max.	Units		15		°C	
	14	Density	Min.	Nor.	Max.	Units					
	15	Molecular Weight	Min.	Nor.	Max.	Units					
	16	Viscosity	Min.	Nor.	Max.	Units				cP	
	17	Pressure Drop					60			mbar	
	18										
Meter	19	Type					Armoured Metal Tube Variable Area Flowmeters - Magnetic				
	20	Connection Size & Type					1" ANSI 300# RF Flange				
	21	Tube Material					316SS/316L SS Dual Cert.				
	22	Float Material					316L SS				
	23	Connection Material					316SS/316L SS Dual Cert.				
	24	Meter Scale Range					6.2 - 62			NM3/H	
	25	Accuracy					1% F.S. / Direct Reading Scale				
	26	Inlet Direction		Outlet Direction			Bottom		Top		
	27										
Indicator / Transmitter	28	Output Signal					Local Indicator with 4-20mA / Hart 7				
	29	Calibration Range					6.2 - 62			NM3/H	
	30	Power Supply					24 VDC Loop Power / 2 wired				
	31	Elect. Connection		Elect. Material			M20 x 1.5			N/A	
	32	Elect. Protect Class					Div 1 ABCD / Zone 1 IIC, Flame-proof XP - ATEX/IECEX/CSA				
	33	Surge Protection Device					3809 Transmitter designed as per IEC61000-4.5				
	34	Indicator Housing					X-proof SS Housing, IP66/67				
	35										
Accessories / Special Service	36	Adjustable Valve					N/A				
	37	Valve Connection Size & Type					N/A				
	38	Pressure Gauge		Pressure Regulator			N/A		N/A		
	39	Painting					N/A				
	40	Tag Plate (316SS wired)					Included				
	41	Name Plate (316SS wired)					Included				
	42										
Purchase	43	Manufacturer					Brooks Instrument				
	44	Model No.					3809GCA10AGBC3D2C0AC				
	45	Serial No.									
	46	Purchase Order Number					PO 1724000791				
	47										

Notes :

No.	By	Date	Revision
D	KP	08/11/2024	Issued for Approval
C	KP	19/09/2024	Issued for Approval
B	KP	01/07/2024	Issued for Approval
A	KP	05/06/2024	Issued for Review

INSTRUMENT DATA SHEET FOR ROTAMETER

BROOKS® INSTRUMENT *Beyond Measure*

Doc. No.	Instrument Data Sheet	Rev.	D
		Sheet	3 of 7

General Data	1	Tag Number					25-FT-034			
	2	Service					NITROGEN TO HYDROGEN STORAGE VESSEL (V-25001D)			
	3	Area Classification					ATEX Zone2 - IIC (IIB+H2) T1			
	4	Line No.		Line Class			1"-HY-189-03HSS-N			
	5	Line Size		Line Schedule			1"		Thk (mm) = 3.38	
	6	P&ID No.					123A90-DDL-PR-PID-80019			
	7									
Process Data	8	Fluid		State			NITROGEN		GAS	
	9	Ambient Temperature (min/norm/max)					-8.4 / 10.5 / 25			°C
	10	Design Pressure								bar (G)
	11	Flow Rate	Min.	Nor.	Max.	Units		40		NM3/H
	12	Press.	Min.	Nor.	Max.	Units		0 - 3		bar (G)
	13	Temp.	Min.	Nor.	Max.	Units		15		°C
	14	Density	Min.	Nor.	Max.	Units				
	15	Molecular Weight	Min.	Nor.	Max.	Units				
	16	Viscosity	Min.	Nor.	Max.	Units				cP
	17	Pressure Drop					60			mbar
	18									
Meter	19	Type					Armoured Metal Tube Variable Area Flowmeters - Magnetic			
	20	Connection Size & Type					1" ANSI 300# RF Flange			
	21	Tube Material					316SS/316L SS Dual Cert.			
	22	Float Material					316L SS			
	23	Connection Material					316SS/316L SS Dual Cert.			
	24	Meter Scale Range					6.2 - 62			NM3/H
	25	Accuracy					1% F.S. / Direct Reading Scale			
	26	Inlet Direction		Outlet Direction			Bottom		Top	
	27									
Indicator / Transmitter	28	Output Signal					Local Indicator with 4-20mA / Hart 7			
	29	Calibration Range					6.2 - 62			NM3/H
	30	Power Supply					24 VDC Loop Power / 2 wired			
	31	Elect. Connection		Elect. Material			M20 x 1.5			N/A
	32	Elect. Protect Class					Div 1 ABCD / Zone 1 IIC, Flame-proof XP - ATEX/IECEX/CSA			
	33	Surge Protection Device					3809 Transmitter designed as per IEC61000-4.5			
	34	Indicator Housing					X-proof SS Housing, IP66/67			
	35									
Accessories / Special Service	36	Adjustable Valve					N/A			
	37	Valve Connection Size & Type					N/A			
	38	Pressure Gauge		Pressure Regulator			N/A		N/A	
	39	Painting					N/A			
	40	Tag Plate (316SS wired)					Included			
	41	Name Plate (316SS wired)					Included			
	42									
Purchase	43	Manufacturer					Brooks Instrument			
	44	Model No.					3809GCA10AGBC3D2C0AC			
	45	Serial No.								
	46	Purchase Order Number					PO 1724000791			
	47									

Notes :

No.	By	Date	Revision
D	KP	08/11/2024	Issued for Approval
C	KP	19/09/2024	Issued for Approval
B	KP	01/07/2024	Issued for Approval
A	KP	05/06/2024	Issued for Review

INSTRUMENT DATA SHEET FOR ROTAMETER

BROOKS® INSTRUMENT *Beyond Measure*

Doc. No.	Instrument Data Sheet	Rev.	D
		Sheet	4 of 7

General Data	1	Tag Number					25-FT-036			
	2	Service					NITROGEN TO HYDROGEN STORAGE VESSEL (V-25001F)			
	3	Area Classification					ATEX Zone2 - IIC (IIB+H2) T1			
	4	Line No.		Line Class			1"-HY-188-03HSS-N			
	5	Line Size		Line Schedule			1"		Thk (mm) = 3.38	
	6	P&ID No.					123A90-DDL-PR-PID-80018			
	7									
Process Data	8	Fluid		State			NITROGEN		GAS	
	9	Ambient Temperature (min/norm/max)					-8.4 / 10.5 / 25			°C
	10	Design Pressure								bar (G)
	11	Flow Rate	Min.	Nor.	Max.	Units		40		NM3/H
	12	Press.	Min.	Nor.	Max.	Units		0 - 3		bar (G)
	13	Temp.	Min.	Nor.	Max.	Units		15		°C
	14	Density	Min.	Nor.	Max.	Units				
	15	Molecular Weight	Min.	Nor.	Max.	Units				
	16	Viscosity	Min.	Nor.	Max.	Units				cP
	17	Pressure Drop					60			mbar
	18									
Meter	19	Type					Armoured Metal Tube Variable Area Flowmeters - Magnetic			
	20	Connection Size & Type					1" ANSI 300# RF Flange			
	21	Tube Material					316SS/316L SS Dual Cert.			
	22	Float Material					316L SS			
	23	Connection Material					316SS/316L SS Dual Cert.			
	24	Meter Scale Range					6.2 - 62			NM3/H
	25	Accuracy					1% F.S. / Direct Reading Scale			
	26	Inlet Direction		Outlet Direction			Bottom		Top	
	27									
Indicator / Transmitter	28	Output Signal					Local Indicator with 4-20mA / Hart 7			
	29	Calibration Range					6.2 - 62			NM3/H
	30	Power Supply					24 VDC Loop Power / 2 wired			
	31	Elect. Connection		Elect. Material			M20 x 1.5			N/A
	32	Elect. Protect Class					Div 1 ABCD / Zone 1 IIC, Flame-proof XP - ATEX/IECEX/CSA			
	33	Surge Protection Device					3809 Transmitter designed as per IEC61000-4.5			
	34	Indicator Housing					X-proof SS Housing, IP66/67			
	35									
Accessories / Special Service	36	Adjustable Valve					N/A			
	37	Valve Connection Size & Type					N/A			
	38	Pressure Gauge		Pressure Regulator			N/A		N/A	
	39	Painting					N/A			
	40	Tag Plate (316SS wired)					Included			
	41	Name Plate (316SS wired)					Included			
	42									
Purchase	43	Manufacturer					Brooks Instrument			
	44	Model No.					3809GCA10AGBC3D2C0AC			
	45	Serial No.								
	46	Purchase Order Number					PO 1724000791			
	47									

Notes :

No.	By	Date	Revision
D	KP	08/11/2024	Issued for Approval
C	KP	19/09/2024	Issued for Approval
B	KP	01/07/2024	Issued for Approval
A	KP	05/06/2024	Issued for Review

INSTRUMENT DATA SHEET FOR ROTAMETER

BROOKS® INSTRUMENT *Beyond Measure*

Doc. No.	Instrument Data Sheet	Rev.	D
		Sheet	5 of 7

General Data	1	Tag Number					25-FT-038				
	2	Service					NITROGEN TO HYDROGEN STORAGE VESSEL (V-25001E)				
	3	Area Classification					ATEX Zone2 - IIC (IIB+H2) T1				
	4	Line No.		Line Class			1"-HY-190-03HSS-N				
	5	Line Size		Line Schedule			1"		Thk (mm) = 3.38		
	6	P&ID No.					123A90-DDL-PR-PID-80020				
	7										
Process Data	8	Fluid		State			NITROGEN		GAS		
	9	Ambient Temperature (min/norm/max)					-8.4 / 10.5 / 25			°C	
	10	Design Pressure								bar (G)	
	11	Flow Rate	Min.	Nor.	Max.	Units		40		NM3/H	
	12	Press.	Min.	Nor.	Max.	Units		0 - 3		bar (G)	
	13	Temp.	Min.	Nor.	Max.	Units		15		°C	
	14	Density	Min.	Nor.	Max.	Units					
	15	Molecular Weight	Min.	Nor.	Max.	Units					
	16	Viscosity	Min.	Nor.	Max.	Units				cP	
	17	Pressure Drop					60			mbar	
	18										
Meter	19	Type					Armoured Metal Tube Variable Area Flowmeters - Magnetic				
	20	Connection Size & Type					1" ANSI 300# RF Flange				
	21	Tube Material					316SS/316L SS Dual Cert.				
	22	Float Material					316L SS				
	23	Connection Material					316SS/316L SS Dual Cert.				
	24	Meter Scale Range					6.2 - 62			NM3/H	
	25	Accuracy					1% F.S. / Direct Reading Scale				
	26	Inlet Direction		Outlet Direction			Bottom		Top		
	27										
Indicator / Transmitter	28	Output Signal					Local Indicator with 4-20mA / Hart 7				
	29	Calibration Range					6.2 - 62			NM3/H	
	30	Power Supply					24 VDC Loop Power / 2 wired				
	31	Elect. Connection		Elect. Material			M20 x 1.5			N/A	
	32	Elect. Protect Class					Div 1 ABCD / Zone 1 IIC, Flame-proof XP - ATEX/IECEX/CSA				
	33	Surge Protection Device					3809 Transmitter designed as per IEC61000-4.5				
	34	Indicator Housing					X-proof SS Housing, IP66/67				
	35										
Accessories / Special Service	36	Adjustable Valve					N/A				
	37	Valve Connection Size & Type					N/A				
	38	Pressure Gauge		Pressure Regulator			N/A		N/A		
	39	Painting					N/A				
	40	Tag Plate (316SS wired)					Included				
	41	Name Plate (316SS wired)					Included				
	42										
Purchase	43	Manufacturer					Brooks Instrument				
	44	Model No.					3809GCA10AGBC3D2C0AC				
	45	Serial No.									
	46	Purchase Order Number					PO 1724000791				
	47										

Notes :

				INSTRUMENT DATA SHEET FOR ROTAMETER		BROOKS INSTRUMENT Beyond Measure	
D	KP	08/11/2024	Issued for Approval				
C	KP	19/09/2024	Issued for Approval				
B	KP	01/07/2024	Issued for Approval				
A	KP	05/06/2024	Issued for Review			Sheet	6 of 7
No.	By	Date	Revision	Doc. No.	Instrument Data Sheet	Rev.	D

General Data	1	Tag Number					64-FG-001				
	2	Service					NITROGEN TO VENT KO DRUM (V-43001)				
	3	Area Classification					ATEX Zone2 - IIC (IIB+H2) T1				
	4	Line No.		Line Class			1"-N-101-01CS-N				
	5	Line Size		Line Schedule			1"		Thk (mm) = 4.55		
	6	P&ID No.					123A90-DDL-PR-PID-80028				
	7										
Process Data	8	Fluid		State			NITROGEN		GAS		
	9	Ambient Temperature (min/norm/max)					-8.4 / 10.5 / 25			°C	
	10	Design Pressure								bar (G)	
	11	Flow Rate	Min.	Nor.	Max.	Units		10		NM3/H	
	12	Press.	Min.	Nor.	Max.	Units		0 - 0.5		bar (G)	
	13	Temp.	Min.	Nor.	Max.	Units		15		°C	
	14	Density	Min.	Nor.	Max.	Units					
	15	Molecular Weight	Min.	Nor.	Max.	Units					
	16	Viscosity	Min.	Nor.	Max.	Units				cP	
	17	Pressure Drop					55			mbar	
	18										
Meter	19	Type					Armoured Metal Tube Variable Area Flowmeters - Magnetic				
	20	Connection Size & Type					1" ANSI 150# RF Flange				
	21	Tube Material					316SS/316L SS Dual Cert.				
	22	Float Material					316L SS				
	23	Connection Material					316SS/316L SS Dual Cert.				
	24	Meter Scale Range					1.5 - 15			NM3/H	
	25	Accuracy					1% F.S. / Direct Reading Scale				
	26	Inlet Direction		Outlet Direction			Bottom		Top		
	27										
Indicator / Transmitter	28	Output Signal					Local Indicator				
	29	Calibration Range					N/A			-	
	30	Power Supply					N/A				
	31	Elect. Connection		Elect. Material			N/A			N/A	
	32	Elect. Protect Class					N/A				
	33	Surge Protection Device					N/A				
	34	Indicator Housing					316SS Housing, Shatterproof Window, IP66/67				
	35										
Accessories / Special Service	36	Adjustable Valve					N/A				
	37	Valve Connection Size & Type					N/A				
	38	Pressure Gauge		Pressure Regulator			N/A		N/A		
	39	Painting					N/A				
	40	Tag Plate (316SS wired)					Included				
	41	Name Plate (316SS wired)					Included				
	42										
Purchase	43	Manufacturer					Brooks Instrument				
	44	Model No.					3809GCC08BFBC9A0V0AC				
	45	Serial No.									
	46	Purchase Order Number					PO 1724000791				
	47										

Notes :

No.	By	Date	Revision
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A	KP	05/05/2024	Issued for Review

INSTRUMENT DATA SHEET FOR ROTAMETER

BROOKS® INSTRUMENT *Beyond Measure*

Doc. No.	Instrument Data Sheet	Rev.	D
		Sheet	7 of 7

VA Web Sizing App v5.9

Step 4: Generate scale details

User input fields are shaded.

Fluid Name	NITROGEN, N2		
Temperature	10.5 °C	Density	0.004774 GM/CC
Back Pressure	3 BARG	Viscosity	0.01725 cP
Phase	Gas		
Flow Type	Standard VolumetricFlow		
Flow Rate	62 NM3/H		
Ref Cond	0 °C & 1 atm		
Prod Family	MT3809	Tube	Size 10-A
Size	10	Float	10-A, 316L SS

This application performs VA flow meter sizing calculations only. Product pressure and temperature limitations are not considered. This application is not intended to replace the selection by a qualified person.

Scale Details

Scale Details

```
Scale range: 6.2 - 62
NM3/H  N2 @ 10.5 °C & 3 BARG
```

Comments

Tag Numbers: 25-FT-031, 25-FT-032, 25-FT-033, 25-FT-034, 25-FT-036, 25-FT-038

VA Web Sizing App v5.9

Step 4: Generate scale details

User input fields are shaded.

Fluid Name	NITROGEN, N2		
Temperature	15 °C	Density	0.00177 GM/CC
Back Pressure	0.5 BARG	Viscosity	0.01742 cP
Phase	Gas		
Flow Type	Standard Volumetric Flow		
Flow Rate	15 NM3/H		
Ref Cond	0 °C & 1 atm		
Prod Family	MT3809	Tube	Size 8-B
Size	8	Float	8-B, 316L SS

This application performs VA flow meter sizing calculations only. Product pressure and temperature limitations are not considered. This application is not intended to replace the selection by a qualified person.

Scale Details

Scale Details

```
Scale range: 1.5 - 15
NM3/H N2 @ 15 °C & 0.5 BARG
```

Comments

Tag Number: 64-FG-001

Project Procedures and Specification

1.2.3 NDE PROCEDURE

Base Load Power Hub (BLPH)

NDE PROCEDURE
VARIABLE AREA FLOWMETERS 3809G

Document Number: 1724000791-NDT-PRO-00005

Document Class: 3

ROSETTI MARINO

1	NO COMMENTS - APPROVED - WORK MAY PROCEED
2	MINOR COMMENTS - REVISE AND RESUBMIT - WORK MAY PROCEED
3	MAJOR COMMENTS – REJECTED – DO NOT PROCEED
4	APPROVAL NOT REQUIRED

NOTE: Approval doesn't relieve the supplier from mandatory compliance with contractual documents and specifications. Comments made do not imply acceptance of any cost or delivery impact.

Sign	Date
Comandini Massimo Level III NDT EN - ISO9712 WI CSWIP 3.1	30-09-2024

Rev.	Date	Description	Prepared	Reviewed	Approved
02	24/9/2024	ISSUE FOR INFORMATION (IFI)	Róbert Seres	Mária Poór	Zsanett Molnár
01	25/7/2024	ISSUE FOR INFORMATION (IFI)	Róbert Seres	Mária Poór	Zsanett Molnár
00	10/5/2024	ISSUE FOR INFORMATION (IFI)	Róbert Seres	Mária Poór	Zsanett Molnár

BROOKS INSTRUMENT
Beyond Measure

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Table of Contents

SH.	DESCRIPTION	REVISIONS							
		00	01	02					
1	Cover	X	X	X					
2	Table of Contents	X	X	X					
3	Revision / Change Log	X	X	X					
4	Addendum		X	X					
5	Radiographic Examination Procedure	X	X	X					
38	LIQUID PENETRANT EXAMINATION PROCEDURE	X	X	X					
52	POSITIVE MATERIAL /DENT/FICA TION	X	X	X					

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Revision / Change Log

Rev.	Description
00	ISSUE FOR INFORMATION (IFI)
01	ISSUE FOR INFORMATION (IFI)
02	ISSUE FOR INFORMATION (IFI)

HOLDS LIST

No.	Description
1.	
2.	
3.	
4.	

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BROOKS INSTRUMENT
Beyond Measure

Document addendum

Form QA-18-A-004

	Subject	Addendum for NDE PROCEDURE
	Customer	Rosetti
	Company document nr.	1724000791-NDT-PRO-00005
	PO number	PO 1724000791
	Item description/scope	Flow Meter (Rotameter)
	TAG numbers	as per order

Radiographic Examination Procedure

3. Personnel

Replace with the following text:

Radiography shall be performed by a person with at least a Level II EN ISO 9712 qualified and certified personnel. Evaluation and interpretation shall be performed by a Level II or III qualified personnel in accordance with EN ISO 9712.

Liquid Penetrant Examination Procedure

5. REFERENCES

Replace with the following text:

(the latest version)
SNT-TC-1A
MSZ EN ISO 9712
ASTM E165/E165M
ASME Code Section V
ASME Code Section VIII, Div 1
EN ISO 3452-1:2021
EN ISO 3452-2:2021
EN ISO 3452-4
EN ISO 23277
ASME B31.3

7.5 EXAMINATION MATERIALS

Add the following text:

"Only In-date consumables showing a batch number that can be traced to a certificate of conformity shall be used"

REV	DATE	CREATED BY	INIT.
2	23/09/2024	Robert Seres	RS

Brooks Instrument B.V. | Einsteinstraat 53, 3902 HN | Veenendaal | The Netherlands | T +31 318 549 300
H.R. no. 09176866 | VAT no. NL818752324.B01 | BrooksInstrument.com

Radiographic Examination Procedure of items for Brooks Instrument Ltd.

APPLICABLE TO WELDS

This Procedure to be used for Work according to the requirements of ASME Code, Sections V. and VIII. Div. 1. Ed. 2021 or ASME B31.3-2020.

CONTENTS

1. Scope
2. General Requirements
3. Personnel
4. Equipment
5. Film selection
6. Calibration
7. Densitometer and Step Wedge Comparison Film
8. Examination
9. Image Quality Indicator (IQI) Selection
10. Use of IQIs to Monitor Radiographic Examination
11. Evaluation of film quality
12. Evaluation by AGMI Pte Co. Ltd. NDT Lab.
13. Selection of enegy of radiation
14. Extent of examination
15. Film processing
16. Documentation
17. Acceptance standards
18. Demonstration
19. Supplements

Dipl.-Ing. (FH) René Sallaberger, MSc Tel. +43 664 88356728 René Sallaberger	AGMI Freiwillig Sándor	Dipl.-Ing. (FH) René Sallaberger, MSc Tel. +43 664 88356728 René Sallaberger
Prepared by ASNT Level III 09.11.2022	Approved by QCM of AGMI Pte Co. L Date 12.12.2022.	Approved by ASNT Level III 04.12.2022

List of revisions:

Rev.	Description	Revised by:	Signature	Date
0	First edition	L. Lukovits		
1	Revision	L. Lukovits		
2	General revision	L. Lukovits		
3	ASME B31.3 2014	L. Lukovits		
4	ASME Code 2015	L. Lukovits		
5	ASME B31.3 2016	L. Lukovits		
6	General revision	Kövári, A.		
7	ASME B31.3 2020 and ASME, Sec. V + VIII. Div. 1. Ed. 2021	Rene Sallaberger		

1. Scope

This procedure is applicable to steel welds, manufactured for Brooks Instrument Ltd. in accordance with ASME Code Section VIII, Div. 1, UW-51, or alternatively B31.3 Table 341.3.2, Severe Cyclic Conditions and relevant Addenda's in conjunction with the referencing Code Section V., Article 2.
The nondestructive examination methods included in this procedure are applicable to most geometric configurations and materials encountered in fabrication in normal condition.
However, special configurations and materials may require modified methods and techniques, in which case special procedures shall be developed.

2. General Requirements

2.1 Procedure Requirements

All radiographic examination shall be performed in accordance with written procedure.
Each procedure shall include at least the following information, as applicable:

(a) material type and thickness range,
(b) isotope or maximum X-ray voltage used,
(c) Source to object distance (D in Para. 8.4.),
(d) Distance from source side of object to the film (d in Para. 8.4.),
(e) Source size (F in Para. 8.4.),
(f) film brand and designation, and
(g) screens used.

2.2 Procedure Demonstration

Demonstration of the density and IQI image requirements of the written procedure on production or technique radiographs shall be considered satisfactory evidence of compliance with that procedure.

2.3. Surface preparation for materials:

Surfaces shall satisfy the requirements of the applicable materials specification or referencing Code Section, with additional conditioning, if necessary, by any suitable process to such a degree that the images of surface irregularities cannot mask or be confused with the image of any discontinuity on the resulting radiograph.

2.4 Surface Preparation of Welds:

The weld ripples or weld surface irregularities on both the inside (where accessible) and outside shall be removed by any suitable process to such a degree that the images of surface irregularities cannot mask or be confused with the image of any discontinuity on the resulting radiograph.

The finished surface of all butt welded joints may be flush with the base material or may have reasonably uniform crowns, with reinforcement not to exceed that specified in the referencing Code Section.

Welds shall be cleaned for at least 1 in. (25mm) on each side.

If any radiograph shows ambiguous defect like indications, more surface conditioning and re-shooting is necessary.

2.5 Backscatter Radiation:

A lead symbol "B" with minimum dimension 11 mm in height and 1,5 mm in thickness, shall be attached to the back of each film holder during each exposure to determine if backscatter radiation is exposing the film. The lead symbol "B" shall be placed in a location so that it would appear within an area on the radiograph that meets the requirements of Para. 11.2.

2.6 System of Identification

A system shall be used to produce on each radiograph an identification that is traceable to the item being radiographed and that is permanent for the required retention period of the radiograph. This information shall include the contract, component, weld number, or part number, as appropriate. In addition the AGMI's symbol or name and the date of radiograph shall be plainly and permanently included with the identification information on each radiograph. The identification system does not necessarily require that the information appear as radiographic images. In any case, this information shall not obscure the area of interest.

2.7 Repair Identification

Radiographs of repairs shall be identified by the letter of R and may include -1,-2 etc. for the number of repair(s).

2.8 Monitoring Density Limitations of Radiographs:

Either a densitometer or step wedge comparison film shall be used for judging film density.

2.9 Extent of Examination

The extent of radiographic examination shall be as specified by referencing Code Section or by Customer.

3. Personnel

Radiography shall be performed by a person with at least a Level II SNT-TC-1A and/or EN ISO 9712:2013 qualified and certified personnel. Evaluation and interpretation shall be performed by a Level II or III qualified personnel in accordance with SNT-TC-1A and/or EN ISO 9712:2013.

4. Equipment

X-Ray equipment used are Eresco 300, maximum voltage 300 Kilovolts. Isotope containers TI and TIF for 1,5-3,7 TBq of Ir 192. Isotope container Gammamat TK100 for max 3,7 TBq of Co 60 sources shall be used.

5. Film Selection

5.1. Used films:

Radiograph shall be made using Class I. or Class II. (acc. to ASTM E-1815-18) industrial radiographic film with original package. In general film with lead screen shall be used, quality and degree of fineness of which shall correspond to the economical exposure time, to the density to be achieved and image quality.

Table 1: Industrial film classification

Film Type (ASTM E-1815-18)	Description		
	Speed	Contrast	Graininess
Class I. (AGFA Structurix D3, D4, D5) (Carestream Industrex M100, Mx125, T200) (FUJI IX50, IX 80)	Low	Very high	Very low
Class II. (AGFA Structurix D7) (Carestream Industrex AA 400) (FUJI IX100)	Medium	High	Low

5.2 Intensifying Screens

Intensifying screens may be used when performing radiographic examination in accordance with this written practice. Leads screens are used in direct contact with films.

5.3 Image Quality Indicator (IQI) Design

IQI shall be wire type, and it shall be manufactured and identified in accordance with the requirements or alternates allowed in SE-747, except the largest wire number or the identity number may be omitted. ASME standard IQI shall consist of those in Table No. 2. (ASME B&PV Code Sect. V., Art. 2, T-233.2) for wire type.

Table No.2: IQI Sizes
Wire Diameters

EN 462-1:1995/ ISO 19232-1:2013				ASME BPVC Sect. V. Art. 2. T-233.2			
			Dia [mm]				Dia [mm
				SET D	W21		8,13
					W20		6,35
					W19		5,08
					W18		4,06
W1	W1		3,20		W17	SET C	3,20
	W2		2,50		W16		2,54
	W3		2,00		W15		2,03
	W4		1,60		W14		1,60
			1,25		W13		1,27
	W6	W6	1,00		W12		1,02
	W7		0,80	SET B	W11		0,81
	W8		0,63		W10		0,64
	W9		0,50		W9		0,51
W10	W10		0,40		W8		0,41
	W11		0,32		W7		0,33
	W12		0,25		W6	SET A	0,25
	W13	W13	0,20		W5		0,20
	W14		0,16		W4		0,16
	W15		0,125		W3		0,13
	W16		0,10		W2		0,10
	W17		0,08		W1		0,08
	W18		0,063				
	W19		0,05				

5.4 Facilities for Viewing of Radiographs

Viewing facilities shall provide subdued background lighting of an intensity that will not cause reflections, shadows, or giere an the radiograph that interfere with the interpretation process. Equipment used to view radiographs for interpretation shall provide a variable light source sufficient for the designated wire to be visible for the specified density range. The viewing condition shall be such that light from around the outer edge of the radiograph or coming through low-density portions of the radiograph does not interfere with interpretation.

6. Calibration

6.1 Verification of Source Size

The equipment manufacturer's or supplier's publications, such as technical manuals, decay curves, or written statements documenting the actual or maximum source size or focal spot, shall be acceptable as source size verification.

6.2. Determination of Source Size

When manufacturer's or supplier's publications are not available, source size may be determined as follows:

6.2.1. X-Ray Machines for X-Ray

Machines operating at 1000 kV and less, the focal spot size may be determined by the pinhole method, or in accordance with SE-1165 (SE-1165 Standard Test Method for Measurement of Focal Spots of Industrial X-Ray Tubes by Pinhole Imaging).

6.2.2. Iridium-192 Sources

For Iridium-192; the source size may be determined in accordance with SE-1114. (SE- 1114 Standard Test Method for Determining the Focal Size of Iridium-192 Industrial Radiographic Sources.)
SE-1114, NOTE 1—The European standard EN 12679:2018 describes a simplified procedure for measurement of source size of Ir-192, Co-60 and Se-75. The resulting source size is comparable to the results obtained by SE-1114 test method.

7. Densitometer and Step Wedge Comparison Film

7.1. Densitometers

Densitometers shall be calibrated at least every 3 months during the use as follows:

a) A national step tablet or a step wedge calibration film, traceable to national standard tablet and having at least 5 steps with neutral densities from at least 1.0 through 4.0, shall be used. The step wedge calibration film shall have been verified within the last year by comparison with national standard step tablet unless, prior to the first use, it was maintained in the original light-tight and waterproof sealed package as sealed by the Manufacturer. Step wedge

calibration films may be used without verification for one year upon opening, provide it is within the manufacturer's stated shelf life.

b) The densitometer manufacturer's step-by-step instructions for the operation of the densitometer shall be followed.

c) The density steps closest to 1.0, 2.0, 3.0 and 4.0 on the national standard step tablet or step wedge calibration film shall be read.

d) The densitometer is acceptable if the density readings do not vary by more than ± 0,05 density units from the actual density stated on the national standard step tablet or step wedge calibration film.

7.2. Step Wedge Comparison Films

Step Wedge Comparison Films shall be verified prior to first use, unless performed by the manufacturer, as follows:

a) The density of the steps on a step wedge comparison film shall be verified by a calibrated densitometer.

b) The step wedge comparison film is acceptable if the density readings do not vary by more than ± 0,1 density units from the density stated on the step wedge comparison film.

7.3. Periodic Verification

a) Densitometers. Periodic calibration verification check shall be performed as described in point 7.1 at the beginning of each shift, after 8 hr of continuous use, or after change of apertures whichever comes first.

b) Step Wedge Comparison Films. Verification checks shall be performed annually per 7.2.

7.4. Documentation

a) Densitometers. Densitometer calibrations required by point 7.1 shall be documented, but the actual readings for each step do not have to be recorded. Periodic densitometer verification checks required by point 7.3(a) do not have to be documented.

b) Step Wedge Calibration Films. Step wedge calibration film verifications required by point 7.1(a) shall be documented, but the actual readings for each step do not have to be recorded.

c) Step Wedge Comparison Films. Step wedge comparison film verifications required by point 7.2 and 7.3(b) shall be documented, but the actual readings for each step do not have to be documented.

8. Examination

8.1. Radiographic Technique

Single wall exposure technique shall be used for radiography whenever practical. When it is not practical to use single wall technique, a double wall technique shall be used. An adequate number of exposures shall be made to demonstrate that the required coverage has been obtained.

(a) Single Wall Technique

In the single wall technique, the radiation passes through only one wall or the weld (material), which is viewed for acceptance on the radiograph.

(b) Double Wall Technique

When it is not practical to use a single wall technique, one of the double wall techniques shall be used:

(a) Single Wall Viewing

For materials and for welds in components, a technique may be used in which the radiation passes through two walls and only the weld (material) on the film side wall is viewed for acceptance on the radiograph. When complete coverage is required for circumferential welds (materials), a minimum of three exposures taken 120 deg. from each other shall be made.

(b) Double Wall Viewing of Welds

For materials and for welds in components 89 mm or less in nominal outside diameter, a technique may be used in which the radiation passes through two walls and the weld (material) in both walls is viewed for acceptance on the same radiograph. For double wall viewing, only a source side IQI shall be used. Care should be exercised to ensure that the required geometric unsharpness in not exceeded. If the geometric unsharpness requirement cannot be met, then single wall viewing shall be used.

1. For welds, the radiation beam may be offset from the plane of the weld at an angle sufficient to separate the images of the source side and film side portions of the weld so that there is no overlap of the areas to be interpreted. When complete coverage is required, a minimum of two exposures taken 90 deg. to each other shall be made for each joint.
2. As an alternative, the weld may be radiographed with the radiation beam positioned so that the images of both walls are superimposed. When complete coverage is required, a minimum of three exposures taken at either 60 deg. or 120 deg. to each other shall be made for each joint.
3. Additional exposures shall be made if the required radiographic coverage cannot be obtained using the minimum number of exposures indicated in (b)(1) or (b)(2) above.

8.2. Radiation Energy

The radiation energy employed for any radiographic technique shall achieve the density and IQI image requirements of this written practice.
Parameters shall be determined according to exposition diagrams of X-ray machine.

Minimum thickness			
Material	Ir 192	Co 60	X-ray (max. 300kV)
Steel	19 mm	38 mm	≤1 mm

When it is not practical to perform radiography within the limitation above , the procedure shall be proven satisfactory by actual demonstration of penetrameter resolution on the required thickness of the material radiographed.

8.3. Direction of Radiation

The direction of the central beam of radiation should be centered on the area of interest whenever practical.

8.4. Geometric Unsharpness

Geometric unsharpness of the radiograph shall be determined in accordance with:

$$Ug = F*d/D$$

Where
Ug = geometric unsharpness
F = source size. The maximum projected dimension of the radiating source (or effective focal spot) in the plane perpendicular to the distance D from the weld or object being radiographed
D = distance from the source of radiation to weld or object being radiographed
d = distance from source side of weld or object being radiographed to the film

8.4.1. *Geometric Unsharpness Limitations*
Geometric unsharpness of radiograph shall not exceed the following:

Table No. 3

Material thickness		Geometric Unsharpness Limitation U_g	
In.	mm	In.	mm
Under 2	Under 50,8	0,02	0,51
2 through 3	50,8 through 76,2	0,03	0,76
3 through 4	over 76,2 through 101,6	0,04	1,02
Over 4	Greater than 101,6	0,07	1,78

8.5. Location Markers

Location Markers (see Supplement No. 3. /Para. T-275 of ASME Code Section V, Art. 2/) which are to appear as radiographic images on the radiograph, shall be placed on the part, not on the exposure holder / cassette. Their location shall be permanently marked on the surface of the part being radiographed when permitted, or on map, in a manner permitting the area of interest on a radiograph to be accurately traceable to its location on the part, for the required retention period of the radiograph. Evidence shall also be provided on the radiograph that the required coverage of the region being examined has been obtained. Location markers shall be placed as follows.

8.5.1. Single-Wall Viewing

a. Source Side Markers
   Source Side Markers Location markers shall be placed on the source side when radiographing the following
   1. flat components or longitudinal joints in cylindrical or conical components;
   2. curved or spherical components whose concave side is toward the source and when the “source to material” is less then the inside radius of the component;
   3. curved or spherical components whose convex side is toward the source.

b. Film Side Markers
   1. Location markers shall be placed on the film side when radiographing either curved, or spherical components whose concave side is toward the source and when the "source to material" distance is greater, then the inside radius.
   2. As an alternative to source side placement in Para. 8.5.1 (a)(1), location markers may be placed on the film side when the radiograph shows coverage beyond the location markers to the extent demonstrated by Supplement No. 3. sketch (e), and when this alternate is documented in accordance with Para. 16

c. Either Side Markers Location markers may be placed on either the source side or film side when radiographing either curved or spherical components whose concave side is toward the source and the "source to material" distance equals the inside radius of the component.

8.5.2. Double Wall Viewing

For double wall viewing, at least one location marker shall be placed adjacent to the weld (or on the material in the area of interest) for each radiograph.

8.5.3. Mapping the Placement of Location Markers

When inaccessibility or other limitations prevent the placement of markers as stipulated in paragraphs *Single Wall Viewing* and *Double Wall Viewing*, a dimensioned map of the actual marker placement shall accompany the radiographs to show that full coverage have been obtained.

9. Image Quality Indicator (IQI) Selection

9.1. Material

IQIs shall be selected from either the same alloy material group or grade as identified in SE-747 or from an alloy material group or grade less radiation absorption than the material being radiographed. Use on all products made of carbon steel, low-alloy steels, stainless steels wire penetrameters shall be made of carbon steel or Type 300 series stainless steel - Materials group 1.

9.2. Size

The designated essential IQI wire be as specified in Supplement No. 2. (ASME Code Section V, Article 2, Table T-276.) For wire-type IQIs, a smaller-diameter wire may be substituted for the essential wire required for any section thickness listed in Table T-276.

a) Welds With Reinforcements. The thickness on which the IQI is based is the nominal single-wall material thickness plus the weld reinforcement thickness estimated to be present on both sides of the weld (I.D. and O.D.). The values used for the estimated weld reinforcement thicknesses shall be representative of the weld conditions and shall not exceed the maximums permitted by the referencing Code Section. Physical measurement of the actual weld reinforcements is not required. Backing rings or strips shall not be considered as part of the thickness in **IQI** selection.

b) Welds Without Reinforcement The thickness on which the **IQI** is based is the nominal single wall thickness. Backing rings or strips shall not be considered as part of the weld thickness in **IQI** selection.

c) Actual Values. With regard to (a) and (b) above, when the actual material/weld thickness is measured, IQI selection may be based on these known values.

The values used for the estimated weld reinforcement thicknesses shall be representative of the weld conditions and shall not exceed the maximums permitted by the referencing Code Section.

9.3. Welds Joining Dissimilar Materials or Welds With Dissimilar Filier Metal:

When the weld metal is of an alloy group or grade that has a radiation attenuation that differs from the base material, the IQI material selection shall be based on the weld metal and be in accordance with Para. 9.1. (IQI Selection, Material). When density limits of Para. 11.2.2 cannot be met with one IQI, and the exceptional density area(s) is at the interface of the weld metal and the base metal, the material selection for the additional IQIs shall be based on the base material, and be accordance with Para. 9.1 (IQI Selection, Material). The actual measurement of the weld reinforcement is not required.

10. Use of IQIs to Monitor Radiographic Examination

10.1. Placement of IQIs

a) Source Side IQIs: The IQIs shall be placed on the source side of the part being examined, except for the condition described in Para.10.1. (b) When due part or weld configuration or size, it is not practical to place the IQI(s) on the part or weld; the IQI(s) may be placed on a separate block. Separate blocks shall be made of the same radiographically similar materials (as defined in SE-1025) and may be used to facilitate IQI positioning. There is no restriction on the separate block thickness, provided the IQI / area of interest density tolerance requirements of Para. 11.2.2 are met.

(1)The IQI on the source side of the separate block shall be placed no closer to the film than the source side of the part being radiographed.

(2)The separate block shall be placed as close as possible to the part being radiographed.

b) Film side IQIs: Where inaccessibility prevents hand placing the IQI(s) on the source side, the IQI(s) shall be placed on the film side in contact with the part being examined. A lead letter "F" shall be placed adjacent to or on the IQI(s), but shall not mask it.

c) IQI Placement for Welds —Wire IQIs: The IQI(s) shall be placed on the weld so that the lengths of the wires transverse to the longitudinal axis of the weld. The identification numbers and, when used, the lead letter "F" shall not be in the area of interest, except when geometric configuration makes it impractical.

d) IQI placement for Material other than Welds: The IQI(s) with the IQI identification number(s), and, when used, the lead "F", may be placed in the area of interest.

10.2. Number of IQIs

When one or more film holders are used for an exposure, at least one IQI image shall appear on each radiograph except as outlined in (b) below:

(a) Multiple IQIs

If the requirements of Para. 11.2 are met by using more than one IQI, one shall be representative of the lightest area of interest and the other the darkest are of interest; the intervening densities on the radiograph shall be considered as having acceptable density.

(b) Special Cases

1. For cylindrical components where the source is placed on the axis of the component for a single exposure, at least three IQIs spaced approximately 120 deg. Apart, are required under the following conditions:
   (a) When the complete circumference is radiographed using one or more film holders, or;
   (b) When a section or sections of the circumference, where the length between the ends of the outermost sections span 240 or more deg., is radiographed using one or more film holders. Additional film locations may be required to obtain necessary IQI spacing.
2. For cylindrical components where the source is placed on the axis of the component for a single exposure, at least three IQIs, with one placed at each end of the span of the circumference radiographed and one in the approximate center of the span, are required under the following conditions:
   (a) When a section of circumference, the length of which is greater than 120 deg. and less then 240 deg. is radiographed using just one film holder, or;
   (b) (b)When a section or sections of the circumference, where the length between the ends of the outermost section spans is less than 240 deg., is radiographed using more than one film holder.
3. In (1) and (2) above, where sections of longitudinal welds adjoining the circumferential weld are radiographed simultaneously with the circumferential weld, an additional IQI shall be placed on each longitudinal weld at the end of the section most remote from the junction with the circumferential weld being radiographed.
4. For spherical components where source is placed at the center of the component for a single exposure, at least three IQIs, spaced approximately 120 deg. apart, are required under the following conditions:
   (a) When a complete circumference is radiographed using one or more film holders, or;
   (b) When a section or sections of a circumference where the length between the ends of the outermost sections span 240 or more deg, is radiographed using one or more film holders. Additional film locations may be required to obtain necessary IQI spacing.
5. For spherical components where the source is placed at the center of the component for a single exposure, at least three IQIs, with one placed at each end of the radiographed span of the circumference radiographed and one in the approximate center of the span, are required under the following conditions:
   (a) When a section of circumference, the length of which greater than 120 deg and less than 240 deg, is radiographed using just one film holder, or;
   (b) When a section or sections of a circumference, where the length between the ends of outermost sections span less than 240 deg is radiographed using more than one film holder.

6. In (4) and (5) above, where outer welds are radiographed simultaneously with the circumferential weld, one additional IQI shall be placed on each other weld.
7. For segments of a flat or curved (i.e. Ellipsoidal, tori-spherical et.) component where the source is placed perpendicular to the center of length of weld for a single exposure when using more than three film holders, at least three IQIs one placed at each end of the radiographed span and one in the approximate center of span required.
8. When an array of components in a circle is radiographed, at least one IQI shall show on each component image.
9. In order to maintain continuity of records involving subsequent exposures, all radiographs exhibiting IQIs that qualify the techniques permitted in accordance with (1) through (7) above shall be retained.

11. Evaluation of Film Quality

11.1. Quality of Radiographs

All radiographs shall be free from mechanical, chemical, or other blemishes to the extent that they do not mask and are not confused with the image of any discontinuity in the area of interest of the object being radiographed. Such blemishes include, but are not limited to:
(a) fogging
(b) processing defects such as streaks, watermarks, or chemical stains;
(c) scratches, finger marks, crimps, dirtiness, static marks, smudges, or tears;
(d) false indications due to defective screens.

11.2. Radiographic Density

Either a densitometer or step wedge comparison film shall be used for judging film density requirements.

11.2.1. Density Limitations

The transmitted film density through the radiographic image of the Body adjacent to the essential wire of a wire type IQI and the area of interest shall be 1,8 minimum for a single film viewing for radiographs made with X-ray source and 2,0 minimum for radiographs made with a gamma ray source. For composite viewing of multiple film exposures, each film of the composite set shall have a minimum density of 1,3. The maximum density shall be 4,0 for either single or composite viewing. A tolerance of 0,05 in density is allowed for variations between densitometer readings.

11.2.2. Density Variation

a) The density of the radiograph anywhere through the area of interest shall not
   (1) vary by more than minus 15% or plus 30% from the density through the Body of the adjacent to the essential wire of a wire-type IQI, and
   (2) exceed the minimum/maximum allowable density ranges specified in Para. Density Limitations
   When calculating the allowable variation in density, the calculation may be rounded to the nearest 0.1 within the range specified in Para. Density Limitations

b) When the requirements of (a) above are not met, then an additional IQI shall be used for each exceptional area or areas and the radiograph retaken.

11.3. IQI Sensitivity

11.3.1. Required Sensitivity

Radiography shall be performed with a technique of sufficient sensitivity to display the essential wire of wire type IQI. The radiographs shall also display the IQI identifying numbers and letters. If the essential wire of a wire type IQI, do not show on any film in a multiple film technique, but do show in composite film viewing, interpretation shall be permitted only by composite film viewing.

For wire-type IQIs, the essential wire shall be visible within the area of interest representing the thickness used for determining the essential wire, inclusive of theallowable density variations described in T-282.2.

11.3.2. Excessive Backscatter

If a light image of the "B", as described in Para. 2 Backscatter Radiation, appears on a darker background of the radiograph, protection from backscatter is insufficient and the radiograph shall be considered unacceptable. A dark image of the "B" on a lighter background is not cause for rejection.

12. Evaluation by AGMI Pte Co. Ltd. NDT Lab.

Our company — AGMI Pte Co. Ltd. NDT Lab. — is responsible for the review, interpretation, evaluation, and acceptance of the completed radiographs to assure compliance with the requirements of Section V, Article 2 and referencing Code Section. As an aid to the review and evaluation, the radiographic technique documentation required by Para. 16 shall be completed prior the evaluation. The radiographic technique details and the radiograph review form documentation shall accompany the radiographs. Acceptance shall be completed prior to presentation of the radiographs and accompanying documentation to the Inspector.

13. Selection of energy of radiation

Note: Material thickness is the thickness on which the IQI is based.

13.1. X-Radiation:

The radiographic energy employed for any radiographic technique shall demonstrate that the required radiographic sensitivity and density requirements have been obtained in accordance with this procedure.
NOTE: Overall radiographic sensitivity is influenced by factors such as film selection, intensifying screen selection, geometric unsharpness and film density.

13.2. Gamma Radiation.

13.2.1. The recommended minimum thicknesses for which radioactive isotopes may be used are as follows:

Material	Iridium-192	Cobalt-60
Steel	0.75 in. (19mm)	1.5 in. (38mm)

13.2.2. The maximum thickness for the use of radioactive isotopes is primarily dictated by exposure time; therefore, the upper material limits are not listed. The minimum recommended thickness limitations may be reduced when the radiographic technique used demonstrates that the required radiographic sensitivity and density requirements have been obtained.
NOTE: Overall radiographic sensitivity is influenced by factors such as: film selection, intensifying screen selection, geometric unsharpness and film density.

13.3. Special Cases

Under special conditions when it is not practical to perform radiography within the limitations outlined in 5.2 or when radioactive isotopes other than Iridium-192 or Cobalt-60 are used, the procedure shall be proven satisfactory by actual demonstration of IQI resolution an the minimum material thickness being rad iographed.

14. Extent of examination

According to the approved drawings and/or welding plans.

15. Film Processing

To produce a satisfactory radiograph, the care used in making the exposure must be followed by equal care in processing.

15.1. Automatic processing

The essence of the automatic processing is control. Film characteristic must be compatible with processing conditions. It is essential that the recommendation of the film, processor and chemical manufacturers be followed.

Drying can vary from still air at ambient temperature to as high as 60°C with air circulated by fan

16. Documentation

16.1. Radiographic Technique Documentation Details

Radiographic technique details shall be prepared and documented. As a minimum, the following information shall be provided.

(a) Identification, e.g. job/contract number and heat number (in accordance with para. 2.6)
(b) Dimensional Map (if used of marker placement in accordance with para. 8.5.3)
(c) Number of radiographs (exposures)
(d) X-ray voltage or isotope type used
(e) X-ray machine focal spot size or isotope physical source size
(f) Base material type and thickness, weld thickness, weld reinforcement thickness, as applicable
(g) Source to object distance (D in Para. 8.4.)
(h) Distance from source side of object to the film (d in Para 8.4.)
(i) Film manufacturer and Manufacturer's type/designation
(j) Number of film in each film holder/cassette
(k) Single or double wall exposure
(l) Single or double wall viewing
(m)Date of examination
(n) Identification of the weld, part, or component examined including weld number, serial number or other identifier.
(o) Examination method, technique, procedure identification, and revision
(p) Name and/or identity and certification level for personnel performing the examination
(q) Result of the examination

Test reports and films shall be sent to Customer.

16.2. Identification of Radiographs

The radiographs shall be marked to identify precisely with the weld which they represent giving at least the following information:

(a) AGMI Pte Co. Ltd.´s symbol or name
(b) job number or film number
(c) weld identification letters and numbers
(d) location markers
(e) repairs (see Note)
(f) date of the radiograph

The identification system does not necessarily require that the information appear as radiographic images.
The identification shall not obscure the area of interest.
Note: All radiographs of repair areas shall be marked with the letter "R" followed by number identifying the number of repairs: -R1- is the first repair of same area etc.

17. Acceptance standards

17.1. Acceptance Criteria according to Section VIII. Div. 1 UW 51, Radiographic examination of welded joints

a) All welded joints to be radiographed shall be examined in accordance with this procedure.
   (1) A complete set of radiographic images and examination records, as described in Section V, Article 2, for each vessel or vessel part shall be retained by the Manufacturer, as follows:
      (-a) radiographic images until the Manufacturer's Data Report has been signed by the Inspector
      (-b) examination records as required by this Procedure
   (2) A written radiographic examination procedure is not required. Demonstration of acceptable density on radiographic films and the ability to see the prescribed image quality indicator (IQI) image and the specified hole or the designated wire of a wire IQI shall be considered satisfactory evidence of compliance with Section V, Article 2.
   (3) The requirements of Para. 8.4.1. (Section V, Article 2, T-274.2), are to be used only as a guide for film-based radiography.

b) Indications revealed by radiography within a weld that exceed the following criteria are unacceptable and therefore are defects. Defects shall be repaired as provided in UW-38, and the repaired area shall be reexamined.
   (1) Any indication characterized as a crack or zone of incomplete fusion or penetration;
   (2) Any other elongated indication on the radiograph which has length greater than:
      (-a) 1/4 in. (6 mm) fort up to 3/4 in. (19 mm)
      (-b) 1/3t for t from 3/4 in. (19 mm) to 21/4 in.(57 mm)
      (-c) 3/4 in. (19 mm) fort over 21/4 in. (57 mm),
      where:
      t = the thickness of the weld excluding any allowable reinforcement. For a butt weld joining two members having different thicknesses at the weld, t is the thinner of these two thicknesses. If a full penetration weld includes a fillet weld, the thickness of the throat of the fillet shall be included in "t" .
   (3) Any group of aligned indications that have an aggregate length greater than t in a length of 12t, except when the distance between the successive imperfections exceeds 6L where L is the length of the longest imperfection in the group;
   (4) Rounded indications in excess of that specified by the acceptance standards given in Supplement No. 4.

17.2. Acceptance standards of butt welds according to ASME Code B31.3

17.2.1. Weldments

17.2.1.1 Extent of Radiography

(a) 100% Radiography. This applies only to girth and miter groove welds and to fabricated branch connection welds comparable to Fig. 328.5.4E, unless otherwise specified in the engineering design.

(b) Random Radiography. This applies only to girth and miter groove welds.

(c) Spot Radiography. This requires a single exposure radiograph in accordance with para. 17.5.1.2.2 at a point within a specified extent of welding. For girth, miter, and branch groove welds the minimum requirement is

(1) for sizes 65 (NPS 21/2), a single elliptical exposure encompassing the entire weld circumference

(2) for sizes >DN 65, the lesser of 25% of the inside circumference or 152 mm (6 in.)

For longitudinal welds the minimum requirement is 152 mm (6 in.) of weld length.

17.2.1.2 Spot Radiography

(a) Longitudinal Welds. Spot radiography for longitudinal groove welds required to have a weld joint factor Ej of 0.90 requires examination by radiography in accordance with para. 17.5.1.2.1 of at least 300 mm (1 ft) in each 30m (100 ft) of weld for each welder or welding operator. Acceptance criteria are those stated in Supplement 10 for radiography under Normal Fluid Service.

(b) Circumferential Butt Welds and Other Welds. It is recommended that the extent of examination be not less than one shot on one in each 20 welds for each welder or welding operator. Unless otherwise specified, acceptance criteria are as stated in Supplement No. 5 (Table 341.3.2 of ASME B31.3) for radiography under Normal Fluid Service for the type of joint examined.

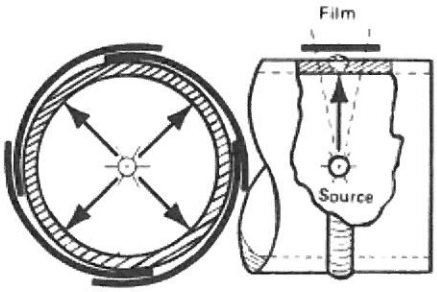
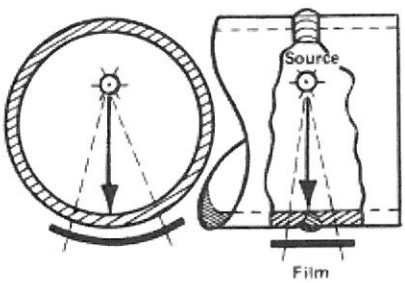
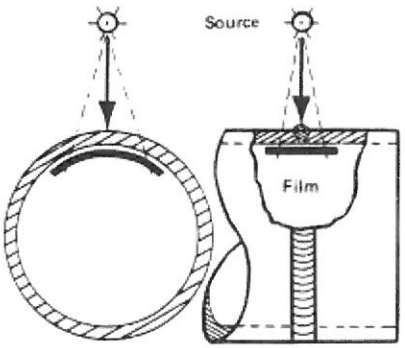
(c) Welds to Be Examined. The locations of welds and the points at which they are to be examined by spot radiography shall be selected or approved by the Inspector.

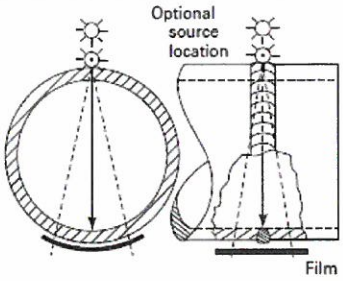
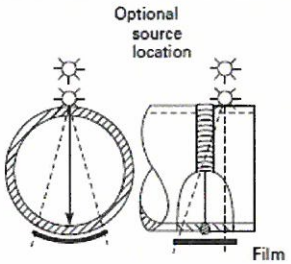
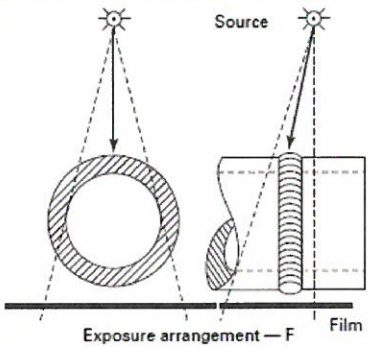
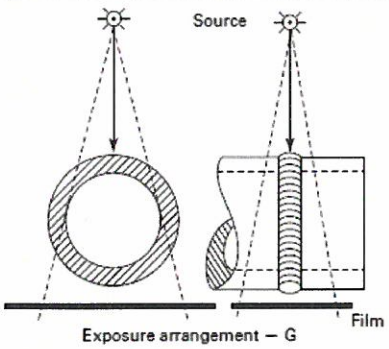
18. Demonstration

Demonstration of the density and IQI image requirements of the written procedure on production or technique radiographs shall be considered satisfactory evidence of compliance with this procedure.

This procedure may be demonstrated to the satisfaction of the Authorized Inspector, according to T-221.2 (Section V)

Supplement No. 1: Radiographic techniques

Pipe O.D.	Exposure Technique	Radiograph Viewing	Source-Weld-Film Arrangement		IQI		Location Marker Placement
			End View	Side View	Selection	Placement	
Any	Single-Wall T-271.1	Single-Wall	 Exposure Arrangement — A		T-276 and Table T-276	Source Side T-277.1(a) Film Side T-277.1(b)	Either Side T-275.3 T-275.1(c)
Any	Single-Wall T-271.1	Single-Wall	 Exposure Arrangement — B		T-276 and Table T-276	Source Side T-277.1(a) Film Side T-277.1(b)	Film Side T-275.1 (b)(1)
Any	Single-Wall T-271.1	Single-Wall	 Exposure Arrangement — C		T-276 and Table T-276	Source Side T-277.1(a) Film Side T-277.1(b)	Source Side T-275.1 (a)(3)

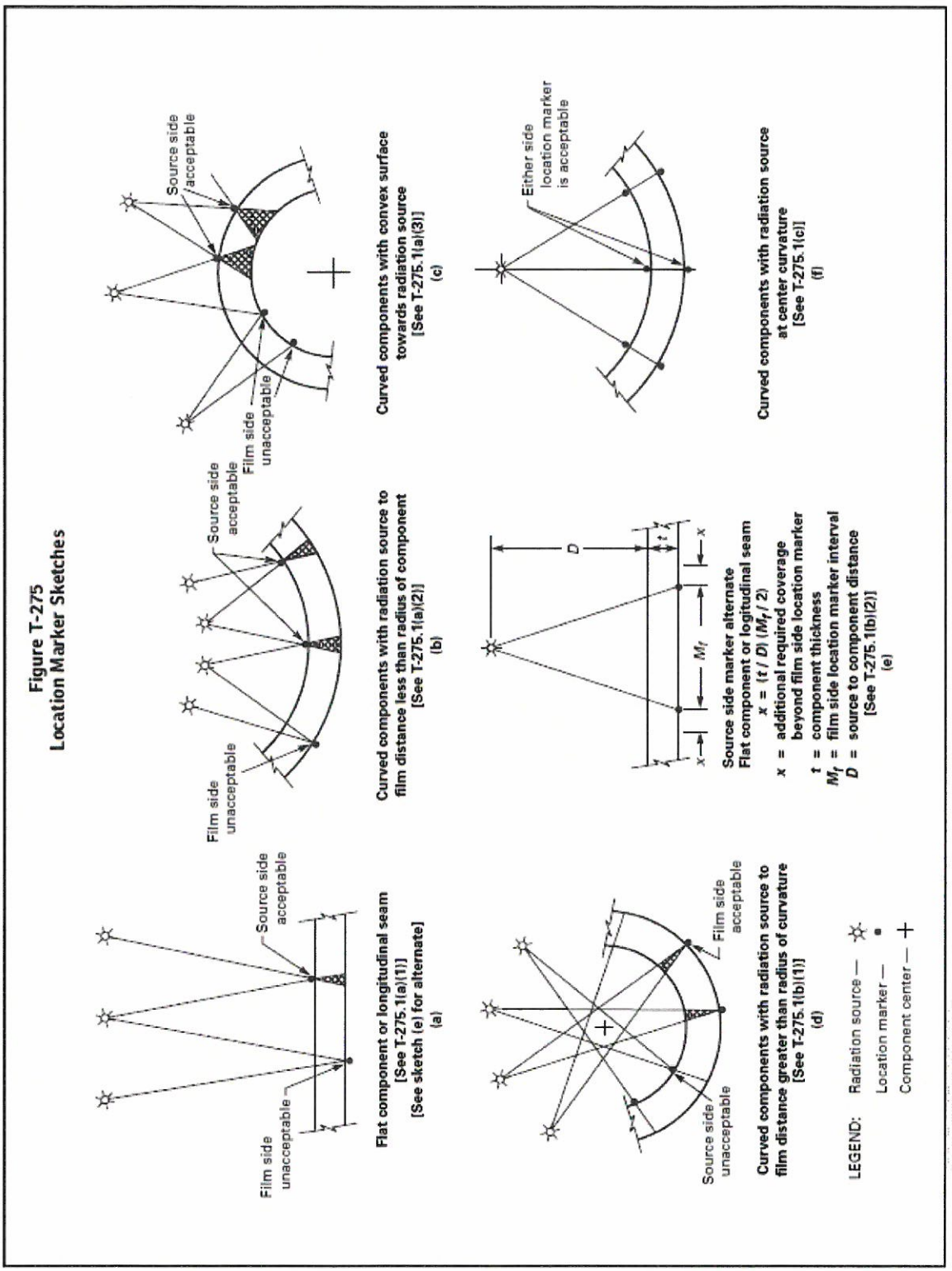
O.D.	Exposure Technique	Radiograph Viewing	Source-Weld-Film Arrangement		IQI		Location Marker Placement
			End View	Side View	Selection	Placement	
Any	Double- Wall: T-271.2(a) at Least 3 Exposures 120 deg to Each Other for Complete Coverage	Single-Wall	 Exposure arrangement — D		T-276 and Table T-276	Source Side T-277.1(a) Film Side T-277.1(b)	Film Side T-275.1(b) (1)
Any	Double- Wall: T-271.2(a) at least 3 Exposures 120 deg to Each Other for Complete Coverage	Single-Wall	 Exposure arrangement — E		T-276 and Table T-276	Source Side T-277.1(a) Film Side T-277.1(b)	Film Side T-275.1(b) (1)
3½ in. (89 mm) or Less	Double-Wall T-271.2(b)(1) at Least 2 Exposures at 90 deg to Each Other for Complete Coverage	Double-Wall (Ellipse): Read Offset Source Side and Film Side Images	 Exposure arrangement — F		T-276 and Table T-276	Source Side T-277.1(a)	Either Side T-275.2
3½ in. (89 mm) or Less	Double-Wall: T-271.2(b)(2) at Least 3 Exposures at 60 deg or 120 deg to Each Other for Complete Coverage	Double-Wall: Read Super-imposed Source Side and Film Side Images	 Exposure arrangement — G		T-276 and Table T-276	Source Side T-277.1(a)	Either Side T-275.2

Supplement No. 2: IQI Selection

Table T-276
IQI Selection

Nominal Single-Wall Material Thickness Range, in. (mm)	IQI					
	Source Side			Film Side		
	Hole-Type Designation	Essential Hole	Wire-Type Essential Wire	Hole-Type Designation	Essential Hole	Wire-Type Essential Wire
≤0.25 (≤6.4)	12	2T	5	10	2T	4
>0.25 through 0.375 (>6.4 through 9.5)	15	2T	6	12	2T	5
>0.375 through 0.50 (>9.5 through 12.7)	17	2T	7	15	2T	6
>0.50 through 0.75 (>12.7 through 19.0)	20	2T	8	17	2T	7
>0.75 through 1.00 (>19.0 through 25.4)	25	2T	9	20	2T	8
>1.00 through 1.50 (>25.4 through 38.1)	30	2T	10	25	2T	9
>1.50 through 2.00 (>38.1 through 50.8)	35	2T	11	30	2T	10
>2.00 through 2.50 (>50.8 through 63.5)	40	2T	12	35	2T	11
>2.50 through 4.00 (>63.5 through 101.6)	50	2T	13	40	2T	12
>4.00 through 6.00 (>101.6 through 152.4)	60	2T	14	50	2T	13
>6.00 through 8.00 (>152.4 through 203.2)	80	2T	16	60	2T	14
>8.00 through 10.00 (>203.2 through 254.0)	100	2T	17	80	2T	16
>10.00 through 12.00 (>254.0 through 304.8)	120	2T	18	100	2T	17
>12.00 through 16.00 (>304.8 through 406.4)	160	2T	20	120	2T	18
>16.00 through 20.00 (>406.4 through 508.0)	200	2T	21	160	2T	20

Supplement No. 3: Location markers



Supplement No. 4: Rounded indications charts acceptance standard for radiographically determined rounded indications in welds

Terminology

(a) Rounded Indications: Indications with a maximum length of three times the width or less an the radiograph are defined as rounded indications. These indications may be circular, elliptical, conical, or irregular in shape and may have teils. When evaluating the size of an indication, the tail shall be included. The indication may be from any imperfection in the weld, such as porosity, slag, or tungsten.

(b) Aligned Indications: A sequence of four or more rounded indications shall be considered to be aligned when they touch a line parallel to the length of the weld drawn through the center of the two outer rounded indications.

(c) Thickness t: t is the thickness of the weld, excluding any allowable reinforcement. For a butt weld joining two members having different thicknesses at the weld, t is the thinner of these two thicknesses. If a full penetration weld includes a fillet weld, the thickness of the throat of the fillet shall be included in t.

S4.1. Acceptance criteria

(a) Image Density: Density within the image of the indication may vary and is not a criterion for acceptance or rejection.

(b) Relevant Indications: (See Table 4-1 for examples) Only those rounded indications which exceed the following dimensions shall be considered relevant.
  (1) 1/10t for t less than 1/8 in. (3 mm)
  (2) 1/64 in. (0,4 mm) for t from 1/8 in. (3mm) to 1/4 in. (6 mm), incl.
  (3) 1/32 in. (0,8 mm) for t greater than 1/4 in. (6 mm) to 2 in. (50 mm), incl.
  (4) 1/16 in. (1,6 mm) for t greater than 2 in. (50 mm)

(c) Maximum Size of Rounded Indication: (See Table 4-1 for examples.) The maximum permissible size of any indication shall be 1/4 t, or 5/32 in. (4 mm), whichever is smaller; except that an isolated indication separated from an adjacent indication by 1 in. (25 mm) or more may be 1/3 t, or 1/4 in. (6 mm), whichever is less. For tgreater than 2 in. (50 mm) the maximum permissible size of an isolated indication shall be increased to 3/8 in. (10 mm).

(d) Aligned Rounded Indications: Aligned rounded indications are acceptable when the summation of the diameters of the indications is less than t in a length of 12t . See Figure 4-1. The length of groups of aligned rounded indications and the spacing between the groups shall meet the requirements of Figure 4-2.

(e) Spacing: The distance between adjacent rounded indications is not a factor in determining acceptance or rejection, except as required for isolated indications or groups of aligned indications.

(f) Rounded Indication Charts: The rounded indications characterized as imperfections shall not exceed that shown in the charts. The charts in Figures 4-3 through 4-8 illustrate various types of assorted, randomly dispersed and clustered rounded indications for different weld thicknesses greater than 1/8 in. (3 mm). These charts represent the maximum acceptable concentration limits for rounded indications. The charts for each thicknessrange represent full-scale 6 in.

(150 mm) radiographs, and shall not be enlarged or reduced. The distributions shown are not necessarily the patterns that may appear an the radiograph, but are typical of the concentration and size of indications permitted.

(g) Weld Thickness t Less Than 1/8 in. (3mm): For t less than 1/8 in. (3 mm) the maximum number of rounded indications shall not exceed 12 in a 6 in. (150 mm) length of weld. A proportionally fewer number of indications shall be permitted in welds less than 6 in. (150 mm) in length.

(h) Clustered indications: The illustrations for clustered indications show up to four times as many indications in a local area, as that shown in the illustrations for random indications. The length of an acceptable cluster shall not exceed the lesser of 1 in. (25 mm) or 2t. Where more than one cluster is present, the sum of the lengths of the clusters shall not exceed 1 in. (25 mm) in a 6 in. (150 mm) length weld.

Table 4-1

Customary Units

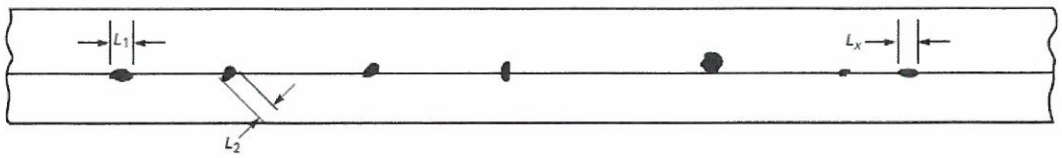
Thickness, *t*, in.	Maximum Size of Acceptable Rounded Indication, in.		Maximum Size of Nonrelevant Indication, in.
	Random	Isolated	
Less than 1/8	1/4 *t*	1/3 *t*	1/10 *t*
1/8	0.031	0.042	0.015
3/16	0.047	0.063	0.015
1/4	0.063	0.083	0.015
5/16	0.078	0.104	0.031
3/8	0.091	0.125	0.031
7/16	0.109	0.146	0.031
1/2	0.125	0.168	0.031
9/16	0.142	0.188	0.031
5/8	0.156	0.210	0.031
11/16	0.156	0.230	0.031
3/4 to 2, incl	0.156	0.250	0.031
Over 2	0.156	0.375	0.063

SI Units

Thickness, *t*, mm	Maximum Size of Acceptable Rounded Indication, mm		Maximum Size of Nonrelevant Indication, mm
	Random	Isolated	
Less than 3	1/4 *t*	1/3 *t*	1/10 *t*
3	0.79	1.07	0.38
5	1.19	1.60	0.38
6	1.60	2.11	0.38
8	1.98	2.64	0.79
10	2.31	3.18	0.79
11	2.77	3.71	0.79
13	3.18	4.27	0.79
14	3.61	4.78	0.79
16	3.96	5.33	0.79
17	3.96	5.84	0.79
19.0 to 50, incl.	3.96	6.35	0.79
Over 50	3.96	9.53	1.60

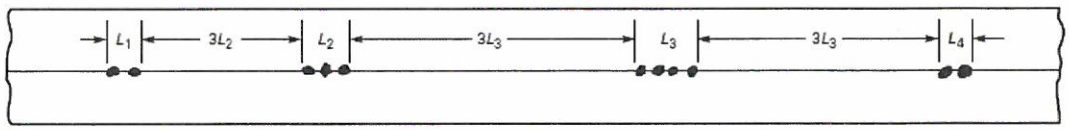
GENERAL NOTE: This Table contains examples only.

Figure 4-1: Aligned rounded indications



GENERAL NOTE: Sum of L_1 to L_x shall be less than t in a length of $12t$.

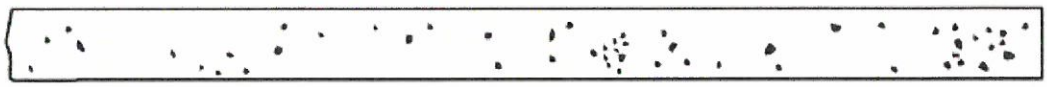
Figure 4-2: Groups of aligned rounded indications



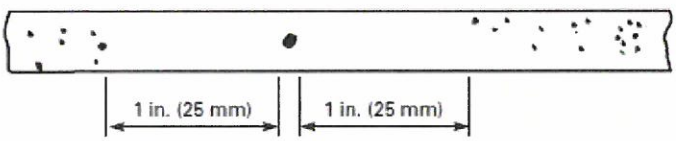
Maximum Group Length	Minimum Group Spacing
L = 1/4 in. (6 mm) for t less than 3/4 in. (19 mm) L = 1/3t for t 3/4 in. (19 mm) to 2 1/4 in. (57 mm) L = 3/4 in. (19 mm) for t greater than 2 1/4 in. (57 mm)	$3L$ where L is the length of the longest adjacent group being evaluated

GENERAL NOTE: Sum of the group lengths shall be less than t in a length of $12t$.

Figure 4-3: Charts for t equal to 1/8 in. (3 mm) to 1/4 in. (6 mm), inclusive



(a) Random Rounded Indications [See Note (1)]



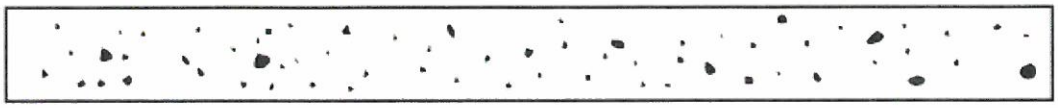
(b) Isolated Indication [See Note (2)]



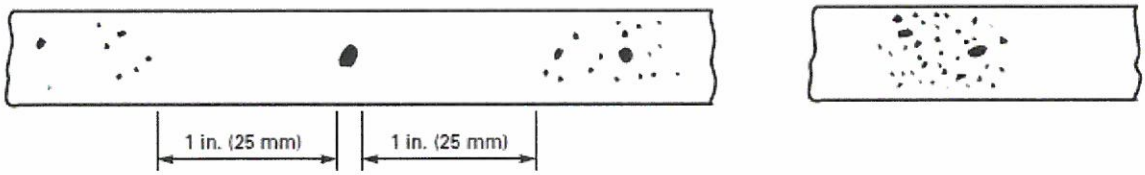
(c) Cluster

NOTES:
(1) Typical concentration and size permitted in any 6 in. (150 mm) length of weld.
(2) Maximum size per Table 4-1.

Fiqure 4-4: Charts for t over 1/4 in. (6 mm) to 3/8 in. (10 mm), inclusive



(a) Random Rounded Indications [See Note (1)]

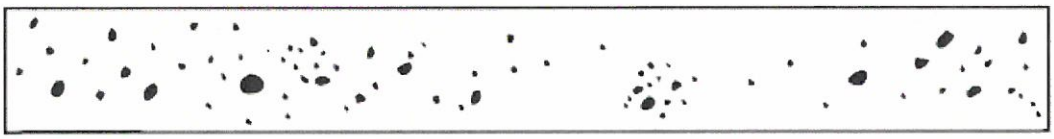


(b) Isolated Indication [See Note (2)]

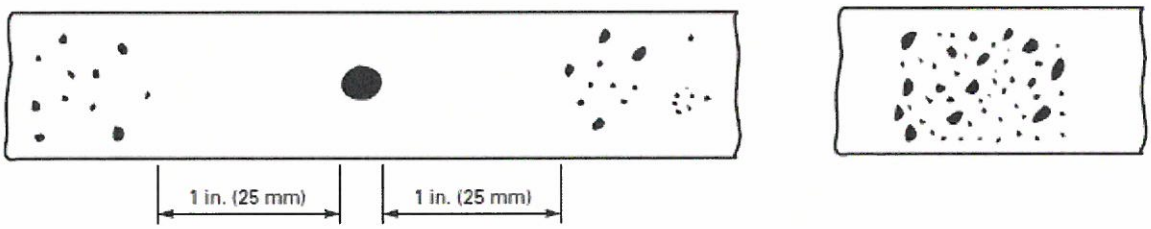
(c) Cluster

NOTES:
(1) Typical concentration and size permitted in any 6 in. (150 mm) length of weld.
(2) Maximum size per Table 4-1.

Figure 4-5: Charts for t over 3/8 in. (10 mm) to 3/4 in. (19 mm), inclusive



(a) Random Rounded Indications [See Note (1)]

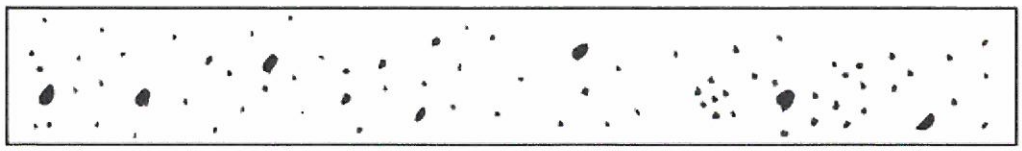


(b) Isolated Indication [See Note (2)]

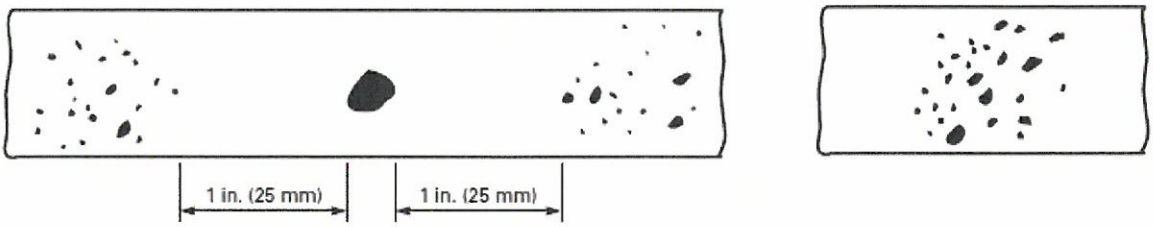
(c) Cluster

NOTES:
(1) Typical concentration and size permitted in any 6 in. (150 mm) length of weld.
(2) Maximum size per Table 4-1.

Fiqure 4-6: Charts for t over 3/4 in. (19 mm) to 2 im. (50 mm), inclusive



(a) Random Rounded Indications [See Note (1)]

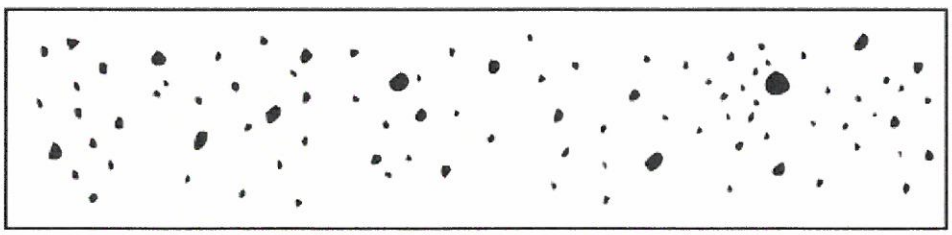


(b) Isolated Indication [See Note (2)]

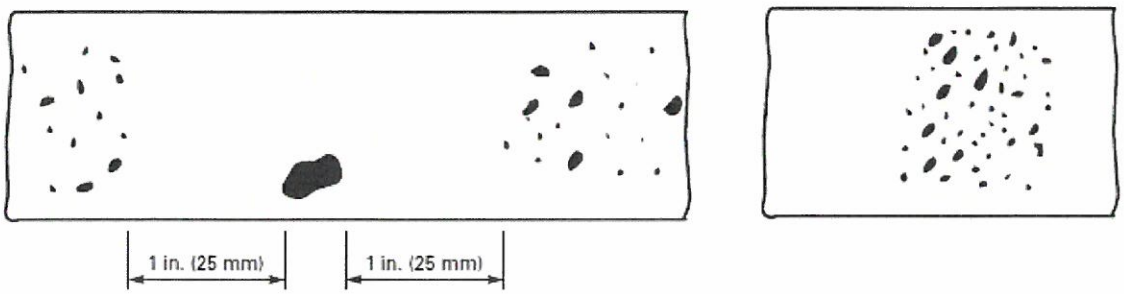
(c) Cluster

NOTES:
(1) Typical concentration and size permitted in any 6 in. (150 mm) length of weld.
(2) Maximum size per Table 4-1.

Figure 4-7: Charts for t over 2 in. (50 mm) to 4 in. (100 mm), inclusive



(a) Random Rounded Indications [See Note (1)]

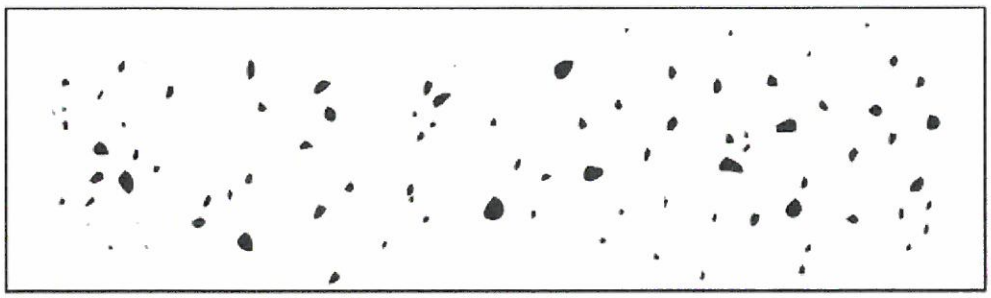


(b) Isolated Indication [See Note (2)]

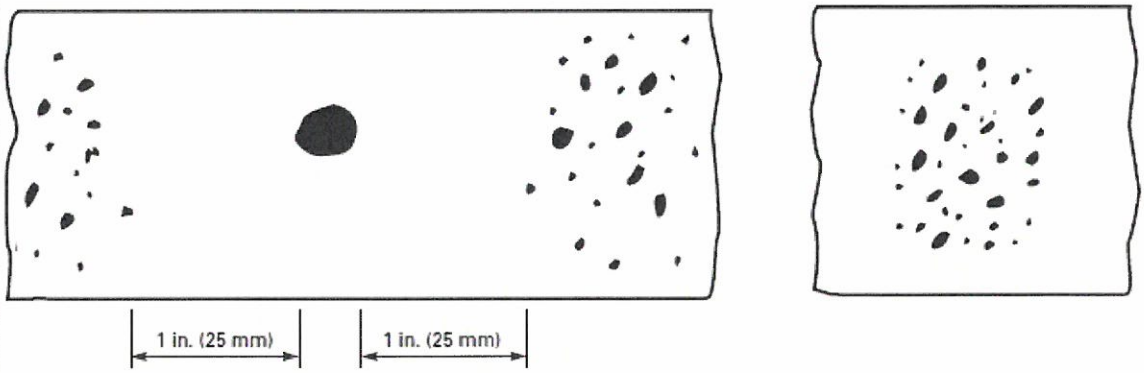
(c) Cluster

NOTES:
(1) Typical concentration and size permitted in any 6 in. (150 mm) length of weld.
(2) Maximum size per Table 4-1.

Figure 4-8: Charts for t over 4 in. (100 mm)



(a) Random Rounded Indications [See Note (1)]



(b) Isolated Indication [See Note (2)]

(c) Cluster

NOTES:
(1) Typical concentration and size permitted in any 6 in. (150 mm) length of weld.
(2) Maximum size per Table 4-1.

Supplement No. 5: Acceptance Criteria for Weldings in accordance with ASME B 31.3-2020

Criteria (A to M) for Types of Welds and for Service Conditions [Note (1)]											Examination Methods	
Normal and Category M Fluid Service			Severe Cyclic Conditions			Category D Fluid Service				Weld Imperfection		
Girth, Miter Groove, and Branch Connection Welds [Note (2)]	Longitudinal Groove Weld [Note (3)]	Fillet Weld [Note (4)]	Girth, Miter Groove, and Branch Connection Welds [Note (2)]	Longitudinal Groove Weld [Note (3)]	Fillet Weld [Note (4)]	Girth and Miter Groove Welds	Longitudinal Groove Weld [Note (3)]	Fillet Weld [Note (4)]	Branch Connection Weld [Note (2)]		Visual	Radiography
A	A	A	A	A	A	A	A	A	A	Crack	✓	✓
A	A	A	A	A	A	C	A	N/A	A	Lack of fusion	✓	✓
B	A	N/A	A	A	N/A	C	A	N/A	B	Incomplete penetration	✓	✓
E	E	N/A	D	D	N/A	N/A	N/A	N/A	N/A	Rounded Indications	...	✓
G	G	N/A	F	F	N/A	N/A	N/A	N/A	N/A	Linear indications	...	✓
H	A	H	A	A	A	I	A	H	H	Undercutting	✓	✓
A	A	A	A	A	A	A	A	A	A	Surface porosity or exposed slag inclusion [Note (5)]	✓	...
N/A	N/A	N/A	J	J	J	N/A	N/A	N/A	N/A	Surface finish	✓	...
K	K	N/A	K	K	N/A	K	K	N/A	K	Concave surface, concave root, or burn-through	✓	✓
L	L	L	L	L	L	M	M	M	M	Weld reinforcement or internal protrusion	✓	...

GENERAL NOTES:

(a) Weld imperfections are evaluated by one or more of the types of examination methods given, as specified in paras. 341.4.1, 341.4.2, 341.4.3, and M341.4, or by the engineering design.
(b) "N/A" indicates the Code does not establish acceptance criteria or does not require evaluation of this kind of imperfection for this type of weld.
(c) Check (✓) indicates examination method generally used for evaluating this kind of weld imperfection.
(d) Ellipsis (...) indicates examination method not generally used for evaluating this kind of weld imperfection.

NOTES:

(1) Criteria given are for required examination. More-stringent criteria may be specified in the engineering design. See also paras. 341.5 and 341.5.3.
(2) Branch connection weld includes pressure containing welds in branches and fabricated laps.
(3) Longitudinal groove weld includes straight and spiral (helical) seam. Criteria are not intended to apply to welds made in accordance with a standard listed in Table A-1, Table A-1M, or Table 326.1. Alternative Leak Test requires examination of these welds; see para. 345.9.
(4) Fillet weld includes socket and seal welds, and attachment welds for slip-on flanges, branch reinforcement, and supports.
(5) These imperfections are evaluated only for welds ≤5 mm ($^{3}/_{16}$ in.) in nominal thickness.

Criterion Value Notes for Table 341.3.2

Criterion		
Symbol	Measure	Acceptable Value Limits [Note (1)]
A	Extent of imperfection	Zero (no evident imperfection)
B	Cumulative length of incomplete penetration	≤38 mm (1.5 in.) in any 150 mm (6 in.) weld length or 25% of total weld length, whichever is less
C	Cumulative length of lack of fusion and incomplete penetration	≤38 mm (1.5 in.) in any 150 mm (6 in.) weld length or 25% of total weld length, whichever is less
D	Size and distribution of rounded indications	See ASME BPVC, Section VIII, Division 1, Appendix 4 [Note (2)]
E	Size and distribution of rounded indications	For $T_w \le 6$ mm ($^1/_4$ in.), limit is same as D [Note (2)] For $T_w > 6$ mm ($^1/_4$ in.), limit is 1.5 × D [Note (2)]
F	Linear indications	
	Individual length	$\le T_w/3$
	Individual width	≤2.5 mm ($^3/_{32}$ in.) and $\le T_w/3$
	Cumulative length	$\le T_w$ in any 12 T_w weld length [Note (2)]
G	Linear indications	
	Individual length	$\le 2T_w$
	Individual width	≤3 mm ($^1/_8$ in.) and $\le T_w/2$
	Cumulative length	$\le 4T_w$ in any 150 mm (6 in.) weld length [Note (2)]
H	Depth of undercut	≤1 mm ($^1/_{32}$ in.) and $\le T_w/4$
	Cumulative length of internal and external undercut	≤38 mm (1.5 in.) in any 150 mm (6 in.) weld length or 25% of total weld length, whichever is less
I	Depth of undercut	≤1.5 mm ($^1/_{16}$ in.) and $\le [T_w/4$ or 1 mm ($^1/_{32}$ in.)]
	Cumulative length of internal and external undercut	≤38 mm (1.5 in.) in any 150 mm (6 in.) weld length or 25% of total weld length, whichever is less
J	Surface roughness	≤12.5 µm (500 µin.) R_a in accordance with ASME B46.1
K	Depth of surface concavity, root concavity, or burn-through	Total joint thickness, including weld reinforcement, $\ge T_w$ [Notes (3) and (4)]
L	Height of reinforcement or internal protrusion [Note (5)] in any plane through the weld shall be within limits of the applicable height value in the tabulation at right, except as provided in Note (6). Weld metal shall merge smoothly into the component surfaces.	For T_w, mm (in.) — Height, mm (in.) ≤6 ($^1/_4$) — ≤1.5 ($^1/_{16}$) >6 ($^1/_4$), ≤13 ($^1/_2$) — ≤3 ($^1/_8$) >13 ($^1/_2$), ≤25 (1) — ≤4 ($^3/_{32}$) >25 (1) — ≤5 ($^3/_{16}$)
M	Height of reinforcement or internal protrusion [Note (5)] as described in L. Note (6) does not apply.	Limit is twice the value applicable for L above

NOTES:
(1) Where two limiting values are separated by "and," the lesser of the values determines acceptance. Where two sets of values are separated by "or," the larger value is acceptable. T_w is the nominal wall thickness of the thinner of two components joined by a butt weld.

Criterion Value Notes for Table 341.3.2 (Cont'd)

NOTES: (Cont'd)

(2) Porosity and inclusions such as slag or tungsten are defined as rounded indications where the maximum length is three times the width or less. These indications may be circular, elliptical, or irregular in shape; may have tails; and may vary in density. Indications where the length is greater than three times the width are defined as linear indications and may also be slag, porosity, or tungsten.

(3) For circumferential groove welded joints in pipe, tube, and headers made entirely without the addition of filler metal, external concavity shall not exceed the lesser of 1 mm ($^1/_{32}$ in.) or 10% of the joint nominal thickness. The contour of the concavity shall blend smoothly with the base metal. The total joint thickness, including any reinforcement, shall not be less than the minimum wall thickness, t_m.

(4) For radiography, acceptability may be determined by comparing the density of the image through the affected area to the density through the adjacent base metal (T_w). If digital radiography is used, brightness comparison may be utilized. A density or brightness darker than the adjacent base metal is cause for rejection.

(5) For groove welds, height is the lesser of the measurements made from the surfaces of the adjacent components; both reinforcement and internal protrusion are permitted in a weld. For fillet welds, height is measured from the theoretical throat. Figure 328.5.2A: internal protrusion does not apply.

(6) For welds in aluminum alloy only, internal protrusion shall not exceed the following values:
(a) 1.5 mm ($^1/_{16}$ in.) for thickness ≤2 mm ($^5/_{64}$ in.)
(b) 2.5 mm ($^3/_{32}$ in.) for thickness >2 mm and ≤6 mm ($^1/_4$ in.)
For external reinforcement and for greater thicknesses, see the tabulation for symbol L.

Supplement No. 6: NDE Report

agmi	***AGMI*** **Material Testing and Quality Management Pte Co. Ltd.** Nondestructiv Testing Laboratory H-1211 Budapest, Duna lejáró 5-9 ☎: +361 277 1555, Fax: +361 277 0902, e-mail: agmindt@agmi.hu	**Radiographic** ***Test Report***	
		Job no.:	
		Contact:	
Client:	**BROOKS Instrument Kft.** H-8001 Székesfehérvár, Berényi u. 72-100., Hungary	**PO no.:**	
		Contact:	

Object id. nr:		**Examination Standard:**			
Object:		**Acceptance Standard:**			
Client order no.:		**Examination Procedure:**	AGMI NDT Written Procedure No. 004		Rev.
Quantity:		**Acceptance Procedure:**	AGMI NDT Written Procedure No. 004		Rev.
Material:		**Type of Film:**		**Screen**	
Weld method:	GTAW **Welder id.**	**I.Q.I Type:**		**Front:**	**Back:**

Source:	x	Seifert ERESCO 300	Focus: 0,3x3		Ir-192	Focus:		Co-60	Focus:	

No.	Film				Material thickness (mm)	Source-Object Distance (mm)	Object-Film Distance (mm)	Energy				I.Q.I-wire			Discontinuity		Judgement	
	Sign.	Size (cm)	Quantity in casette	Single (1) or double (2) wall				kV	mA	Activity (GBq)	Time (min)	Density	Side	Visible	Type	Local	Acceptable	Not Acceptable
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
20																		

Defects in Welds

CR	Cracks	PI	Incomplete penetration	SI	Slag, inclusions	CC	Concave root surface (suck up)
LF	Lack of fusion	IP	Internal porosity	UC	Undercutting		

Date:	**Prepared and reviewed by:**	**Interpreted and evaluated by:**	**Accepted by:**
Page(s):			
1 of 1			

LIQUID PENETRANT EXAMINATION PROCEDURE

THIS PROCEDURE TO BE USED FOR WORK ACCORDING TO THE REQUIREMENTS OF ASME CODE ED. 2021 SECTION V, ARTICLE 6, SECTION VIII, DIV.1, ASME 31.3-2020 OR ALTERNATIVELY EN ISO 23277: 2015

Approval Signatures

	Authorized Representative	Date
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The data contained herein is proprietary to the Brooks Instrument and shall not be disclosed in whole or in part for any purpose other than evaluation, provided that, if a contract is awarded to Brooks Instrument, as a result of or in connection with the submission of such data, the customer shall have the right to duplicate, use or disclose this data to the extent provided in the contract.

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1.0 SCOPE

Detection, interpretation and evaluation of surface discontinuities (voids, inclusions, cracks, etc.) on cast, formed, machined surfaces, welds and their HAZ.

2.0 PURPOSE

Liquid penetrant examination of welds according to ASME Code Edition 2021, Section V Art. 6 and Section VIII Div.1, Mandatory App. 8., ASME B31.3-2020 and alternatively EN ISO 23277:2015 level 1.

3.0 TERMS, ABBREVIATIONS

Term, abbreviation	Description
AI	Authorized Inspector

4.0 FORMS

ISP041-01 Liquid penetrant Test Report

5.0 REFERENCES

SNT-TC-1A-2016
MSZ EN ISO 9712:2013
ASTM E165/E165M-18
ASME Code Section V, Ed.2021
ASME Code Section VIII, Div 1, Ed.2021
EN ISO 3452-1:2013
EN ISO 3452-2:2013
EN ISO 3452-4:1998
EN ISO 23277:2015
ASME B31.3-2020

6.0 REVISION HISTORY

Date	Revision	Description	Author
01/15/2012	1	*Release*	A. Demeter
06/15/2016	2	ASME Code 2015	L. Lukovits
05/15/2017	3	-Modify type of cleaner -Add information to 7.6	J. Strausz
Jan.22,2019	4	ASME Code 2017	A. Kővári
Dec.06,2019	5	ASME Code 2019, ASME B31.3 added	A. Kővári
April 27, 2020	6	EN ISO standards added	A. Kővári
Oct. 27,2021	7	Correspondence with ASME Code 2021 Edition and ASME B31.3-2020 reviewed	A. Kővári
Nov. 09, 2022	8	Revised	René Sallaberger

7.0 PROCEDURE

7.1. PRINCIPLE OF METHOD

In principle a liquid penetrant is applied to the previously cleaned surface to be examined and allowed to enter discontinuities. All excess penetrant is then removed, the part is dried and a developer is applied. The developer acts both as a blotter to absorb penetrant that has been trapped in discontinuities, and as a contrasting background to enhance the visibility of penetrant indications.
The liquid penetrant examination method is an effective means for detecting discontinuities which are open to the surface of nonporous metals and other materials.
Typical discontinuities detectable by this method are:

- Cracks
- Seams
- Laps
- Cold shuts
- Laminations
- Porosity
- Through leaks or
- Lack of fusion.

7.2. PERSONNEL QUALIFICATION

Personnel implementing examination and evaluation shall have at least Level II qualification according to SNT-TC-1A, Code accepted Edition and/or EN ISO 9712. Examination shall be supervised by Level III according to EN ISO 9712 and/or SNT-TC-1A.

7.3. WRITTEN PROCEDURE REQUIREMENTS

Liquid penetrant examination shall be performed in accordance with this procedure which contains the requirements listed in Table 1.

Table 1

Requirements of Liquid Penetrant Examination Procedure

Requirement	Essential Variable	Non-essential Variable
Identification of any change in type or family group of penetrant material including developers etc.	X	
Surface preparation (finishing and cleaning, including type of cleaning solvent)	X	
Method of applying penetrant	X	
Method of removing excess surface penetrant	X	
Method of applying developer	X	
Minimum and maximum time periods between steps and drying aids	X	
Decrease in penetrant dwell time	X	
Increase in developer dwell time (Interpretation time)	X	
Minimum light intensity	X	
Surface temperature outside 10 to 52 °C or as previously qualified	X	
Performance demonstration, when required	X	
Personnel qualification requirements		X
Materials, shapes, or sizes to be examined and the extent of examination		X
Post examination cleaning technique		X

Any change of requirement in Table 1 identified as an essential variable from the specified value, or range of values, shall require re-qualification of the written procedure. A change of a requirement identified as a nonessential variable from the specified value, or range of values, does not require re-qualification of written procedure. All changes of essential, or nonessential variables from the value, or range of values, specified by the written procedure shall require revision of, or an addendum to, the written procedure.

7.4. EXAMINATION VARIABLES

- In wintertime test items shall be transported to laboratory area one shift in advance of examination.

- Surface to be examined shall be cleaned from scale, welding flux. Wire disk, grit blasting or any other method capable to close surface discontinuities are prohibited. After mechanical cleaning surface shall be de-greased according to 7.6.1.
- During visual inspection — prior liquid penetrant examination — the minimum light intensity 1076 lx.
- In case of visible penetrant examination minimum acceptable white light intensity is 1076 lux measured at the part surface.
- The temperature of the penetrant materials and the surface of the part to be inspected shall be in the temperature range of 10 and 52 °C. When it is not possible to comply with these temperature limits, local heating or cooling is allowed.
- In case of simultaneous examination, multiple parts possible shift of technological times are to be considered. The minimum dwell time can't be changed.

7.5. EXAMINATION MATERIALS

Examination materials definition includes all materials (cleaner, penetrant, remover, developer, etc.) being used during examination.
Type and method being used during examination: ASTM E165/E165M-12 Type II, Method C. This means visible penetrant solvent removable penetrant examination.
The assurance and applicability of examination materials shall be proved by certificates containing batch numbers and contaminant contents.
Examination materials shall meet ISO 3452 and Low sulfur and halogen content according to ASME Code, Section V, Article 6. standard requirements. Intermixing different examination material families is prohibited.
Materials used:

Table 1 Materials used:

	Visible
Cleaner:	KD-Check PR-2
Penetrant:	KD-Check RDP-1
Penetrant remover:	KD-Check PR-2
Developer:	KD-Check SD-1

7.6. SPECIFIC PRACTICES

ASME V. Table T-621.1
Requirements of Liquid Penetrant Examination Procedure

Procedure Step	Minimum	Maximum
Drying after preparation (T-643)	X	
Penetrant dwell (T-672)	X	X
Penetrant removal (solvent removable) (T-673.3)		
Drying after penetrant removal (T-674)		X
Solvent removable penetrants		X
Developer application (T-675)		X
Developing and interpretation time (T-675.3 and T-676)	X	X

7.6.1. SURFACE TREATMENT

Prior to each liquid penetrant examination, the surface to be examined and all adjacent areas within at least 1 inch (25 mm) shall be dry and free of all dirt, grease, lint, scale, welding flux, weld spatter, paint, oil and other extraneous matter that could obscure surface openings or otherwise interfere with examination.
Cleaner used: KD-Check PR-2
Cleaner shall be applied either from hand pumped spray dose or by wetted cloth or absorbent towel.

7.6.2. DRYING AFTER CLEANING

After cleaning the surface to be examined shall be dried by natural evaporation. Minimum drying time is 5 min.

7.6.3. APPLICATION OF PENETRANT

The penetrant shall be brushed to the surface.
Penetrant used: KD-Check RDP-1
Penetration (Dwell) time is critical. The minimum penetration shall be as required in Table 2 or as qualified by demonstration for specific applications. The dwell time shall not exceed 2 hours or as qualified by demonstration for specific application.

Table 2
Minimum Dwell Times

Material	Penetrant Dwell Time min
Austenitic steel; Austenitic cladding Nickel base weld; Titanium	>30

7.6.4. EXCESS PENETRANT REMOVAL

In case of solvent removable penetrants, care shall be taken to remove as small amount of penetrant, as possible from surface discontinuities.
Solvent-removable penetrant shall be removed by first wiping the excess penetrant with a clean, lint-free, dry cloth or absorbent towel, repeating the wiping operation until most traces of penetrant have been removed. A single stroke shall be used in one direction, so that maximum amount of penetrant will be removed. A clean, lint-free material shall then be lightly moistened with solvent and used to wipe the remaining penetrant from the surface of the part. Again a single stroke shall be used in one direction. The wet wiping shall be followed by a dry wiping. The part surface shall not be flushed with solvent and the cloth or towel shall not be saturated with solvent. Sometimes additional wet wipings are necessary, but examiner shall keep in mind, every additional stroke removes penetrant from surface discontinuities, thus reducing sensitivity of examination.
After cleaning the surface shall be dried by natural evaporation.
Penetrant remover used: KD-Check PR-2
Drying time: 3 - 5 min
After excess penetrant removal cleanliness of surface shall be checked.

7.6.5. APPLICATION OF DEVELOPER

The developer shall be sprayed to the surface. Before use, cans shall be thoroughly shaken. The developer shall be applied to provide a thin, even coating over the entire area being inspected. The coating shall be applied as uniformly as possible. The coating shall not be so thick as to mask any potential light indications.
Developer used: KD-Check SD-1
The minimum development time is 10 minutes and the maximum development time is 60 minutes.

7.6.6. EXTENT OF EXAMINATION

All pressure boundary weld and its adjacent 10 mm areas shall be examined in full extent.

7.6.7. **INTERPRETATION**

Color Contrast Penetrants.
With a color contrast penetrant, the developer forms a reasonably uniform white coating. Surface discontinuities are indicated by bleed-out of the penetrant which is normally a deep red color that stains the developer. Indications with a light pink color may indicate excessive cleaning. Inadequate cleaning may leave an excessive background making interpretation difficult. A minimum visible light intensity of 1076 lx is required on the surface to be examined to ensure adequate sensitivity during the examination and evaluation of indications.

It is hard to determine the type of discontinuity if penetrant diffuses in excess amount to developer. If this condition occurs, close observation of the formation of indication(s) during application of the developer may assist in characterizing and determining the extent of the indication(s).
Interpretation can be done with a 5-10X magnifier lens.
Items for certain reason unable to evaluate or unacceptable, the examination can be repeated twice. Between the repeated examinations an extensive cleaning is necessary.

7.6.8. **EVALUATION**

An indication of an imperfection may be larger than the imperfection that causes it; however, the size of the indication is the basis for acceptance evaluation. Only indications with major dimensions greater than $^{1}/_{16}$ in. (1,5 mm) shall be considered relevant.

- A linear indication is one having a length greater than three times the width.
- A rounded indication is one of circular or elliptical shape with the length equal to or less than three times the width.
- Any questionable or doubtful indications shall be reexamined to determine whether or not they are relevant.

The minimum and maximum evaluation times are 10 minutes and 60 minutes, respectively, if 7.6.5 point is fulfilled. If bleed out does not alter results, a longer time is allowed. Indications shall be marked, logged, if necessary photographed.

7.6.9. ACCEPTANCE STANDARDS

7.6.9.1. ACCEPTANCE ACCORDING TO ASME CODE SECTION VIII, DIV. 1, MANDATORY APP. 8

All surfaces to be examined shall be free of:

- relevant linear indications;
- relevant rounded indications greater than $^{3}/_{16}$ in. (5 mm);
- four or more relevant rounded indications in a line separated by $^{1}/_{16}$ in. (1,5 mm) or less (edge to edge).

7.6.9.2. ACCEPTANCE ACCORDING TO EN ISO 23277 LEVEL 1

Type of discontinuity	Acceptance level		
	1	2	3
Linear	l ≤ 2 mm	N/A	N/A
Nonlinear	d ≤ 4 mm	N/A	N/A

Note: “d” is the longer axis of indication

7.6.9.3. ACCEPTANCE ACCORDING TO ASME B31.3

All surfaces to be examined shall be free of
(1) relevant linear indications
(2) relevant rounded indications >5.0 mm ($^{3}/_{16}$ in.)
(3) four or more relevant rounded indications in a line separated by 1.5 mm ($^{1}/_{16}$ in.) or less, edge to edge

7.6.9.4. POST INSPECTION CLEANING

Post inspection cleaning shall be carried out as soon as possible, after evaluation and documentation. This shall be done with wiping the area with cleaner moistened rug. Final cleaning can be made with high pressure water or steam jet.

7.7. RE-EXAMINATION AND REPAIR

Unacceptable indications shall be repaired and re-examination performed to assure removal or reduction to an acceptable size. Whenever an imperfection is repaired by chipping or grinding and subsequent repair by welding is not required, the excavated area shall be blended into the surrounding surface so as to avoid sharp notches, crevices or corners.
Repair welding shall be performed using a qualified procedure and the method and extent of repair shall be acceptable to the Inspector.

7.8. INDICATIONS BELIEVED NON-RELEVANT

Any indication which is believed to be non-relevant shall be regarded as an imperfection unless it is shown by re-examination by the same method or by use of other nondestructive methods and/or by surface conditioning that no unacceptable imperfection is present.

7.9. EXAMINATION OF AREAS FROM WHICH DEFECTS HAVE BEEN REMOVED

After a defect is thought to have been removed and prior to making repairs, the area shall be examined by suitable methods to ensure it has been removed or reduced to an acceptably sized imperfection.

7.10. RE-EXAMINATION OF REPAIR AREAS

After repairs have been made, the repaired area shall be blended into the surrounding surface so as to avoid sharp notches, crevices or corners and
reexamined by the liquid penetrant method and by all other methods of examination, that were originally required for the affected area.

7.11. DOCUMENTATION

7.11.1. RECORDING OF INDICATIONS

Non-rejectable Indications. Non-rejectable Indications shall be recorded as specified by referencing Code Section.
Rejectable Indications. Rejectable Indications shall be recorded. As a minimum, the type of indications (linear or rounded) location and extent (length or diameter or aligned) shall be recorded.

All data that influence the result of the examination shall be recorded in the report. The description of the defects may be practically simplified by making a photo of the image of the defects. If it is necessary to help the evaluation, a tape measure and markings for the identification and tracing shall be placed on the photograph.

7.12. EXAMINATION RECORDS

For each examination the following information shall be recorded:
(a) manufacturer
(b) procedure identification and revision
(c) liquid penetrant type (visible or fluorescent)
(d) examination materials (number or letter designation of each penetrant, penetrant remover, and developer used)
(e) examination personnel identity and if required by referencing Code Section,
(f) qualification level;
(g) map of record of indications
(h) material and thickness;

(i) lighting equipment;
(j) date examinations were performed.
(k) identificaton of the weld, part, or component examened
(l)results of examination

7.13. POST EXAMINATION CLEANING

If the post examination cleaning is required, it should be conducted as soon as practical after Evaluation and Documentation, by brushing.

7.14. PERIODIC INSPECTIONS, CALIBRATIONS

Thermometer, light meter shall be calibrated at least once a year or whenever the meter has been repaired. If meters have not been in use for one year or more, calibration shall be done before being used. Visible light shall achieve a minimum of 1076 lux on the surface of the part being examined throughout the examination.
The visible light source, technique used, and light level verification is required to be demonstrated one time, documented, and maintained on file.

7.15. SAFETY

Since penetrant materials have adverse effect on health material safety data sheet requirements to be followed. Use of gloves, mask, glasses and protecting cloth shall be used when necessary. Empty doses, containers and used testing materials shall be handled according to requirements of manufacturer.

7.16. DEMONSTRATION

Testing procedures shall be demonstrated to the satisfaction of the Authorized Inspector (AI). Procedure demonstration shall be documented.

Hereby we certify that this procedure has been demonstrated to the satisfaction of the AI, and it is capable of detecting discontinuities under the conditions defined in the procedure.

BROOKS INSTRUMENT

Liquid Penetrant

Test Report

Report nr:

Brooks Instrument
Kft
Berényi str 72-100
8000

Object id. nr:			**Examination Standard:**	ASME V, Art. 6			
Client order nr:			**Acceptance Standard:**	ASME B31.3			
Size and Model			**Examination Procedure:**	ISP041			Rev.
Quantity:			**Acceptance Procedure:**	ISP041			Rev.
Parent material thickness:		mm	**Equipment:**			**Technique:**	**Brush**
Parent material:		**Heat treated**	**Serial no.:**			**Calibration exp.:**	
Welding procedure:			**Material**	**Nomination**	**Batch no.**		**Time (min)**
Weld material:			**Pre & Post cleaning:**				
Temp. obj.:		°C	**Penetrant:**				
Surface:			**Penetrant remover:**				
Object:			**Developer:**				

Purpose of examination: detection of surface defects

Items examined:

Result: Body(s) Acceptable according to "Acceptance Standard".

Defect(s): -

Operator:	**Signature:**		**Accepted by QA:**	Signature:	
	Name:				
	Level:	PT level II EN ISO 9712 / SNT-TC-1A		Name:	
Page(s):			**Date:**		
1 of 1					

POSITIVE MATERIAL IDENTIFICATION

Approval Signatures

	Authorized Representative	Date
Prepared By:	Robert Seres, Senior Quality Process Technician	22/04/2022
Approved By:	Attila Demeter, Quality manager	22/04/2022

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1.0 SCOPE

This document defines the process of performing Positive Material Identification at the Hungarian facility of Brooks Instrument.

2.0 PURPOSE

The document provides guidance for the qualification of personnel, preparation and performing the needed test and to record the findings. The main purpose is to assure that the specified materials are according the design requirements.

3.0 TERMS, ABBREVIATIONS

Term, abbreviation	Description
PMI	Positive Material Identification

4.0 FORMS

ISP042-01 PMI report

5.0 REFERENCES

ISP016 Positive Material Identification instruction
MT3800194 PMI identification drawing for 3809 screwed meters
MT3800195 PMI identification drawing for 3809 flanged meters
MT3800196 PMI identification drawing for 3809 welding neck flanged meters
3750120 PMI identification drawing for 3750 all body construction
ASME Section II Part A Ed. 2019
ASME Section II Part C Ed. 2019

6.0 REVISION HISTORY

Date	Revision	Description	Author
2/4/2014	2	Adding section 7.8 (Marking)	Attila D
15/06/2016	3	Issuing ASME Code 2015	L. Lukovits
01/02/2019	4	Overall update, excluding ASME code	Attila D
08/28/2020	5	Correction in section 7.3	Attila D
24/06/2021	6	Added to references and terms, abbreviations sections	R Seres
20/04/2022	7	Correction in section 7.10 (remove 316L and C)	R Seres

7.0 PROCEDURE

7.1. GENERAL

PMI testing is performed on components listed in this instruction. Testing of other components on customer demand should be clarified in the order entry phase.
PMI testing primarily should be done after the welding activity, before assembly activities would start.
PMI test is done whenever a customer request is placed and manufacturing order is referring to it.

7.2. RESPONSIBILITIES

It is the responsibility of the QA department to:
- support the qualification process of new testing personnel
- maintain personnel qualifications

Testing personnel is responsible to adhere to the requirements of this instruction and in case of any deviation to report to direct superior or QA department. Furthermore it is responsible to consider all safety precautions during testing.

7.3. METHOD OF EXAMINATION

Test method mentioned in this document is used to identify the nominal composition of alloy materials and welds verifying that it meets the material specification minimum requirements.
The equipment used for verification is a hand-held energy dispersive X-ray fluorescent analyzer. The working principle of this equipment is based on X-ray excitation. The X-ray tube of the instrument emits X-ray photons with certain energy what can kick out an inner electron of the atom of interest. To terminate this instable energy state, an electron from the outermost orbit jumps to the empty position emitting the energy difference as characteristic energy what is detectable by the device. The value of this energy determines qualitatively the atom itself.
Using this method Carbon content can not be detected. If PMI test with Carbon content is requested, test should be performed by a qualified third party laboratory using an optical emission spectrograph.

7.4. EQUIPMENT SET-UP

The PMI equipment should be operated in accordance with the operating manual of the manufacturer.

7.5. EQUIPMENT VERIFICATION

Proper functioning of the equipment is insured by the standardization procedure. The standardization is done on a sample alloy material provided by the manufacturer. This activity must be performed automatically each time the instrument is started up. Samples used for standardization shall be a Certified Reference Material obtained from the manufacturer of the equipment.

During verification the PMI equipment collects a spectrum on a known standard (316 stainless steel alloy) and then compares a variety of parameters with the preset values. When results are within preset tolerances, the unit confirms that it is properly calibrated.

7.6. PREPARATION OF SAMPLE

Sample surface shall be clean, free of dirt and oil, free of oxides and paint.
Surfaces should not be blasted. In case tested surfaces are already blasted, customer approval should be requested prior to start testing and a remark should be added to the test report, referring to the condition of the surface prior to testing.

7.7. ANALYZE MATERIAL

Mentioned test method identifies the nominal composition of alloy materials and welds and verifies that the nominal composition meets the minimum material specification requirements. An alloy should be positively identified if alloying components are present and concentration deviations do not exceed +/-10% of the specified value.

7.8. COMPONENTS SUBJECT TO PMI

PMI testing is performed on all pressure containing, pressure retaining component, such as:
- Pressure containing piping elements (flanges, tubes, end fittings)
- External valve components (body, bonnet, plugs)
- Welds (Note: in case PMI test with carbon content is requested on welds, separate test coupon should be prepared using the same heat of filler material, as used for the flow body)
- If requested by the customer order, other components can be tested as well, meeting the surface preparation requirements.

PMI testing is done 100% on above mentioned components when required by the production order.

7.9. ACCEPTANCE CRITERIA

For all components requiring PMI, the measured value of alloying elements shall be within +/10% of the specified range in the applicable materials standards.
Components tested shall contain the amount of alloying elements specified for ferrous materials as per ASME Section IIA. Alloys not listed including castings, shall be acceptable if the alloying elements are within the ranges permitted by the material specification plus the tolerance of the equipment used.
Welds shall contain the amounts of alloying elements specified in ASME Section IIC.
If the PMI test results fall outside the permitted range, then test should be repeated. If results still fail, it should be investigated. Until the investigation of the rejected material is not completed, materials from suspected heat should be segregated and marked. Nonconforming materials should be scrapped or deviation approval should be obtained from the customer.

7.10. REPORTING ALLOY ELEMENTS

Alloying elements listed in below table are reported. Other elements might be reported in case customer order clearly defines these.

Generic type	Alloy	Reported elements						
		Cr	Ni	Mo	Fe	W	Ti	Cu
Austenitic SS	316	X	X	X				
Nickel alloy	Hastelloy C-276	X		X	X	X		
	Inconel 625	X	X	X				
	Monel K-500		X		X			X
Titanium	Grade 2				X		X	

7.11. RECORDS

Test results are stored first in the test equipment and are later recorded in a Test report. Test report should be prepared in any case, both for acceptable and rejected results.
Test report can be found in the Attachment of this document and should contain as a minimum:

- report number
- item identification data
- order identification data
- used equipment
- key elements with quantities in %
- identified alloy material
- disposition
- date
- Operator performing the test

7.12. MARKING AND DISPOSITION OF TESTED MATERIAL

All verified components with an acceptable analysis shall be marked with letters “PMI1”. Marking should be done using a dye stamp, being of low stress type. Marking should be placed in the close proximity of the tested point (for example flanges to be marked on the rim, tubes to be marked next to heatcode engraving).
Components with not acceptable PMI results should be clearly marked with a red tag and segregated till further disposition.

7.13. PROCEDURE AND PERSONAL QUALIFICATION

PMI test should be performed by operators qualified for this activity. Qualification of operators consists of two steps:

1- Practical experience of at least 80 hours (2 weeks, 8 hours per day)
2- Formal training course held by the manufacturer/distributor on operating the PMI equipment

Training records for both of the two steps should be kept on file and retained as per the general retention procedure.
Test personnel must be knowledgeable in operating the test equipment, be aware of the required safety precautions and must be able to recognize the limitations of the instrument in terms of material and surface profile requirements.

7.14. SAFETY

PMI equipment must only be used by trained and authorized operators in accordance with proper safety procedures. Do not use the equipment if there is any evidence of damage. In case of damage, equipment shall be forwarded to a qualified service center.
The handheld Innov-X XRF instrument emits a small diameter focused X-ray beam. Although the intensity is decreasing in the function of distance, the rays can pass several meters in the air, if it is improperly used. The equipment, if properly used, is safe and can not cause injuries.

Brooks Instrument Kft
Berényi str 72-100
8000 Székesfehérvár
Hungary

PMI TEST REPORT

Report nr: | Page 1 of 1

Client order nr:	Procedure nr:	
Test equipment: Olympus Innov-X Delta Premium 2000 element analyzer XRF spectrometer		Test equipment nr: 82000/001 Last test date:
Date of examination:	Specification:	
Place of examination: Szekesfehervar		

Object id. nr:	Model description	Part Description	% MIN: MAX:	% MIN: MAX:	% MIN: MAX:	% MIN: MAX:	% MIN: MAX:	% MIN: MAX:

Analysis done by:	Signature Name		Accepted by QA	Signature Name	
Results in accordance with specification:					
Above mentioned items are marked with low stress dye-stamp:					

Remarks: ND - Not Detectable

1.2.4 PAINTING PROCEDURE

Base Load Power Hub (BLPH)

PAINTING PROCEDURE

Document Number: 1724000791-MAT-PRO-00006

Document Class: 3

ROSETTI MARINO

1	NO COMMENTS - APPROVED - WORK MAY PROCEED
2	MINOR COMMENTS - REVISE AND RESUBMIT - WORK MAY PROCEED
3	MAJOR COMMENTS – REJECTED – DO NOT PROCEED
4	APPROVAL NOT REQUIRED

NOTE: Approval doesn't relieve the supplier from mandatory compliance with contractual documents and specifications. Comments made do not imply acceptance of any cost or delivery impact.

Sign	Date
Michele Sacchi	04/07/2024

Rev.	Date	Description	Prepared	Reviewed	Approved
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BROOKS INSTRUMENT Beyond Measure

File: Cover_Paint
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SH.	DESCRIPTION	REVISIONS							
		00	01						
1	Cover	X	X						
2	Table of Contents	X	X						
3	Revision / Change Log	X	X						
4	PAINTING PROCEDURE	X	X						

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Revision / Change Log

Rev.	Description
00	ISSUE FOR INFORMATION (IFI)
01	ISSUE FOR INFORMATION (IFI)

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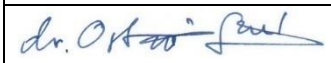
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Painting technology working procedure for surface preconditioning and coating technologies and control processes pertaining to

Brooks Instrument

Acc Spec: *123A90-DDL-MAT-SP-60006_02 Coating and* Painting Specification

made by	***controlled***	***accepted***	***accepted***
dr Ostorházi László	Ostorházi Norbert		
			
Frosio level III. inspector	Ostorházi Bevonattechnika	Client	enginier
2024-05-15	2024-05-15		

revision history

Rev. No.	***Modification***	***checked***	***rewiewed***	***date***
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1. INTRODUCTION

Ostorházi Bevonattechnika Kft. is a family enterprise established in 1991. The Company has three sites and more than 50 employees who perform coating technology tasks in given work areas or factory environment, in a number of industrial fields. The Company has extensive experiences in the corrosion protection of oil industry equipment, pipelines and tanks, as well as in making ceramic coatings of pumps exposed to special wearing conditions. The Company is one of the key suppliers to the aircraft and railway vehicle industries. It has the most modern technologies available in the coating technology field. We have gained major experience in the application of special coatings applicable in the food processing industry. When requested, we make coating systems combined with active metal spraying and passive coating.

With the fleet of mobile assets, the Company can ensure the conditions necessary for high standard coating on the given site. Both individual specimens with special dimensions and items in high number of series are painted and polished in industrial quality, including the various associated surface preparation procedures. For the purposes of moving large pieces a travelling crane with a load bearing capacity of 10t is available.

Surface preparation is made in accordance with the relevant standards, for which a number of different equipment are available. The cleaning process accomplished in the closed system shot blasting cubicles and grit blasting room ensures appropriate cleanliness of the surfaces and a level of roughness fit for the coating system to be applied.

For the purposes of quality assurance, a wide range of measuring instruments and testing equipment are available to conduct the required examinations.

The company operates an ISO9001 quality assurance and ISO 14001 environmental and OHSAS management system certified periodically by an accredited organisation.

Production processes are supported by highly qualified engineers with a wide range of experiences. Complex engineering solutions and procedures are developed for conducting working processes by which the quality expected by Customers and required by the relevant standards can be ensured.

High professional standards are secured with the regular further education of the staff. Changes in technology and procedures are monitored continuously.

2. SCOPE

This document is intended to describe for surface preparation, painting and inspection in accordance with painting specification *123A90-DDL-MAT-SP-60006* **(rev. 02)**

- Technical data sheets of Hempel products
- Painting Quality Controll Plan

Expected amount of items to paint:

7 pieces 3809 instrument body, tube and flanges! (sum:7 pieces)

base material :	**SS**
Operating temperature:	**ambient**
Insulation condition:	**Un-insulated (**
Coating system:	**Acc. To Norsok M 501: 6A**
Color:	**RAL 9002 (white)**

3. BASE DOCUMENTS

1. This Painting technology working procedure has been made on the basis of Client specification No. *123A90-DDL-MAT-SP-60006_02 Coating and* Painting Specification (“client spec.”)
2. ASTM D4285-83(2018) (Standard Test Method for Indicating Oil or Water in Compressed Air)
3. SSPC-SP 1-2016, Solvent Cleaning SSPC-SP2 (hand tool cleaning)
4. SSPC-SP 3-2018, Power Tool Cleaning
5. SSPC-SP 10 (WAB)/NACE No. 2 (WAB)-2015, “Near-White Metal Wet Abrasive Blast Cleaning” SSPC-SP 16 Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals)
6. ISO 2808:2019 Paints and varnishes — Determination of film thickness
7. ISO 2409:2020 Paints and varnishes — Cross-cut test
8. ISO 4624:2023 Paints and varnishes — Pull-off test for adhesion
9. ISO 8501-1:2007 Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness (Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings)
10. ISO 8501-3:2006 Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness (Part 3: Preparation grades of welds, edges and other areas with surface imperfections)
11. ISO 8502-3:2017 Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness (Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness)
12. ISO 8502-6:2020 Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness (Part 6: Extraction of water soluble contaminants for analysis (Bresle method))
13. ISO 8502-9:2020 Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness (Part 9: Field method for the conductometric determination of water-soluble salts)
14. ISO 8503-1:2012 Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates (Part 1: Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast-cleaned surfaces)

15. ISO 8504-2:2019 Preparation of steel substrates before application of paints and related products — Surface preparation methods (Part 2: Abrasive blast-cleaning)
16. ISO 12944-4:2017 Paints and varnishes — Corrosion protection of steel structures by protective paint systems (Part 4: Types of surface and surface preparation)
17. ISO 12944-5:2019 Paints and varnishes — Corrosion protection of steel structures by protective paint systems (Part 5: Protective paint systems)
18. ISO 19840:2012 Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces
19. NORSOK M-001 Materials selection (Edition 5, September 2014)
20. NORSOK M-501 Surface protection and protective coating (2022)
21. NORSOK S-002N:2018+AC:2021 Working environment
22. SFS 8145 Anticorrosive painting. Quality grades of mechanical surface preparations for blast cleaned or blast-cleaned and prefabrication primed steel substrates (2001)

All conflicts between the requirements of this procedure, related contract documents, referenced codes of practice and international standards shall be referred to Brooks Instrument for clarification.

4. SURFACE PRECONDITIONING

Prior to blast cleaning, solvent cleaning shall be performed in accordance with SSPC SP1; SSPC-SP16. Surface preparation shall be made by aluminium oxide (grit) performing **Sweep Blast Cleaning**. The cleaned surface shall be free of residual welding fumes, oil and grease and other adhesive contaminants.

The abrasive material to be used for aluminium oxide (grit) blasting shall be free of iron, iron oxide any contamination from iron.

Any contaminations from processing/machining shall be removed from the surface, when necessary, prior to abrasive blasting by proper detergent using running water and then it shall be dried to be free of damp.

Should there be any welding defect, weld spatter or other surface damage seen/detected on the surface of the work piece, it shall be returned along with the relevant report on deviation found to the site of Brooks Instrument. All structures should be free of sharp edges. Radius needs to be 2mm minimum wherever possible. Any repairs made on the structures shall be recorded in the relevant report in every case.

Prepare also for every coating system at least **one test plate of material 316L SS, 5x140x185/245 mm (net length/total length)** and treat it the same way as the instruments. This part will be used to perform destructive tests acc. to “client spec. Should be at least 3 measure points on the coating system.

All degreased components must meet the requirement cleanliness parameters (salt concentration) as per “client spec.”, use one of the methods assigned. Results shall be recorded.

The maximum chloride level on the blast cleaned surface should not higher than 20 mg / m2 (ISO 8502-6)

On the SS surface have to be measured ferrous contamination according to ASTM A380. Any surface pollution is not accepted.

4.1. ENVIRONMENTAL PARAMETERS

No abrasive blasting is allowed when

- the relative environmental humidity is above 85%
- the steel temperature is less than dew point + 3ºC
- the environmental temperature is not between +10°C and +40°C
- the surface is wet

5. COATING TECHNOLOGY (PAINT APPLICATION)

Proposed procedures for painting work pieces are HVLP blasting, and/or Airless or Airmix blasting, in consideration of the dimensions and geometry of them. Airmix blasting can also be used.

When setting the blasting parameters, even the layer thickness to be applied in a single work phase and uniform blasting shall be considered. The parameters given on the manufacturer's technical data sheet shall be used in every case.

5.1. COATING SYSTEMS:

material: stainless steel (SS)		coating system acc. to "client spec.": **6A**		
specification summary: Paint system shall be suitable for Stainless Steel taking into consideration ambient temperature. Ambient conditions for the coating as per "client spec." between +10°C and +40°C and humidity max 85%. Do not apply coating unless temperature of the substrate is expected to remain 3°C above dew point. Max. DFTs are according to manufacturer's recommendation				
Surface preparation	Sweep Blast Cleaning (ISO 8501-1) Ry_5 30-50µm			
1st layer base coat	EPPH	Hempadur 15570 or 15590	50	µm
2nd layer intermediate coat	EPPH	Hempaprime Multi 500 (different colour from base coat)	100	µm
3rd layer top coat (finish)	EPPH	Hempel's Pro Acrylic 55883 (RAL 9002)	75	µm
Total DFT (NDFT)			225	µm

5.2. LAYER (FILM) THICKNESSES

Wet film thickness shall be continuously inspected during application.

When defining the wet film thickness to be applied, the manufacturer's information (technical data sheet), such as the dry material content of the film and the quantity of dissolvent to be applied in consideration of the application technology shall be considered into account.

The dry thickness gage shall be calibrated prior to measuring the dry film thickness, by using foils in the thickness range required. Such calibration shall be made at least once per day. When defining the zero value of the instrument, a base surface identical with that of the work piece shall be used. Instrument to be used: Byco Test 4500

The dry film thickness shall be measured by each film and documented in a record including the name of the person performing such measurement and identification of the measuring instrument. The measuring report shall be signed by a certified FROSIO III. inspector.

The minimum and maximum values are specified in the EN ISO 12944-5 (5.4)

6. EXECUTIVE SECTION (THE PROCEDURE OF COAT PREPARATION)

6.1. GENERAL SPECIFICATIONS

Work pieces should be readily accessible in each phase during the preparation of the coating system. Make sure the work area and the jobs are properly lit.
Check the following before using any starting materials:

- Does the identification code indicated on the container of the starting material conform with the product identifier specified in the process technology instructions?
- Can you experience any curdling of the material following the opening of the container?
- Can the starting material be readily stirred, is there any excessive settling?
- Does the processing temperature conform with the specifications of the manufacturer?

When you select the application technology, take into account the size, geometry of the work piece, the environmental requirements, and the number of specimen to be painted at the same time.
Ensure that the spraying will be uniform and a homogeneous thickness of the coating layer be formed.
Make attempts to minimise application losses and to reduce the amount sprayed astray
Avoid dry spraying and fogging.
Apply preliminary smearing at the shadowed parts which are difficult to access so that the coating layer to be formed should cover the painted area of the job piece evenly.
Make sure the surfaces to be protected and the coating of which is not desirable be masked out according to the specifications of the Customer.
Make sure the coat thickness to be in accordance with manufacturer requirements.

Drying times between layers need to be observed with due consideration given to the drying parameters and instructions of the manufacturer.
Defects, deficiencies or deviations occurring on the coating layer formed need to be corrected so that the protective capacities and aesthetic appearance of the coat be preserved.
Before packaging, make sure the coating layer is fully hardened and protect the state of the work pieces in the packaging process.

Defects may lead to a reduced level of protection in any layer or coat of paint.

6.2. CONDITIONS OF APPLICATION

In order to provide the appropriate level of quality assurance, environmental parameters shall be checked and documented. The governing instructions are contained in the technical data sheets provided by the manufacturer. Take into account r-painting and drying times with a view to the ambient temperature.

Make sure before starting the application of the coating procedure that no pollutants other than the amount included in the standards is released into the environment during the accomplishment of the activity.

Make sure the required temperature parameters are maintained during processing and drying.

No coat is to be applied when there is a danger of vapour precipitation.

Select the procedures to be applied so that the quality requirements could be met. Supports and hangers must not prevent the application of a homogeneous layer.

6.3. APPLICATION METHODS

6.3.1. BRUSHING

The use of brushes is allowed on surfaces where the application of a homogeneous coat cannot be accomplished using the spraying technology.
Brush application may be used only under the following circumstances:

- When the areas cannot be properly coated by spray,
- For stripe-coat application,
- In case where the spray application may affect equipment or persons of the working area,
- For touch-up or small repairs to damaged areas.

Do not use brushes with plastic and polyamide bristles.
A Stripe coat of epoxy intermediate paint over all welds and sharp edges is required before the spray application of the primer and intermediate coat.

6.3.2. SPRAY

The following spraying methods can be used to apply the coat:

Conventional low pressure HVLP spray

The spraying viscosity shall be adjusted to the method applied so that uniform and continuous coatings are produced.

For coating materials having a tendency to settle, ensure continuous stirring during application.

Select the spraying distance so that no dry spraying, fogging or flowing due to excessive spraying occurred.

6.4 Conditions for spraying

- The relevant Working procedure and its attachments shall be available.
- The Manufacturer's technical data sheet shall be available.
- The Safety data sheet of the raw material to be processed shall be available.
- The process operator shall have sufficient working knowledge and experience.
- The required tools and equipment shall be available for work.
- The work piece to be coated shall be at hand.
- All devices and instruments affecting quality work shall be available for measurements.

7 Supervision of coating (paint work)

7.1 General

The execution of the work and its inspection shall be supervised at all stages by a qualified Frosio/Nace coating inspector.
Coating activities can only be made by properly qualified and experienced staff.
In issues emerging during the execution of the work it is recommended that the manufacturer of the coating material be consulted.
Check all work phases during the coating work.
Record findings of inspections in an inspection report (protocol)
Differently from Annex 1 in this project only DFT-report is needed acc. to Annex 2.

7.2 Instruments of measurements and testing

Carry out the verification of the parameters influencing the quality of the operation using instruments dedicated for the purpose and make sure measured data are genuine and credible.

7.3 Checking layer (film) thickness

The respective data for the inspection of film thickness are included in the Client's specifications, the Manufacturer's data sheet of the coating material to be applied and in the relevant standards.

Visual assessment provides for continuosity and uniformity of the film thickness, as well as for correct colour. Gauge is proposed to be used for checking.

Determine dry thickness of coats using non-destructive methods pursuant to the ISO 2808 standard or SSPC-PA2.
Adhesion testing is accomplished by destructive methods using a sample specimen in accordance with the standards ISO 2409 or ISO 4624.
When checking coat thickness, take into account the deviations arising from the initial unevenness of the surface. The Inspection and test plan defines the location and number of the measuring points.

The film thickness shall be checked in the case of all coats.

Verify calibration of the instrument used for checking coat thickness and ensure it was properly calibrated.

The specimen serving for destructive tests shall be coated under the same conditions as for those of the original work pieces.

8 Safety precautions

When applying paint materials, the relevant safety precautions shall be followed; Personal Protective Equipment (PPE, such as active carbon coal-filtered mask, overalls, safety shoes, gloves and goggles) shall be used.

9 Clean-up

The applied equipment and tools shall be cleaned after their use. For clean-up, use the cleaning material specified by the Manufacturer.

Flush spray equipment until drained cleaning agent is clear and transparent. After flushing, disassemble and clean the filter unit of the equipment and the parts of the spray gun in contact with any paint and flush them separately as well. Follow the precautionary measures during the clean-up process.

10 Repairs

Repairs of any coatings (films) shall be made by following the instructions for application of the coating system. Surface preparation for repairing shall be performed in accordance with SSPC-SP2 (hand tool cleaning) and SSPC-SP3 (power tool cleaning). Small areas may be brush applied. It used only for tuch up and repair.

11 Inspection and testing

11.1 Report

A daily inspection report shall be made and kept about the details of coating according to the standard measuring and reporting record. It shall contain the identification of the work pieces and the details of the application.

11.2 Quality assurance and sampling (Inspection and test) plan

The Quality Assurance (QA) and Sampling Plan (Attachment I) provides the adequacy of the relevant activities in an inspected and documented manner. It defines the inspection and sampling points, their methods and devices. It designates the persons participating in the process, their tasks and responsibilities.

It contains the set of requirements, permissible deviations and raising verifying methods of the repairs made. It defines the mode of issuing the finished and accepted product, the conditions for delivery and the adequacy of the required packaging.

11.3 Equipment

- Clemco blast cabinet
- Graco president 33:1 airless sprayer
- Jonswill HVLP
- Ambient temperature and humidity meter - Elcometer 319 Top
- Surface roughness meter - Rank Taylor Hobson Surtronic 10
- Dry film thickness gage - Byco Test 4500
- Surface temperature meter - Elcometer 319 Top
- Viscosity meter (DIN 4)

12 Training and education

The training/education of the employees involved in the coating processes (such as blasters, painters, QC/QA personnel and all affected employees) shall be made regarding the contents of this Working procedure. The training shall be managed/supervised by a person who has FROSIO level III / NACE level II certification. The training/education shall address the coating materials used by the Manufacturer's and the Manufacturer's instructions and principles and the relevant standards.

12.1 Quality control

A FROSIO III / NACE II level person shall supervise and countersign all quality control related activities in the project.

13 Coating materials

13.1 Documents

The Manufacturer's specification relating to the components of the coating system, and this Working procedure shall be available in an understandable manner for the employees involved in the process.

13.2 STORAGE

In the course of raw material storage the shelf lives indicated by the Manufacturer shall be taken into account; in the case of several supplies the materials which have a shorter shelf live shall be used as soon as possible.

In the course of storage the relevant Manufacturer's instructions shall be followed, unless specified elsewhere, the storage temperature shall be between +5 and +32 ^{0}C.

The manufacturer's package shall be kept sealed and intact until the contents are prepared for use. Following opening the time period of usability shall be clearly and visibly indicated.

13.3 ENVIRONMENTAL CONFORMITY

For the coating activity see the relevant environmental instructions in the ISO 14001 standard.

ANNEX 1: QUALITY CONTROL PLAN

test type	Method	Frequency	Acceptance criteria	Consequence	OST	Brooks	3rd party
Visual examination	Visual for sharp edges weld spatter slivers, rust grade, etc. ISO 8501-3	100 % of all surfaces	No defects, see specified requirements	Defects to be repaired	M	H	n.a.
Delivered parts control	Visual inspection	every delivery	parts identification, quantity, no damage,	note for Brooks	H		n.a.
Checking abrasive	ASTM D4940	before blasting	max conductivity of 150 µS/cm	change abrasive	H		n.a.
Environmental conditions	ISO 8502-4	Before start of each shift and twice a day.	In accordance with specified requirements	No blasting or coating	H		n.a.
Unblasted surface protection	Masking with special masks	every protected surface	must 100% be protected	No blasting	W	H	n.a.
Cleanliness	a) ISO 8501-1 b) ISO 8502-3	a) 100 % visual of all surfaces b) Spot checks	a) Sa 2,5 b) Maximum quantity and size rating 2	a) Reblasting b) Recleaning and retesting until acceptable	H		n.a.
Ferroxyl Test	ASTM A380	after blast cleaning - spot check	No iron on surface	cleaning, reblast with iron free grit	N.a.	N.a.	n.a.
Salt test	ISO 8502-6 and ISO 8502-9	Spot checks	Maximum conductivity corresponding to 20 mg/m2 NaCl	Repeated washing with potable water and retesting until acceptable	H		n.a.
Roughness	Comparator, stylus instrument or testex tape (see ISO 8503)	Each component or once per 10 m2 As	Ry5 30-50µm	Reblasting	H		n.a.
Examination of primer coat	Visual to determine curing, contamination, solvent retention, pinholes/popping, sagging and surface defects + DFT measurement	every protected surface	No imperfection, DFT 50µm	Repair, additional coats or recoating as appropriate	H	M	n.a.

Examination of intermediate coat	Visual to determine curing, contamination, solvent retention, pinholes/popping, sagging and surface defects + DFT measurement	every protected surface	No imperfection, DFT 100µm	Repair, additional coats or recoating as appropriate	H		n.a.
Examination of top coat	Visual to determine curing, contamination, solvent retention, pinholes/popping, sagging and surface defects + DFT measurement	every protected surface	No imperfection, DFT 75µm	Repair, additional coats or recoating as appropriate	H		n.a.
Examination of total coating system	Visual to determine curing, contamination, solvent retention, pinholes/popping, sagging and surface defects + DFT measurement	every protected surface	No imperfection, DFT 225µm	Repair, additional coats or recoating as appropriate	H	R	n.a.
Adhesion	On test panel ISO 4624, using equipment with an automatic centred pulling force, and carried out when coating system are fully cured	every paint charge No. using	5 Mpa	reblasting, recoating	H	R	n.a.
Prepare transport	All parts packaging in paper and foil	every part separaatly	No damage	repair	H	R	n.a.
Prepare documentation	Data book	after final inspection	According to Norsok M 501		H	M	n.a.
NOTE 1: **H** hold, **W** witness, **M** monitor, **R** rewiew. **Na**. Not aplicable.							

ANNEX 2: INSPECTION AND TESTPLAN (SAMPLE)

www.korrozio.com	Title		FROSIO	
	Procedure		Rev	0

Part No./ Termék típus		Serial No./ Szériá szám	

Receipt of Goods / Felület előírások

YES	NO	Degreasing Total parts/ Zsírtalanítás
YES	NO	Welds are continuous & no sharp projections, No excessive under cutting, No Spatter, No Pin holes, No Slag/ Hegesztések folytonosak, nincsenek éles sarkok, túlzott bevágás
YES	NO	No Contamination, No Laminations, No sharp edges, No Burrs/ Nincs szennyeződés, rétegesség, éles sarkok, sorja

Blast Process Control/ Szemcseszórás

Start date/ Kezdés dátuma	Start time/ Kezdés óra:perc	Cleanliness/ Tisztaság	Salt Soluble/ Sótartalom	Surface Profile/ Érdesség	Dust level/Szennyezettség	Blast noze pressure (Bar)/ Szemcseszóró nyomás	Abrasive Type Used/Szemcse típusa	Blasting Batch nr/Szemcse az.
			N.a.					

Finish date / Befejezés dátuma	Finish time / Befejezés óra:perc	Air Temp (°C) / Levegő hőm.	Humidity / Páratartalom	Dew Point / Harmatpont	Surface Temp(°C) / Felületi hőm.	Paint Operative / Szemcseszóró neve	Signature / Aláírása

Comments		Validation		Signature & date	

Paint Process Control / Festés ellenőrzése

		1st Coat/ 1. réteg	2nd Coat/ 2. réteg	3rd Coat/ 3. réteg	4th Coat/ 4. réteg
Paint Manufacturer/ Festék gyártó	Paint Name / Festék				
	Thinners Name / Hígító				
	Hardener Name / Edző				
Paint Batch Numbers / Adagszám	Paint / Festék				
	Thinners / Hígító				
	Hardener / Edző				
Shelf life / Lejárati idő	Paint / Festék				
	Thinners / Hígító				
	Hardener / Edző				
Thinning % / Hígító %-a					
Time and Date starting / Festés kezdete (dátum, óra:perc)					
Time and Date Finish / Befejezés (dátum, óra:perc)					
Drying time between layers / Száradási idő					
Air Temperature / Levegő hőmérséklet					
Humidity / Páratartalom					
Surface Temperature / Felületi hőmérséklet					
Dew Point Temperature / Harmatpont					
ΔT between surface temp. To dew point (>= 3°C)/ ΔT (felületi h. és harmatpont)					
WFT (Wet Film Thickness) / Nedves rétegvastagság					
DFT (Dry Film Thcikness) / Szárazréteg vastagság					
Paint Operative / Festő neve					
Signature / Aláírás					
Comments / Megjegyzés					

Quality Control (Inspection) / Minőség ellenőrzés

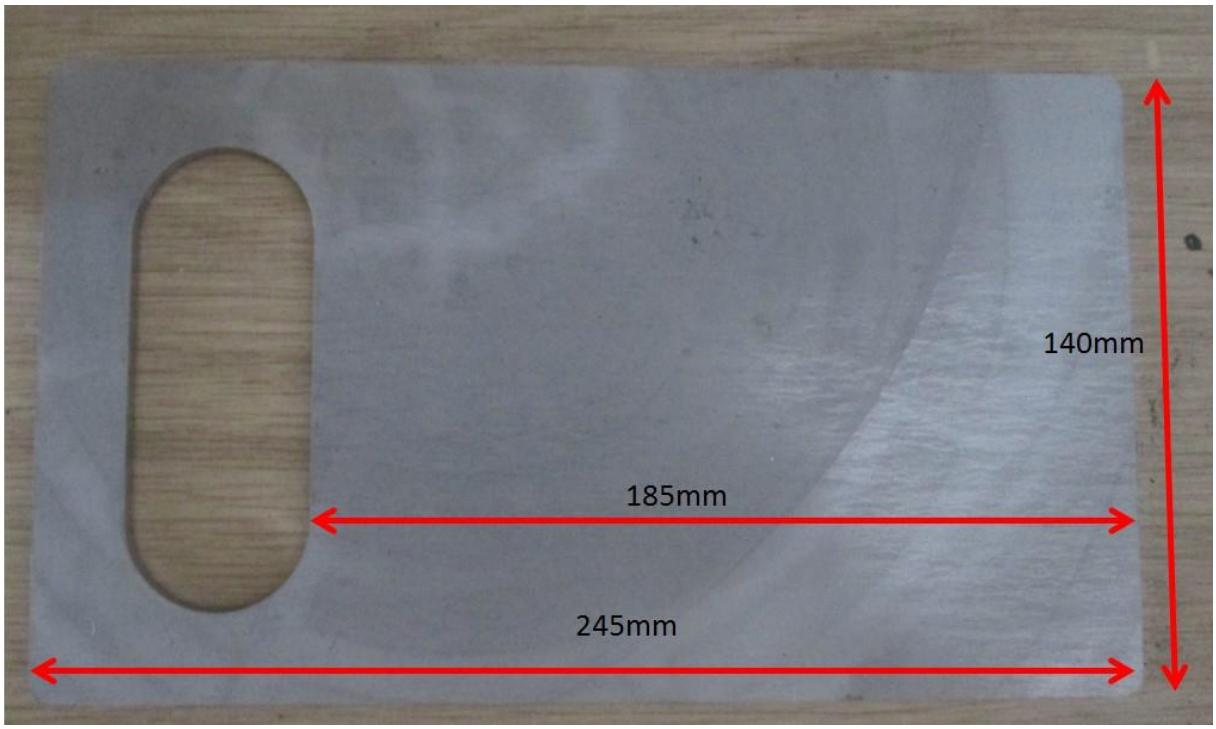
Quality Control verification of completeness and accuracy of paint record sheet including DFT results and Visual inspection / A minőség ellenőrzés hitelesítése a mérési jegyzőkönyv adatai (DFT, vizuális értékelés) alapján.

Date of Verification/ Dátum		Signature of Inspector/ MEO aláírása	

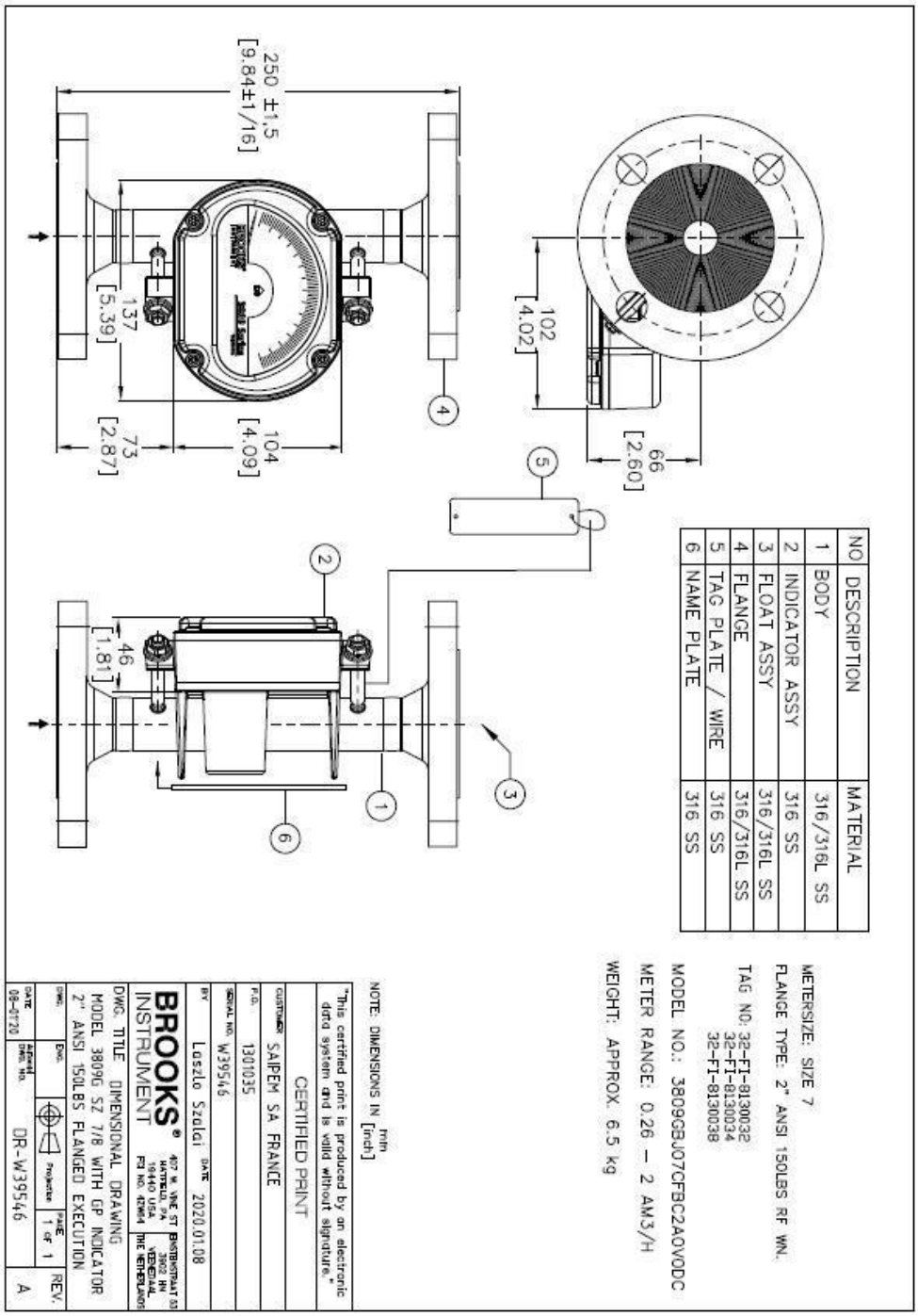
If Required - Adhesion Test completed in accordance with requirements detailed in QP/paint specification (if nothing specified use ISO 4624) / Amennyiben követelmény - tapadás vizsgálat a pelfikációban meghatározottak szerint. (ha nincs erre adat, akkor ISO 4624 szeint)

Adhesion Test Date / tapadásvizsgálat dátuma		Adhesion Test Value/ mért átlag érték	Mpa
Adhesion Test Comments/ tapadási tulajdonságok			Signature / aláírás

ANNEX 3: TEST PLATE



ANNEX 4: TECHNICAL DRAW



ANNEX 5: TECHNICAL DATASHEETS



System 6A: Stainless steel and aluminium

Pre-qualification is not required

Product	DFT (µm)
Hempadur 15570 or 15590	50
Hempaprime Multi 500	100
Hempel's Pro Acrylic 55883 [2]	75
Total	**225**

Sweep blasting

System 6B: Hot dip galvanized steel

Pre-qualification is not required

Product	DFT (µm)
Hempadur 15553	50
Hempaprime Multi 500	100
Hempel's Pro Acrylic 55883 [2]	75
Total	**225**

No sweep blasting

For advice on regional product availability and additional schemes, please contact your local Hempel representative or email protective@hempel.com

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System 6C: Insulated stainless steel piping and vessels at temperatures < 150°C

Pre-qualification is not required

Product	DFT (µm)
Hempadur 85671	125
Hempadur 85671	125
Total	**250**

Sweep blasting

Note 1: As pre-qualification is not required additional systems may also be recommended. Contact your Hempel representative for further details. This note applies to all of the above systems.

Note 2: Topcoats which have been pre-qualified in System 1 may also be used for Systems 6A and 6B. Commonly used topcoats, which may be substituted for those listed, include:

- Hempaxane Light 55030
- Hempathane HS 55610
- Hempathane 55210
- Hempathane Speed Dry Topcoat 250

Hempadur 15570

Product characteristics

Description
Hempadur 15570 is a two component, polyamide-adduct cured epoxy paint, which cures to a strong and highly corrosion resistant coating, at temperatures down to -10°C/14°F. The Micaceous Iron Oxide pigmented reddish grey 12430 shade is also well suited for application under humid conditions, on damp steel surfaces, and may be applied on moist surfaces. The greyish yellow 21780 and the grey 11320 shades contains zinc phosphate.
Complies with EU Directive 2004/42/EC, The Paints Directive on the limitation of volatile organic compounds: subcategory j.

Recommended use
As a maintenance and repair primer, intermediate, and/or finishing coat in Hempadur systems in severely corrosive environment. As a finishing coat where a cosmetic appearance is of less importance.
As a low temperature curing epoxy primer, intermediate, and/or finishing coat in paint systems according to specification. Well suited as a (blast) primer in epoxy systems.
Mist coat on Galvosil.

Service temperature:
- Maximum, dry exposure only: 140°C [284°F].

Certificates / Approvals
- EC-type examined as a low flame spread material when used as part of a predefined paint system. Please refer to “Declaration of Conformity” on hempel.com for further details.
- Reaction to fire tested (as part of a coating system with approved primer and topcoat) according to EN13501-1 B-s1, d0.

Product safety

Flash point 25°C [77°F]

VOC content mixed product

Legislation	Value	15% thinning, by volume	Limit value, phase II (2010)[a]
EU	412 g/L [3.44 lb/US gal]	478 g/L [3.99 lb/US gal]	500 g/L [4.17 lb/US gal]
US (coatings)	412 g/L [3.44 lb/US gal]	-	-
US (regulatory)	412 g/L [3.44 lb/US gal]	-	-
China	412 g/L [3.44 lb/US gal]	-	-

According to specific legislation, see details in the Explanatory Notes available at Hempel website, hempel.com or at your local Hempel website. VOC values may vary with shade, please consult the Safety Data Sheet, section 9. [a]EU Directive 2004/42/CE.

Handling
Handle with care. Before and during use, observe safety labels on packaging and paint containers and follow all local and national safety regulations. Always consult Hempel’s Safety Data Sheet for this product along with the Product Data Sheet.

For professional use only.

Product data

Product code
15570

Product components
Base 15579
Curing Agent 95570

Standard shade* / code
Brownish red 50630

Gloss
Flat

* Other shades are available, please contact your local Hempel representative.

Hempadur 15570

Volume solids
54 ± 2%

Specific gravity
1.3 kg/L [11 lb/US gal]

Reference dry film thickness
100 micron [4.0 mils]

Micaceous iron oxide (MIO) shade / code
Metallic grey 12430

Gloss
Flat

Volume solids
54 ± 2%

Specific gravity
1.4 kg/L [12 lb/US gal]

Reference dry film thickness
100 micron [4.0 mils]

Surface preparation

Cleanliness
- Remove oil, grease and other contaminants by suitable detergent cleaning.
- Remove salts, detergents and other contaminants by high pressure fresh water cleaning.
- All damage of shopprimer and contamination from storage and fabrication should be thoroughly mechanically/chemically cleaned prior to final painting.

New build:
- Abrasive blasting to min. Sa 2½ (ISO 8501-1) / SP 10 (SSPC).
- Stainless steel, aluminium and other non ferric metals and alloys: use non-metallic blast media (corundum, garnet, etc.). Sweep blasting to a uniform dense sharp profile, without blank spots.
- Remove dust, blast media and loose materials.

Maintenance and Repair
- Abrasive blasting to min. Sa 2 (ISO 8501-1) / SP 6 (SSPC).
- Water jetting to min. Wa 2 (ISO 8501-4).
- Flash rust degree of maximum FR M (ISO 8501-4).
- Minor areas can be cleaned by power tool to St 3 provided the surface is roughened and not polished.
- Stainless steel, aluminium and other non ferric metals and alloys: use non-metallic blast media (corundum, garnet, etc.). Sweep blasting to a uniform dense sharp profile, without blank spots.
- Remove dust, blast media and loose materials.

Roughness
- Surface profile Medium (G) (ISO 8503-2).

Consult Hempel's separate Surface Preparation Guidelines for more details.

Application

Mixing ratio
Base 15579 : Curing Agent 95570
(3 : 1 by volume)

Stir well before use.

Hempadur 15570

Thinner
Hempel's Thinner 08450

Cleaner
Hempel's Tool Cleaner 99610

Pot life

Product temperature	20°C [68°F]
Pot life	2 hours

Application method

Tool	Thinning max vol.	Application parameters
Airless spray	5%	Nozzle pressure: 175 bar [2500 psi] Nozzle orifice: 0.019-0.021"
Air spray	15%	Not Applicable.
Brush	5%	Not Applicable.

If brush or roller application is used, more coats will be necessary to achieve the specified dry film thickness. Spray data are indicative and subject to adjustment. Pressure is for a material temperature of 20°C [68°F].

Film thickness

Specification range	Low	High	Recommended
Dry film thickness	50 micron [2.0 mils]	125 micron [5.0 mils]	100 micron [4.0 mils]
Wet film thickness	90 micron [3.6 mils]	230 micron [9.2 mils]	190 micron [7.6 mils]
Theoretical spreading rate	11 m²/L [448 sq ft/US gal]	4.3 m²/L [175 sq ft/US gal]	5.4 m²/L [220 sq ft/US gal]

For best performance, avoid excessive film thickness. Product may be specified in another film thickness than indicated depending on purpose and area of use. This will alter spreading rate, drying and curing time and overcoating interval.

Application conditions
- To avoid condensation, apply on a clean and dry surface with a temperature that is at least 3°C [5°F] above the dew point.
- Surface temperature must be above -10°C [14°F] during application and curing.
- Beware of ice on the surface at low temperatures.
- Temperature of product must be above 15°C [59°F] during application.

Relative Humidity:
- Relative humidity must be below 85% during application.
- Relative humidity must be below 85% during curing.

Application remarks
- Metallised surfaces should be overcoated before exposure to open air conditions.
- Flash-coat technique is recommended when overcoating porous substrates.

Drying and overcoating

Product compatibility
- Previous coat: None or according to Hempel's specification.
- Subsequent coat: According to Hempel's Specification. Recommended products are: Hempadur, Hempathane, Hempatex

Drying time

Surface temperature		20°C [68°F]
Touch dry	min	60
Hard dry	hours	5
Fully cured	days	7

Determined for dry film thickness 100 micron [4.0 mils] at standard conditions, see Hempel's Explanatory Notes for details.

Hempadur 15570

Overcoating

Hempel's specification supersedes any guidelines indicated in the overcoating table

Quality name		0°C [32°F]	10°C [50°F]	20°C [68°F]	30°C [86°F]
Atmospheric medium					
Hempadur 15570	Min Max	18 h Ext	8 h Ext	4 h Ext	3 h Ext
Hempathane HS 55610	Min Max	18 h Ext	8 h Ext	4 h Ext	3 h Ext
Hempatex Enamel 56360	Min Max	9 h 36 h	4 h 16 h	2 h 8 h	90 min 6 h
Immersion					
Hempadur 15570	Min Max	36 h Ext	16 h Ext	8 h Ext	6 h Ext

Overcoating times are indicative for products of the same generic chemistry. Consult Hempel's specification for more information.

Drying conditions

- To obtain the drying time stated, it is important to maintain sufficient ventilation during application, drying and curing.

Overcoating details

- If the maximum overcoating interval is exceeded, roughening of the surface is necessary to ensure intercoat adhesion.
- The surface must be clean before overcoating.

Other remarks

- Epoxy coats have an inherent tendency of chalking in outdoor exposure. This does not affect the performance of the coating.
- Hempel's Specification supersedes any recommendations given in the Product Data Sheets.

Storage

Shelf life

Ambient temperature	25°C [77°F]
Base	36 months
Curing Agent	36 months

Shelf life from date of production, when stored in original, unopened containers. Thereafter, the product quality must be re-inspected. Storage at elevated temperatures may reduce shelf life. For advice, please consult Hempel.

Storage conditions

- Product must be stored according to local legislation, at maximum 40°C [104°F], without direct sunlight and protected from rain and snow.

Carbon Footprint

Dry film thickness	1 µm	1 mil
GWP (Global Warming Potential)	9.1 g CO_2e/m^2	0.047 lb CO_2e/ft^2

The carbon footprint is for 1 square meter / square foot of surface area with a dry film thickness of 1 micron / mil.

The scope includes raw materials, in-bound transport to the Hempel factory, Hempel manufacturing processes, and any Volatile Organic Compounds emitted during and after the application of the product.

It is calculated based on the standard shade defined in this PDS. Values may vary with shade.

Hempadur 15570

Additional documents

Additional information is available at the Hempel website
https://www.hempel.com/service-and-support/technical-guidelines
or at your local Hempel website:

- Explanatory Notes for Product Data Sheet.
- Application methods.
- General Application Guidelines

This Product Data Sheet ("**PDS**") relates to the supplied product ("**Product**") and is subject to updating from time-to-time. Accordingly, the buyer/applicator should have regard to the PDS supplied together with the relevant batch of the Product (and not an earlier version). In addition to the PDS, the buyer/applicator may receive some or all of the following specifications, statements and/or guidelines as listed below or as are available from the Hempel website under 'Products' at www.hempel.com (the "**Additional documents**"):

No.	Document description	Location/comments
1.	Technical Statement	One-off specific advice provided on request for specific projects
2.	Specification	Only issued for specific projects
3.	PDS	This document
4.	Explanatory Notes to the PDS	Available at www.hempel.com and contain relevant information about the Product testing parameters
5.	Application Instruction	Where available, at www.hempel.com
6.	Generic technical guidelines (e.g. on application and surface preparation)	Where available, at www.hempel.com

In the event of a conflict of information between the PDS and the Additional documents, the order of priority of information shall be in the order as set out above. In such event you should also contact your representative at Hempel for clarification. Furthermore, the buyer/applicator must have full regard to the relevant Safety Data Sheet provided with each Product and which can also be downloaded from www.hempel.com.

Hempel shall not be liable for defects where the application of the Product has not been made fully in accordance with the recommendations and requirements set out in the relevant PDS and the Additional Documents. The information and terms of this disclaimer apply to this PDS, the Additional documents and any other documents supplied by Hempel in respect of the Product. In addition, the Product is supplied and all technical assistance is given subject to Hempel's General Conditions of Sale, Delivery and Service, unless otherwise expressly agreed in writing.

Hempaprime Multi 500

Product characteristics

Description
Hempaprime Multi 500 is a fast drying, high solids epoxy paint. It provides hard wearing and long lasting barrier protection in coating systems for severe corrosive environments. The product meets the requirements of ISO 12944 Part 5, 2019 when used as part of a predefined paint system.

Recommended use
Hempaprime Multi 500 is recommended as a high-build, intermediate coat in high performance coating systems where fast handling and short overcoating times are required. Due to its fast drying - up to twice as fast as comparable products - the product is excellent for projects where fast throughput is key. The product can also be used as a self-priming, surface tolerant coat and a finishing coat in heavy-duty coating systems. Suited for application down to 10°C [50°F]. The product is available in several MIO shades such as 18021 and 18061; both with 80% MIO content. The volume solids % for MIO shades is 82 ± 2.

Service temperature:
- Maximum, dry exposure only: 120°C [248°F].

Certificates / Approvals
- Meets requirements to ISO 12944 when used as part of a predefined paint system. Part 6, Im2; Part 9, CX.
- Meets requirements to NORSOK M-501 when used as part of a predefined paint system. Edition 6, System 1. Edition 7, System 1A, 1B.

Features
- Fast overcoating.
- Crack resistant in high film thickness.
- Low VOC.
- Ready to use - optimised application properties.
- Surface tolerant.

DRAFT

Product safety

Flash point 25°C [77°F]

VOC content mixed product

Legislation	Value
EU	196 g/L [1.64 lb/US gal]
US (coatings)	196 g/L [1.64 lb/US gal]
US (regulatory)	196 g/L [1.64 lb/US gal]
China	196 g/L [1.64 lb/US gal]

According to specific legislation, see details in the Explanatory Notes available at Hempel website, hempel.com or at your local Hempel website. VOC values may vary with shade, please consult the Safety Data Sheet, section 9.

Handling
Handle with care. Before and during use, observe safety labels on packaging and paint containers and follow all local and national safety regulations. Always consult Hempel's Safety Data Sheet for this product along with the Product Data Sheet.

For professional use only.

Product data

Product code
45950

Product components
Base 45959
Curing Agent 95090

Standard shade / code
Brownish red 50630 *

Wide range of colours is available via Hempel's tinting system.

Gloss
Semi-gloss

* Slight discolouration may occur. This does not affect the performance of the coating.

Hempaprime Multi 500

Volume solids
85 ± 2%

Specific gravity
1.4 kg/L [12 lb/US gal]

Reference dry film thickness
150 micron [6.0 mils]

Aluminium shade / code
Aluminium grey 19002

Gloss
Please consult Hempel's Guideline on aluminium pigmented coatings.

Volume solids
78 ± 2%

Specific gravity
1.3 kg/L [11 lb/US gal]

Reference dry film thickness
150 micron [6.0 mils]

DRAFT

Surface preparation

Cleanliness
- Remove oil, grease and other contaminants by suitable detergent cleaning.
- Remove salts, detergents and other contaminants by high pressure fresh water cleaning.

New build:
- Abrasive blasting to min. Sa 2½ (ISO 8501-1) / SP 10 (SSPC).
- Stainless steel, aluminium and other non ferric metals and alloys: use non-metallic blast media (corundum, garnet, etc.). Sweep blasting to a uniform dense sharp profile, without blank spots.
- Remove dust, blast media and loose materials.

Maintenance and Repair
- Spot abrasive blasting to min. PSa 2 (ISO 8501-2) / SP 6 (SSPC).
- Minor areas may be hand or power tool cleaned instead of abrasive blasting.
- Water jetting to min. Wa 2 (ISO 8501-4).
- Flash rust degree of maximum FR M (ISO 8501-4).
- Stainless steel, aluminium and other non ferric metals and alloys: use non-metallic blast media (corundum, garnet, etc.). Sweep blasting to a uniform dense sharp profile, without blank spots.
- Feather edges to sound surrounding coating.
- Remove dust, blast media and loose materials.

Roughness
- Surface profile Medium (G) (ISO 8503-2).

Consult Hempel's separate Surface Preparation Guidelines for more details.

Application

Mixing ratio
Base 45959 : Curing Agent 95090
(4 : 1 by volume)

Stir well before use.

Thinner
Hempel's Thinner 08450

Hempaprime Multi 500

Cleaner
Hempel's Tool Cleaner 99610
Hempel's Thinner 08450

Pot life

Product temperature	10°C [50°F]	20°C [68°F]	30°C [86°F]	40°C [104°F]
Pot life	2½ hours	1 hour	¾ hours	½ hours
Pot life (brush)	-	60 min	-	-

Application method

Tool	Thinning max vol.	Application parameters
Airless spray	5%	Nozzle pressure: 225 bar [3300 psi] Nozzle orifice: 0.019-0.023"
Brush/Roller	5%	Not Applicable.

If brush or roller application is used, more coats will be necessary to achieve the specified dry film thickness. Spray data are indicative and subject to adjustment. Pressure is for a material temperature of 20°C [68°F].

Film thickness

Specification range	Low	High	Recommended
Dry film thickness	100 micron [4.0 mils]	250 micron [10 mils]	150 micron [6.0 mils]
Wet film thickness	118 micron [4.7 mils]	295 micron [12 mils]	177 micron [7.1 mils]
Theoretical spreading rate	3.4 m²/L [139 sq ft/US gal]	8.5 m²/L [346 sq ft/US gal]	5.6 m²/L [228 sq ft/US gal]

Product may be specified in another film thickness than indicated depending on purpose and area of use. This will alter spreading rate, drying and curing time and overcoating interval. For best performance, avoid excessive film thickness.

Application conditions
- Optimal paint temperature for proper mixing, pumping and spraying is: 20°C [68°F].
- To avoid condensation, apply on a clean and dry surface with a temperature that is at least 3°C [5°F] above the dew point.
- Surface temperature must be above 10°C [50°F] during application and curing.

Relative Humidity:
- Relative humidity must be below 85% during application.
- Relative humidity must be below 85% during curing.

Application remarks
- Product requires heavy duty spray equipment; spray hoses shall be as short as possible.
- Metallised surfaces should be overcoated before exposure to open air conditions.
- Flash-coat technique is recommended when overcoating porous substrates.

DRAFT

Drying and overcoating

Product compatibility
- Previous coat: None or according to Hempel's specification.
- Subsequent coat: None or according to Hempel's specification. Recommended products are: Hempadur, Hempaprime, Hempathane

Drying time

Surface temperature		10°C [50°F]	20°C [68°F]	30°C [86°F]	40°C [104°F]
Touch dry	hours	2½	1	⅔	⅓
Surface dry	hours	5½	2½	1	½
Hard dry	hours	8	3½	1½	¾
Fully cured	days	-	7	-	-

Determined for dry film thickness 150 micron [6.0 mils] at standard conditions, see Hempel's Explanatory Notes for details.

Hempaprime Multi 500

Overcoating

Hempel's specification supersedes any guidelines indicated in the overcoating table

Quality name		10°C [50°F]	20°C [68°F]	30°C [86°F]	40°C [104°F]
Atmospheric medium					
Hempaprime Multi 500	Min	7 h	3 h	2 h	90 min
	Max	Ext*	Ext	Ext	Ext
Hempathane HS 55610	Min	7 h	3 h	2 h	90 min
	Max	Ext*	Ext	Ext	Ext

Overcoating times are indicative for products of the same generic chemistry. Consult Hempel's specification for more information.

Drying conditions

- To obtain the drying time stated, it is important to maintain sufficient ventilation during application, drying and curing.
- According to Hempel's Specification.

Overcoating details

- If the maximum overcoating interval is exceeded, roughening of the surface is necessary to ensure intercoat adhesion.
- The surface must be dry and clean prior to application.

Other remarks

- Epoxy coats have an inherent tendency of chalking in outdoor exposure. This does not affect the performance of the coating.
- Hempel's Specification supersedes any recommendations given in the Product Data Sheets.

Storage

Shelf life

Ambient temperature	25°C [77°F]
Base	24 months
Curing Agent	24 months

Shelf life from date of production, when stored in original, unopened containers. Thereafter, the product quality must be re-inspected. Storage at elevated temperatures may reduce shelf life. For advice, please consult Hempel.

Storage conditions

- Product must be stored according to local legislation, at maximum 40°C [104°F], without direct sunlight and protected from rain and snow.

Carbon Footprint

Dry film thickness	1 µm	1 mil
GWP (Global Warming Potential)	5.5 g CO_2e/m^2	0.028 lb CO_2e/ft^2

The carbon footprint is for 1 square meter / square foot of surface area with a dry film thickness of 1 micron / mil.

The scope includes raw materials, in-bound transport to the Hempel factory, Hempel manufacturing processes, and any Volatile Organic Compounds emitted during and after the application of the product.

It is calculated based on the standard shade defined in this PDS. Values may vary with shade.

DRAFT

Hempaprime Multi 500

Additional documents

Additional information is available at the Hempel website
https://www.hempel.com/service-and-support/technical-guidelines
or at your local Hempel website:

- Explanatory Notes for Product Data Sheet.
- Application methods.
- Substrates.
- Surface Preparation.
- Application Instruction for this product.
- Repair & maintenance.
- Inspection & quality control.

DRAFT

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No.	Document description	Location/comments
1.	Technical Statement	One-off specific advice provided on request for specific projects
2.	Specification	Only issued for specific projects
3.	PDS	This document
4.	Explanatory Notes to the PDS	Available at www.hempel.com and contain relevant information about the Product testing parameters
5.	Application Instruction	Where available, at www.hempel.com
6.	Generic technical guidelines (e.g. on application and surface preparation)	Where available, at www.hempel.com

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Hempel shall not be liable for defects where the application of the Product has not been made fully in accordance with the recommendations and requirements set out in the relevant PDS and the Additional Documents. The information and terms of this disclaimer apply to this PDS, the Additional documents and any other documents supplied by Hempel in respect of the Product. In addition, the Product is supplied and all technical assistance is given subject to Hempel's General Conditions of Sale, Delivery and Service, unless otherwise expressly agreed in writing.

Hempel's Pro Acrylic

Product characteristics

Description
Hempel's Pro Acrylic 55883 is a two-component, isocyanate-free, acrylic finishing coat with good gloss and colour retention. It is resistant to water and spillage of aliphatic hydrocarbons.
Minimum curing temperature is 0°C/32°F.

Recommended use
Hempel's Pro Acrylic is recommended as a finishing coat for protection of structural steel in severely corrosive environment, where light-fastness and gloss retention are required.
The product may be specified as a one-coat direct-to-metal system in corrosive environments classified as C2 and C3.

Service temperature:
- Maximum, dry exposure only: 120°C [248°F].

Certificates / Approvals
- Meets requirements to NORSOK M-501 when used as part of a predefined paint system. Edition 6, System 1.

Product safety

Flash point 32°C [90°F]

VOC content mixed product

Legislation	Value
EU	362 g/L [3.02 lb/US gal]
US (coatings)	432 g/L [3.61 lb/US gal]
US (regulatory)	432 g/L [3.61 lb/US gal]
China	432 g/L [3.61 lb/US gal]

According to specific legislation, see details in the Explanatory Notes available at Hempel website, hempel.com or at your local Hempel website. VOC values may vary with shade, please consult the Safety Data Sheet, section 9.

Handling
Handle with care. Before and during use, observe safety labels on packaging and paint containers and follow all local and national safety regulations. Always consult Hempel's Safety Data Sheet for this product along with the Product Data Sheet.

For professional use only.

Product data

Product code
55883

Product components
Base 55889
Curing Agent 97883

Standard shade* / code
White 10000 **

Gloss
Glossy

Volume solids
58 ± 2%

Specific gravity
1.3 kg/L [11 lb/US gal]

Reference dry film thickness
50 micron [2.0 mils]

Aluminium shade* / code**
Aluminium grey 19000 ****

Gloss
Please consult Hempel's Guideline on aluminium pigmented coatings.

* Wide range of colours is available via Hempel's Multi-Tint® system.
** Colour stability may be affected by exposure to chemicals, elevated temperatures, low light conditions and/ or inadequate ventilation.
*** Other shades may be available upon request.
**** Appearance of the aluminium pigmented coats will depend on application method, drying conditions, handling etc. Please see the Guideline on Aluminium pigmented coatings at hempel.com or at your local Hempel website.

Issued by Hempel A/S - December 2023

Document Number: 1724000791-MAT-PRO-00606_04

Hempel's Pro Acrylic

Volume solids
52 ± 2%

Specific gravity
1.1 kg/L [9 lb/US gal]

Reference dry film thickness
50 micron [2.0 mils]

Surface preparation

Cleanliness
- According to Hempel's Specification.

Consult Hempel's separate Surface Preparation Guidelines for more details.

Application

Mixing ratio
Base 55889 : Curing Agent 97883
(7 : 1 by volume)

Stir well before use.

Thinner
Hempel's Thinner 08450

Cleaner
Hempel's Thinner 08450

Pot life

Product temperature	20°C [68°F]
Pot life	4 hours

Application method

Tool	Thinning max vol.	Application parameters
Airless spray	5%	Nozzle pressure: 150 bar [2200 psi] Nozzle orifice: 0.017-0.019"

If brush or roller application is used, more coats will be necessary to achieve the specified dry film thickness. Spray data are indicative and subject to adjustment. Pressure is for a material temperature of 20°C [68°F].

Film thickness

Specification range	Low	High	Recommended
Dry film thickness	50 micron [2.0 mils]	120 micron [4.7 mils]	50 micron [2.0 mils]
Wet film thickness	90 micron [3.5 mils]	210 micron [8 mils]	90 micron [3.5 mils]
Theoretical spreading rate	12 m²/L [490 sq ft/US gal]	4.8 m²/L [200 sq ft/US gal]	12 m²/L [490 sq ft/US gal]

For best performance, avoid excessive film thickness.

Application conditions
- To avoid condensation, apply on a clean and dry surface with a temperature that is at least 3°C [5°F] above the dew point.
- Surface temperature must be above 0°C [32°F] during application and curing.

Application remarks
- Two coats of the topcoat may be necessary to obtain full hiding power.

Drying and overcoating

Product compatibility
- Previous coat: According to Hempel's Specification. Recommended products are: Hempadur Mastic 4588W, Hempadur 45141/45143
- Subsequent coat: None.

Hempel's Pro Acrylic

Drying time

Surface temperature		20°C [68°F]
Surface dry	hours	4½
Hard dry	hours	10
Fully cured	days	7

Determined for dry film thickness 50 micron [2.0 mils] at standard conditions, see Hempel's Explanatory Notes for details.

Overcoating

Hempel's specification supersedes any guidelines indicated in the overcoating table

Quality name		0°C [32°F]	10°C [50°F]	20°C [68°F]
		Atmospheric medium		
Hempel's Pro Acrylic	Min	18 h	9 h	6 h
	Max	Ext*	Ext	Ext

Overcoating times are indicative for products of the same generic chemistry. Consult Hempel's specification for more information.

Drying conditions

- To obtain the drying time stated, it is important to maintain sufficient ventilation during application, drying and curing.
- Condensation on the freshly applied coating should be avoided.

Overcoating details

- The surface must be dry and clean prior to application.

Other remarks

- Hempel's Specification supersedes any recommendations given in the Product Data Sheets.

Storage

Shelf life

Ambient temperature	25°C [77°F]
Base	36 months
Curing Agent	18 months

Shelf life from date of production, when stored in original, unopened containers. Thereafter, the product quality must be re-inspected. Storage at elevated temperatures may reduce shelf life. For advice, please consult Hempel.

Storage conditions

- The curing agent is sensitive to moisture. Store in a dry place and keep the can tightly closed until use.

Carbon Footprint

Dry film thickness	1 µm	1 mil
GWP (Global Warming Potential)	11.4 g CO_2e/m^2	0.059 lb CO_2e/ft^2

The carbon footprint is for 1 square meter / square foot of surface area with a dry film thickness of 1 micron / mil.

The scope includes raw materials, in-bound transport to the Hempel factory, Hempel manufacturing processes, and any Volatile Organic Compounds emitted during and after the application of the product.

It is calculated based on the standard shade defined in this PDS. Values may vary with shade.

Hempel's Pro Acrylic

Additional documents

Additional information is available at the Hempel website
https://www.hempel.com/service-and-support/technical-guidelines
or at your local Hempel website:

- Explanatory Notes for Product Data Sheet.
- Application methods.
- General Application Guidelines

This Product Data Sheet ("**PDS**") relates to the supplied product ("**Product**") and is subject to updating from time-to-time. Accordingly, the buyer/applicator should have regard to the PDS supplied together with the relevant batch of the Product (and not an earlier version). In addition to the PDS, the buyer/applicator may receive some or all of the following specifications, statements and/or guidelines as listed below or as are available from the Hempel website under 'Products' at www.hempel.com (the "**Additional documents**"):

No.	Document description	Location/comments
1.	Technical Statement	One-off specific advice provided on request for specific projects
2.	Specification	Only issued for specific projects
3.	PDS	This document
4.	Explanatory Notes to the PDS	Available at www.hempel.com and contain relevant information about the Product testing parameters
5.	Application Instruction	Where available, at www.hempel.com
6.	Generic technical guidelines (e.g. on application and surface preparation)	Where available, at www.hempel.com

In the event of a conflict of information between the PDS and the Additional documents, the order of priority of information shall be in the order as set out above. In such event you should also contact your representative at Hempel for clarification. Furthermore, the buyer/applicator must have full regard to the relevant Safety Data Sheet provided with each Product and which can also be downloaded from www.hempel.com.

Hempel shall not be liable for defects where the application of the Product has not been made fully in accordance with the recommendations and requirements set out in the relevant PDS and the Additional Documents. The information and terms of this disclaimer apply to this PDS, the Additional documents and any other documents supplied by Hempel in respect of the Product. In addition, the Product is supplied and all technical assistance is given subject to Hempel's General Conditions of Sale, Delivery and Service, unless otherwise expressly agreed in writing.

1.2.5 PRESSURE TEST PROCEDURES

Base Load Power Hub (BLPH)

PRESSURE TEST PROCEDURES
VARIABLE AREA FLOWMETERS 3809G

Document Number: 1724000791-QC-PRO-00007

Document Class: 2

ROSETTI MARINO

1	NO COMMENTS - APPROVED - WORK MAY PROCEED
2	MINOR COMMENTS - REVISE AND RESUBMIT - WORK MAY PROCEED
3	MAJOR COMMENTS – REJECTED – DO NOT PROCEED
4	APPROVAL NOT REQUIRED

NOTE: Approval doesn't relieve the supplier from mandatory compliance with contractual documents and specifications. Comments made do not imply acceptance of any cost or delivery impact.

Sign	Date
V. Barratta	07-11-2024

Rev.	Date	Description	Prepared	Reviewed	Approved
03	30/10/2024	ACCEPTED FOR CONSTRUCTION (AFC)	Krisztián Pohorlyák	Mária Poór	Zsanett Molnár
02	19/7/2024	ACCEPTED FOR CONSTRUCTION (AFC)	Krisztián Pohorlyák	Mária Poór	Zsanett Molnár
01	3/6/2024	ACCEPTED FOR CONSTRUCTION (AFC)	Krisztián Pohorlyák	Mária Poór	Zsanett Molnár
00	10/5/2024	ISSUE FOR REVIEW (IFR)	Krisztián Pohorlyák	Mária Poór	Zsanett Molnár

BROOKS INSTRUMENT
Beyond Measure

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Table of Contents

SH.	DESCRIPTION	REVISIONS							
		00	01	02	03				
1	Cover	X	X	X	X				
2	Table of Contents	X	X	X	X				
3	Revision / Change Log	X	X	X	X				
4	Addendum			X	X				
7	PRESSURE TEST PROCEDURES	X	X	X	X				

Document Number: 1724000791-QC-PRO-00007_03
This document undergoes an issuance cycle within EDMS "Fusionlive".
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Document Number: 1724000791-QC-DB-00009_03

Revision / Change Log

Rev.	Description
00	ISSUE FOR REVIEW (IFR)
01	ACCEPTED FOR CONSTRUCTION (AFC)
02	ACCEPTED FOR CONSTRUCTION (AFC)
03	ACCEPTED FOR CONSTRUCTION (AFC)

HOLDS LIST

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Document Number: 1724000791-QC-DB-00009_03

Document addendum

Form QA-18-A-004

Subject	PRESSURE TEST PROCEDURES
Customer	ROSETTI MARINO S.p.A
Reference to customer procedure/ specification	1724000791-QC-PRO-00007
PO number	1724000791
Item description/scope	Flow Meter (Rotameter)
TAG numbers	As per order

Test Pressure Details:

All values are expressed in barg and PSIG at 21°C / 69.8°F

Modelcode	Tag number	Connection size	Flange material	Pressure test duration (min)	Pressure test medium	Pressure value (barg)	Acceptance criteria
3809GCA10AGBC3D2C0AC	25-FT-031	1" 300 Lbs	316SS /316L SS	2	Water	75	No visual leakage
3809GCA10AGBC3D2C0AC	25-FT-032	1" 300 Lbs	316SS /316L SS	2	Water	75	No visual leakage
3809GCA10AGBC3D2C0AC	25-FT-033	1" 300 Lbs	316SS /316L SS	2	Water	75	No visual leakage
3809GCA10AGBC3D2C0AC	25-FT-034	1" 300 Lbs	316SS /316L SS	2	Water	75	No visual leakage
3809GCA10AGBC3D2C0AC	25-FT-036	1" 300 Lbs	316SS /316L SS	2	Water	75	No visual leakage
3809GCA10AGBC3D2C0AC	25-FT-038	1" 300 Lbs	316SS /316L SS	2	Water	75	No visual leakage
3809GCC08BFBC9A0V0AC	64-FG-001	1" 150 Lbs	316SS /316L SS	2	Water	29	No visual leakage

REV	DATE	CREATED BY	INIT.
2	30/10/2024	Krisztian Pohorlyak	KP
1	10/07/2024	Krisztian Pohorlyak	KP

FULL QUALITY ASSURANCE CERTIFICATE

Certificate No.:
10000454590-PA-ACCREDIA-NLD

Initial date:
2002-07-03

Validity:
05 July, 2023 - 04 July, 2026

This certificate consists of 2 pages

This is to certify that the quality system of:

Brooks Instrument LLC

407 West Vine Street, PA 19440 Hatfield, United States of America

has been assessed and found to comply with respect to the conformity assessment procedure described in:

ANNEX III MODULE H OF DIRECTIVE 2014/68/EU ON PRESSURE EQUIPMENT

This certificate is valid for the following scope:

Type of Pressure Equipment	**Pressure Accessories**
Product Name	**Precision fluid measurement and control instruments**

Place and date:
Vimercate, 04 July 2023

Check Validity

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

SGQ N° 003 A
SGA N° 003 D
SGE N° 007 M
SCR N° 004 F
EMAS N° 009 P
PRD N° 003 B
PRS N° 094 C
SSI N° 002 G

Membro di MLA EA per gli schemi di accreditamento SGQ, SGA, PRD, PRS, ISP, GHG, LAB e LAT, di MLA IAF per gli schemi di accreditamento SGQ, SGA, SSI, FSM e PRD e di MRA ILAC per gli schemi di accreditamento LAB, MED, LAT e ISP

For the issuing office:
Notified Body 0496, Italy
DNV Business Assurance Italy S.r.l.

Maurizio Bellina
Management Representative

Jurisdiction

Application of Directive 2014/68/EU and Decreto Legislativo n. 26 of 15 February 2016.

Certificate history:

Revision	Description	Issue Date
02-SKM-H-146535-00	Certification Brooks Instrument B.V. by DNV, PED 97/23/EC, Module H	2002-07-03
05-PED-ROT-H-05.3960-00	Re-Certification	2005-11-16
08-PED-ROT-H-08.4390-01	Re-Certification Brooks Instrument LLC by DNV	2008-06-06
11-PED-ROT-H-11.007820-01	Re-Certification	2011-07-03
14-PED-ROT-H-14.A0006826-01	Re-Certification	2014-07-03
14-PED-ROT-H-14.A0006826-01, R1	Revision DNV GL entity	2016-07-19
17-PED-ROT-H-16.Z0553001-01	Re-certification	2017-07-04
17-PED-ROT-H-16.Z0553001-01 R1	Location Veenendaal removed from certificate, ISO 9001:2015 certificate reference updated	2019-03-13
20-PED-ROT-H-16.Z0553001-01	Re-certification	2020-09-03
10000454590-PA-ACCREDIA-NLD rev. 0	Transfer of certificate to EU-CAB 0496	2021-10-04
10000454590-PA-ACCREDIA-NLD rev. 1	Re-certification	2023-07-04

Products covered by this Certificate:

Product Name	Product Description	Type of material	Applied product standard
Pressure Accessories	Precision fluid measurement and control instruments	Austenitic stainless steels Nickel Chrome alloys Titanium alloys	AD 2000 Merkblätter ASME B31.3 ASME VIII, div. 1

Sites covered by this certificate

Site Name	Site Address	Audited by	Date	Report ref
Central Office - Brooks Instrument LLC Manufacturing by assembly and testing	407 West Vine Street, Hatfield, PA, 19440, USA	R-J Kaagman	2023-06-29&30	SC239685-2023-AP-RC-00
Manufacturing location - Brooks Instrument Kft Manufacturing by welding, assembly and testing	Berényi út 72-100, Székesfehérvár, Hungary	Peter Éros	2023-06-21&22	239685-2023/06/21–RP/RC-00

Terms and conditions

Valid terms and conditions are found in the DNV´s PED Certification Requirements

End of Certificate

Test Specification	
Description:	**PRESSURE TEST FOR 38xxG SUPERFAMILY**

1. OBJECT

1.1 A pressure-technical test description of all products, which are used in the product group, referred to in the heading.

2. APPLICATION

2.1 This specification includes tables, which partly relate to basic components like flanged or threaded flow meters, with or without valves or controllers directly related to final products. The weakest link in the construction must be the determining factor for the pressure test values.

2.1.1 Table 1 listed the flange pressure if applicable.
2.1.2 Table 2 and 3 : Lists the Tube pressure for Threaded meters
2.1.3 Table 4 and 5: List the optional Flow Controller or Valve options.

Example: Model #10-MT 3809, 1" flange ANSI 300 LBS RF (PN50) 316L is assembled together with 8830 Flow Controller.
Max. pressure for 3809: 49.6bar (720psi), Acc. to ANSI B16.5.
Max. pressure for 8830: 21bar (305psi).
The weakest link is the 8830 FC. This is then the determining factor for the test pressure. The instrument mentioned above should be pressure-tested at 31bar (450psi).

2.2 The pressure-test factor used by Brooks is 1.5 x of the maximum (design / tube) pressure and all values are indicated in bar and PSI.

2.3 Valves, as indicated in the table on page 7, depend on the supplier. If for some reason needle valves are purchased from a different supplier than indicated on Purchase specification, the applicable maximum/test pressure should be considered again used the pressure value which is permitted by the supplied valve.

i.e. Flange material with equal or higher tensile strength than 316 SS.

2.4 The maximum pressure rating for flanges is partly dictated by their construction material. The table on page 3 indicates that relatively great differences exist depending on the material used. This should be taken into consideration in assessing jobs assigned by customers and in the design.
This does not apply to pressure tests for our standard range of flanges: ANSI 150 (PN20), ANSI 300 (PN50), ANSI 600 (PN100), DIN PN40, JIS 10K, JIS 20K. These nominal pressure values are assumed in determining the pressure test values.

Rev.	No.	Description	Revised by	Chk.	Date
H	GR11	Added acceptance criteria for test	AD	JPP	Nov-20-2023
G	GK98	Rewrittem to new format, Section 6 added	AD	RBS	Apr-22-2022
F	FW14	Corrected values for threaded female St'd pressude design for ELF	NRM	JJR	Jul. 22. 2019
E	FK66	Add instruction for assembled units (see 3.3): Pressure test time 10min	AL	JvL	Aug. 29. 2016
D	FC58	Update Pressure values according to ASME B16.5	JES	JvL	July 23. 2015

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BROOKS® INSTRUMENT
407 W. VINE ST
HATFIELD, PA
19440 USA
FCI NO. 4ZW64

Document No.: 834-C-118 Rev. H

3. METHOD

3.1 The pressure test is carried out with the appropriate test equipment.

Hydrostatic pressure tests with water: at ambient temperature
Pneumatic pressure tests with air or nitrogen: at ambient temperature
(Water must be clean and have chloride content lower than 30 ppm)

3.2 Pressure should be built up as smoothly as possible and all safety precautions must be observed.

3.3 The duration of the pressure test of **individual units must be at least two minutes** at test pressure, except where otherwise stated on the order routing. (i.e. CRN orders needs to be pressure tested at least 10 minutes)

The duration of the leak test of units **assembled with valve or flowcontroller** must be at least **ten** minutes at test pressure of weakest link in the construction.
Pressure test shall be conducted after any other treatments or applicable examinations (e.g.: heat treatment, LDP..etc) BUT needs to be executed before primed and painted.
In case the pressure rating of the individual units are the same, only testing as a complete assembly for the duration mentioned above, is sufficient.

3.4 After testing the inside of the product, must be cleaned and dried. The dismantling of the assembled instruments is no longer permitted after this time.

3.5 When pressure tests are being carried out on the meter bodies, the Certification Tag or Log File should be completed with details of the actual pressure values. The assembled meters, including FC 88/8900 series and 8830 should be supplied with a stamped PT sticker. The sticker should be placed in a position where it can easily be seen, but it must not deface the instrument. The assembled meters should be supplied with a stamped PT sticker.

3.6 Pressure test equipment must be controlled within the test equipment control program for traceability and periodical calibration.

4. ASSEMBLED MODELS

If a number of pressure-tested components are built together to form an assembly (e.g. 38xxG with Flow Controller), which may not be tested on water, the assembly should be tested for any signs of leakage by using compressed air or nitrogen.
The test pressure has to be determined by the components with the lowest permissible working pressure.

Rev.	No.	Description	Revised by	Chk.	Date
H	GR11	Added acceptance criteria for test	AD	JPP	Nov-20-2023
G	GK98	Rewrittem to new format, Section 6 added	AD	RBS	Apr-22-2022
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5. DEFINITIONS

- The ambient temperature referred to in the pressure test should be 21°C ± 5°C (69.8°F ± 9.0 ºF).

6. ACCEPTANCE CRITERIA

- The acceptance criteria through the duration of the test are that there will be no breakage or permanent distortion of any structural member and be totally leak free by visual inspection.
- No formation of a water drop is allowed during the whole cycle of the pressure test.

Rev.	No.	Description	Revised by	Chk.	Date
H	GR11	Added acceptance criteria for test	AD	JPP	Nov-20-2023
G	GK98	Rewrittem to new format, Section 6 added	AD	RBS	Apr-22-2022
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FIGURES RELATING TO PRESSURE TEST FOR FLANGES

According to ANSI B 16.5, EN1092-1 and JIS B 2220

Pressure should be built up gradually to the value below -0% to +8% to the nearest increment on the gage. All values are expressed in bar and PSIG at 21°C / 69,8°F
The duration of the test must be at least two minutes, except where otherwise stated on order routing (See 3.3)

Table 1:

Flange Rating	316SS dual cert.			
	Maximum Pressure		Test Pressure	
	(bar)	(PSI)	(bar)	(PSI)
150 lbs / PN 20	19	275	29	425
300 lbs / PN 50	49.6	720	75	1100
600 lbs / PN 100	99.3	1440	149	2175
900 lbs / PN 150	148.9	2160	224	3250
1500 lbs / PN 250	248.2	3600	372	5400
2500 lbs / PN 420	413.7	6000	621	9000
PN 16	16	232	24	350
PN 25	25	363	38	550
PN 40	40	580	60	875
PN 64	64	928	96	1400
PN 100	100	1450	150	2200
10 K (JIS)	14	203	21	325
20 K (JIS)	34	493	51	750

Flange Rating	Hastelloy C276, Inconel 625				Titanium GR 2			
	Max. Pressure		Test Pressure		Max. Pressure		Test Pressure	
	(bar)	(PSI)	(bar)	(PSI)	(bar)	(PSI)	(bar)	(PSI)
150 lbs / PN 20	20	290	30	450	16.1	234	24	350
300 lbs / PN 50	51.7	750	78	1125	42.2	612	63	925
600lbs / PN 100	103.4	1500	155	2250	84.4	1224	126	1850
900lbs / PN 150	155.1	2250	233	3375	126.6	1836	191	2775
1500lbs / PN 250	258.6	3750	388	5625	211	3060	317	4600
2500lbs / PN 420	430.9	6250	647	9375	351.6	5100	528	7650
PN 16	16	232	24	350	13.6	197	21	325
PN 25	25	363	38	550	21.3	309	32	475

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PN 40	40	580	60	875	34	493	51	750
PN 64	64	928	96	1400	54.4	789	82	1200
PN 100	100	1450	150	2200	85	1233	128	1850
10 K (JIS	14	203	21	325	11.9	173	18	275
20 K (JIS)	34	493	51	750	28.9	419	44	650

Notes: For other pressure values or unspecified flange norms where the pressure test values are not indicated on the routing, please consult the engineer responsible.

FIGURES RELATING TO PRESSURE TEST FOR THREADED METERS.

Pressure should be built up gradually to the value below -0% to +8% to the nearest increment on the gage. All values are expressed in bar and PSIG at 21°C / 69,8°F
The duration of the test must be at least two minutes, except where otherwise stated on order routing (See 3.3)

Table 2:

Meter Size	316 SS DUAL CERT.							
	Threaded Female St'd Pressure Design				Threaded Female High Press.			
	Maximum Pressure		Test Pressure		Maximum Pressure		Test Pressure	
	(bar)	(PSI)	(bar)	(PSI)	(bar)	(PSI)	(bar)	(PSI)
ELF	177	2567	266	3875	414	6000	621	9000
7/8	177	2567	266	3875	414	6000	621	9000
10	160	2321	240	3500	414	6000	621	9000
12	133	1929	200	2900	414	6000	621	9000
13	120	1740	180	2625	-	-	-	-

Meter Size	HASTELLOY C276			
	Threaded Female St'd Pressure Design		Threaded Female High Press.	
	Maximum Pressure	Test Pressure	Maximum Pressure	Test Pressure

Rev.	No.	Description	Revised by	Chk.	Date
H	GR11	Added acceptance criteria for test	AD	JPP	Nov-20-2023
G	GK98	Rewrittem to new format, Section 6 added	AD	RBS	Apr-22-2022
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	(bar)	(PSI)	(bar)	(PSI)	(bar)	(PSI)	(bar)	(PSI)
ELF	242	3510	363	5275	431	6250	647	9375
7/8	242	3510	363	5275	431	6250	647	9375
10	218	3162	327	4750	431	6250	647	9375
12	182	2640	273	3975	431	6250	647	9375
13	164	2379	246	3575	-	-	-	-

Meter Size	**INCONEL 625**							
	Threaded Female St'd Pressure Design				**Threaded Female High Press.**			
	Maximum Pressure		Test Pressure		Maximum Pressure		Test Pressure	
	(bar)	(PSI)	(bar)	(PSI)	(bar)	(PSI)	(bar)	(PSI)
ELF	279	4047	419	6075	431	6250	647	9375
7/8	279	4047	419	6075	431	6250	647	9375
10	251	3640	377	5475	431	6250	647	9375
12	210	3046	315	4575	431	6250	647	9375
13	189	2741	284	4125	-	-	-	-

Meter Size	**TITANIUM GRADE 2**							
	Threaded Female St'd Pressure Design				**Threaded Female High Press.**			
	Maximum Pressure		Test Pressure		Maximum Pressure		Test Pressure	
	(bar)	(PSI)	(bar)	(PSI)	(bar)	(PSI)	(bar)	(PSI)
ELF	148	2147	222	3225	352	5100	528	7650
7/8	148	2147	222	3225	352	5100	528	7650
10	133	1929	200	2900	352	5100	528	7650
12	111	1610	167	2425	352	5100	528	7650
13	100	1450	150	2200	-	-	-	-

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Table 3:

Meter Size	316 SS DUAL CERT. Threaded Male			
	Maximum Pressure		Test Pressure	
	(bar)	(PSI)	(bar)	(PSI)
ELF	414	6000	621	9000
7/8	324	4699	486	7050
10	261	3785	392	5700
12	254	3684	381	5550

Meter Size	HASTELLOY C276 Threaded Male			
	Maximum Pressure		Test Pressure	
	(bar)	(PSI)	(bar)	(PSI)
ELF	431	6250	647	9375
7/8	344	4989	516	7500
10	356	5163	534	7750
12	347	5033	521	7550

Meter Size	INCONEL 625 Threaded Male			
	Maximum Pressure		Test Pressure	
	(bar)	(PSI)	(bar)	(PSI)
ELF	431	6250	647	9375
7/8	397	5758	596	8650
10	411	5961	617	8950
12	400	5802	600	8725

Meter Size	TITANIUM GR 2 Threaded Male			
	Maximum Pressure		Test Pressure	
	(bar)	(PSI)	(bar)	(PSI)
ELF	352	5100	528	7650

Rev.	No.	Description	Revised by	Chk.	Date
H	GR11	Added acceptance criteria for test	AD	JPP	Nov-20-2023
G	GK98	Rewrittem to new format, Section 6 added	AD	RBS	Apr-22-2022
F	FW14	Corrected values for threaded female St'd pressude design for ELF	NRM	JJR	Jul. 22. 2019
E	FK66	Add instruction for assembled units (see 3.3): Pressure test time 10min	AL	JvL	Aug. 29. 2016
D	FC58	Update Pressure values according to ASME B16.5	JES	JvL	July 23. 2015

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7/8	210	3046	315	4575
10	217	3147	326	4725
12	212	3075	318	4625

FIGURES RELATING TO HYDROSTATIC PRESSURE TEST FOR MODEL 38xxG (316 SS, E/TFE LINED)

The practical operating and test pressures are determined by the type of flange. See Table 1 page 3 for 316SS dual cert values.

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FIGURES RELATING TO HYDROSTATIC PRESSURE TESTS FOR NEEDLE VALVES

This part of this procedure is only applicable where 38xx instruments are used in combination with a mounted needle valve. For mounted needle valves see table 1 or 2 (when applicable, 316SS only) whichever is the lowest operating pressure.

Pressure should be built up gradually to the value below -0% to +8% to the nearest increment on the gage. All values are expressed in bar and PSIG at 21°C / 69,8°F
The duration of the test must be at least **ten minutes**, except where otherwise stated on order routing (See 3.3)

Table 4:

NEEDLE VALVE size	Maximum Pressure		Test Pressure	
	(bar)	(PSI)	(bar)	(PSI)
088Z080BMF - Brooks Industrial 1/4" ELF	138	2000	207	3000
947B360BMA - 1/4" 947B359BMA - 1/2" 947B364BMA - 3/4" 947B365BMA - 1"	210	3045	315	4575
947B521BMA - 1½"	100	1450	150	2200

Notes:

1. Always use the lowest permissible test pressure for the components in the final product related to the lowest operating pressure from one of the components.
2. The pressure test values shown above are maximum permissible pressures and may not be exceeded, even if a higher value is permitted by a flange pressure class. Please consult the engineer responsible if in doubt.

Rev.	No.	Description	Revised by	Chk.	Date
H	GR11	Added acceptance criteria for test	AD	JPP	Nov-20-2023
G	GK98	Rewrittem to new format, Section 6 added	AD	RBS	Apr-22-2022
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D	FC58	Update Pressure values according to ASME B16.5	JES	JvL	July 23. 2015

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FIGURES RELATING TO PNEUMATIC PRESSURE TESTS

FOR FLOW CONTROLLERS

(Technical air or nitrogen)

Pressure should be built up gradually to the value below -0% to +8% to the nearest increment on the gage. All values are expressed in bar and PSIG at 21°C / 69,8°F
The duration of the test must be at least **ten minutes.**
For mounted Flow Controller see table 1 or 2 (when applicable) whichever is the lowest operating pressure.

Table 5:

FLOWCONTROLLER TYPE	Maximum Pressure		Test Pressure	
	(bar)	(PSI)	(bar)	(PSI)
316SS 8802/12 – 8902/12	21	305	31	450
316SS 8805/15 – 8905/15	69	1000	104	1500
316SS 8830	21	305	31	450

Notes:

1. Always use the lowest permissible test pressure for the components in the final product related to the lowest operating pressure from one of the components.
2. The pressure test values shown above are maximum permissible pressures and may not be exceeded, even if a higher value is permitted by a flange pressure class. Please consult the engineer responsible if in doubt.

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1.2.6 FAT PROCEDURES

Base Load Power Hub (BLPH)

FAT PROCEDURES

Document Number: 1724000791-QC-PRO-00008

Document Class: 2

ROSETTI MARINO

1	NO COMMENTS - APPROVED - WORK MAY PROCEED
2	MINOR COMMENTS - REVISE AND RESUBMIT - WORK MAY PROCEED
3	MAJOR COMMENTS – REJECTED – DO NOT PROCEED
4	APPROVAL NOT REQUIRED

NOTE: Approval doesn't relieve the supplier from mandatory compliance with contractual documents and specifications. Comments made do not imply acceptance of any cost or delivery impact.

Sign	Date
V. Barratta	13-12-2024

03	28/11/2024	ACCEPTED FOR CONSTRUCTION (AFC)	Róbert Seres	Mária Poór	Zsanett Molnár
02	25/7/2024	ACCEPTED FOR CONSTRUCTION (AFC)	Róbert Seres	Mária Poór	Zsanett Molnár
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00	22/5/2024	ISSUE FOR REVIEW (IFR)	Róbert Seres	Mária Poór	Zsanett Molnár
Rev.	Date	Description	Prepared	Reviewed	Approved

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BROOKS® INSTRUMENT

Document Title: Factory Acceptance Test Procedure (FAT)

End User:		**PO NO:**	
Vendor:	ROSETTI MARINO S.p.A	**PO NO:**	1724000791
Sub-vendor Name:	Brooks Instrument	**Document No:**	
Project:	HOLLANDSE KUST NOORD WIND PARK Project		

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4 Tools and Test Equipment

5 Utility

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- A. Visual and Dimensional Inspection
- B. Calibration Test
- C. Pressure Test.
- D. Documentation check

7 Punch List

8 Inspection Acceptance Record

BROOKS® INSTRUMENT

1. Introduction:

This section describes the procedure by which the individual equipment's or combined system shall be inspected and tested to assure its proper operation. A list of check items required shall be prepared (see attached FAT Report). The completed list with the results recorded, it's supporting data and documents shall be attached to form a part of the completed FAT Record.

2. TAG No. Details:

Sl. No.	Modelcode	Tag Number	Instrument	Remarks
1	3809GCA10AGBC3D2C0AC	25-FT-031	VA Flowmeter	
2	3809GCA10AGBC3D2C0AC	25-FT-032	VA Flowmeter	
3	3809GCA10AGBC3D2C0AC	25-FT-033	VA Flowmeter	
4	3809GCA10AGBC3D2C0AC	25-FT-034	VA Flowmeter	
5	3809GCA10AGBC3D2C0AC	25-FT-036	VA Flowmeter	
6	3809GCA10AGBC3D2C0AC	25-FT-038	VA Flowmeter	
7	3809GCC08BFBC9A0V0AC	64-FG-001	VA Flowmeter	

3. Reference Documents (Latest Revision):

Sl. No.	Document Number	Description
1	834P054	PRESSURE TEST FOR 38xxG SUPERFAMILY
2	834C118	Calibration procedure for MT3809G
3	ISP063	Visual and Dimensional Inspection of Completed Instruments

4. Tools and Test Equipment:

a Calibration Master Meter
b Pressure Test Bench.

5. Utility:

a Calibration Medium - Air

BROOKS® INSTRUMENT

6 FAT Procedure

Activities:

A. Visual / Dimensional Inspection:

The construction, quantities, dimensions of all equipment's shall conform to the customer's final approved drawings, BOM and project specifications. The visual and dimensional inspection shall be performed as per Brooks procedure ISP063.

a. Verify that all tagging was as per the approved drawings.

b. Check all Flow meter Flange to Flange distance inline as per approved drawings.

c. Use the referenced drawing & Bill of material to perform the check and highlight the respective item on the drawing & Bill of material to mark as checked and approved.

d. Results shall be recorded as shown below.

				Visual/ Dimensional Test
Sl. No.	Modelcode	Tagnumber	Visual / Dimension	Acceptance criteria
1	3809GCA10AGBC3D2C0AC	25-FT-031	Checked	Pass / Fail
2	3809GCA10AGBC3D2C0AC	25-FT-032	Checked	Pass / Fail
3	3809GCA10AGBC3D2C0AC	25-FT-033	Checked	Pass / Fail
4	3809GCA10AGBC3D2C0AC	25-FT-034	Checked	Pass / Fail
5	3809GCA10AGBC3D2C0AC	25-FT-036	Checked	Pass / Fail
6	3809GCA10AGBC3D2C0AC	25-FT-038	Checked	Pass / Fail
7	3809GCC08BFBC9A0V0AC	64-FG-001	Checked	Pass / Fail

e. Any defects found shall be recorded, rectified and re-checked. If immediate rectification of defect is not possible, that particular defect shall be logged on the Punch List record indicating the rectification and corrective action required by the responsible party or parties involved.

f. When the test is completed, have the customer's inspector sign off the marked drawing, indicating test is completed. The signed drawing shall be attached to and become part of the acceptance report.

B. Calibration Test Procedure.:

The calibration shall be performed as per Brooks calibration procedure 834P054.
Below is the details of the accuracy limits for the applicable Tags.

BROOKS® INSTRUMENT

			Calibration	
Modelcode	Tagnumber	Flange rating	Accuracy / Limits	Acceptance criteria
3809GCA10AGBC3D2C0AC	25-FT-031	1" 300Lbs RF	1% Full Scale	Pass / Fail as per accuracy limits
3809GCA10AGBC3D2C0AC	25-FT-032	1" 300Lbs RF	1% Full Scale	Pass / Fail as per accuracy limits
3809GCA10AGBC3D2C0AC	25-FT-033	1" 300Lbs RF	1% Full Scale	Pass / Fail as per accuracy limits
3809GCA10AGBC3D2C0AC	25-FT-034	1" 300Lbs RF	1% Full Scale	Pass / Fail as per accuracy limits
3809GCA10AGBC3D2C0AC	25-FT-036	1" 300Lbs RF	1% Full Scale	Pass / Fail as per accuracy limits
3809GCA10AGBC3D2C0AC	25-FT-038	1" 300Lbs RF	1% Full Scale	Pass / Fail as per accuracy limits
3809GCC08BFBC9A0V0AC	64-FG-001	1" 150 Lbs RF	1% Full Scale	Pass / Fail as per accuracy limits

a. Any defects found shall be recorded, rectified and re-checked. If immediate rectification of defect is not possible, that particular defect shall be logged on the Punch List record indicating the rectification and corrective action required by the responsible party or parties involved.

b. When the test is completed, have the customer's inspector sign off the Calibration certificate, indicating test is completed. The signed Certificates shall be attached to and become part of the acceptance report.

C. Pressure Test Procedure

The pressure Test shall be performed as per Brooks standard procedure 834C118.

Below are the details of the pressure test on all applicable Tags.

			Pressure test				
Modelcode	Tag	Connection size	Flange material	Pressure test duration (min)	Pressure test medium	Pressure value (bar)	Acceptance criteria
3809GCA10AGBC3D2C0AC	25-FT-031	1" 300 Lbs	316/316L	2	Water	75	No visual leakage
3809GCA10AGBC3D2C0AC	25-FT-032	1" 300 Lbs	316/316L	2	Water	75	No visual leakage
3809GCA10AGBC3D2C0AC	25-FT-033	1" 300 Lbs	316/316L	2	Water	75	No visual leakage
3809GCA10AGBC3D2C0AC	25-FT-034	1" 300 Lbs	316/316L	2	Water	75	No visual leakage
3809GCA10AGBC3D2C0AC	25-FT-036	1" 300 Lbs	316/316L	2	Water	75	No visual leakage
3809GCA10AGBC3D2C0AC	25-FT-038	1" 300 Lbs	316/316L	2	Water	75	No visual leakage
3809GCC08BFBC9A0V0AC	64-FG-001	1" 150 Lbs	316/316L	2	Water	29	No visual leakage

a. Any defects found shall be recorded, rectified and re-checked. If immediate rectification of defect is not possible, that particular defect shall be logged on the Punch List record indicating the rectification and corrective action required by the responsible party or parties involved.

b. When the test is completed, have the customer's inspector sign off the Pressure Test certificate, indicating test is completed. The signed Certificates shall be attached to and become part of the acceptance report

D. Documentation Review

a) Verification of Manufacturer's Functionality reports, Calibration reports, Certificate of Compliance.
b) Hazardous certificate if any as applicable.

End User:	
Vendor:	ROSETTI MARINO S.p.A
Sub-vendor Name:	Brooks Instrument
Project:	HOLLANDSE KUST NOORD WIND PARK Project

Item No	Detail Failure Description and Corrective Action	Tag No.	Area	Date	Completion Date / Signature		Action	Status
					Seller	Buyer		
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

8. INSPECTION ACCEPTANCE RECORD

End user Name:	**Sub-Vendor Name:**
	Brooks Instrument
Project title::	**Location:**
HOLLANDSE KUST NOORD WIND PARK Project	**Brooks Instrument Kft** Berenyi street 72-100. 8000 Székesfehérvár Hungary **Contact:**

DOCUMENT TITLE:

		Date:	
Sr. No.	**Item Description**	**Remarks**	**Customers / TPI**
1	Visual and Dimensional Check		
2	Calibration Test		
3	Pressure Test		
4	Documentation Review		

I,_____(TPI's Name) on behalf of _____ (Company's Name) do hereby, accept and provide notice that I have witnessed and inspected the items of the above-mentioned purchase order.

Date : _____ TPI's Signature : _____

Date : _____ Brooks Rep.'s Signature: _____

BROOKS INSTRUMENT	BROOKS PROCESS INSTRUCTION	Number: ISP063 Rev: *1* Date: *22 Sep 2016*

VISUAL AND DIMENSIONAL INSPECTION OF COMPLETED INSTRUMENTS

Approval Signatures

	Authorized Representative	Date
		23-09-2016
Prepared By:	Janos Strausz, Quality Engineer	
		23-09-2016
Approved By:	Attila Demeter, Quality Manager	
		23-09-2016
Approved By:	Machiel Mandersloot, Project Coordinator	

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1.0 OBJECTIVE

This instruction details the visual and dimensional final inspection criteria related to customer demands.

2.0 SCOPE

Instruction is applicable for all Variable Area and Thermal Mass Flow devices in case customer orders contain a special request for creating a Visual and Dimensional Inspection Report.

3.0 TERMS, ACRONYMS AND ABBREVIATIONS

Term, Acronym or Abbreviation	Definition
N/A	

4.0 FORMS

ISP063-01 Visual and Dimensional Inspection Report

5.0 REFERENCES

N/A

6.0 REVISION HISTORY

Date	Revision	ECN Number (Copy Exact)	Description	Author
09/22/2016	1		*Release*	Janos Strausz

7.0 PROCEDURE

7.1 Visual inspection

Inspect the product considering the following aspects:

- metal surfaces of parts should not have marks, dents, scratches visible from 50cm at normal ambient light conditions. Marks, dents and scratches of flanges should be evaluated based on related flange standards.
- painted surfaces should not have damages, scratches, overflows visible from 50cm at normal ambient light conditions.
- labels should be positioned per prints, aesthetically acceptable.
- content of labels, plates, stickers and, if available, scales should be compared with customer orders.
- layout of the labels, plates and stickers should be compared with available instructions.
- check if connections are per customer requirements.
- check availability of all additional components as required by the customer order.

7.2 Dimensional inspection

The overall dimensions of the completed devices must be measured as per the released General Arrangement Drawings.

7.3 Reporting

Result of the visual and dimensional inspection should be recorded on the ISP063-01 form and should be saved within the final inspection records of the related serial number.

Visual and Dimensional
Inspection Report

Project name :
Name of owner :
Purchase order nr. :
Reference nr. :
Subject :
Quantity :

Tag nr	Serial nr

Tag nr	Serial nr

Tag nr	Serial nr

Test	Result	Remarks
Visual		
Dimensional		

Date of inspection:
Inspection by (stamp):

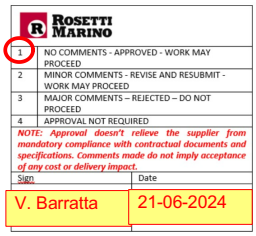
1.2.7 INSTALLATION OPERATING AND MAINTENANCE MANUAL

Base Load Power Hub (BLPH)

INSTALLATION OPERATING AND MAINTENANCE MANUAL

Document Number: 1724000791-IN-MAN-00013

Document Class: 2



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Rev.	Date	Description	Prepared	Reviewed	Approved

BROOKS INSTRUMENT
Beyond Measure

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Installation & Operation Manual

Models MT3809G and MT3810G
Metal Tube Variable Area Flowmeters

BROOKS® INSTRUMENT

Beyond Measure

Essential Instructions
Read before proceeding!

Brooks Instrument designs, manufactures and tests its products to meet many national and international standards. These products must be properly installed, operated and maintained to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, operating and maintaining Brooks Instrument products.

- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- Read all instructions prior to installing, operating and servicing the product. If this instruction manual is not the correct manual, please see back cover for local sales office contact information. Save this instruction manual for future reference.

⚠ **WARNING: Do not operate this instrument in excess of the specifications listed in the Instruction and Operation Manual. Failure to heed this warning can result in serious personal injury and / or damage to the equipment.**

- If you do not understand any of the instructions, contact your Brooks Instrument representative for clarification.
- Follow all warnings, cautions and instructions marked on and supplied with the product.

⚠ **WARNING: Prior to installation ensure this instrument has the required approval ratings to meet local and national codes. Failure to heed this warning can result in serious personal injury and / or damage to the equipment.**

- Install your equipment as specified in the installation instructions of the appropriate instruction manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- Operation: (1) Slowly initiate flow into the system. Open process valves slowly to avoid flow surges. (2) Check for leaks around the flow meter inlet and outlet connections. If no leaks are present, bring the system up to the operating pressure.
- Please make sure that the process line pressure is removed prior to service. When replacement parts are required, ensure that qualified people use replacement parts specified by Brooks Instrument. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look-alike substitutions may result in fire, electrical hazards or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place to prevent electrical shock and personal injury, except when maintenance is being performed by qualified persons.

⚠ **WARNING: For liquid flow devices, if the inlet and outlet valves adjacent to the devices are to be closed for any reason, the devices must be completely drained. Failure to do so may result in thermal expansion of the liquid that can rupture the device and may cause personal injury.**

European Pressure Equipment Directive (PED)

All pressure equipment with an internal pressure greater than 0.5 bar (g) and a size larger than 25mm or 1" (inch) falls under the Pressure Equipment Directive (PED).

- The Specifications Section of this manual contains instructions related to the PED directive.
- Products described in this manual are in compliance with EN directive 2014/34/EU.
- All Brooks Instrument Flowmeters fall under fluid group 1.
- Products larger than 25mm or 1" (inch) are in compliance with PED category I, II or III.
- Products of 25mm or 1" (inch) or smaller are Sound Engineering Practice (SEP).

European Electromagnetic Compatibility (EMC)

The Brooks Instrument (electric/electronic) equipment bearing the CE mark has been successfully tested to the regulations of the Electro Magnetic Compatibility (EMC directive 2014/30/EU).
Special attention however is required when selecting the signal cable to be used with CE marked equipment.

Quality of the signal cable, cable glands and connectors:

Brooks Instrument supplies high quality cable(s) which meets the specifications for CE certification.
If you provide your own signal cable you should use a cable which is overall completely screened with a 100% shield.
"D" or "Circular" type connectors used should be shielded with a metal shield. If applicable, metal cable glands must be used providing cable screen clamping.
The cable screen should be connected to the metal shell or gland and shielded at both ends over 360 Degrees.
The shield should be terminated to an earth ground.
Card Edge Connectors are standard non-metallic. The cables used must be screened with 100% shield to comply with CE certification.
The shield should be terminated to an earth ground.
For pin configuration : Please refer to the enclosed Instruction Manual.

ESD (Electrostatic Discharge)

⚠ **CAUTION: This instrument contains electronic components that are susceptible to damage by static electricity. Proper handling procedures must be observed during the removal, installation or other handling of internal circuit boards or devices.**

Handling Procedure:

1. Power to unit must be removed.
2. Personnel must be grounded, via a wrist strap or other safe, suitable means before any printed circuit card or other internal device is installed, removed or adjusted.
3. Printed circuit cards must be transported in a conductive container. Boards must not be removed from protective enclosure until immediately before installation. Removed boards must immediately be placed in protective container for transport, storage or return to factory.

Comments

This instrument is not unique in its content of ESD (electrostatic discharge) sensitive components. Most modern electronic designs contain components that utilize metal oxide technology (NMOS, SMOS, etc.). Experience has proven that even small amounts of static electricity can damage or destroy these devices. Damaged components, even though they appear to function properly, exhibit early failure.

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Introduction

The Brooks® Models MT3809 and MT3810 are rugged, all metal flowmeters offering reliable operation based on the variable area principle. The Model MT3809 is constructed with stainless steel components for measuring a variety of liquid and gas applications while the Model MT3809 ETFE utilizes an E/TFE lining for aggressive liquid and gas applications.

Flow rate indication is provided by means of magnetic coupling where a magnet, encapsulated in the float, is coupled to a rotatable magnet located in the rear of the indicator, thus turning the dial indicator mounted on the meter.

Optional accessories available includes transmitter with 4-20 mA analog output with HART® communications or FOUNDATION™ Fieldbus communications with or without configurable alarms and pulse output for totalization. Also available are front adjustable inductive alarms, high temperature or stainless steel indicator housings, valves, flow controllers and certifications.

Design Features

The Brooks Model MT3809 has been the “go to” meter for several years and the choice of Engineering Contractor customers (EPC). Brooks is proud to raise the performance of the standard meter by adding these new features and options:

- Transmitter with 4-20mA/HART-7, or transmitter with FOUNDATION™ Fieldbus Communications
- Local Operator Interface with LCD display without removing the cover which means changes can be made even in hazardous areas
- 316SS flameproof housing
- The broadest range of operating temperatures in the industry, the perfect meter for even more applications
- Even lower flow rates with the current lay lengths which means one meter style can be used for very low to high flow rates
- The new meter is designed to ASME B31.3 and gasket sealing surface is per ASME a rugged design that does not require special gaskets at installation
- Weldneck flanges are standard which means full penetration welds that can easily be tested for integrity
- Mechanical and alarm design that meets SIL 2 requirements

Overview of Meter Specifications

⚠WARNING

Do not operate this instrument in excess of the specifications listed in Table 1-1. Failure to heed this warning can result in serious personal injury and/or damage to the equipment.

⚠ CAUTION

It is the user’s responsibility to select and approve all materials of construction. Careful attention to metallurgy, engineered materials and elastomeric materials is critical to safe operation.

Table 1-1 Meter Specifications

		MT3809	MT3809 ELF	MT3810	TFE Lined
Measuring Range		See Capacity Tables			
Rangeability		10:1 (most sizes)			
Metering Tube	Standard	316/316L (dual certified stainless steel)			Tefzel® Lined 316/316L (dual certified stainless steel)
	Premium	Alloy 625, Hastelloy® C, Titanium Gr. II	Monel® K-500, Hastelloy C	-	-
Flanges and End Fittings	Standard	316/316L (dual certified stainless steel)		316/316L (dual certified stainless steel)	Tefzel Lined 316/316L (dual certified stainless steel)
	Premium	Alloy 625, Hastelloy C, Titanium Gr. II		-	-
Accuracy		2%, 1%, VDI/VDE class 2.5, 1.6	5%, 3%, VDI/VDE class 4, 2.5	5%, VDI/VDE class 6	2%, VDI/VDE class 2.5
Repeatability		0.25% Full Scale	1% Full Scale	0.25% Full Scale	0.25% Full Scale
Scale type / material		Dark increments with white background / Aluminum			
Installation orientation and location		Vertical (within 5% of true-vertical), bottom inlet, top outlet. Do not locate in proximity of other magnetic interfering components.			
Connections	Flanged:	Weldneck flanges			Slip on flanges
	- to ANSI B16.5	ANSI 1/2" to 4" 150# RF to 600# RF	ANSI 1/2" to 1" 150# RF to 600# RF	ANSI 1/2" to 2" 150# RF to 300# RF	ANSI 1/2" to 2" 150# RF to 300# RF
	- to DIN 2527/2635	DIN PN 40			
	- Flange finish	3.2 - 6.3 Ra			
	Threaded female	1/2" to 2"NPT/Rc-Female	1/2" NPT/Rc-Female	1/2" to 2" NPT-Female	-
	Threaded male	1" to 2-1/2" NPT-Male	1" NPT-Male	-	-
O-ring material	Flanged	None	Kalrez® 4079	None	
	Threaded male	None		-	-
	Threaded female std	Viton® or Teflon®		Viton or Teflon	-
	Threaded female high pressure 2500lbs	Viton Shore 90 + Teflon back-up ring or Kalrez 3018 Shore 90 + Teflon back-up ring		-	-
Floats	Standard	316L stainless steel			Hastelloy C-276 (sizes 7,8) PVDF (sizes 10-13)
	Premium	Alloy 625, Hastelloy C, Titanium Gr. II	Monel K-500, Hastelloy C	-	-
Protection Category	Indicator only	IP67 / NEMA 4X			
	Transmitter ALU	IP64			
	Transmitter SS	IP67 / NEMA 4X			
Indicator Housing & Cover material	Indicator only ALU	Die cast Aluminum (Alloy 380), epoxy paint, glass window			
	Transm/Alarm/HiTemp ALU	Die cast Aluminum (Alloy 380), epoxy paint, glass window			
	Indicator only SS	Cast 316 stainless steel, glass window			
	Transm/Alarm/HiTemp SS	Cast 316 stainless steel, 316 stainless steel hardware, glass window			
Pressure/Temperature		See Pressure/Temperature Tables			
Maximum Fluid Temperature		420°C/788°F (Refer to Temperature Tables)		300°C/570°F	150°C/270°F
Meter Dimensions		Refer to Product Dimension Figures			
Needle Control Valves & Flow Controllers		Valves - Sizes 7 - 12 / FCA Sizes 7,8	Valve/FCA Sizes 0-5	Valves - Sizes 7 - 12 / FCA Sizes 7,8	-
Product Approvals		Refer to Product Approvals Pages			
Transmitter	Current loop 4-20mA/HART®	Refer to Transmitter Section for detailed specifications on 4-20mA/HART-7 transmitter, Hi/Lo-alarm and pulse ouput - N **ot Available 3810G**			
	FOUNDATION™ Fieldbus	Refer to FOUNDATION Fieldbus Section for detailed specifications on FOUNDATION Fieldbus transmitter, Hi/Lo-alarm and pulse ouput - **Not Available 3810G**			
Inductive Alarms		Refer to Inductive Alarm Section - **Not Available 3810G**			Refer to Inductive Alarm Section
Local Operator Interface (incl. LCD)		Refer to Temperature Tables			

Table 1-2 ELF Body/Float Stop/Float/Metering Tube Material Restrictions

ELF BODY MAT'L (#1)	METERING TUBE MAT'L (#6)	OUTLET FLOAT STOP MAT'L (#13)	FLOAT MAT'L (#14) *	INLET FLOAT STOP MAT'L (#17)
316 LSS	316SS	INCONEL 625	316SS	316SS
HASTELLOY C-276	HASTELLOY C-276	HASTELLOY C-276	HASTELLOY C-276	HASTELLOY C-276
INCONEL 625	MONEL	INCONEL 625	MONEL	MONEL
TITANIUM GR2	MONEL	INCONEL 626	TITANIUM GR2	MONEL

***Note: Size 0 float is always TITANIUM GR2 FLOAT**

Table 1-3 Flow Capacities, Pressure Drop and Viscosity Immunity Ceiling Values

Meter type	Meter size	Connection size DIN (mm)	Connection size ANSI (inch)	Float code	Float material	water[3] max volume flow	water unit	water max volume flow	water unit	air[1,2] max volume flow	air unit	air max volume flow	air unit	Pressure drop mbar	Pressure drop inches WC	VIC cSt	Max visc. cSt	PED category
MT3809 ELF	0			0	Titanium	0.96		0.25		1.6		44		12	5	1	5	SEP
	1					1.3		0.34		2.1		59		12	5	1	10	SEP
	2					3.6		0.96	gph	4.9	scfh	130	l_n/h	12	5	1	20	SEP
	3					10		2.8		12		350		12	5	1	35	SEP
	4					21		5.5		23		650		32	13	1	70	SEP
	5					42		11		53		1400		38	15	1	100	SEP
MT3809 / MT3810	7	15	1/2"	A	SS316	25		0.11		0.49		0.8		30	13	1	40	SEP
				B[4]		65		0.28		1.2		2.1		30	13	1	20	SEP
				C		130		0.59		2.4		3.9		30	13	1	120	SEP
				D[4]		200		0.88		3.7		6.1		35	15	1	20	SEP
	8			A		250		1.1		5.2		8.5		45	19	2	250	SEP
				B		400		1.7		7.7		12		55	23	1	180	SEP
				C		650		2.8		11		19		60	25	2	475	SEP
				D		1000		4.4		21		35		130	53	1.5	250	SEP
	10	25	1"	A		1200		5.2		19		31		60	25	5	300	CAT I, II or III
				B		1500		6.6		31		51		70	29	1.5	300	CAT I, II or III
				C		2400		10		41		68		85	35	7	300	CAT I, II or III
				D		3500		15		65		100		155	63	4	300	CAT I, II or III
	12	40	1-1/2"	A		4000		17		67		100		50	21	50	300	CAT I, II or III
				B		6000		26		95		150		60	25	30	300	CAT I, II or III
				C		8000		35		150		240		150	61	2	300	CAT I, II or III
				D		10000		46		210		340		300	121	2	300	CAT I, II or III
	13	50	2"	A		6500		28		100		160		50	21	50	300	CAT I, II or III
				B		9500		41		160		260		60	25	50	300	CAT I, II or III
				C		12000	l/h	55		200		330		100	41	2.5	300	CAT I, II or III
				D		20000		88		390		650		300	121	1	300	CAT I, II or III
	15	80	3"	A		20000		88		390		640		110	45	8	300	CAT I, II or III
				B		30000		130	gpm	550	scfm	900	m_n^3/h	140	57	7	300	CAT I, II or III
				C		40000		170		750		1200		280	113	5	300	CAT I, II or III
	16	100	4"	A		49000		210		N/A		N/A		160	65	15	300	CAT I, II or III
				B		70000		300		N/A		N/A		210	85	10	300	CAT I, II or III
				C		100000		440		N/A		N/A		300	121	5	300	CAT I, II or III
MT3809 TFE Lined[5]	7	15	1/2"	A	Hastel-C	110		0.48		2.2		3.7		25	11	1	2	SEP
				B		170		0.75		3.5		5.8		50	21	1	2	SEP
	8			A		250		1.1		5.1		8.3		30	13	1	2	SEP
				B		420		1.8		8.5		13		45	19	1	2	SEP
				C		500		2.2		9.9		16		40	17	1	2	SEP
				D		850		3.7		18		30		130	53	1	2	SEP
	10	25	1"	A	PVDF	1400		6.2		27		45		45	19	2	3	CAT I, II or III
				B		2000		8.8		39		63		106	43	2	3	CAT I, II or III
				C		2400		10		47		77		90	37	2	3	CAT I, II or III
				D		3000		13		58		95		130	53	2	3	CAT I, II or III
	12	40	1-1/2"	A		3000		13		58		95		50	21	2	3	CAT I, II or III
				B		4000		18		73		120		75	31	2	3	CAT I, II or III
				C		5000		22		94		150		85	35	2	3	CAT I, II or III
				D		6000		26		110		180		120	49	2	3	CAT I, II or III
	13	50	2"	A		6000		26		110		180		95	39	2	3	CAT I, II or III
				B		8000		35		150		250		125	51	2	3	CAT I, II or III
				C		12000		53		220		370		200	81	2	3	CAT I, II or III
				D		15000		66		280		470		225	91	2	3	CAT I, II or III

[1] Air flows in scfm or scfh are given at 70°F and 14.7 psia

[2] Air flows in m_n^3/h or ln/h are given at 0°C and 1,013 bar(a)

[3] Water flows in l/h, gph and gpm are given at 70°F

[4] Minimum operating pressure required 7 psig / 0.48 bar

[5] For TFE lined gas applications operating pressure must be greater than 29 psia / 2 bar(a)

Pressure Ratings

Please reference Tables 1-3, 1-4 and 1-5.

Table 1-4 Model MT3809/MT3810 Pressure Ratings, Flanged

Flanged - 150LBS, ANSI*

Temperature		316/316L		Titanium Gr.2		Alloy C-276/625	
°F	°C	psi	Bar	psi	Bar	psi	Bar
-325	-198	275	19.0			290	20.0
-75	-59	275	19.0	234	16.1	290	20.0
100	38	275	19.0	234	16.1	290	20.0
212	100	235	16.2	200	13.8	257	17.7
392	200	199	13.7	139	9.6	200	13.8
572	300	148	10.2	88	6.1	148	10.2
617	325			81	5.6		
752	400	94	6.5			94	6.5

Flanged - 300LBS, ANSI*

Temperature		316/316L		Titanium Gr.2		Alloy C-276/625	
°F	°C	psi	Bar	psi	Bar	psi	Bar
-325	-198	720	49.6			750	51.7
-75	-59	720	49.6	612	42.2	750	51.7
100	38	720	49.6	612	42.2	750	51.7
212	100	612	42.2	521	35.9	747	51.5
392	200	518	35.7	363	25.0	701	48.3
572	300	458	31.6	276	19.0	622	42.9
617	325			268	18.5		
752	400	426	29.4			529	36.5

Flanged - 600LBS, ANSI*

Temperature		316/316L		Titanium Gr.2		Alloy C-276/625	
°F	°C	psi	Bar	psi	Bar	psi	Bar
-325	-198	1440	99.3			1500	103.4
-75	-59	1440	99.3	1224	84.4	1500	103.4
100	38	1440	99.3	1224	84.4	1500	103.4
212	100	1224	84.4	1040	71.7	1494	103.0
392	200	1034	71.3	724	49.9	1403	96.7
572	300	917	63.2	550	37.9	1243	85.7
617	325			538	37.1		
752	400	854	58.9			1063	73.3

*** Meter sizes 15 and 16 have a Minimum Temperature of -150°F/-101°C**

Note: Flanged ELF O-ring is Kalrez 4079.

Flanged - PN16, EN-1092*

Temperature		316/316L		Titanium Gr.2		Alloy C-276/625	
°F	°C	psi	Bar	psi	Bar	psi	Bar
-325	-198	232	16.0			232	16.0
-75	-59	232	16.0	197	13.6	232	16.0
100	38	232	16.0	197	13.6	232	16.0
212	100	196	13.5	167	11.5	232	16.0
392	200	160	11.0	112	7.7	232	16.0
572	300	139	9.6	84	5.8	223	15.4
752	400	129	8.9			173	11.9

Flanged - PN40, EN-1092*

Temperature		316/316L		Titanium Gr.2		Alloy C-276/625	
°F	°C	psi	Bar	psi	Bar	psi	Bar
-325	-198	580	40.0			580	40.0
-75	-59	580	40.0	493	34.0	580	40.0
100	38	580	40.0	493	34.0	580	40.0
212	100	490	33.8	416	28.7	580	40.0
392	200	400	27.6	280	19.3	580	40.0
572	300	348	24.0	209	14.4	557	38.4
752	400	322	22.2			431	29.7

Flanged - 10K, JIS B2220*

Temperature		316/316L		Titanium Gr.2		Alloy C-276/625	
°F	°C	psi	Bar	psi	Bar	psi	Bar
-325	-198	203	14.0			203	14.0
-75	-59	203	14.0	173	11.9	203	14.0
100	38	203	14.0	173	11.9	203	14.0
212	100	203	14.0	173	11.9	203	14.0
392	200	174	12.0	122	8.4	174	12.0
572	300	145	10.0	87	6.0	145	10.0

Flanged - 20K, JIS B2220*

Temperature		316/316L		Titanium Gr.2		Alloy C-276/625	
°F	°C	psi	Bar	psi	Bar	psi	Bar
-325	-198	493	34.0			493	34.0
-75	-59	493	34.0	419	28.9	493	34.0
100	38	493	34.0	419	28.9	493	34.0
212	100	493	34.0	419	28.9	493	34.0
392	200	450	31.0	315	21.7	450	31.0
572	300	421	29.0	252	17.4	421	29.0
752	400	334	23.0			334	23.0

Table 1-5 Model MT3809/MT3810 Pressure Ratings, NPT Female

NPT - Female - Standard Design (Teflon O-rings)									
316/316L									
Temperature		#7/8		#10		#12		#13	
°F	°C	psi	Bar	psi	Bar	psi	Bar	psi	Bar
-58 to 100	-50 to 38	2567	177	2321	160	1929	133	1740	120
212	100	2190	151	1973	136	1653	114	1479	102
392	200	1842	127	1668	115	1392	96	1247	86
482	250	1726	119	1552	107	1291	89	1160	80

NPT - Female - ELF - 2500LBS Design			
316/316L			
Temperature		ELF	
°F	°C	psi	Bar
-58 to 100	-50 to 38	6000	414
212	100	5100	351.6
392	200	4311	297.2
572	300	3822	263.5

NPT - Female - 7-12 - 2500LBS Design			
316/316L			
Temperature		#7-12	
°F	°C	psi	Bar
-31 to 100	-35 to 38	6000	413.7
212	100	5100	351.6
392	200	4311	297.2
550	288	3822	263.5

NPT - Female - Standard Design (Teflon O-rings)									
Titanium Gr. 2									
Temperature		#7/8		#10		#12		#13	
°F	°C	psi	Bar	psi	Bar	psi	Bar	psi	Bar
-58 to 100	-50 to 38	2147	148	1929	133	1610	111	1450	100
212	100	1813	125	1639	113	1363	94	1233	85
392	200	1334	92	1204	83	1001	69	899	62
482	250	1160	80	1044	72	870	60	783	54

NPT - Female - ELF - 2500LBS Design			
Titanium Gr. 2			
Temperature		ELF	
°F	°C	psi	Bar
-58 to 100	-50 to 38	5100	352
212	100	4335	298.9
392	200	3017	208.0
572	300	2293	158.1

NPT - Female - 7-12 - 2500LBS Design			
Titanium Gr. 2			
Temperature		#7-12	
°F	°C	psi	Bar
-31 to 100	-35 to 38	5100	351.6
212	100	4335	298.9
392	200	3017	208.0
550	288	2293	158.1

NPT - Female - Standard Design (Teflon O-rings)									
Hastelloy Alloy C-276									
Temperature		#7/8		#10		#12		#13	
°F	°C	psi	Bar	psi	Bar	psi	Bar	psi	Bar
-58 to 100	-50 to 38	3510	242	3162	218	2640	182	2379	164
212	100	3162	218	2857	197	2379	164	2147	148
392	200	2756	190	2480	171	2074	143	1871	129
482	250	2582	178	2335	161	1944	134	1755	121

NPT - Female - ELF - 2500LBS Design			
Alloy C-276/ Alloy 625			
Temperature		ELF	
°F	°C	psi	Bar
-58 to 100	-50 to 38	6250	431
212	100	6228	429.4
392	200	5842	402.8
572	300	5179	357.1

NPT - Female - 7-12 - 2500LBS Design			
Alloy C-276/ Alloy 625			
Temperature		#7-12	
°F	°C	psi	Bar
-31 to 100	-35 to 38	6250	430.9
212	100	6228	429.4
392	200	5842	402.8
550	288	5179	357.1

NPT - Female - Standard Design (Teflon O-rings)									
Inconel Alloy 625									
Temperature		#7/8		#10		#12		#13	
°F	°C	psi	Bar	psi	Bar	psi	Bar	psi	Bar
-58 to 100	-50 to 38	4047	279	3640	251	3046	210	2741	189
212	100	4047	279	3640	251	3046	210	2741	189
392	200	3902	269	3510	242	2930	202	2640	182
482	250	3800	262	3423	236	2857	197	2567	177

Female ELF - 2500LBS Design: O-ring is Kalrez 4079
Female Sizes 7-12 - 2500LBS Design: O-ring is Kalrez 3018

Table 1-6 Model MT3809/MT3810 Pressure Ratings, NPT Male

NPT - Male - Standard Design							
316/316L							
Temperature		#7/8		#10		#12	
°F	°C	psi	Bar	psi	Bar	psi	Bar
-325	-198	4699	324	3785	261	3684	254
100	38	4699	324	3785	261	3684	254
212	100	4018	277	3234	223	3147	217
392	200	3379	233	2712	187	2654	183
572	300	3002	207	2408	166	2350	162
752	400	2785	192	2248	155	2190	151

NPT - Male - Standard Design							
Hastelloy Alloy C-276							
Temperature		#7/8		#10		#12	
°F	°C	psi	Bar	psi	Bar	psi	Bar
-325	-198	4989	344	5163	356	5033	347
100	38	4989	344	5163	356	5033	347
212	100	4511	311	4670	322	4540	313
392	200	3931	271	4061	280	3960	273
572	300	3466	239	3597	248	3495	241
752	400	3176	219	3292	227	3205	221

NPT - Male - Standard Design							
Titanium Gr. 2							
Temperature		#7/8		#10		#12	
°F	°C	psi	Bar	psi	Bar	psi	Bar
-75	-59	3046	210	3147	217	3075	212
100	38	3046	210	3147	217	3075	212
212	100	2596	179	2683	185	2611	180
392	200	1900	131	1973	136	1914	132
572	300	1450	100	1494	103	1450	100
617	325	1349	93	1407	97	1363	94

NPT - Male - Standard Design							
Inconel Alloy 625							
Temperature		#7/8		#10		#12	
°F	°C	psi	Bar	psi	Bar	psi	Bar
-325	-198	5758	397	5961	411	5802	400
100	38	5758	397	5961	411	5802	400
212	100	5758	397	5961	411	5802	400
392	200	5540	382	5729	395	5584	385
572	300	5279	364	5453	376	5323	367
752	400	5062	349	5236	361	5105	352

NPT - Male - ELF - 2500LBS Design*			
316/316L			
Temperature		ELF	
°F	°C	psi	Bar
-58 to 122	-50 to 50	6000	414
212	100	5100	351.6
392	200	4311	297.2
572	300	3822	263.5

NPT - Male - ELF - 2500LBS Design*			
Titanium Gr. 2			
Temperature		ELF	
°F	°C	psi	Bar
-58 to 122	-50 to 50	5100	352
212	100	4335	298.9
392	200	3017	208.0
572	300	2293	158.1

NPT - Male - ELF - 2500LBS Design*			
Alloy C-276/ Alloy 625			
Temperature		ELF	
°F	°C	psi	Bar
-58 to 122	-50 to 50	6250	431
212	100	6228	429.4
392	200	5842	402.8
572	300	5179	357.1

* ELF 2500# Design (Kalrez 4079)

Temperature Ratings

Please reference Table 1-6.

Table 1-7 Temperature Cut-off Tables

Meter with 316 SS Mechanical Indicator

	Process Temperature		Ambient Temperature	
Connection type	°C	°F	°C	°F
Flanged / MNPT	-198 to 420	-325 to 788	-55 to 75	-67 to 167
Threaded female	-50 to 300*	-58 to 572*	-55 to 75	-67 to 167
ETFE lined	-30 to 150	-22 to 302	-30 to 40	-22 to 104

Meter with Aluminum Mechanical Indicator

	Process Temperature		Ambient Temperature	
Connection type	°C	°F	°C	°F
Flanged / MNPT	-198 to 300	-325 to 572	-55 to 75	-67 to 167
Threaded female	-50 to 300*	-58 to 572*	-55 to 75	-67 to 167
ETFE lined	-30 to 150	-22 to 302	-30 to 40	-22 to 104

Ambient Temperatures with Electrical Components

Option	°C	°F
Transmitter	-40 to 70	-40 to 158
Transmitter w/display	-20 to 70	-4 to 158
Inductive switches	-40 to 70	-40 to 158

Insulation required when process temperatures are greater than 300°C/572°F.

Meter with Electrical Components - Ambient Temperature 30°C / 86°F

	Process Temperature	
Connection type	°C	°F
Transmitter	-198 to 420	-325 to 788
Transmitter w/display	-198 to 420	-325 to 788
Inductive switches	-198 to 420	-325 to 788

Meter with Electrical Components - Ambient Temperature 60°C / 140°F

	Process Temperature	
Connection type	°C	°F
Transmitter	-198 to 200	-325 to 392
Transmitter w/display	-198 to 175	-325 to 350
Inductive switches	-198 to 200	-325 to 392

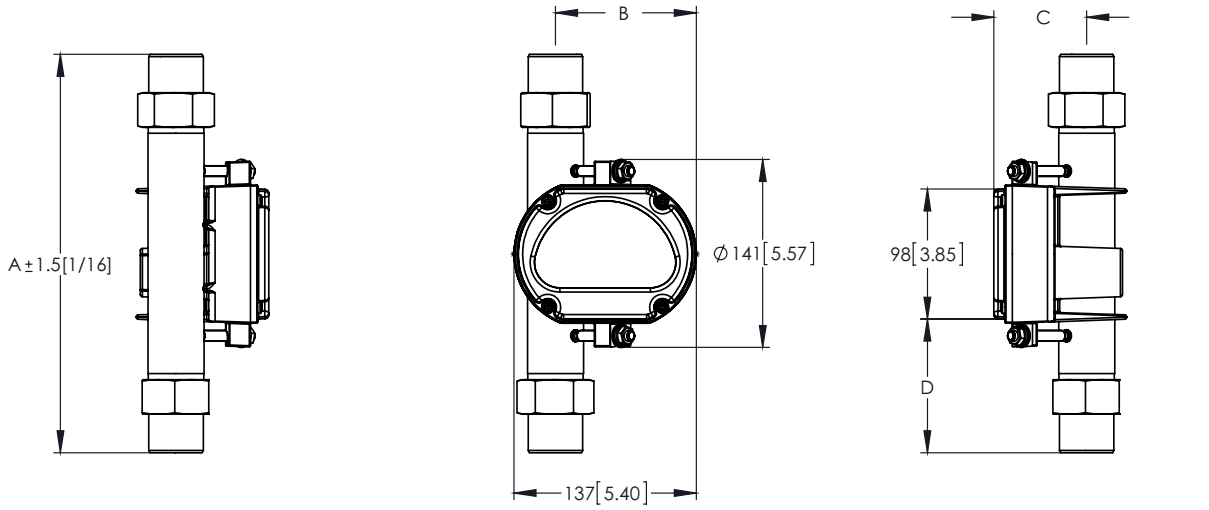
*

Elastomer Materials	Minimum Temperature °F	Minimum Temperature °C	Maximum Temperature °F	Maximum Temperature °C
Kalrez 4079	-58	-50	572	300
Kalrez 3018	-31	-35	550	288
Teflon PTFE	-58	-50	482	250
Viton A	5	-15	400	204
Teflex (Viton core, FEP jacket)	5	-15	400	204

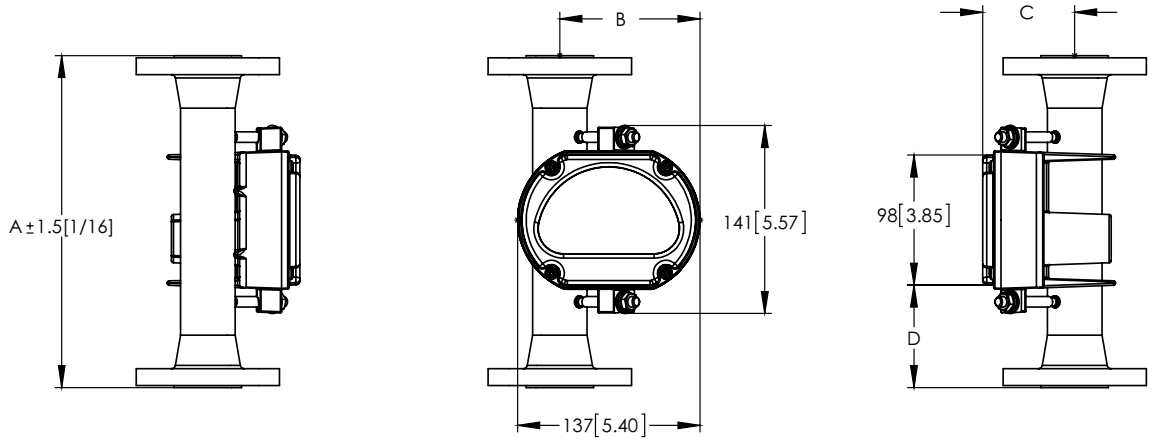
Outline and Dimensions

Please reference Figures 1-1, 1-2 and 1-3 on the following pages.

Model 3809 & 3810 General Purpose Indicator Housing with Threaded Female Connections mm [inches]



Model 3809 & 3810 General Purpose Indicator Housing with Flanged Connections mm [inches]

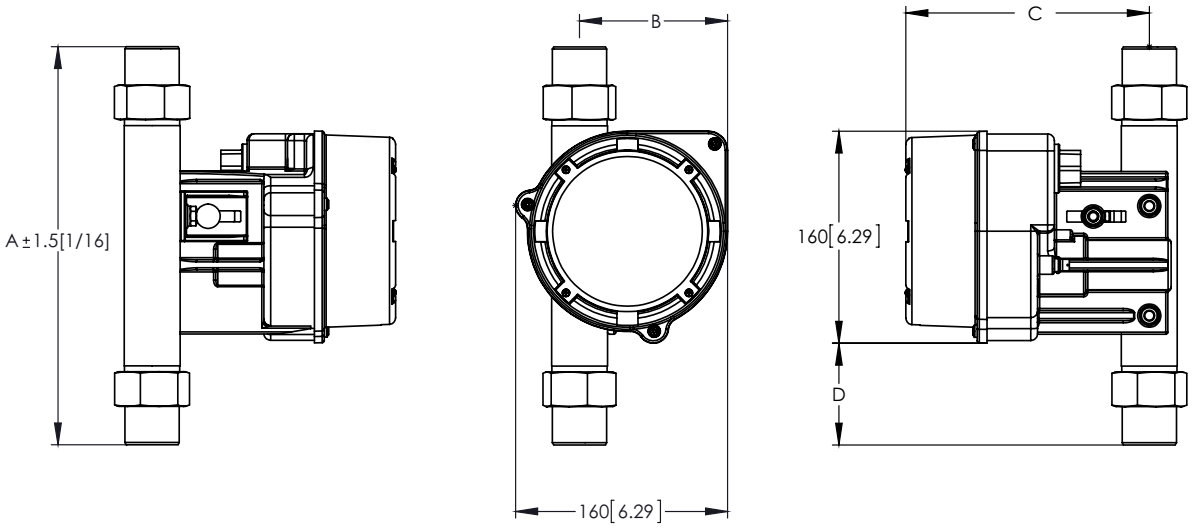


Meter Size	Connection	A	B	C	D	Weight (Approx.)*
0-5	1/2" Threaded Female	225 [8.85]	99 [3.90]	63 [2.56]	61 [2.40]	2.7 kg [6 lbs.]
	1" Threaded Male	200 [7.87]	100 [3.94]	65 [2.56]	48 [1.89]	2.7 kg [6 lbs.]
7 & 8	1/2" Threaded Female	225 [8.85]	99 [3.90]	63 [2.56]	61 [2.40]	2.7 kg [6 lbs.]
	3/4" Threaded Female	225 [8.85]	99 [3.90]	63 [2.56]	61 [2.40]	2.7 kg [6 lbs.]
	1" Threaded Male	200 [7.87]	100 [3.94]	65 [2.56]	48 [1.89]	2.7 kg [6 lbs.]
10	1" Threaded Female	300 [11.81]	107 [4.21]	71 [2.80]	98 [3.86]	4.5 kg [10 lbs.]
	1-1/2" Threaded Male	250 [9.84]	108 [4.25]	72 [2.83]	73 [2.87]	4.5 kg [10 lbs.]
12	1-1/2" Threaded Female	300 [11.81]	116 [4.57]	80 [3.15]	98 [3.86]	6.8 kg [15 lbs.]
	2-1/2" Threaded Male	250 [9.84]	118 [4.65]	83 [3.27]	73 [2.87]	6.8 kg [15 lbs.]
13	2" Threaded Female	300 [11.81]	122 [4.78]	86 [3.39]	98 [3.86]	7.7 kg [17 lbs.]
0-5	Flanged (ANSL DIN and JIS)	250 [9.84]	99 [3.90]	63 [2.48]	73 [2.87]	4.1 kg [9 lbs.] - 6.5 kg [14 lbs.]
7 & 8		250 [9.84]	99 [3.90]	63 [2.48]	73 [2.87]	4.1 kg [9 lbs.] - 11.9 kg [26 lbs.]
10		250 [9.84]	106 [4.13]	70 [2.76]	73 [2.87]	7.7 kg [17 lbs.] - 14.5 kg [32 lbs.]
12		250 [9.84]	115 [4.53]	79 [3.11]	73 [2.87]	12.2 kg [27 lbs.] - 17.7 kg [39 lbs.]
13		250 [9.84]	122 [4.80]	85 [3.35]	73 [2.87]	14.1 kg [31 lbs.] - 28 kg [62 lbs.]
15		250 [9.84]	139 [5.47]	103 [4.06]	73 [2.87]	20.0 kg [44 lbs.] - 45 kg [99 lbs.]
16		350 [13.78]	154 [6.06]	118 [4.65]	123 [4.84]	37.6 kg [83 lbs.] - 58.6 kg [129 lbs.]

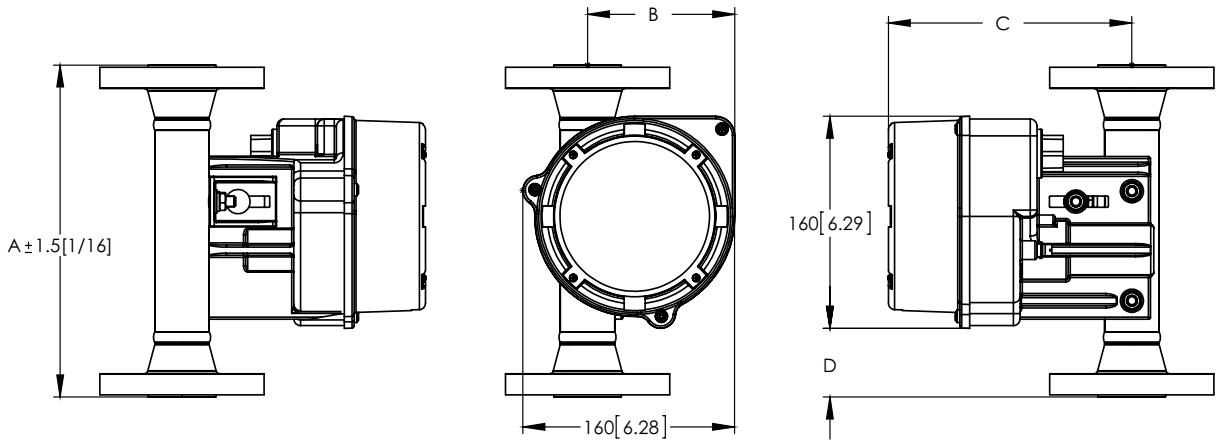
*Weights shown for aluminum indicator. Add 1.8 [4 lbs.] for steel indicator housing.

Figure 1-1 Model MT3809 and MT3810 Dimensional Drawings (mm/in) and Weights (kg/lbs) - General Purpose Housing

Model 3809 Intrinsically Safe Indicator Housing with Threaded Female Connections mm [inches]



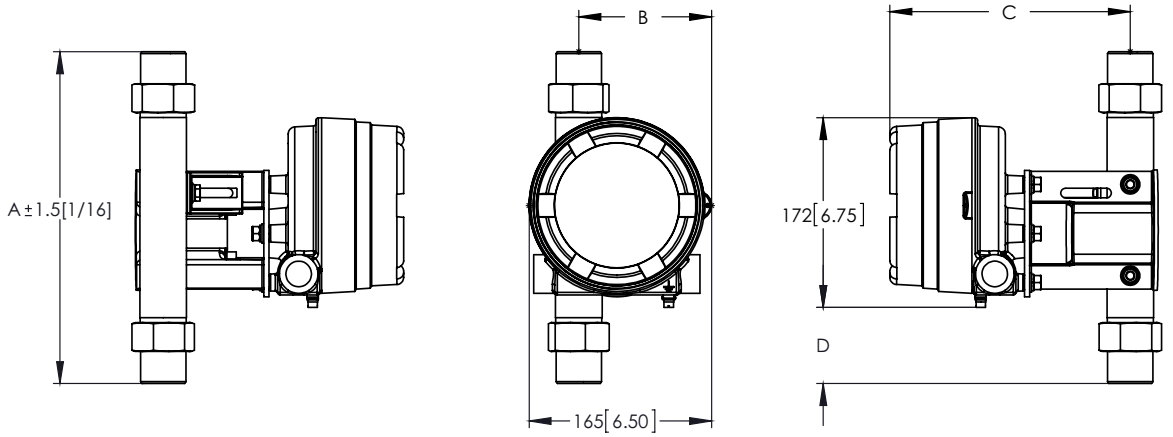
Model 3809 Intrinsically Safe Indicator Housing with Flanged Connections mm [inches]



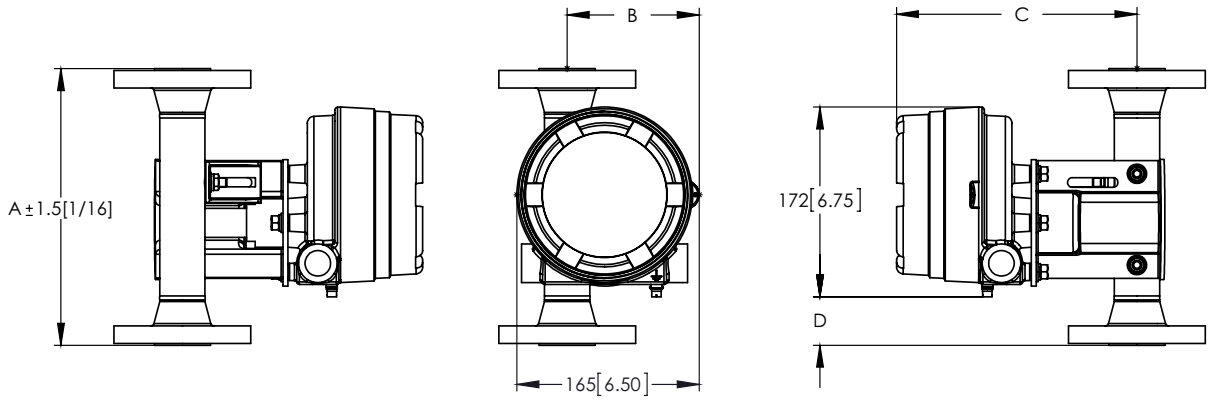
Meter Size	Connection	A	B	C	D	Weight (Approx.)*
0-5	1/2" Threaded Female	225 [8.85]	104 [4.10]	183 [7.20]	40 [1.57]	5.4 kg [12 lbs.]
	1" Threaded Male	200 [7.87]	105 [4.13]	183 [7.20]	27 [1.06]	5.4 kg [12 lbs.]
7 & 8	1/2" Threaded Female	225 [8.85]	104 [4.10]	183 [7.20]	40 [1.57]	5.4 kg [12 lbs.]
	3/4" Threaded Female	225 [8.85]	104 [4.10]	183 [7.20]	40 [1.57]	5.4 kg [12 lbs.]
	1" Threaded Male	200 [7.87]	105 [4.13]	183 [7.20]	27 [1.06]	5.4 kg [12 lbs.]
10	1" Threaded Female	300 [11.81]	121 [4.76]	183 [7.20]	77 [3.03]	7.3 kg [16 lbs.]
	1-1/2" Threaded Male	250 [9.84]	113 [4.45]	183 [7.20]	52 [2.05]	7.3 kg [16 lbs.]
12	1-1/2" Threaded Female	300 [11.81]	121 [4.76]	183 [7.20]	77 [3.03]	9.5 kg [21 lbs.]
	2-1/2" Threaded Male	250 [9.84]	120 [4.72]	183 [7.20]	52 [2.05]	9.5 kg [21 lbs.]
13	2" Threaded Female	300 [11.81]	127 [5.00]	183 [7.20]	77 [3.03]	10.4kg [23 lbs.]
0-5	Flanged (ANSI, DIN and JIS)	250 [9.84]	104 [4.10]	183 [7.20]	52 [2.05]	6.8 kg [15 lbs.] - 9.2 kg [20 lbs.]
7 & 8		250 [9.84]	104 [4.10]	183 [7.20]	52 [2.05]	6.8 kg [15 lbs.] - 14.6 kg [32 lbs.]
10		250 [9.84]	111 [4.37]	183 [7.20]	53 [2.05]	10.4 kg [23 lbs.] - 17.2 kg [38 lbs.]
12		250 [9.84]	120 [4.72]	183 [7.20]	54 [2.05]	15 kg [33 lbs.] - 20.5 kg [45 lbs.]
13		250 [9.84]	126 [4.96]	183 [7.20]	55 [2.05]	16.8 kg [37 lbs.] - 30.7 kg [68 lbs.]
15		250 [9.84]	144 [5.67]	183 [7.20]	56 [2.05]	22.7 kg [50 lbs.] - 47.7 kg [105 lbs.]
16		350 [13.78]	159 [6.26]	183 [7.20]	57 [2.05]	40.4 kg [89 lbs.] - 61.4 kg [135 lbs.]

Figure 1-2 Model MT3809 and MT3810 Dimensional Drawings (mm/in) and Weights (kg/lbs) - Intrinsically Safe Housing

Model 3809 Explosion Proof Indicator Housing with Threaded Female Connections mm [inches]



Model 3809 Explosion Proof Indicator Housing with Flanged Connections mm [inches]



Meter Size	Connection	A	B	C	D	Weight (Approx.)*
0-5	1/2" Threaded Female	225 [8.85]	113 [4.45]	218 [8.58]	41 [1.61]	11.8 kg [26 lbs.]
	1" Threaded Male	200 [7.87]	114 [4.49]	218 [8.58]	28 [1.10]	11.8 kg [26 lbs.]
7 & 8	1/2" Threaded Female	225 [8.85]	113 [4.45]	218 [8.58]	41 [1.61]	11.8 kg [26 lbs.]
	3/4" Threaded Female	225 [8.85]	113 [4.45]	218 [8.58]	41 [1.61]	11.8 kg [26 lbs.]
	1" Threaded Male	200 [7.87]	114 [4.49]	218 [8.58]	28 [1.10]	11.8 kg [26 lbs.]
10	1" Threaded Female	300 [11.81]	120 [4.72]	218 [8.58]	78 [3.07]	13.6 kg [30 lbs.]
	1-1/2" Threaded Male	250 [9.84]	121 [4.76]	218 [8.58]	53 [2.09]	13.6 kg [30 lbs.]
12	1-1/2" Threaded Female	300 [11.81]	129 [5.08]	218 [8.58]	78 [3.07]	15.9 kg [35 lbs.]
	2-1/2" Threaded Male	250 [9.84]	131 [5.16]	218 [8.58]	53 [2.09]	15.9 kg [35 lbs.]
13	2" Threaded Female	300 [11.81]	135 [5.31]	218 [8.58]	78 [3.07]	16.8 kg [37 lbs.]
0-5	Flanged (ANSL DIN and JIS)	250 [9.84]	113 [4.45]	218 [8.58]	53 [2.09]	13.2 kg [29 lbs.] - 15.6 kg [34 lbs.]
7 & 8		250 [9.84]	113 [4.45]	218 [8.58]	53 [2.09]	13.2 kg [29 lbs.] - 21 kg [46 lbs.]
10		250 [9.84]	120 [4.72]	218 [8.58]	53 [2.09]	16.8 kg [37 lbs.] - 23.6 kg [52 lbs.]
12		250 [9.84]	129 [5.08]	218 [8.58]	53 [2.09]	21.3 kg [47 lbs.] - 26.8 kg [59 lbs.]
13		250 [9.84]	135 [5.31]	218 [8.58]	53 [2.09]	23.1 kg [51 lbs.] - 37 kg [81 lbs.]
15		250 [9.84]	153 [6.02]	218 [8.58]	53 [2.09]	29 kg [64 lbs.] - 54 kg [119 lbs.]
16		350 [13.78]	168 [6.61]	218 [8.58]	103 [4.06]	46.7 kg [103 lbs.] - 67.7 kg [149 lbs.]

Figure 1-3 Model MT3809 and MT3810 Dimensional Drawings (mm/in) and Weights (kg/lbs) - Explosion Proof Housing

Optional Valves and Flow Controllers

Needle valves and flow controllers may be externally piped into the inlet or outlet side of the instrument. Needle valves can be supplied up to size 12 1-1/2" maximum 10000 l/hr / 46 gpm water equivalent. Needle valves and flow controllers will be supplied separately with the flanged meter.

Optional Electronic Features

Electronic equipment available with the Model MT3809 includes:

- Current loop 4-20mA/HART Transmitter with Alarms and Pulse Output
- FOUNDATION Fieldbus Transmitter with Alarms and Pulse Output
- Inductive Alarms; stand-alone or in combination with above transmitters

Refer to the table below for the model code nomenclature for the electronics options. All models are designed to be either intrinsically safe or explosion proof.

Nomenclature and Type Designation

MT3809 … B …
I-IV XV

XV	Electronics configuration	B, C	Indicator with inductive alarm, 1 or 2 switches
		D … L	Transmitter, 4 – 20 mA / Hart, with optionally: - pulse output - inductive alarm contact(s) - LOI or combinations thereof.
		M … U	Transmitter, FOUNDATION Fieldbus, with optionally: - pulse output - inductive alarm contact(s) - LOI or combinations thereof.

Current Loop 4-20 mA with HART Transmitter, with Alarms, Display and Pulse Output

Design Features

• 4-20 mA analog output for flowrate
• Bell-202 modulated HART digital communication over the 4-20 mA signal
• Current loop powered 2-wire connection
• User selectable 0% and 100% analog output ranges with optional smoothing
• Flexible (mix & match) units of measure for flowrates, totals, temperatures, densities, etc.
• Two flow totalizers: Resettable and inventory totalization
• User configurable, scalable pulse output for various engineering units
• Hi- and Lo-flow alarm output

Description

The 4-20 mA with HART transmitter is a compact microprocessor device designed to interface directly with the Model MT3809. This transmitter includes a Hi- and Lo alarm switch output and a pulse output.

The HART digital communication signals are superimposed on top of the 4-20 mA signal, allowing communication of more than just the process variable.

The transmitter is HART-programmable or for numerous variables such as flow rate, totalization, calibration factors, and high-low alarm parameters. It is programmable with easy-to-use hand held configurators. Prior to shipment, commonly used default values are programmed by Brooks to ensure ease of operation and quick startup. However, parameters may be reprogrammed by the user if needed. Flow rate information may be viewed locally at the meter scale, LCD display or displayed remotely.

Table 1-8 4-20 mA with HART Transmitter Description Table

Power supply voltage	21 to 30 Vdc: (2-wire current loop transmitter)
Loop current / current consumption range	3.8 to 22.0 mA.
Hi- and Lo-alarm outputs	Open collector alarm output Optically isolated outputs assignable to alarms. • Max. off-state voltage: 30 Vdc • Max. off-state current: 0,05 mA • Max. on-state voltage: 1.2 Vdc • Max. on-state current: 20 mA
Pulse Output	Optically isolated. Scalable to a variety of engineering unit systems (pulses per liter, gallons, etc.). • Range: 1 Hz to 1 kHz • Max. off-state voltage: 30 Vdc • Max. off-state current: 0.05 mA • Max. on-state voltage: 1.2 Vdc • Max. on-state current: 20 mA
Temperature Specification	See Temperature Cut-off Table
Electrical Connector	M20 x 1,5 according to ISO (1/2" NPT, 3/4” NPT (F) or cable gland optional) • Brass/Nickel plated cable gland cable diameter range 8-11 mm (Aluminum housing) • Stainless steel cable gland cable diameter range 7-10.5 mm (SS housing)
Linearity	Less than 1% at max. current.
Temperature influence	Less than 0.04% per °C.
Voltage influence	Less than 0.002% / Vdc.
Load resistance influence	± 0.1% full scale.
HART Revision	HART-7

FOUNDATION Fieldbus Transmitter, with Alarms and Pulse Output

Design Features

• FOUNDATION™ Fieldbus digital communication network interface
• Ease of wiring and installation with a single 2-wire bus connection
• Powered over 2-wire FOUNDATION™ Fieldbus connection
• Flexible (mix & match) units of measure for flowrates, totals, temperatures, densities, etc.
• Two flow totalizers: Resettable and inventory totalization
• User configurable, scalable pulse output for various engineering units
• Hi- and Lo-flow alarm output

Description

The FOUNDATION™ Fieldbus transmitter is a compact microprocessor device designed to interface directly with the Model MT3809.

The transmitter communicates over the 2-wire network per the international FOUNDATION™ Fieldbus standard for access to numerous variables such as flow rate, totalization, calibration factors, and high-low alarm parameters.

Table 1-9 FOUNDATION Fieldbus Transmitter Description Table

Power supply voltage	9-32Vdc
Power supply protection	Protected against reverse polarity
Current consumption	12 mA Entire transmitter is powered from 2-wire bus
Hi- and Lo-alarm outputs	Open collector alarm output Optically isolated outputs assignable to alarms. • Max. off-state voltage: 30 Vdc • Max. off-state current: 0,05 mA • Max. on-state voltage: 1.2 Vdc • Max. on-state current: 20 mA
Pulse Output	Optically isolated. Scalable to a variety of engineering unit systems (pulses per liter, gallons, etc.). • Range: 1 Hz to 1 kHz • Max. off-state voltage: 30 Vdc • Max. off-state current: 0.05 mA • Max. on-state voltage: 1.2 Vdc • Max. on-state current: 20 mA
Temperature Specification	See Temperature Cut-off Table
Electrical Connector	M20 x 1,5 according to ISO (1/2" NPT, 3/4” NPT (F) or cable gland optional) • Brass/Nickel plated cable gland cable diameter range 8-11 mm (Aluminum housing) • Stainless steel cable gland cable diameter range 7-10.5 mm (SS housing)
Linearity	Less than 1%
Temperature Influence	Less than 0.04% per °C
Voltage influence	Less than 0.002% / Vdc
FOUNDATION Fieldbus Revision	ITK6

Inductive Alarms

Design Features

- 1 or 2 normally open inductive limit switches
- Optional intrinsically safe power supply/amplifier/relay unit
- For low or high limit signaling/switching
- Front adjustable
- Optional Relay Power Supply – recommended

Description

One or two electronic limit switches can be installed in the indicator housing to allow signaling or switching functions on a preset flow value. The limit switch operates as a slot initiator that is inductively actuated by a disc mounted on the pointer shaft. Any flow value can be used for setting the limit value by sliding the initiator along the indicator scale. Minimum setting distance between two limit switches is approximately 40% full scale. The position of the initiator also serves to visually indicate the signaling set value. Settings can be adjusted by removing the indicator cover, loosening, moving and retightening of the alarm indication needle, and replacement of the indicator front cover. Refer to Section 2-5-1.

Table 1-10 Inductive Alarms Description Table

Power supply voltage	5 - 25 Vdc: (8 Vdc nominal)
Impedance	- Approximately 1 kohm with cam absent - Approximately 8 kohm with cam present
Ambient and process temperature	See Temperature Cut-off Table
Electrical Connector	M20 x 1,5 according to ISO (1/2" NPT, 3/4” NPT (F) or cable gland optional) • Brass/Nickel plated cable gland cable diameter range 8-11 mm (Aluminum housing) • Stainless steel cable gland cable diameter range 7-10.5 mm (SS housing)

Product Approvals Overview

Table 1-11 Product Approvals

Declarations	Mark	Meter Options				Standards/Directives/Marking	Declaration/ Certificate
		Mechanical	HART Transmitter	Foundation Fieldbus Transmitter	Inductive Alarm		
EU Declaration of Conformity	CE		✓	✓	✓	EMC Directive (2014/30/EU)	Declaration
		✓	✓	✓	✓	RoHS Directive (2011/65/EU)	Declaration
		✓	✓	✓	✓	Pressure Equipment Directive (2014/68/EU)	Declaration
SIL Declaration					✓	IEC 61508-2: 2010	Declaration
NAMUR Declaration			✓			NAMUR NE21, NE43	Declaration
IP66/67			✓	✓	✓	IEC 60529 (Stainless Steel Enclosure)	DEKRA Certificate
IP64			✓	✓	✓	IEC 60529 (Aluminum Enclosure)	DEKRA Certificate
IP66/67		✓				IEC 60529 (Stainless Steel or Aluminum Enclosure)	DEKRA Certificate
Explosion Safety "Flame Proof" For temperature limits, see Table: Process and ambient temperature limits Flame Proof / Ex-d	ATEX Ex		✓	✓	✓	II 2 G Ex db IIC T6...T1 Gb II 2 D Ex tb IIIC T85°C...T450°C Db	DEKRA 13ATEX0086X
						Ex db IIC T6...T1 Gb Ex tb IIIC T85°C...T450°C Db	IECEx DEK13.0027X
						Standards used for evaluation: (13ATEX0086X and IECEx DEK13.0027X) EN 60079-0:2012+A11:2013, EN 60079-1:2014, EN 60079-31:2014 IEC 60079-0:2011 mod + Cor.:2012 + Cor.:2013, IEC 60079-1:2014, IEC 60079-31:2013 **Special conditions for safe use:** For information regarding the dimension of the flameproof joints the manufacturer shall be contacted. **Electrical connections conditions:** For application in environments requiring EPL Gb the threaded entries of the enclosure shall be sealed with plugs, cable entry devices such as glands or conduit entry devices which are Ex db IIC Gb approved. For application in environments requiring EPL Db the threaded entries of the enclosure shall be sealed with plugs, cable entry devices such as glandsor conduit entry devices which are Ex tb IIIC Db approved. For application in environments requiring EPL Gb or EPL Db, in case the optional surge protector is used, the surge protector shall be installed with a high strength locking compound on the mounting thread.	
Explosion Safety "Constructional Safety (c)" Non-Electrical / Mechanical ATEX	ATEX Ex	✓				II2G Ex h IIC T6...T3 Gb II2D Ex h IIIC T200°C Db -20°C ≤ Ta ≤ 70°C	MBID 022
						Special conditions for safe use: Enclosure contains glass & painted aluminum parts. If it is mounted in an area where the use of category 2G or 2D apparatus is required, it must be installed such that ignition source due to propagating brush discharge sparks are excluded. The actual maximum surface temperature of the equipment depends not on the equipment itself, but on operating conditions of the process fluid/gas flowing through the equipment. The equipment by itself does not generate heat. Due to this reason the temperature class is marked as a range. The maximum permitted ambient and process temperature limits can be found in the operating instructions. At start up especially for gas applications, ensure that the pressure is gradually increased through the piping system. A sudden pressure spike situation may result in a fast movement of the float within the VA flowmeter & the float may hit hard against the float stop. Supply grounding connection by the process connections or earthing terminal.	

Table continued on next page

Table 1-11 Product Approvals (Continued)

Declarations	Mark	Meter Options: Mechanical	Meter Options: HART Transmitter	Meter Options: Foundation Field Bus Transmitter	Meter Options: Inductive Alarm	Standards/Directives/Marking	Declaration/Certificate
Explosion safety "Intrinsic Safety (ia)" "Increased safety (ec)" "Enclosure Dust (tc)" For temperature limits, see Table: Process and ambient temperature limits Intrinsic Safety / Increased Safety/ Enclosure dust	ATEX IECEX		✓	✓	✓		DEKRA 13ATEX0086X (ia) DEKRA 21ATEX0326X (ec & tc) IECEx DEK13.0027X

Option	Enclosure Type	M1	M2	M1 = Apparatus with Transmitter only M2 = Apparatus with Inductive Alarm
Unit without Digital Display	Aluminum	✓ ✓	✓ ✓	II 2 G Ex ia IIC T6…T4 Gb II 2 D Ex ia IIIC T85 °C…T135 °C Db II 3 G Ex ec IIC T6…T4 Gc II 3 D Ex tc IIIC T85 °C…T135 °C Dc II 3 G Ex ic IIC T6…T4 Gc II 3 D Ex ic IIIC T85 °C…T135 °C Dc
	Stainless Steel	✓ ✓	✓ ✓	II 1 G Ex ia IIC T6…T3 Ga II 2 D Ex ia IIIC T85 °C…T200 °C Db II 3 G Ex ec IIC T6…T3 Gc II 3 D Ex tc IIIC T85 °C…T200 °C Dc II 3 G Ex ic IIC T6…T3 Gc II 3 D Ex ic IIIC T85 °C…T200 °C Dc
	Stainless Steel High Temperature	✓ ✓	✓ ✓	II 1 G Ex ia IIC T6…T2 Ga II 2 D Ex ia IIIC T85 °C…T300 °C Db II 3 G Ex ec IIC T6…T2 Gc II 3 D Ex tc IIIC T85 °C…T300 °C Dc II 3 G Ex ic IIC T6…T2 Gc II 3 D Ex ic IIIC T85 °C…T300 °C Dc
Unit with Digital Display	Aluminum	✓ ✓	✓ ✓	II 2 G Ex ia IIC T4 Gb II 2 D Ex ia IIIC T135 °C Db II 3 G Ex ec IIC T4 Gc II 3 D Ex tc IIIC T135 °C Dc II 3 G Ex ic IIC T4 Gc II 3 D Ex ic IIIC T135 °C Dc
	Stainless Steel	✓ ✓	✓ ✓	II 1 G Ex ia IIC T4…T3 Ga II 2 D Ex ia IIIC T135 °C…T200 °C Db II 3 G Ex ec IIC T4…T3 Gc II 3 D Ex tc IIIC T135 °C…T200 °C Dc II 3 G Ex ic IIC T4…T3 Gc II 3 D Ex ic IIIC T135 °C…T200 °C Dc
	Stainless Steel High Temperature	✓ ✓	✓ ✓	II 1 G Ex ia IIC T4…T2 Ga II 2 D Ex ia IIIC T135 °C…T300 °C Db II 3 G Ex ec IIC T4…T2 Gc II 3 D Ex tc IIIC T135 °C…T300 °C Dc II 3 G Ex ic IIC T4…T2 Gc II 3 D Ex ic IIIC T135 °C…T300 °C Dc

Standards used for evaluation: (13ATEX0086X, 21ATEX0326X and IECEx DEK13.0027X)
EN 60079-0:2018, EN 60079-11:2012, EN 60079-7:2015, EN 60079-31:2014
IEC 60079-0:2017, IEC 60079-11:2011 + Cor.:2012, IEC 60079-7:2015, IEC 60079-31:2013

Special conditions for safe use:

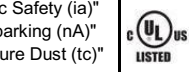
• For models marked with material code M, Titanium Grade II, the installation instructions contain the specification of the alloy, allowing the user determine the suitability of the equipment for the particular application.

• From the safety point of view the circuits shall be assumed to be connected to earth.

• On units with digital display the programming function through the LCD display shall only be done outside the hazardous area.

Table continued on next page

Table 1-11 Product Approvals (Continued)

Declarations	Mark	Mechanical	HART Transmitter	Foundation Field Bus Transmitter	Inductive Alarm	Standards/Directives/Marking	Status/Certificate
Explosion safety "Intrinsic Safety (ia)" "Non-sparking (nA)" "Enclosure Dust (tc)"	UL 		✓		✓	Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III Hazardous Locations Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; Class III Hazardous Locations Class I, Zone 1, AEx ia IIC T2/T3/T4/T5/T6 Gb Zone 21, AEx ia IIIC T85°C/T100°C/T135°C/T200°C/T300°C Db Class I, Zone 2, AEx nA IIC T2/T3/T4/T5/T6 Gc Zone 22, AEx tc IIIC T85°C/T100°C/T135°C/T200°C/T300°C Dc For temperature limits, see Table: Process and ambient temperature limits Intrinsic Safety / Non-Sparking / Enclosure dust	E73889
Explosion safety "Flame Proof"	CSA 		✓	✓	✓	Ex d IIC T6 Gb / Class I, Div.1 Group A, B, C and D Ex tb IIIC T85 Db / Class II, Div.1, Groups E, F, and G Class I, Zone 1, AEx d IIC T6 Gb / Zone 21, AEx tb IIIC T85 Db For temperature limits, see Table: Process and ambient temperature limits Flame Proof / Ex-d	14.2628516
NEMA 4X - Watertight			✓	✓	✓	NEMA 250 (Stainless Steel Enclosure)	CSA Certificate 14.2628516
NEMA 4X - Watertight		✓				NEMA 250 (Stainless Steel or Aluminum Enclosure)	DEKRA Certificate
CRN		✓	✓	✓	✓	ASME 31.3	CRN Registration Number

Declarations	Mark	Meter Options				Standards/Directives/Marking	Status/Certificate
		Mechanical	HART Transmitter	Foundation Field Bus Transmitter	Inductive Alarm		
Customs Union - Russia Declaration	EAC	✓	✓	✓	✓	TR CU 032/2013 "On safety of the equipment operating under excessive pressure"	RU Д- US.AM02.B.01243/20
Explosion safety "Flame Proof"	EAC		✓	✓	✓	Customs Union & Russia TR CU 012/2011 1 Ex d IIC «T6…T1» GbX : Ex tb IIIC «T85°C…T400°C» Db X	RU C-US.HA65.B.00647/20
Explosion safety "Intrinsic Safety (ia)" "Non-sparking (nA)" "Enclosure Dust (tc)"	EAC		✓	✓	✓	Customs Union & Russia TR CU 012/2011 Zone 1 / Zone2 - Intrinsic safety ia/ic, Zone 2 non-sparking (nA)	RU C-US.HA65.B.00647/20
Explosion safety "Flame Proof"	KOSHA		✓		✓	Exd IIC T6..T1 Gb : Ex tb IIIC T85°C…T400°C Db	15-AV4BO-0353
Explosion safety "Intrinsic Safety (ia)"	PESO		✓	✓	✓	Zone 1 - Intrinsic safety (ia), (India - Petroleum & Exposive Safety Organization PESO / CCOE)	P468175/1

Table 1-12 Process and ambient temperature limits (Document # 834Z948)

			Maximum Process Temperature (°C)					
		Temperature Class	T6	T5	T4	T3	T2	T1
Approval type	Meter type	Ambient Temperature (°C)						
Flame-proof / Ex-d CSA / ATEX/IECex	Flanged and Male Threaded versions	-40 to 32.5	85	100	135	200	300*	420*
		-40 to 47	85	100	135	200	300*	N/A
		-40 to 58	85	100	135	200	N/A	N/A
		-40 to 65	85	100	135	N/A	N/A	N/A
		-40 to 70	85	100	N/A	N/A	N/A	N/A
	ELF and Female Threaded versions	-40 to 47	85	100	135	200	300*	N/A
		-40 to 58	85	100	135	200	N/A	N/A
		-40 to 65	85	100	135	N/A	N/A	N/A
		-40 to 70	85	100	N/A	N/A	N/A	N/A
	ETFE Lines versions	-40 to 64	85	100	135	150	N/A	N/A
		-40 to 65	85	100	135	N/A	N/A	N/A
		-40 to 70	85	100	N/A	N/A	N/A	N/A
	NOTE	* For application with process temperature equal to or greater than +300 °C heat shield and custom installation required. Refer to installation manual for details.						

			Maximum Process Temperature (°C)					
		Meter Option	Without Digital Display			With or without Digital Display		
		Temperature Class	T6	T6	T5	T4	T3	T2
Approval type	Housing type	Ambient Temperature (°C)	Without Inductive Alarm	With Inductive Alarm	With or without Inductive Alarm	With or without Inductive Alarm	With or without Inductive Alarm	With or without Inductive Alarm
Intrinsic Safety / Non-Sparking / Enclosure dust ATEX/IECex	Aluminum	-40 to +35	85	85	100	135	N/A	N/A
		-40 to +40	85	85	100	126	N/A	N/A
		-40 to +45	85	85	100	115	N/A	N/A
		-40 to +50	85	85	100	104	N/A	N/A
		-40 to +55	85	84	94	94	N/A	N/A
		-40 to +60	84	76	84	84	N/A	N/A
		-40 to +65	76 **	69 **	76	76	N/A	N/A
		-40 to +70 *	69 **	N/A	69	69	N/A	N/A
	Stainless Steel	-40 to +40	85	85	100	135	200	N/A
		-40 to +45	85	85	100	135	194	N/A
		-40 to +50	85	85	100	135	167	N/A
		-40 to +55	85	85	100	135	138	N/A
		-40 to +60	85	85	100	110	110	N/A
		-40 to +65	85 **	69 **	86	86	86	N/A
		-40 to +70 *	69 **	N/A	69	69	69	N/A
	Stainless Steel High Temp	-40 to +35	85	85	100	135	200	300
		-40 to +40	85	85	100	135	200	267
		-40 to +45	85	85	100	135	200	221
		-40 to +50	85	85	100	135	182	182
		-40 to +55	85	85	100	135	149	149
		-40 to +60	85	85	100	119	119	119
		-40 to +65	85 **	69 **	91	91	91	91
		-40 to +70 *	69 **	N/A	69	69	69	69
	NOTE	* Maximum Ambient Temperature for Inductive alarm = +66 °C ** Not Applicable/Available for Foundation Field Transmitter. (Model code XV = M...U)						

Table continued on next page

Table 1-12 Process and Ambient Temperature Limits (Document # 834Z948) (continued)

			Maximum Process Temperature (°C)					
	Meter Option		Without Digital Display			With or Without Digital Display		
	Temperature Class		T6	T6	T5	T4	T3	T2
Approval Type	Housing Type	Ambient Temperature (°C)	Without Inductive Alarm	With Inductive Alarm	With or Without Inductive Alarm	With or Without Inductive Alarm	With or Without Inductive Alarm	With or Without Inductive Alarm
Intrinsic Safety / Non-Speaking / Enclosure dust cULus	Aluminum	-40 to 40	85	85	100	126	N/A	N/A
		-40 to 45	85	85	100	115	N/A	N/A
		-40 to 50	85	85	100	104	N/A	N/A
		-40 to 55	85	84	94	94	N/A	N/A
		-40 to 60	84	76	84	84	N/A	N/A
		-40 to +65	76	69	76	76	N/A	N/A
		-50 to +70*	69	N/A	69	69	N/A	N/A
	Stainless Steel	-40 to 40	85	85	100	135	200	N/A
		-40 to 45	85	85	100	135	194	N/A
		-40 to 50	85	85	100	135	167	N/A
		-40 to 55	85	85	100	135	138	N/A
		-40 to 60	85	85	100	110	110	N/A
		-40 to +65	85	69	86	86	86	N/A
		-40 to +70*	69	N/A	69	69	69	N/A
	Stainless Steel High Temp	-40 to 40	85	85	100	135	200	267
		-40 to 45	85	85	100	135	200	221
		-40 to 50	85	85	100	135	182	182
		-40 to 55	85	85	100	135	149	149
		-40 to 60	85	85	100	119	119	119
		-40 to +65	85	69	91	91	91	91
		-40 to +70*	69	N/A	69	69	69	69
	NOTE *Maximum Ambient Temperature for Inductive alarm = +66 °C							

Approval Type	Housing Type	Ambient Temperature (°C)
ATEX - Zone 1 / Zone 2, Non-Electrical	Aluminum	-20 to 70
	Stainless Steel	-20 to 70

Table 1-13 Electrical Data Intrinsic Safety (Document # 834Z948)

Electronics configuration	Function / signal	Ui,V	Ii, mA	Pi, mW	Ci, nF	Li, µH	Recommended Barrier #
4-20mA / HART	Signal 4-20mA (J1 terminals 12+ and 13-)	28	96	605	2,2	0.365	Stahl Type: 9260-13-11-10S Stahl Type : 9001/01-280-075-101
	Pulse output (J1 terminals 7+ and 8-)	10,6	19,1	51	≈0	≈0	Pepperl & Fuchs: KFA5-SR2-EX2.W KFA6-SR2-EX2.W
		10,5	13	34	≈0	≈0	Pepperl & Fuchs: KFD2-SR2-EX2.W
	Alarm circuits A (J1 terminals 1+ and 2-)	10,6	19,1	51	≈0	≈0	Pepperl & Fuchs: KFA5-SR2-EX2.W KFA6-SR2-EX2.W
		10,5	13	34	≈0	≈0	Pepperl & Fuchs: KFD2-SR2-EX2.W
	Alarm circuits B (J1 terminals 4+ and 5-)	10,6	19,1	51	≈0	≈0	Pepperl & Fuchs: KFA5-SR2-EX2.W KFA6-SR2-EX2.W
		10,5	13	34	≈0	≈0	Pepperl & Fuchs: KFD2-SR2-EX2.W
		Uo,V	**Io, mA**	**Po, mW**	**Co, µF**	**Lo, mH**	**Notes**
	Remote zero loop signal (J1 terminals 10+ and 11-)	28	2,83	80	0.083	44	

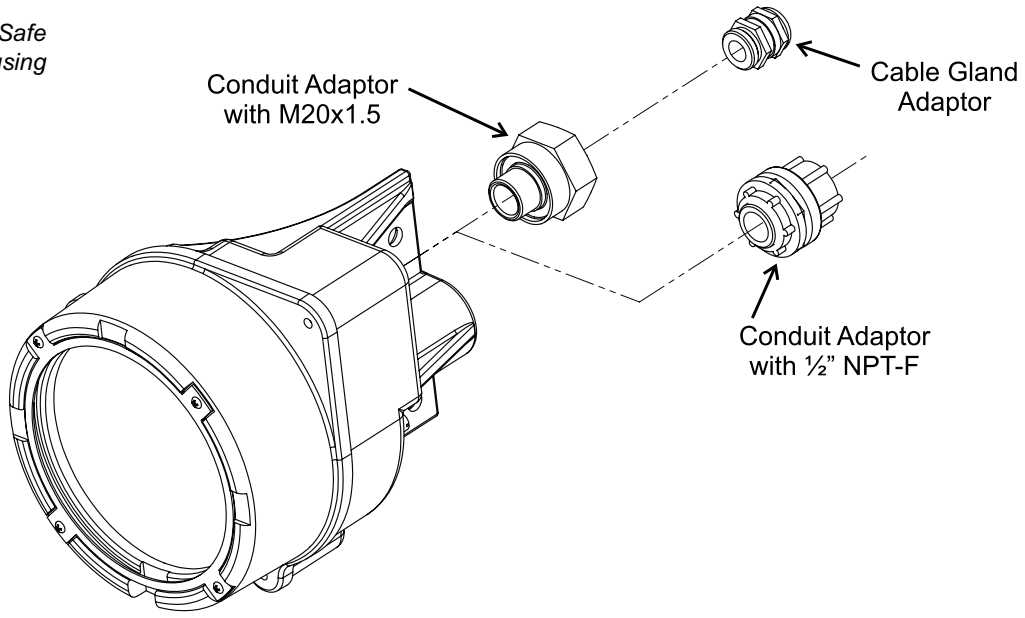
		Ui,V	Ii, mA	Pi, mW	Ci, nF	Li, mH	Recommended Barrier #
Foundation Fieldbus	FOUNDATION Fieldbus loop (J1 terminals 10+/11+ and 12-/13-)	24	380	5320	0	0	FISCO barrier
	Pulse output (J1 terminals 5+ and 6-)	10,6	19,1	51	≈0	≈0	Pepperl & Fuchs: KFA5-SR2-EX2.W KFA6-SR2-EX2.W
		10,5	13	34	≈0	≈0	Pepperl & Fuchs: KFD2-SR2-EX2.W
	Alarm circuits A (J1 terminals 1+ and 2-)	10,6	19,1	51	≈0	≈0	Pepperl & Fuchs: KFA5-SR2-EX2.W KFA6-SR2-EX2.W
	Alarm circuits B (J1 terminals 3+ and 4-)	10,6	19,1	51	≈0	≈0	Pepperl & Fuchs: KFA5-SR2-EX2.W KFA6-SR2-EX2.W
		Uo,V	**Io, mA**	**Po, mW**	**Co uF**	**Lo mH**	**Notes**
	Remote zero loop signal (J1 terminals 8+ and 9-)	8,03	0,81	6,5	8,4	1215	

		Ui,V	Ii, mA	Pi, mW	Ci, nF	Li, µH	Recommended Barrier #
Inductive Alarms	Inductive High Alarm circuits (terminals «+» and «-») – for connection of circuits Pepperl+Fuchs mod. SJ 3,5-SN type 2	10,6	19,1	51	30	100	Pepperl & Fuchs:KFA5-SR2-EX2.W or KFA6-SR2-EX2.W
	Inductive Low Alarm circuits (terminals «+» and «-») – for connection of circuits Pepperl+Fuchs mod. SJ 3,5-SN type 2	10,6	19,1	51	30	100	Pepperl & Fuchs:KFA5-SR2-EX2.W or KFA6-SR2-EX2.W

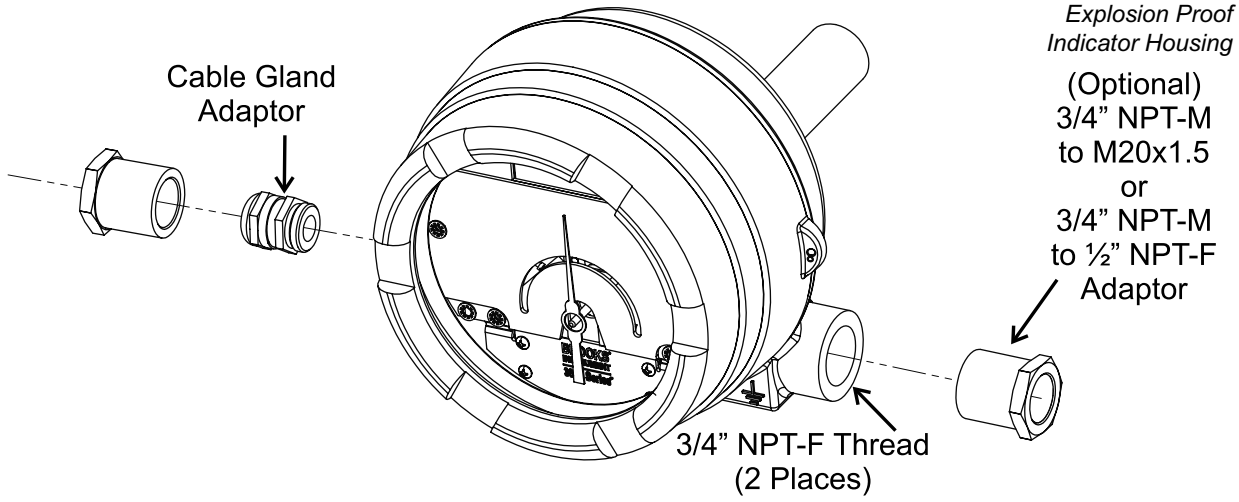
Table 1-14 Electrical Entries

Protection Concept / Electrical Connection Entry	ATEX/IECEx		CSA	UL
	Ex db/Ex tb	Ex ia, Ex ic Ex nA, Ex tc	Ex db/Ex tb	Ex ia, Ex ic Ex nA, Ex tc
3/4" NPT - F	X	X	X	X
3/4" NPT-M to M20 X 1.5 (Adaptor)	X	X	X	X
3/4" NPT-M to 1/2" NPT - F (Adapter)	X	X		X
Cable Gland (Adapter)		X		

MT3809G
Instrinsically Safe
Indicator Housing



MT3809G
Explosion Proof
Indicator Housing



General

This section contains the procedures for the receipt and installation of the instrument. Do not attempt to start the system until the instrument has been permanently installed. It is extremely important that the start-up procedures be followed in the exact sequence presented.

Receipt of Equipment

When the equipment is received, the outside packing case should be checked for damage incurred during shipment. If the packing case is damaged, the local carrier should be notified at once regarding his liability. A report should be submitted to the nearest Brooks Instrument location listed on the Global Service Network page on our website: BrooksInstrument.com/GlobalSupportCenters

Remove the envelope containing the packing list. Carefully remove the instrument from the packing case. Make sure spare parts are not discarded with the packing materials. Inspect for damaged or missing parts.

Recommended Storage Practices

If intermediate or long-term storage is required for equipment, as supplied by Brooks Instrument, it is recommended that the equipment be stored in accordance with the following:

a. Within the original shipping container.
b. Stored in a sheltered area, preferably a warm, dry, heated warehouse.
c. Ambient temperature of 21°C (70°F) nominal, 43°C (110°F) maximum, 7°C (45°F) minimum.
d. Relative humidity 45% nominal, 60% maximum, 25% minimum.

Upon removal from storage, a visual inspection should be conducted to verify the condition of equipment is "as received".

Return Shipment

Prior to returning any instrument to the factory for any reason, visit our website for instructions on how to obtain a Return Materials Authorization Number (RMA #) and complete a Decontamination Statement to accompany it: BrooksInstrument.com/Service. All instruments returned to Brooks also require a Material Safety Data Sheet (MSDS) for the fluid(s) used in the instrument. Failure to provide this information will delay processing of the instrument.

Instrument must have been purged in accordance with the following:

⚠ WARNING

Before returning the device, purge thoroughly with a dry inert gas such as Nitrogen before disconnecting process connections. Failure to correctly purge the instrument could result in fire, explosion or death. Corrosion or contamination may occur upon exposure to air.

Installation of Flowmeter

⚠WARNING

If the inlet and outlet valves adjacent to the indicator are to be closed for any reason, the indicator must be completely drained. Failure to do so may result in thermal expansion of the liquid which can rupture the meter and cause possible personal injury.

⚠CAUTION

Meters weighing more than 40 pounds/18 kilograms are labeled and should be handled with care to prevent personal injury. The product can be lifted by the meter flange or meter pipe. The caution label is shown below.



⚠WARNING

The meter is capable of process fluids to 750°F/400°C with specific options. It is recommended that user install label(s) indicating hot surfaces.

Recommended installation for Models MT3809 and MT3810 is as follows:

a. Carefully remove the covers from each end of the flowmeter. The float may be fixed to avoid damage during transport. These plugs must be removed before use.

b. Install the flowmeter with the inlet at the bottom and the outlet at the top.

⚠CAUTION

Since this is a magnetically activated device, strong magnetic fields and materials with magnetic properties may cause faulty operation when in close proximity to the flowmeter. This includes steel pipes, steel conduit, motors and transformers.

⚠CAUTION

Flowmeters with a transmitter must be mounted at least 0.5 meters (18 inches) apart to prevent the interaction of adjacent float magnets and transmitter.

c. When installing the flowmeter in the process line, follow accepted plumbing practices.

i. **For flanged meters (without lining):**
Select bolts and gaskets (customer supply) in keeping with the flange pressure rating or the operating pressure. Also note corrosion resistance and thermal stability.
Align gasket and tighten nuts using the torques specified for the relevant pressure ratings. Advised bolting acc. ASTM A307 Grade B

ii. **For threaded meters:**
Follow the applicable installation instructions for threaded connections.
Important: ensure that thread sealing material does not get into the flow path. Loose pieces can cause obstruction inside the measurement section of the meter, and potentially even blockage of the measurement float within the measurement tube.

iii. **For ETFE lined meters:**
Select bolts and gaskets (customer supply) in keeping with the flange pressure rating or the operating pressure. Also note corrosion resistance and thermal stability.
Important: the inside diameter of the flanges deviates from the standard dimensions. Enlarge the flange gaskets to the appropriate size.Align gasket and tighten nuts using the torques specified in Table 2-1
Important: PTFE is deformable under pressure in the cold state. Do not exceed maximum torque.

d. Install the flowmeter within 5° of true vertical. Use of a level is recommended to determine the proper alignment.

e. When the process temperature is 300°C / 572°F or above insulation is required on the meter body and flanges. The insulation is installed between the indicator housing and the body and flanges. Do not wrap the indicator with insulation.

Recommended insulation materials are calcium silicate, cellular glass or mineral wool with a thermal conductivity of .083 W/m-K at 300°C / 572°F.

Installation and Maximum Torques of Model MT3809 ETFE

MAXIMUM TORQUES MODEL MT3809 ETFE
Please refer to Table 2-1 below.

- Select **bolts and gaskets** (customer supply) in keeping with the flange pressure rating or the operating pressure. Also note corrosion resistance and thermal stability.
Important: the inside diameter of the flanges deviates from the standard dimensions. Enlarge the flange gaskets to the appropriate size.
- **Align gaskets**, tighten nuts using the torques specified for the relevant pressure ratings.
- **Measuring section with E/TFE line with PTFE sealing face**
PTFE is deformable under pressure in the cold state.
- Tighten the flange bolts nuts only with the following maximum torques:
- Advised bolting acc. ASTM A307 Grade B)

Table 2-1 Maximum Torques Model MT3809 ETFE

Connection size				Stud bolts			Max. torque	
DIN		ASME		DIN	ASME			
DN	PN	inch	lb		150lb	300lb	Nm	ft.lbs
15	40	1/2"	150/300	4x M12	4x 1/2"	4x 1/2"	3.4	2.5
25	40	1"	150/300	4x M12	4x 1/2"	4x 5/8"	6.5	4.8
40	40	1,5"	150/300	4x M16	4x 1/2"	4x 3/4"	13.6	10
50	40	2"	150/300	4x M16	4x 5/8"	8x 5/8"	23.6	17.4

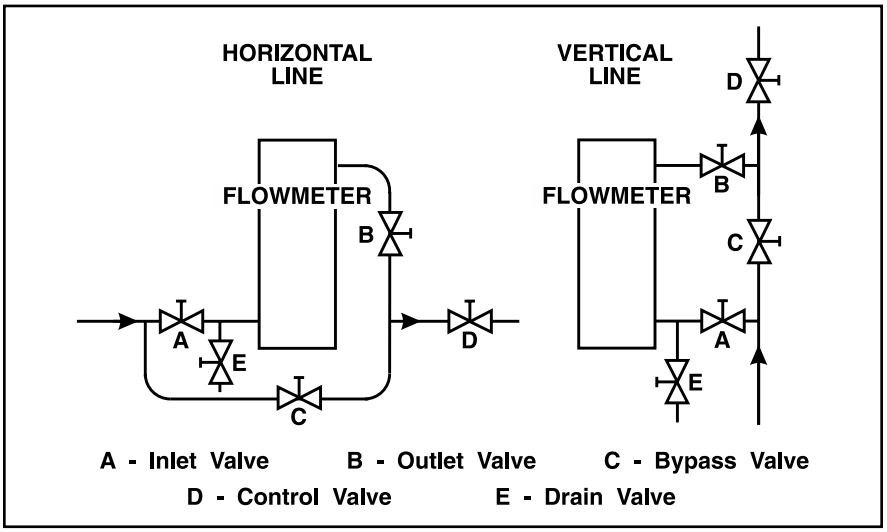


Figure 2-1 Typical Bypass Installation

How to Remove and Reinstall GP Housing Indicator Covers







Directions to remove and reinstall the GP Housing Cover and adjust the Pointer:

1. To begin, make sure the float is at rest and there isn't flow going through the meter.

2. Loosen the 4 cover screws.

- For aluminum housing, use a T20 TORX drive tool.

- For stainless steel housing, use a #2 Phillips drive tool. Note, the screws will stay attached to the cover.

3. Remove the cover from the housing. The gasket should still be attached to the cover in the gasket groove. If not, place the gasket into the groove of the cover.

4. Using a flat blade screwdriver with a 1/8" blade, hold the pointer and turn the screw to align with the "R" on the scale. It may take a few adjustments to get the pointer on the "R".

5. To replace the cover, place the cover against the housing and tighten the 4 screws using the same tool used in step 2. Tighten to 45 in-lbs or 5.08 N-m to keep a watertight seal. and tighten the 4 screws using a T20 TORX tool. Tighten to 45 in-lbs or 5.08 N-m to keep a watertight seal.







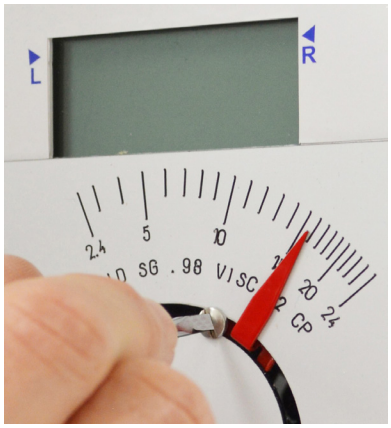
How to Remove and Reinstall IS Housing Indicator Covers

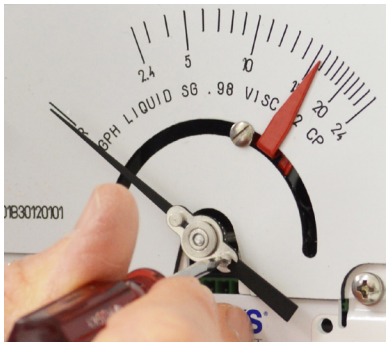
⚠ WARNING

If it becomes necessary to service or remove the instrument from the system, power to the device is disconnected at the power supply.





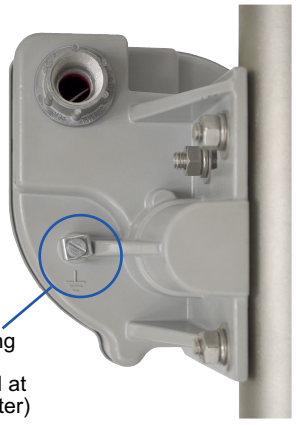




Directions to remove and reinstall the IS Housing Indicator Cover, adjust Alarms and the Pointer:

1. To begin make sure the float is at rest and there isn't flow going through the meter.
2. Using a T20 TORX tool loosen the 3 cover screws. Note, the screws will stay attached to the cover.
3. Remove the cover from the housing. The gasket should still be attached to the cover in the gasket groove. If not place the gasket into the groove of the cover.
4. Using a flat blade screwdriver with a 1/8" blade, hold the red alarm pointer and turn the screw counterclockwise to loosen the pointer, slide it to desired position on scale and tighten screw.
5. Using a flat blade screwdriver with a 1/8" blade, hold the pointer and turn the screw to align with the "R" on the scale. It may take a few adjustments to get the pointer on the "R".
6. To replace the cover, place the cover against the housing and tighten the 3 screws using a T20 TORX tool. Tighten to 45 in-lbs or 5.08 N-m to keep a watertight seal.





Grounding Screw (accessed at rear of meter)

How to Remove and Reinstall XP Housing Indicator Covers

⚠ WARNING

If it becomes necessary to service or remove the instrument from the system, power to the device is disconnected at the power supply.



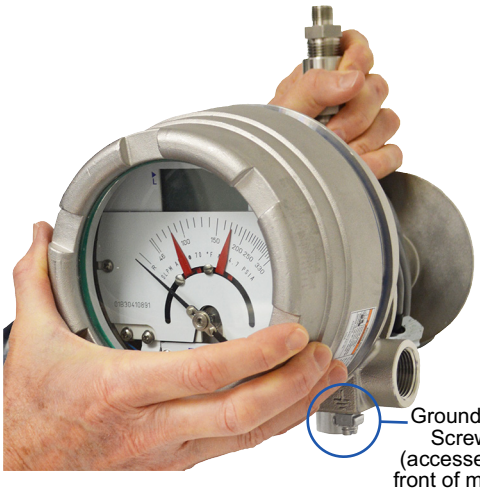




Directions to remove and reinstall the XP Housing Indicator Cover, adjust Alarms and the Pointer:

1. To begin make sure the float is at rest and there isn't flow going through the meter.
2. Using your hands or a strap wrench turn the cover counter clockwise to remove the cover from the housing
3. Remove the cover from the housing. The gasket should stay attached to the groove in the housing
4. Using a flat blade screwdriver with a 1/8" blade, hold the red alarm pointer and turn the screw counterclockwise to loosen the pointer, slide it to desired position on scale and tighten screw.
5. Using a flat blade screwdriver with a 1/8" blade, hold the pointer and turn the screw to align with the "R" on the scale. It may take a few adjustments to get the pointer aligned to the "R".
6. To replace the cover, place the cover against the housing and turn the cover clockwise. Note, it will take several rotations to tighten the cover and the cover must be in contact with the gasket to keep a watertight seal.





Electrical Connections to MT3809 with 4-20 mA/HART Transmitter, Alarms and Pulse Output

⚠ WARNING

If it becomes necessary to service or remove the instrument from the system, power to the device is disconnected at the power supply.

a) Before electrical connection, install the meter into the pipeline as described in previous Section 2.5.
b) The electrical installation practice for conventional 4-20 mA and wired HART devices is generally the same:

i. To avoid electrical interference and to meet the Electro Magnetic Compatibilty (EMC directive) requirements, use individually shielded twisted pair cable, either in single pair or multi-pair varieties. The minimum conductor size is 0.51mm diameter (#24 AWG) for cable runs less than 1,500 meters (@ 5,000 ft.) and 0.81mm diameter (#20 AWG) for longer distances.

ii. In case of installation into explosion hazardeous environments it is important to eliminate a potential incentive level of circulating current through the cable shield in the event that there are local differences in chassis ground potential between the two ends of the cable. Therefore, able shields shall be connected to chassis ground (earth) in accordance with the applicable national & regional installation codes and regulations. A terminal screw inside the device allows for shield to chassis connection in case the applicable installation regulation requires earthing at the transmitter end.

iii. To prevent external interference, the signal loop should be grounded at one point only. The single ground point will usually be at or near the host (e.g. at the control system).

iv. Ensuring a properly specified power supply. Power for a two-wire instrument loop is typically 24 Vdc. The voltage must be sufficient to provide the necessary minimum voltage at the transmitter terminal. Take into account voltage drops in the cable and load resistor, as well as from any intrinsic safety barrier present. The transmitter could take up to 22 mA to indicate an alarm condition. Use this value to calculate the worst loop voltage drop.

The maximum resistance of the loop resistor, the associated cable and the barrier is determined by the power supply voltage and is shown graphically in Figure 2-2.

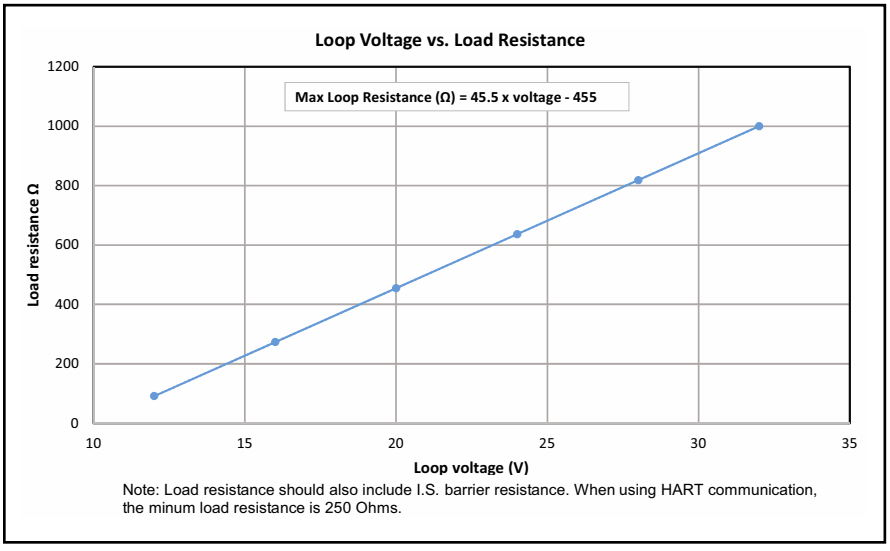


Figure 2-2 Power Supply vs. Maximum Load Resistance

v. Staying below the maximum allowable cable length which depends upon the cable capacitance and the number of network devices. Most installations are well within the 3000 meter (10,000 ft) theoretical limit for HART communication. However, the electrical characteristics of the cable (primarily its capacitance) and the number of connected devices can affect the maximum allowable cable length. Detailed information for determining the maximum cable length for any HART network configuration can be found in the HART Physical Layer Specifications.

c) The housing of the transmitter should be grounded in accordance with the applicable installation regulations. When the device is not sufficiently grounded via the process cables, a grounding terminal screw is available on the transmitter housing for earth connection.

d) Transmitter wiring connection diagrams are given in Sections 2-6-1. (4-20 mA/HART Transmitter Instrinsically Safe Installation), 2-6-2. (4-20mA/HART Transmitter Division 2 Installation) and 2-6-3. (4-20mA/HART Transmitter Flameproof Installation). Ensure that the installation complies with given hazardeous area protection requirements.

i. Intrinsically safe installations require the use of barriers, power supply limits and cable parameters as shown in the installation diagram. All connections are made in the transmitter housing.

ii. If the area classification is Division 2, barriers are not required and cable parameters are not applicable. However, the electrical code will require the use of conduit for wire protection.

iii. For flameproof installation the optional explosion proof enclosure is required and explosion proof installation methods must be followed

iv. For both Division 1 explosion proof and Division 2 non-incendive installations, the barriers shown in the installation drawings are optional.

⚠WARNING

To prevent ignition of hazardous atmospheres and serious personal injury, proper installation methods must be used as defined in Article 505 of the National Electrical Code, and the Canadian Electrical Code and ISA Standard 12.6 and in accordance with Cenelec regulations.

Transmitter with alarm and pulse output wiring connections
The alarm contact and pulse output digital signals are electrically identical, independent, optically coupled transistor outputs. Wiring will be as required by the external driven system - Prover, DCS/PLC, terminal-automation system, batch controller etc. These can be wired as an open collector or open signal on the high or low side of voltage-rail within the receiving equipment, depending upon the signal needs. When interfacing to external electronics, be careful to work within the voltage/current polarity and limits as specified in Section 1.

e) Common transmitter parameters are set during manufacturing at Brooks Instrument based on order information, meter configuration or defaults inherent to the transmitter. Further detailed configurations as well as on-line monitoring can be done through standard HART or FOUNDATION™ Fieldbus communication protocol, see Section 3-3. for details.

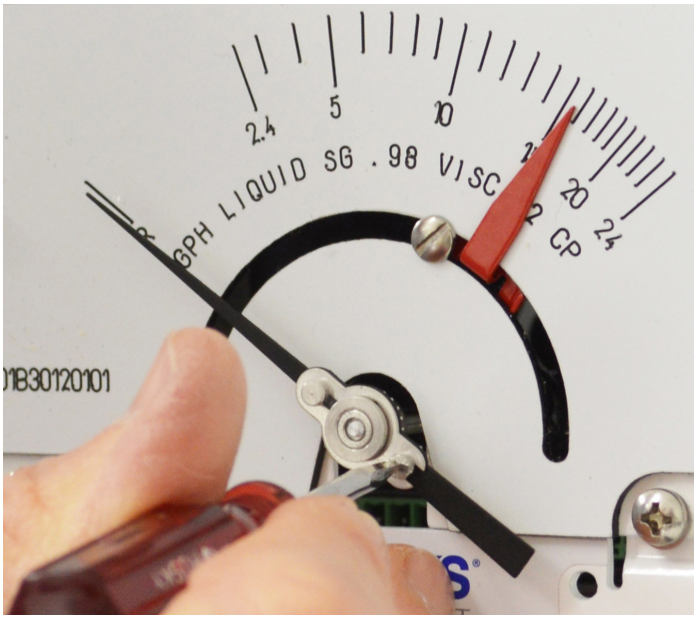
The float is constructed with an integral magnet that activates a magnetic sensor that is part of the transmitter. This same float magnet also drives the mechanical pointer. The flow rate is scaleable by setting independent high and low range parameters. The analog output (AO) transmitter parameters, AO Hi-Range and AO Lo-Range span the 4-20 mA signal. For example, if flow rate is normally between 100 and 500 gpm, the AO Hi-Range parameter is set at 500 and the AO Lo-Range is set at 100.

f) Typically applications require only the use of the 2 wire loop analog signal. In some applications where transmitters and actuators are widely separated (e.g. tank farms), devices are wired in a multi-drop configuration to save wiring costs. Each unit is given an individual HART address to distinguish each unit during communications over a common wire pair. In this configuration, the 4-20 mA output signal cannot be used. Follow the general HART foundation instructions for setting up a multi-drop configuration.

g) After installation and powering of the loop, the transmitter must be zeroed, both electrically and mechanically. This operation will compensate for any stray magnetic effects in the vicinity of the transmitter.
Important: The zero adjusting of the pointer influences the transmitter indication, but not the other way around. Therefore, first adjust the pointer at the zero flow position, then the transmitter must be zeroed.

i. Flow must be verified to be zero during the entire zeroing.

ii. With the flow at zero and the float at the zero flow position, adjust the mechanical indicator to point to the ‘R’ (reference line) using the adjustment screw on the face of the pointer, next to the hub.



Using a flat blade screwdriver with a 1/8" blade, hold the pointer and turn the screw to align with the “R” on the scale.

It may take a few adjustments to get the pointer on the “R”.

Figure 2-3 Mechanical Indicator Zero

iii. Then, zero the transmitter shorting the two pins at the terminal block. Reference Figure 2-4 below.

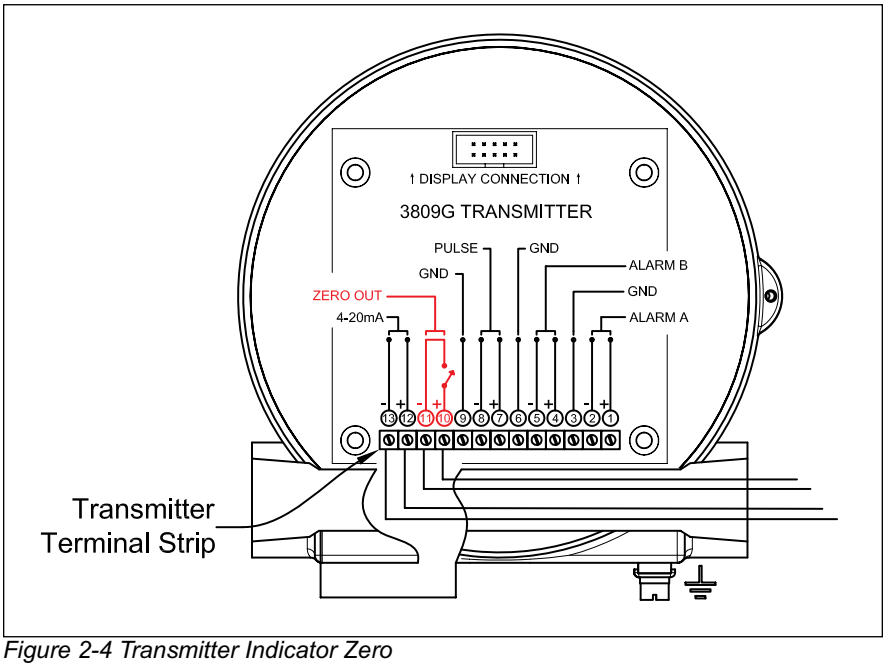


Figure 2-4 Transmitter Indicator Zero

Note: The zero function may be activated as part of a periodical maintenance check. If desired, a zero switch can be remotely mounted and wired to these terminals. The hazardous area classification will determine the wiring methods used for this switch.

h) Under actual flow conditions, verify that the transmitter output matches the mechanical pointer position. If a discrepancy is noted, the HART communications channel can be used to verify or adjust the transmitter settings repositioning the pointers.

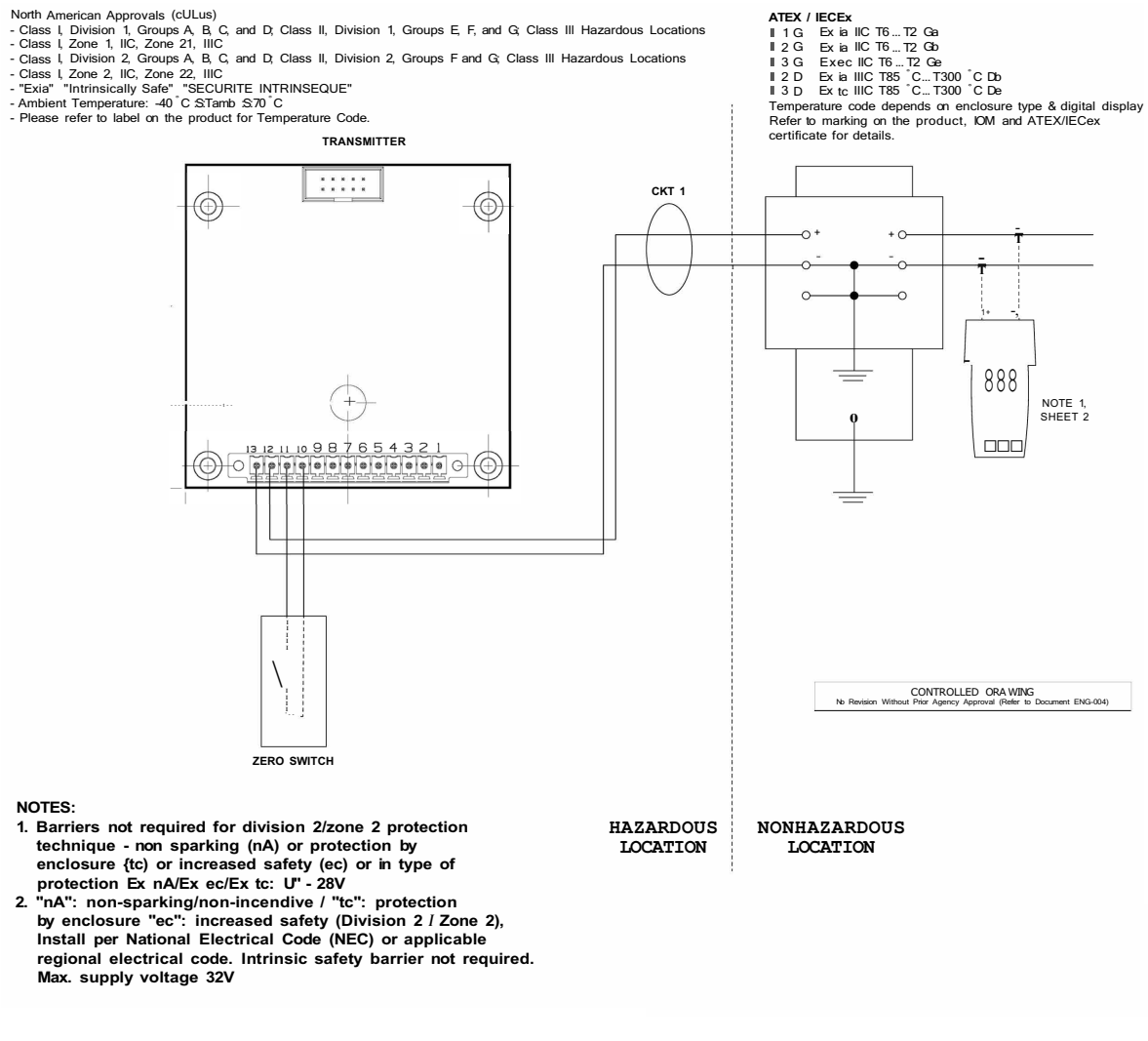
Installation of the Model MT3809 Flowmeter with Transmitter and Digital Display and Inductive Alarms

a. Install the meter as described in Section 2-5
b. Install the transmitter as described in Section 2-6
c. Install the inductive alarms as indicated below Section 2-8

4-20 mA/HART Transmitter Intrinsically Safe Installation

For intrinsically safe installation, intrinsic safety barrier selection, cable parameters, and power supply limits must be in accordance with the entity parameters shown in Figure 2-5a/2-5b. Alternatively, the optional intrinsically safe power supply available from Brooks may be used. Cable parameters for inductance and capacitance still apply.

Note: To ensure full EMC protection the ferrite core included with the meter must be installed to the input power I/O cable at the supply end of cable.



(Continued on next page)

Figure 2-5 Wiring Diagram, Model MT3809 Transmitter, 4-20 mA

1. This device is a Rosemount hand help communicator.
2. WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY, AVERTISSEMENT: LA SUBSTITUTION DE COMPOSANTS PEUT COMPROMETTRE LA SÉCURITÉ INTRINSÈQUE
3. WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS. AVERTISSMENT – RISQUE D'EXPLOSION NE PAS DÉBRANCHER TANT QUE LE CIRCUIT EST SOUS TENSION À MOINS QU'IL NE S'AGISSE D'UN EMPLACEMENT NON DANGEREUX.
4. THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS (AS APPLICABLE) OR NON-HAZARDOUS LOCATIONS ONLY. CET EQUIPEMENT CONVIENT POUR UTILISATION CLASSE I, DIVISION 2, GROUPES (TOUS) OU LOCATIONS NON-DANGEREUSES SEULEMENT.
5. WARNING – ENCLOSURE CONTAINS ALUMINUM. PRECAUTIONS MUST BE TAKEN TO AVOID IGNITION DUE TO IMPACT. AVERTISSEMENT- LE BOÎTIER CONTIENS DE L'ALUMINIUM, DES PRÉCAUTIONS S'APPLIQUENT POUR ÉVITER L'IGNITION PAR IMPACT.
6. WARNING – FROM A SAFETY POINT OF VIEW THE CIRCUITS SHALL BE ASSUMED TO BE CONNECTED TO EARTH AVERTISSEMENT: PAR SÉCURITÉ LES CIRCUITS DEVRAIENT ÊTRE RELIÉS À LA MISE À LA TERRE.
7. Note for cULus approvals units: For devices using cable gland at field installation the following cable gland shall be used - American IP67 cable gland for the aluminum housing and an American rated IP68 cable gland for the Stainless steel and high temperature housings.
8. Entity Parameters:
   In type of protection Ex ia IIC/IIIC or Ex ic IIC/IIIC, only for connection to a certified intrinsically safe circuit, with following maximum values.

	Ui,V	Ii, mA	Pi, mW	Ci, nF	Li, µH	Recommended Barrier #
Signal 4-20mA (J1 terminals 12+ and 13-)	28	96	605	2,2	0.365	Stahl Type : 9001/01-280-075-101 Stahl Type : 9260-13-11-105
	Uo,V	Io, mA	Po, mW	Co, µF	Lo, mH	Notes
Remote zero loop signal (J1 terminals 10+ and 11-)	28	2,83	80	0,083	44	

   # Note: The Recommended barrier listed above is not part of this UL certification.
9. The intrinsically safe device does not provide 500 V isolation with respect to earth.
   Associated apparatus used must be galvanically isolated or dual channel shunt zener diode barriers with linear outputs used channel to channel.
10. Selected associated apparatus must be third party listed as providing intrinsically safe circuits for the application, and have Voc or Vt not exceeding Vmax (or Uo not exceeding Ui), Isc or It not exceeding Imax (or Io not exceeding Ii), and the Po of the associated apparatus must be less than or equal to the Pmax or Pi of the intrinsically safe equipment, as shown in Table 1.
11. Capacitance and inductance of the field wiring from the intrinsically safe equipment to the associated apparatus shall be calculated and must be included in the system calculations as shown in Table 1. Cable capacitance, Ccable, plus intrinsically safe equipment capacitance, Ci, must be less than the marked capacitance, Ca (or Co), shown on any associated apparatus used. The same applies for inductance (Lcable, Li and La or Lo, respectively). Where the cable capacitance and inductance per foot are not known, the following values shall be used: Ccable = 60 pF/ft., Lcable = 0.2 µH/ft.

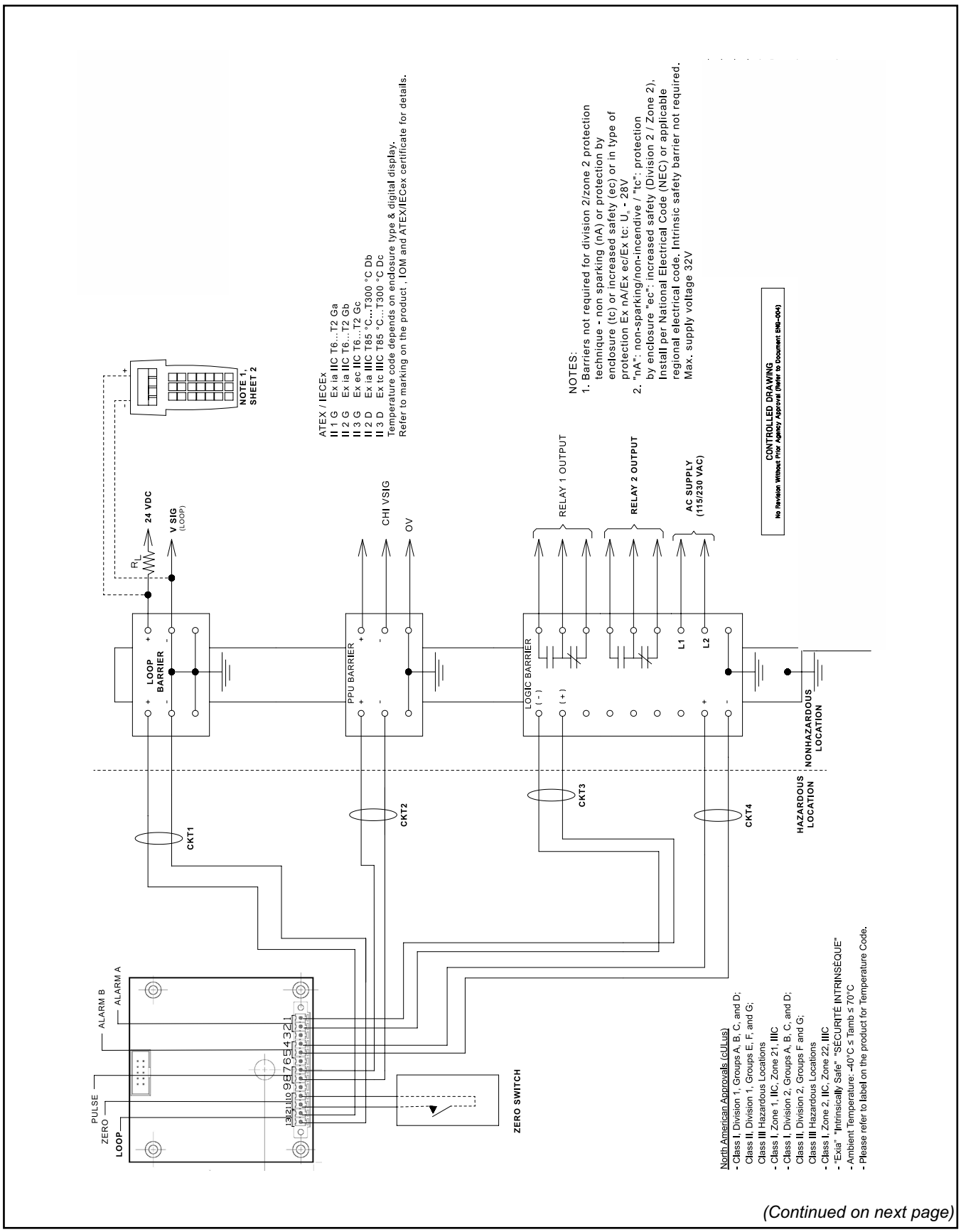
TABLE 1:		
I.S. Equipment		Associated Apparatus
V max (or Ui)	≥	Voc or Vt (or Uo)
I max (or Ii)	≥	Isc or It (or Io)
Pmax (or (Pi)	≥	Po
Ci + Ccable	≤	Ca (or Co)
Li + Lcable	≤	La (or Lo)

   If Po of the associated apparatus is not known, it may be calculated using the formula Po = (Voc * Isc)/4 = (Uo * Io)/4.

12. Associated apparatus must be installed in accordance with its manufacturer's control drawing and Article 504 of the National Electrical Code (ANSI/NFPA 70) for installation in the United States, or Section 18 of the Canadian Electrical Code for installations in Canada.
13. When required by the manufacturer's control drawing, the associated apparatus must be connected to a suitable ground electrode per the National Electrical Code (ANSI/NFPA 70), the Canadian Electrical Code, or other local installation codes, as applicable. The resistance of the ground path must be less than 1 ohm.
14. Where multiple circuits extend from the same piece of intrinsically safe equipment to associated apparatus, they must be installed in separate cables or in one cable having suitable insulation. Refer to Article 504.30(B) of the National Electrical Code (ANSI/NFPA 70) and Instrument Society of America Recommended Practice ISA RP12.6 for installing intrinsically safe equipment.
15. Associated apparatus must not be used in combination unless permitted by the associated apparatus certification.
16. Control equipment must not use or generate more than 250 V rms or dc with respect to earth.
17. Standards use for evaluation:
    US Standards: UL 913 - Ed 8, UL 60079-31 - Ed 2, UL 60079-15 - Ed 4, UL 60079-11 - Ed 6, UL 60079-0 - Ed 6, ISA 12.12.01
    Canadian Standards: CSA C22.2 NO. 157 - Ed 3, CSA C22.2 NO. 213-M1987 - Ed 1, CSA C22.2 NO. 60079-0:11 - Ed 2, CSA C22.2 NO. 60079-11:14 - Ed 2, CSA C22.2 NO. 60079-15:12 - Ed 1, CSA C22.2 NO. 60079-31:12 - Ed 1

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Figure 2-5 Wiring Diagram, Model MT3809 Transmitter, 4-20 mA (continued)



(Continued on next page)

Figure 2-6 Wiring Diagram, Model MT3809, 4-20 mA Transmitter, One or Two Optical Alarms and PPU

1. This device is a Rosemount hand help communicator.
2. WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY. AVERTISSEMENT: LA SUBSTITUTION DE COMPOSANTS PEUT COMPROMETTRE LA SÉCURITÉ INTRINSÈQUE
3. WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS.
   AVERTISSMENT – RISQUE D'EXPLOSION. NE PAS DÉBRANCHER TANT QUE LE CIRCUIT EST SOUS TENSION À MOINS QU'IL NE S'AGISSE D'UN EMPLACEMENT NON DANGEREUX.
4. THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS (AS APPLICABLE) OR NON-HAZARDOUS LOCATIONS ONLY. CET EQUIPEMENT CONVIENT POUR UTILISATION CLASSE I, DIVISION 2, GROUPES (TOUS) OU LOCATIONS NON-DANGEREUSES SEULEMENT.
5. WARNING – ENCLOSURE CONTAINS ALUMINUM. PRECAUTIONS MUST BE TAKEN TO AVOID IGNITION DUE TO IMPACT.
   AVERTISSEMENT- LE BOÎTIER CONTIENS DE L'ALUMINIUM. DES PRÉCAUTIONS S'APPLIQUENT POUR ÉVITER L'IGNITION PAR IMPACT.
6. WARNING – FROM A SAFETY POINT OF VIEW THE CIRCUITS SHALL BE ASSUMED TO BE CONNECTED TO EARTH
   AVERTISSEMENT: PAR SÉCURITÉ LES CIRCUITS DEVRAIENT ÊTRE RELIÉS À LA MISE À LA TERRE.
7. Note for cULus approvals units: For devices using cable gland at field installation the following cable gland shall be used - American IP67 cable gland for the aluminum housing and an American rated IP68 cable gland for the Stainless steel and high temperature housings.
8. Entity Parameters:
   In type of protection Ex ia IIC/IIIC or Ex ic IIC/IIIC, only for connection to a certified intrinsically safe circuit, with following maximum values.

CONTROLLED DRAWING
No Revision Without Prior Agency Approval (Refer to Document ENG-004)

Input/Output	Ui, V	Ii, mA	Pi, mW	Ci, nF	Li, µH	Recommended Barrier #
Signal 4-20mA (J1 terminals 12+ and 13-)	28	96	605	2.2	0.365	Stahl Type: 9001/01-280-075-101
Pulse output (J1 terminals 7+ and 8-)	10.6	19,1	51	~0	~0	Pepperl & Fuchs: KFA5-SR2-EX2.W or KFA6-SR2-EX2.W
	10,5	13	34	~0	~0	Pepperl & Fuchs: KFD2-SR2-EX2.W
Alarm circuits (J1 terminals 1+ and 2-)	10.6	19,1	51	~0	~0	Pepperl & Fuchs: KFA5-SR2-EX2.W or KFA6-SR2-EX2.W
	10,5	13	34	~0	~0	Pepperl & Fuchs: KFD2-SR2-EX2.W
Alarm circuits (J1 terminals 4+ and 5-)	10.6	19,1	51	~0	~0	Pepperl & Fuchs: KFA5-SR2-EX2.W or KFA6-SR2-EX2.W
	10,5	13	34	~0	~0	Pepperl & Fuchs: KFD2-SR2-EX2.W
	Uo,V	Io, mA	Po, mW	Co, µF	Lo, mH	Notes
Remote zero loop signal (J1 terminals 10+ and 11-)	28	2,83	80	0,083	44	

Note: The Recommended barriers listed above are not part of this UL certification.

9. The intrinsically safe device does not provide 500 V isolation with respect to earth. Associated apparatus used must be galvanically isolated or dual channel shunt zener diode barriers with linear outputs used channel to channel.
10. Selected associated apparatus must be third party listed as providing intrinsically safe circuits for the application, and have Voc or Vt not exceeding Vmax (or Uo not exceeding Ui), Isc or It not exceeding Imax (or Io not exceeding Ii), and the Po of the associated apparatus must be less than or equal to the Pmax or Pi of the intrinsically safe equipment, as shown in Table 1.
11. Capacitance and inductance of the field wiring from the intrinsically safe equipment to the associated apparatus shall be calculated and must be included in the system calculations as shown in Table 1. Cable capacitance, Ccable, plus intrinsically safe equipment capacitance, Ci, must be less than the marked capacitance, Ca (or Co), shown on any associated apparatus used. The same applies for inductance (Lcable, Li and La or Lo, respectively). Where the cable capacitance and inductance per foot are not known, the following values shall be used: Ccable = 60 pF/ft., Lcable = 0.2 µH/ft.

TABLE 1:

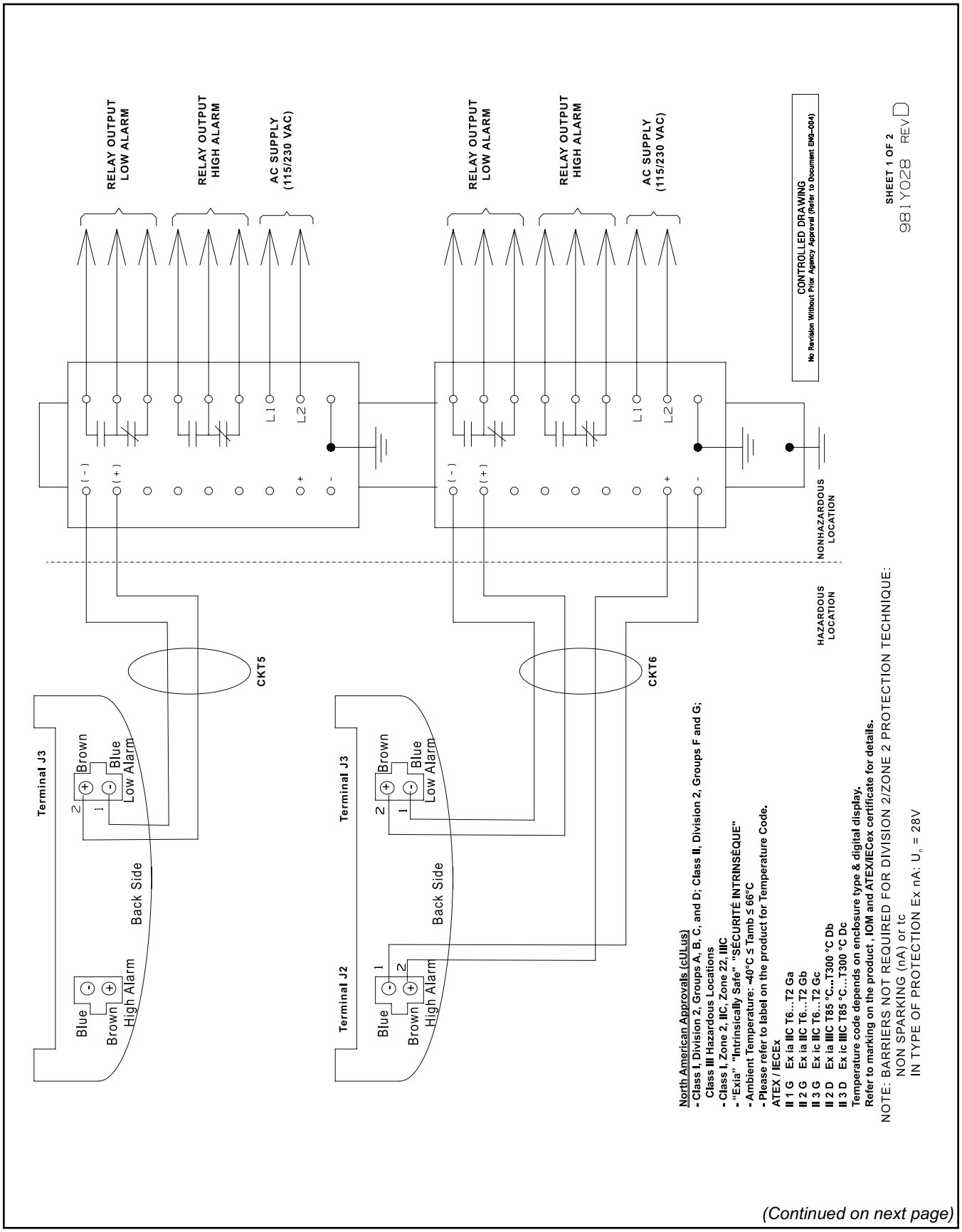
I.S. Equipment		Associated Apparatus
V max (or Ui)	≥	Voc or Vt (or Uo)
I max (or Ii)	≥	Isc or It (or Io)
Pmax (or (Pi)	≥	Po
Ci + Ccable	≤	Ca (or Co)
Li + Lcable	≤	La (or Lo)

If Po of the associated apparatus is not known, it may be calculated using the formula Po = (Voc * Isc)/4 = (Uo * Io)/4.

12. Associated apparatus must be installed in accordance with its manufacturer's control drawing and Article 504 of the National Electrical Code (ANSI/NFPA 70) for installation in the United States, or Section 18 of the Canadian Electrical Code for installations in Canada.
13. When required by the manufacturer's control drawing, the associated apparatus must be connected to a suitable ground electrode per the National Electrical Code (ANSI/NFPA 70), the Canadian Electrical Code, or other local installation codes, as applicable. The resistance of the ground path must be less than 1 ohm.
14. Where multiple circuits extend from the same piece of intrinsically safe equipment to associated apparatus, they must be installed in separate cables or in one cable having suitable insulation. Refer to Article 504.30(B) of the National Electrical Code (ANSI/NFPA 70) and Instrument Society of America Recommended Practice ISA RP12.6 for installing intrinsically safe equipment.
15. Associated apparatus must not be used in combination unless permitted by the associated apparatus certification.
16. Control equipment must not use or generate more than 250 V rms or dc with respect to earth.
17. Standards use for evaluation:
    US Standards: UL 913 - Ed 8, UL 60079-31 - Ed 2, UL 60079-15 - Ed 4, UL 60079-11 - Ed 6, UL 60079-0 - Ed 6, ISA 12.12.01
    Canadian Standards: CSA C22.2 NO. 157 - Ed 3, CSA C22.2 NO. 213-M1987 - Ed 1, CSA C22.2NO. 60079-0:11 - Ed 2,
    CSA C22.2 NO. 60079-11:14 - Ed 2, CSA C22.2 NO. 60079-15:12 - Ed 1, CSA C22.2 NO. 60079-31:12 - Ed 1

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Figure 2-6 Wiring Diagram, Model MT3809, 4-20 mA Transmitter, One or Two Optical Alarms and PPU (continued)



(Continued on next page)

Figure 2-7 Wiring Diagram, Model MT3809, One or Two Inductive Alarms

1. This device is a Rosemount hand help communicator.
2. WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY. AVERTISSEMENT: LA SUBSTITUTION DE COMPOSANTS PEUT COMPROMETTRE LA SÉCURITÉ INTRINSÈQUE
3. WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS.
   AVERTISSMENT – RISQUE D'EXPLOSION. NE PAS DEBRANCHER TANT QUE LE CIRCUIT EST SOUS TENSION A MOINS QU'IL NE S'AGISSE D'UN EMPLACEMENT NON DANGEREUX.
4. THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS (AS APPLICABLE) OR NON-HAZARDOUS LOCATIONS ONLY.
   CET EQUIPEMENT CONVIENT POUR UTILISATION CLASSE I, DIVISION 2, GROUPES (TOUS) OU LOCATIONS NON-DANGEREUSES SEULEMENT.
5. WARNING – ENCLOSURE CONTAINS ALUMINUM. PRECAUTIONS MUST BE TAKEN TO AVOID IGNITION DUE TO IMPACT.
   AVERTISSEMENT- LE BOÎTIER CONTIENS DE L'ALUMINIUM. DES PRÉCAUTIONS S'APPLIQUENT POUR ÉVITER L'IGNITION PAR IMPACT.
6. WARNING – FROM A SAFETY POINT OF VIEW THE CIRCUITS SHALL BE ASSUMED TO BE CONNECTED TO EARTH
   AVERTISSEMENT: PAR SÉCURITÉ LES CIRCUITS DEVRAIENT ÊTRE RELIÉS À LA MISE À LA TERRE.
7. Note for cULus approvals units: For devices using cable gland at field installation the following cable gland shall be used - American IP67 cable gland for the aluminum housing and an American rated IP68 cable gland for the Stainless steel and high temperature housings.
8. Standards use for evaluation:
   US Standards: UL 60079-31 - Ed 2, UL 60079-15 - Ed 4, UL 60079-0 - Ed 6, ISA 12.12.01
   Canadian Standards: CSA C22.2 NO. 213-M1987 - Ed 1, CSA C22.2 NO. 60079-0:11 - Ed 2,
   CSA C22.2 NO. 60079-15:12 - Ed 1, CSA C22.2 NO. 60079-31:12 - Ed 1

   Notes 9 through 12 are not applicable for cULus certification

9. Entity Parameters:
   In type of protection Ex ia IIC/IIC or Ex ic IIC/IIIC, only for connection to a certified intrinsically safe circuit, with following maximum values.

	Ui,V	Ii, mA	Pi, mW	Ci, nF	Li, µH	Recommended Barrier #
Inductive High Alarm circuits (terminals «+» and «-») – for connection of circuits PepperI+Fuchs mod. SJ 3.5-SN type 2	10,6	19,1	51	30	100	Pepperl & Fuchs: KFA5-SR2-EX2.W or KFA6-SR2-EX2.W
Inductive Low Alarm circuits (terminals «+» and «-») – for connection of circuits PepperI+Fuchs mod. SJ 3.5-SN type 2	10,6	19,1	51	30	100	Pepperl & Fuchs: KFA5-SR2-EX2.W or KFA6-SR2-EX2.W

10. The intrinsically safe device does not provide 500 V isolation with respect to earth. Associated apparatus used must be galvanically isolated or dual channel shunt zener diode barriers with linear outputs used channel to channel.
11. Selected associated apparatus must be third party listed as providing intrinsically safe circuits for the application, and have Voc or Vt not exceeding Vmax (or Uo not exceeding Ui), Isc or It not exceeding Imax (or Io not exceeding Ii), and the Po of the associated apparatus must be less than or equal to the Pmax or Pi of the intrinsically safe equipment, as shown in Table 1.
12. Capacitance and inductance of the field wiring from the intrinsically safe equipment to the associated apparatus shall be calculated and must be included in the system calculations as shown in Table 1.
    Cable capacitance, Ccable, plus intrinsically safe equipment capacitance, Ci, must be less than the marked capacitance, Ca (or Co), shown on any associated apparatus used.
    The same applies for inductance (Lcable, Li and La or Lo, respectively). Where the cable capacitance and inductance per foot are not known, the following values shall be used: Ccable = 60 pF/ft., Lcable = 0.2 µH/ft.

TABLE 1:

I.S. Equipment		Associated Apparatus
V max (or Ui)	≥	Voc or Vt (or Uo)
I max (or Ii)	≥	Isc or It (or Io)
Pmax (or Pi)	≥	Po
Ci + Ccable	≤	Ca (or Co)
Li + Lcable	≤	La (or Lo)

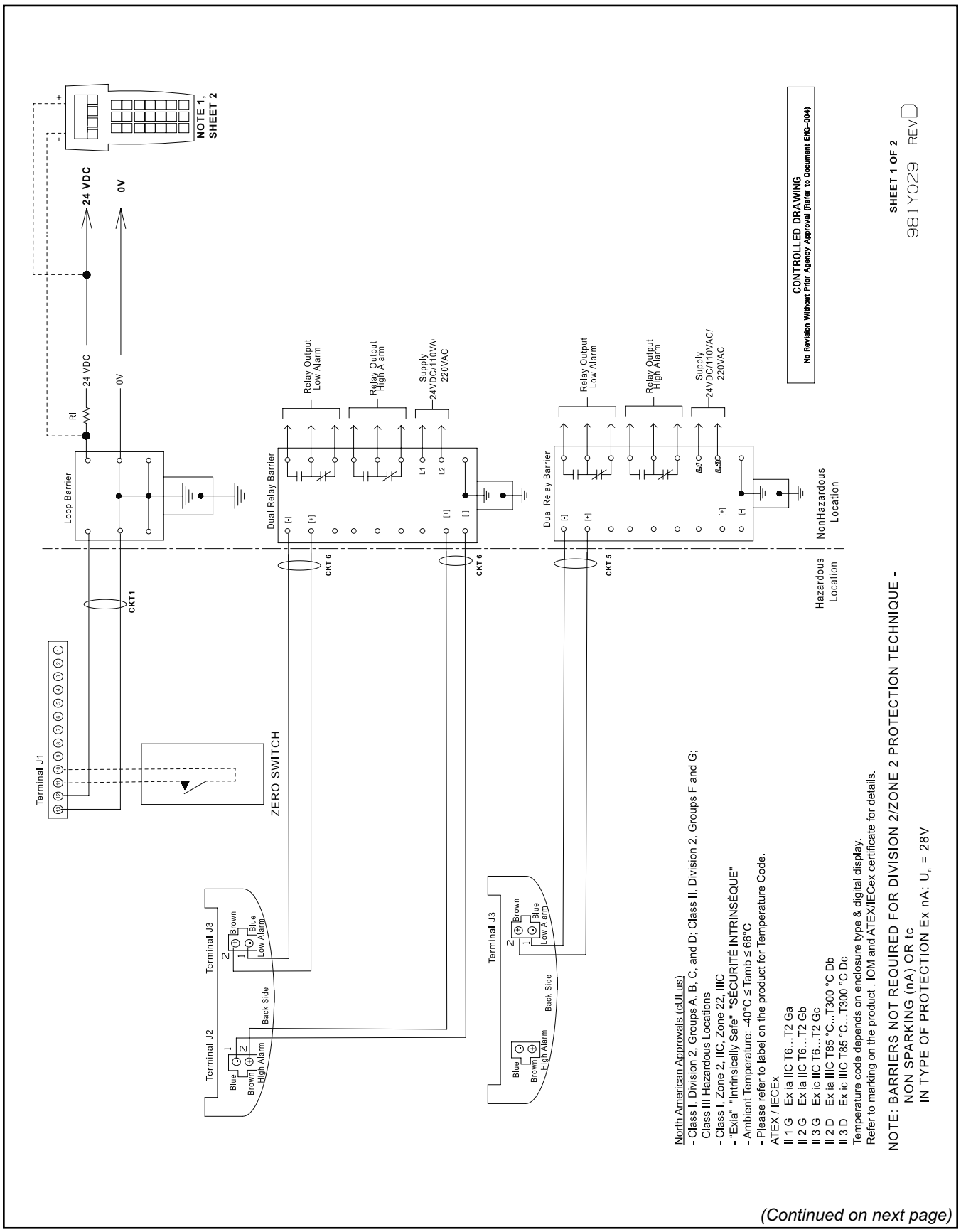
If Po of the associated apparatus is not known, it may be calculated using the formula Po = (Voc * Isc)/4 = (Uo * Io)/4.

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Figure 2-7 Wiring Diagram, Model MT3809, One or Two Inductive Alarms (continued)



(Continued on next page)

Figure 2-8 Wiring Diagram, Model MT3809, 4-20 mA Transmitter, One or Two Inductive Alarms

1. This device is a Rosemount hand help communicator.
2. WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY; AVERTISSEMENT: LA SUBSTITUTION DE COMPOSANTS PEUT COMPROMETTRE LA SÉCURITÉ INTRINSÈQUE
3. WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS.
   AVERTISSMENT – RISQUE D'EXPLOSION. NE PAS DÉBRANCHER TANT QUE LE CIRCUIT EST SOUS TENSION À MOINS QU'IL NE S'AGISSE D'UN EMPLACEMENT NON DANGEREUX.
4. THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS (AS APPLICABLE) OR NON-HAZARDOUS LOCATIONS ONLY.
   CET EQUIPEMENT CONVIENT POUR UTILISATION CLASSE I, DIVISION 2, GROUPES (TOUS) OU LOCATIONS NON-DANGEREUSES SEULEMENT.
5. WARNING – ENCLOSURE CONTAINS ALUMINUM. PRECAUTIONS MUST BE TAKEN TO AVOID IGNITION DUE TO IMPACT.
   AVERTISSEMENT- LE BOÎTIER CONTIENS DE L'ALUMINIUM. DES PRÉCAUTIONS S'APPLIQUENT POUR ÉVITER L'IGNITION PAR IMPACT.
6. WARNING – FROM A SAFETY POINT OF VIEW THE CIRCUITS SHALL BE ASSUMED TO BE CONNECTED TO EARTH
   AVERTISSEMENT: PAR SÉCURITÉ LES CIRCUITS DEVRAIENT ÊTRE RELIÉS À LA MISE À LA TERRE.
7. Note for cULus approvals units: For devices using cable gland at field installation the following cable gland shall be used - American IP67 cable gland for the aluminum housing and an American rated IP68 cable gland for the Stainless steel and high temperature housings.
8. Standards use for evaluation:
   US Standards: UL 60079-31 - Ed 2, UL 60079-15 - Ed 4, UL 60079-0 - Ed 6, ISA 12.12.01
   Canadian Standards: CSA C22.2 NO. 213-M1987 - Ed 1, CSA C22.2 NO. 60079-0:11 - Ed 2,
   CSA C22.2 NO. 60079-15:12 - Ed 1, CSA C22.2 NO. 60079-31:12 - Ed 1

   Notes 9 through 12 are not applicable for cULus certification

9. Entity Parameters:
   In type of protection Ex ia IIC/IIIC or Ex ic IIC/IIIC, only for connection to a certified intrinsically safe circuit, with following maximum values.

	Ui,V	Ii, mA	Pi, mW	Ci, nF	Li, µH	Recommended Barrier #
Signal 4-20mA (J1 terminals 12+ and 13-)	28	96	605	2,2	0.365	Stahl Type : 9001/01-280-075-101
Inductive High Alarm circuits (terminals «+» and «-») – for connection of circuits Pepperl+Fuchs mod. SJ 3,5-SN type 2	10,6	19,1	51	30	100	Pepperl & Fuchs: KFA5-SR2-EX2.W or KFA6-SR2-EX2.W
Inductive Low Alarm circuits (terminals «+» and «-») – for connection of circuits Pepperl+Fuchs mod. SJ 3,5-SN type 2	10,6	19,1	51	30	100	Pepperl & Fuchs: KFA5-SR2-EX2.W or KFA6-SR2-EX2.W
	Uo,V	Io, mA	Po, mW	Co, µF	Lo, mH	Notes
Remote zero loop signal (J1 terminals 10+ and 11-)	28	2,83	80	0.083	44	

10. The intrinsically safe device does not provide 500 V isolation with respect to earth. Associated apparatus used must be galvanically isolated or dual channel shunt zener diode barriers with linear outputs used channel to channel.
11. Selected associated apparatus must be third party listed as providing intrinsically safe circuits for the application, and have Voc or Vt not exceeding Vmax (or Uo not exceeding Ui), Isc or It not exceeding Imax (or Io not exceeding Ii), and the Po of the associated apparatus must be less than or equal to the Pmax or Pi of the intrinsically safe equipment, as shown in Table 1.
12. Capacitance and inductance of the field wiring from the intrinsically safe equipment to the associated apparatus shall be calculated and must be included in the system calculations as shown in Table 1.
    Cable capacitance, Ccable, plus intrinsically safe equipment capacitance, Ci, must be less than the marked capacitance, Ca (or Co), shown on any associated apparatus used. The same applies for inductance (Lcable, Li and La or Lo, respectively). Where the cable capacitance and inductance per foot are not known, the following values shall be used: Ccable = 60 pF/ft., Lcable = 0,2 µH/ft.

TABLE 1:

I.S. Equipment		Associated Apparatus
V max (or Ui)	≥	Voc or Vt (or Uo)
I max (or Ii)	≥	Isc or It (or Io)
Pmax (or (Pi)	≥	Po
Ci + Ccable	≤	Ca (or Co)
Li + Lcable	≤	La (or Lo)

If Po of the associated apparatus is not known, it may be calculated using the formula Po = (Voc * Isc)/4 = (Uo * Io)/4.

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Figure 2-8 Wiring Diagram, Model MT3809, 4-20 mA Transmitter, One or Two Inductive Alarms (continued)

4-20 mA/HART Transmitter Division 2 Installation

If the area classification is Division 2, a barrier is not required and cable parameters are not applicable. The electrical code will require the use of conduit for wire protection. Refer to Figure 2-5a/2-5b.

4-20 mA/HART Transmitter Flameproof Installation

For flameproof installation, the optional explosion proof enclosure is required and explosion proof installation methods must be followed. Refer to Figure 2-9.

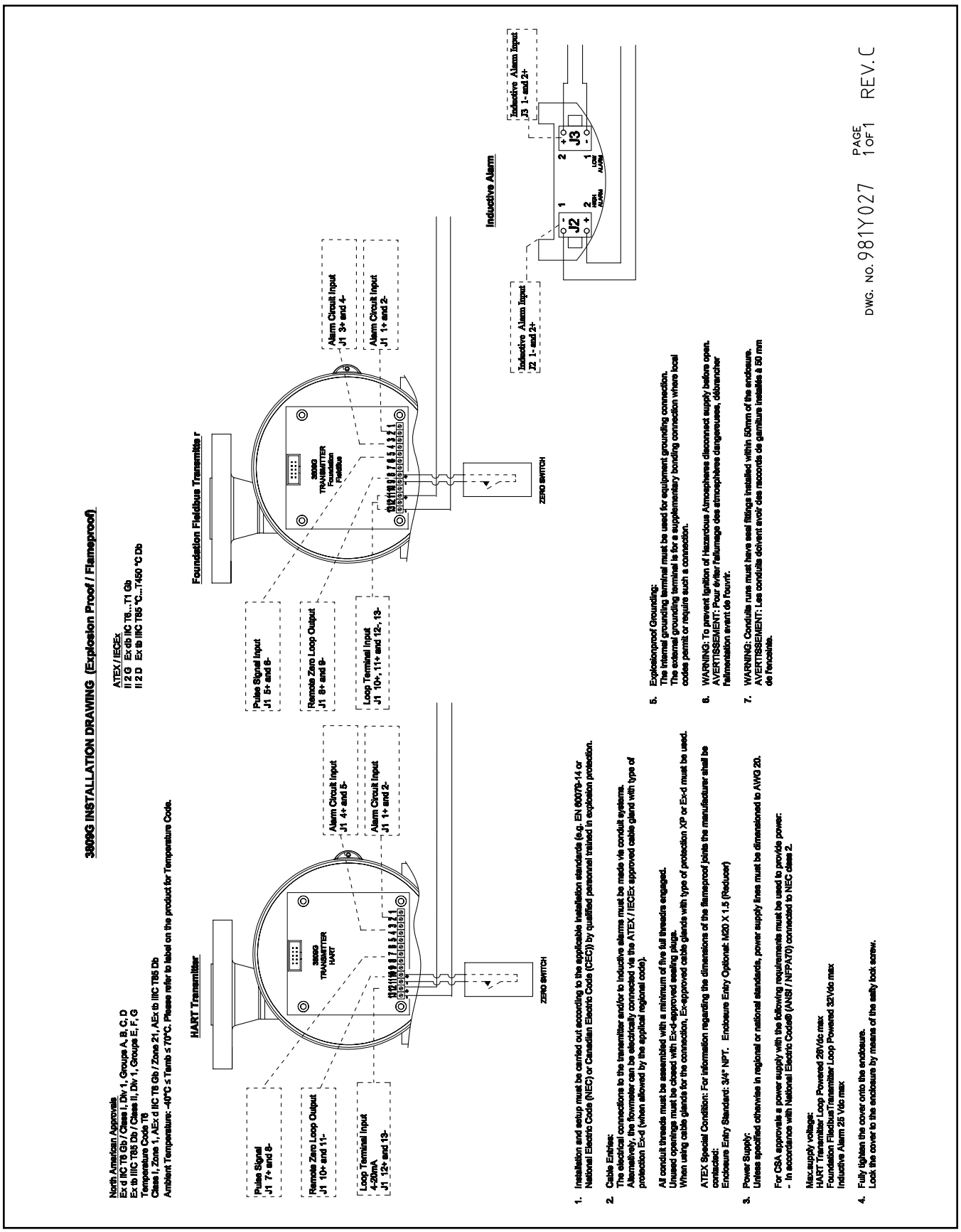


Figure 2-9 Wiring Diagram, Model MT3809 Explosion Proof with Transmitter and/or Inductive Alarm

Electrical Connections to MT3809 with FOUNDATION Fieldbus Transmitter, Alarms and Pulse Output

⚠ WARNING

If it becomes necessary to service or remove the instrument from the system, power to the device is disconnected at the power supply.

a) Before electrical connection, install the meter into the pipeline as described in previous Section 2-5.

b) For electrical installation follow the general FOUNDATION Fieldbus practices and take the following into account:

i. To avoid electrical interference and to meet the Electro Magnetic Compatibilty (EMC directive) requirements, use shielded twisted pair cables.

ii. In case of installation into explosion hazardeous environments it is important to eliminate a potential incentive level of circulating current through the cable shield in the event that there are local differences in chassis ground potential between the two ends of the cable. Therefore, cable shields shall be connected to chassis ground (earth) in accordance with the applicable regional & local installation code. A terminal screw inside the device allows for shield to chassis connection in case the applicable installation regulation requires earthing at the transmitter end.

iii. Ensuring a properly specified power supply:

- Bus supply voltage 9 .. 32 Vdc
- Nominal current 12mA

iv. Use cables as specified in IEC 61158-2. Stay below the maximum allowable cable length which depends upon the cable specifications, the number of network devices and the network topology. Connect the transmitter to the network following IEC 61158-2.

c) The housing of the transmitter should be grounded in accordance with the applicable installation regulations. When the device is not sufficiently grounded via the process cables, a grounding terminal screw is available on the transmitter housing for earth connection.

d) Transmitter wiring connection diagrams are given in Section 2-7-1 Ensure that the installation complies with given hazardous area protection requirements.

e) Transmitter wiring connection diagrams are given is Section 2-7-1. Ensure that installation complies with given hazardous area protection requirements.

i. Intrinsically safe installations require the use of barriers, power supply limits and cable parameters as shown in the installation diagram. All connections are made in the transmitter housing. Refer to Figures 2-5a/2-5b and 2-8a/2-8b.

ii. If the area classification is Division 2, barriers are not required and cable parameters are not applicable. However, the electrical code will require the use of conduit for wire protection.
Refer to Figures 2-5a/2-5b and 2-8a/2-8b.

iii. For flameproof installation the optional explosion proof enclosure is required and explosion proof installation methods must be followed. Refer to Figure 2-9.

⚠WARNING

To prevent ignition of hazardous atmospheres and serious personal injury, proper installation methods must be used as defined in Article 505 of the National Electrical Code, and the Canadian Electrical Code and ISA Standard 12.6 and in accordance with Cenelec regulations.

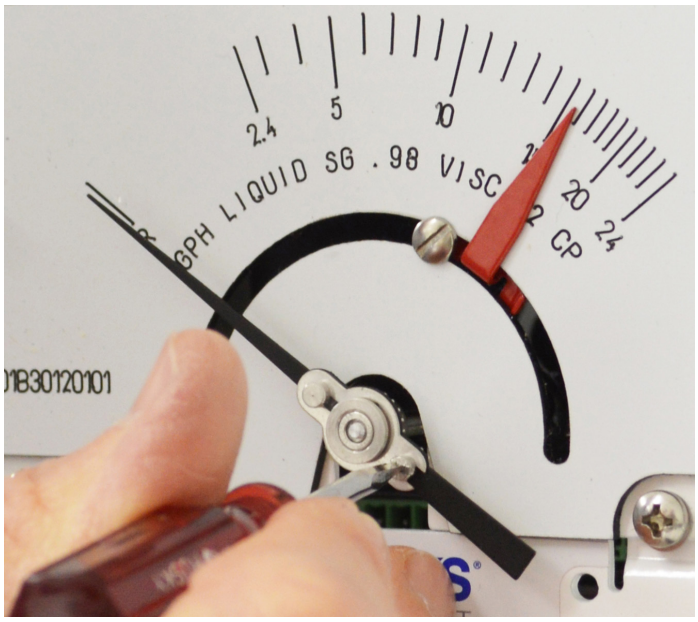
f) Common transmitter parameters are set during manufacturing at Brooks Instrument based on order information, meter configuration or defaults inherent to the transmitter. Further detailed configurations as well as on-line monitoring can be done through the FOUNDATION Fieldbus communication protocol.See Foundation Fieldbus supplemental manual (X-DPT-FF-MT3809G-Alarms-eng).

g) After installation and power up of the transmitter, the transmitter must be zeroed, both electrically and mechanically. This operation will compensate for any stray magnetic effects in the vicinity of the transmitter.
Important: The zero adjusting of the pointer influences the transmitter indication, but not the other way around. Therefore, first adjust the pointer at the zero flow position, then the transmitter must be zeroed.

i. Flow must be verified to be zero during the entire zeroing.

ii. With the flow at zero and the float at the zero flow position, adjust the mechanical indicator to point to the ‘R’ (reference line) using the adjustment screw on the face of the pointer, next to the hub. See Figure 2-10.

iii. Then, zero the transmitter shorting the two pins at the terminal block, See Figure 2-11.



Using a flat blade screwdriver with a 1/8" blade, hold the pointer and turn the screw to align with the “R” on the scale.

It may take a few adjustments to get the pointer on the “R”.

Figure 2-10 Mechanical Indicator Zero

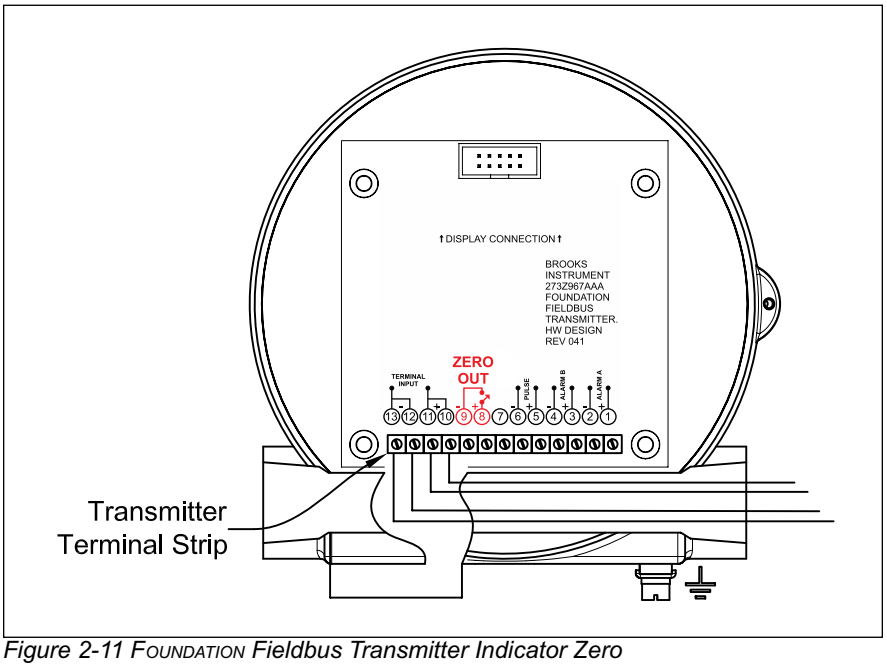


Figure 2-11 FOUNDATION Fieldbus Transmitter Indicator Zero

Note: The zero function may be activated as part of a periodical maintenance check. If desired, a zero switch can be remotely mounted and wired to these terminals. The hazardous area classification will determine the wiring methods used for this switch.

h) Under actual flow conditions, verify that the transmitter output matches the mechanical pointer position. If a discrepancy is noted, the FOUNDATION Fieldbus communication can be used to verify or adjust the transmitter settings.

Transmitter with alarm and pulse output wiring connections:
The alarm contact and pulse output digital signals are electrically identical, independent, optically coupled transistor outputs. Wiring will be as required by the external driven system - Prover, DCS/PLC, terminal-automation system, batch controller etc. These can be wired as an open collector or open signal on the high or low side of voltage-rail within the receiving equipment, depending upon the signal needs. When interfacing to external electronics, be careful to work within the voltage/current polarity and limits as specified in Section 1.

To install the typical transmitter alarms and/or pulse digital outputs configuration:

i. Intrinsically safe installations require the use of barriers, power supply limits and cable parameters. All connections are made in the transmitter housing. Refer to Table 1-12 in approvals section and Figures 2-5a/2-5b and 2-8a/2-8b.

ii. If the area classification is Division 2, barriers are not required and cable parameters are not applicable. However, the electrical code will require the use of conduit for wire protection. Refer to Figures 2-5a/2-5b and 2-8a/2-8b.

iii. For flameproof installation the optional explosion proof enclosure is required and explosion proof installation methods must be followed. Refer to Figure 2-9.

a. The shielded cable must be used for hook up. In case of installation into explosion hazardeous environments it is important to eliminate a potential incentive level of circulating current through the cable shield in the event that there are local differences in chassis ground potential between the two ends of the cable. Therefore, cable shields shall be connected to chassis ground (earth) in accordance with the applicable regional & local installation code. A terminal screw inside the device allows for shield to chassis connection in case the applicable installation regulation requires earthing at the transmitter end.

b. The pulse and alarm outputs function as isolated switch closures (optically isolated open collector) and must be supplied with a power source, as shown in wiring diagram, Figure 2-6a/2-6b. Observe polarity and do not exceed 30 volts for the supply and limit load current to 20 mA for each output.

FOUNDATION Fieldbus Transmitter Intrinsically Safe Installation

For intrinsically safe installation, intrinsic safety barrier selection, cable parameters, and power limits, follow Figures 2-12 through 2-15.

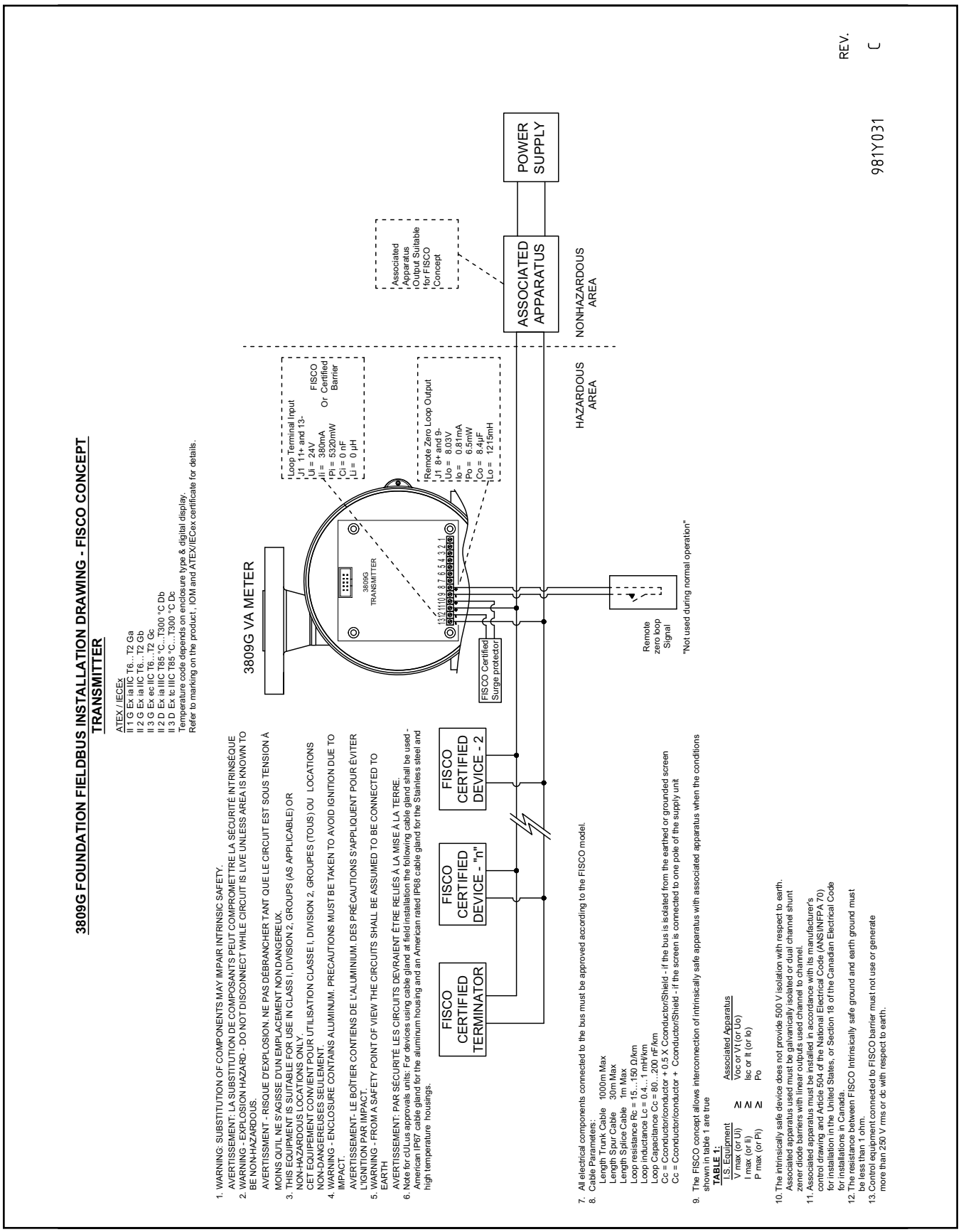


Figure 2-12 Wiring Diagram, Model MT3809, Foundation Fieldbus - FISCO Concept - Transmitter

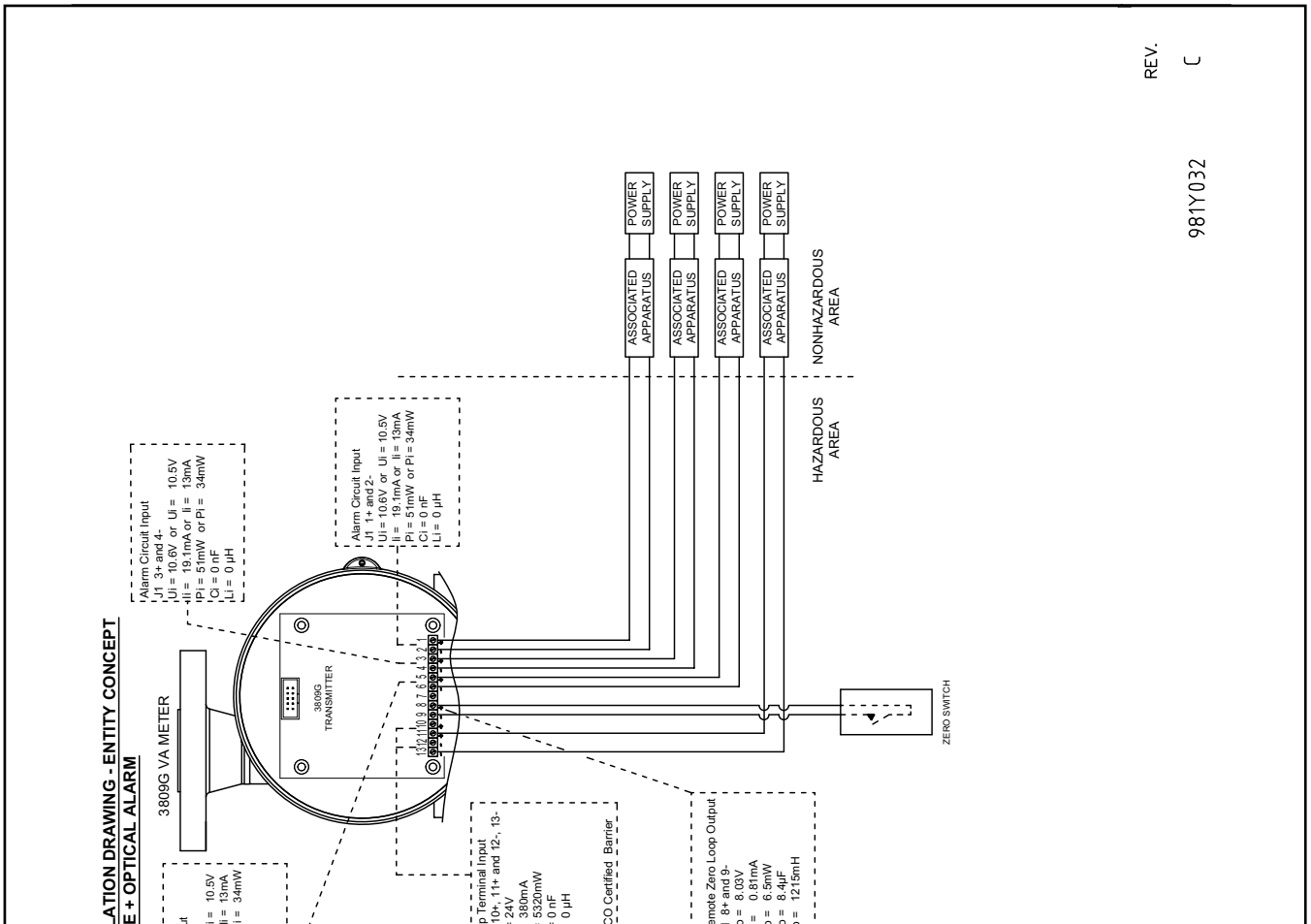


Figure 2-13 Wiring Diagram, Model MT3809, Foundation Fieldbus - Entity Concept - Transmitter

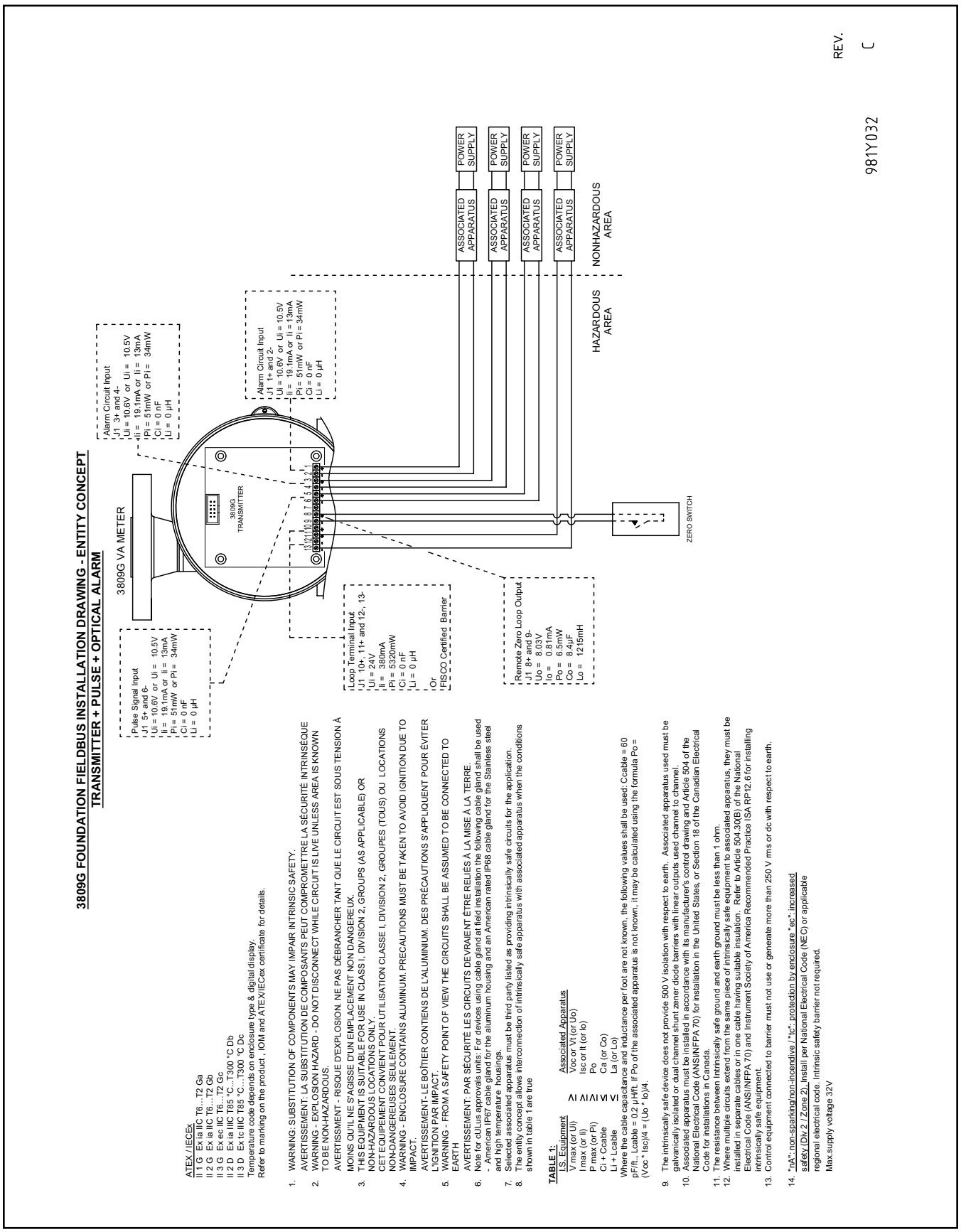


Figure 2-14 Wiring Diagram, Model MT3809, Foundation Fieldbus - Entity Concept - Transmitter - Pulse - Alarm Contacts

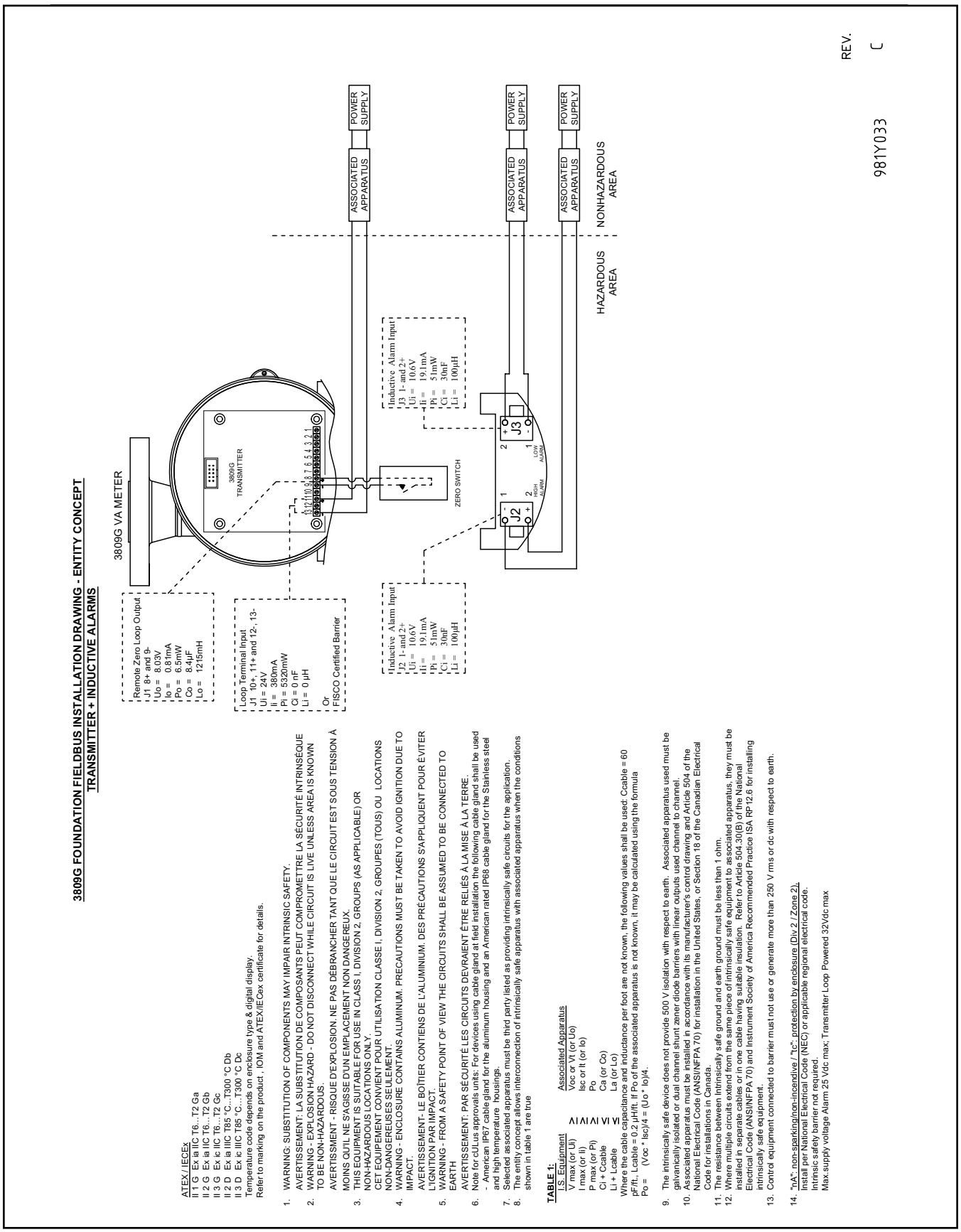


Figure 2-15 Wiring Diagram, Model MT3809, Foundation Fieldbus - Entity Concept - Transmitter - Inductive Alarms

Installation of the Model MT3809 Flowmeter with Inductive Alarms (1 or 2 switches)

⚠ WARNING

If it becomes necessary to service or remove the instrument from the system, power to the device is disconnected at the power supply.

⚠ WARNING

To prevent ignition of hazardous atmospheres and serious personal injury, proper installation methods must be used as defined in Article 505 of the National Electrical Code, and the Canadian Electrical Code and ISA Standard 12.6 and in accordance with Cenelec regulations.

a. Install the meter as described in Section 2-5

b. Install the inductive alarms (1 or 2 switches) following the wiring instructions given in Section 2-6 or 2-7, depending on the configuration (with or without HART or FOUNDATION™ Fieldbus transmitter)

c. Intrinsically safe installations require the use of relay isolators for the alarms and a barrier for the transmitter, if equipped. Power supply limits and cable parameters must be as shown in the applicable installation diagram from Section 2-6. or 2-7.

d. If the area classification is Division 2, the transmitter barrier and cable parameters are not applicable. However for proper operation of the inductive alarms, the relay isolators must be used. The electrical code will require the use of conduit for wire protection.

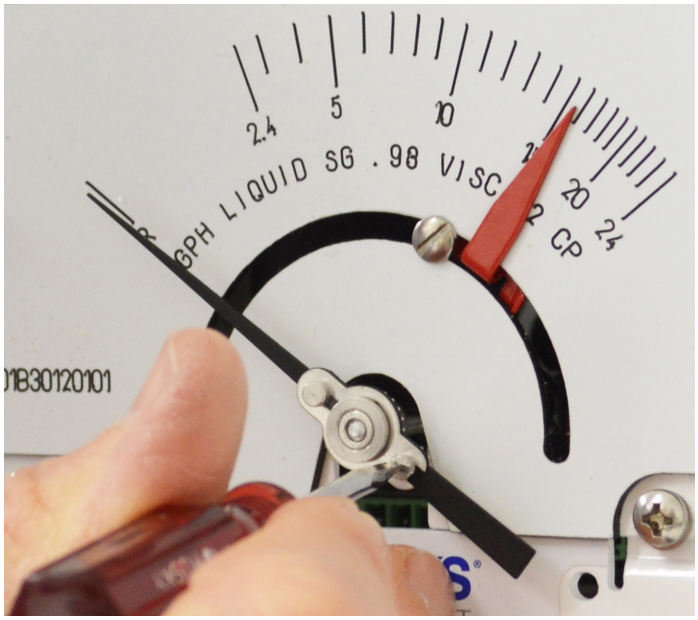
e. For flameproof installation the optional explosion proof enclosure is required and explosion proof installation methods must be followed. For proper operation of the inductive switches, the relay isolators must be used.

f. The shielded cable must be used for hook up. The shields should beconnected to chassis ground at the transmitter/alarm end and should be taped up and not connected at the receiver end. The taping and insulation of the shields at the receiving end is especially important for intrinsically safe installations.

g. The relay isolator has built in power handling contacts. Refer to the specifications for these ratings.

h. The pointer must be adjusted to the reference line on the scale using the adjustment screw on the face of the pointer, next to the hub. See Figure 2-16.

i. Proper operation of the inductive alarms can be determined by manually rotating the mechanical pointer and observing the status lights on the relay isolator. The small alarm pointers indicate the alarm trip points. Changes to the set points can be made by loosening the pointer screws and repositioning the pointers.



Using a flat blade screwdriver with a 1/8" blade, hold the pointer and turn the screw to align with the “R” on the scale.

It may take a few adjustments to get the pointer on the “R”.

Figure 2-16 Mechanical Indicator Zero

Start-up and Operation of Flowmeter

⚠WARNING

Operating Procedure: Do not operate this instrument in excess of the specifications listed in Section 1. Before bringing the unit into operation, make sure that all fluid connections have been correctly tightened and that all electrical connections where applicable have been made. Failure to heed this warning can result in serious personal injury and/or damage to the equipment.

a. After the flowmeter has been properly installed in the process, it is ready for operation. When initiating flow, slowly open the valve to avoid a flow surge. Bypass is a help in bringing the flow on smoothly. Avoid starting a pump to supply the flowmeter without the use of a valve upstream of the flowmeter.

b. Check for leaks around the meter inlet and outlet connections. If no leaks are present, bring the system up to operating pressure.

⚠ CAUTION

Any sudden change in system pressure may cause mechanical damage to elastomer materials. Damage can occur when there is a rapid expansion of fluid that has permeated elastomer materials. The user must take the necessary precautions to avoid such conditions.

c. At no flow condition the indicator pointer should align with the “R” mark on the scale. If necessary, adjust the pointer as per directions in the Maintenance Section 4.

Operation of the Model MT3809 Flowmeter with a Transmitter with or without Optional Alarms and Pulse Output for Totalization

***** Start-up the meter as described in Section 3-1.
* Programming performed prior to shipment (parameters).
The transmitter with or without alarms and pulse output is preprogrammed prior to shipment for the following parameters based on the order information, meter configuration and application. If parameters are not specified in the customer purchase order, the defaults inherent to the electronics will be as shown in (parenthesis).

Transmitter only pre-programmed parameters	**Transmitter plus alarms and pulse output preprogrammed parameters**
Model Number	Alarm LoLimit (0% FS flow)
Serial Number	Alarm HiLimit (100% FS flow)
Tag Name (blank)	Pulse output units (1 ppl)
Flow Rate units of measure (lpm)	Resettable totalizer units of measure (lit.)
Low Flow cutoff (8% FS flow)	Inventory totalizer units of measurement (lit.)
Calibration factor (% scales only)	
Analog Output LoRange (4 mA @ 0% flow)	
Analog Output HiRange (20 mA @ 100% flow)	

* Manual programming or reprogramming of the electronics.
Programming of the transmitter with or without alarms and pulse output may also be done locally via an HART or FOUNDATION Fieldbus Communicator. Please refer to the manual of the communicator for detailed description.

***** Recalibration of transmitter output (spanning high and low)
At any time after factory calibration, shipment, installation, or service, the transmitter can be recalibrated by overwriting any of the previous calibration point-pairs, assuming that the user can provide a series of accurate rates of flow through the meter. If preferred, the meter with transmitter may be returned for recalibration at the Brooks service department for a fee.

***** Basic transmitter setup parameters
These are meter identification parameters set prior to shipment of the meter.
Flowmeter identification: Model number, serial number, tag name.
Flowmeter configuration: Low flow cutoff, calibration factor, flow rate units of measure.
Transmitter analog output: Analog output HiRange, analog output LoRange.

***** Optional programmable alarm and pulse output parameters and features

Alarm contact output: HiLimit, LoLimit
Latching or non-latching option shall be added for contact outputs.
Alarm contact outputs can be configured to either latching type or non-latching type.

Communication with HART Transmitter using Device Descriptor

The structure of the device descriptor for the HART transmitter is given in Figures 3-1 and 3-2. The alarms may be set at the minimum and maximum flow rate or at any other preferred high and low limits. The units of measure of the alarm limits are the same units of measure as the process variable itself.

DD structure:

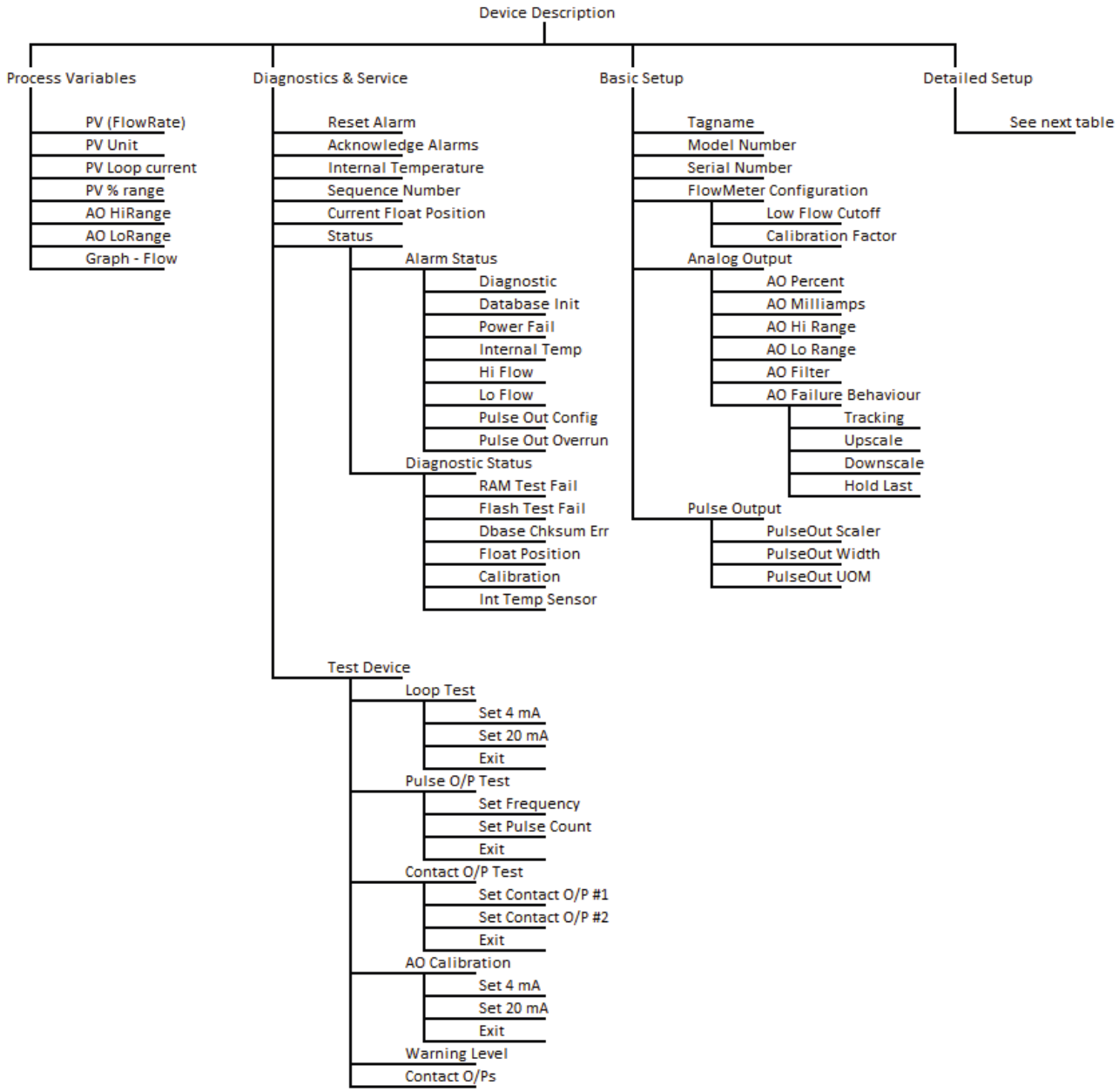


Figure 3-1 Model MT3809 Electronics Basic Setup Menu Tree

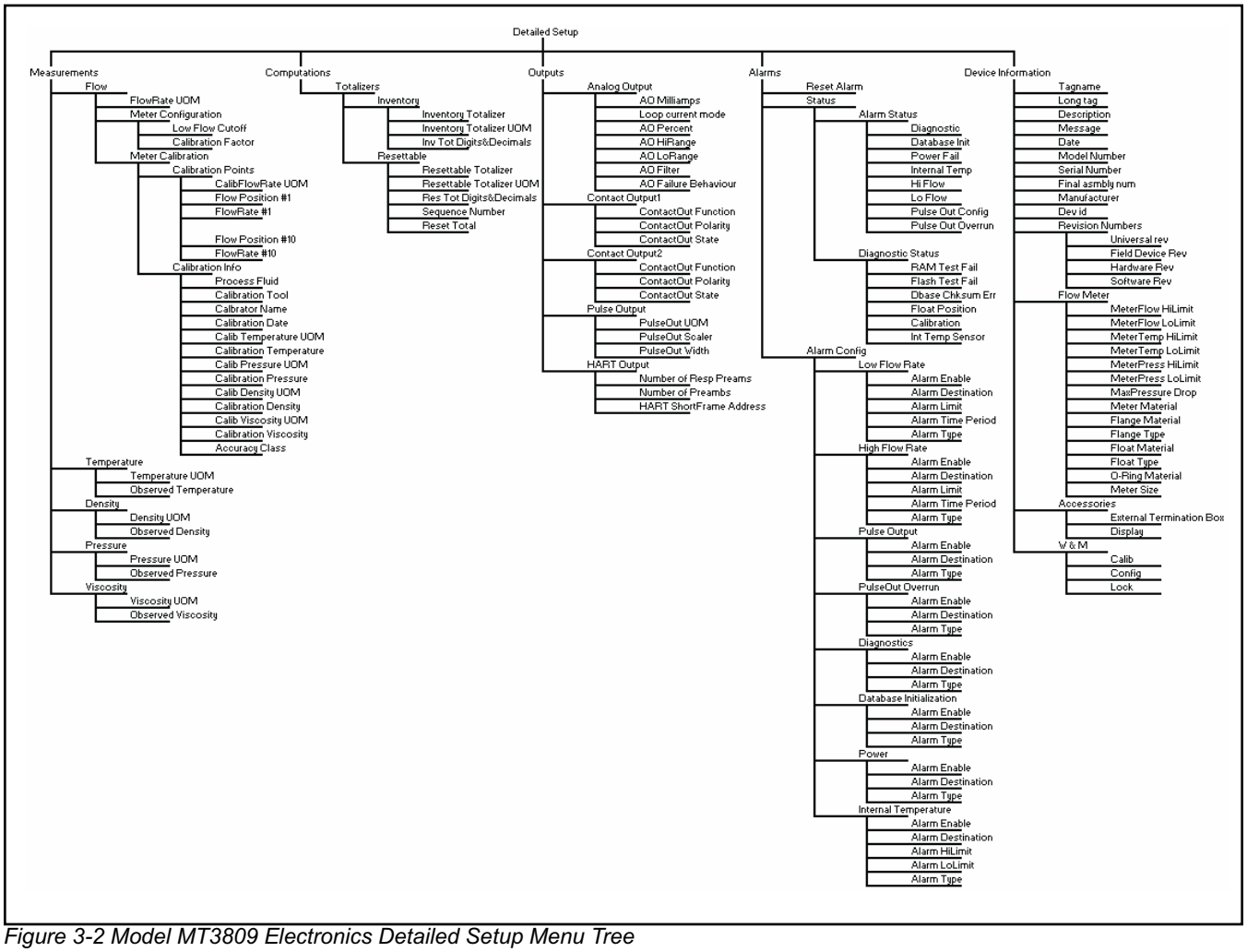


Figure 3-2 Model MT3809 Electronics Detailed Setup Menu Tree

Computations: Totalization
Totalizers are available in both resettable and inventory options. Resettable totalization is used for batching while inventory totalization measures the total volume over time. Units of measure are set independently for each of these options.

Pulse output: Pulse out scaler, pulse out width
The transmitter has a pulse output channel that indicates flow rate as a variable frequency and therefore can pass information to many types of external equipment such as batch controllers, automation systems or provers. The output pulse width default is 1 millisec but may be user-configured since certain external receiving equipment cannot keep up with high incoming frequency.

Low flow cutoff warning for pulse output and totalization
The low flow cutoff parameter can be programmed to signal when the flow level is below which the process is intended. Below this level, the totalizer will assume that the flow rate is actually zero and that no data should be accumulated by the totalizers.

Pulse output overrun alarm
If a larger than acceptable output pulse width is configured, totalizer pulses may be delayed or queued. No loss of pulses will occur. The totalizer output pulses will to be sent until the queue is empty. Under these circumstances, an alarm message will be sent to the control station. However, the alarm can be disabled if not required.

Optional alarm configurations- enable, destination, alarm type (latching)
Three additional parameters may be programmed for process and diagnostic alarms to control functionality- enable, destination, and alarm type (latching). ‘Enable’ allows alarms to be enabled and disabled depending on use of the alarm. For example, if output pulses are being used it may be normal practice to delay (e.g. queue up) output pulses because of a slow receiving end-device that requires a wide pulse-width. The ‘enable’ parameter allows the user to *disable* the pulse output overrun alarm and not send an alarm when in fact pulse outputs are delayed by choice. Some critical diagnostic alarms, such as database initialization, can not be disabled or turned off. When an alarm occurs, it can be posted through the defined ‘destination’ digital contact closure outputs #1, #2 both or neither. Therefore the alarms may be managed according to local operating practices and the need to notify upstream control/safety systems.

An alarm may be posted at a designated destination only when the alarm situation is occurring or posted until the alarm is acknowledged by the operator. The decision to ‘latch or unlatch’ the alarm is controlled by setting the ‘alarm type’ parameter. By utilizing this optional parameter, the operator can see that there is an alarm as it is occurring (unlatched) or even after the fact, in the case when the operator did not directly observe the unit alarm (latched).

Communication with FOUNDATION Fieldbus Transmitter

For details on the Foundation Fieldbus interface, refer to the supplemental manual (X-DPT-FF-MT3809G-Alarms-eng), also available on BrooksInstrument.com/Documentation

Communication with Transmitter using Local Operator Interface with LCD Display

The LCD display is a three line liquid crystal display. It can easily be programmed to provide basic information such as flow rates and product totalization. Configuration adjustments to upper/lower range values can also be performed using the display. Access to the display can be accomplished by removing the cover or by using the supplied magnet with the cover in place. Refer to Figure 3-4 for the menu tree for more details.

Adjusting Inductive Alarms (1 or 2 switches)

To modify the alarm set points, remove the front cover with gasket of the indicator housing by removing the four screws. Set the alarm position by loosening the two pointer screws, moving the pointer to the desired alarm setting and tightening the screws. Replace the indicator housing cover with gasket and secure with the four screws.

Simulate

Foundation Fieldbus specs require that the customer be able to access and enable/disable physical "simulate", this can be done by creating a short between Pin 9 and Pin 7 on the terminal strip. See Figure 3-3 below.

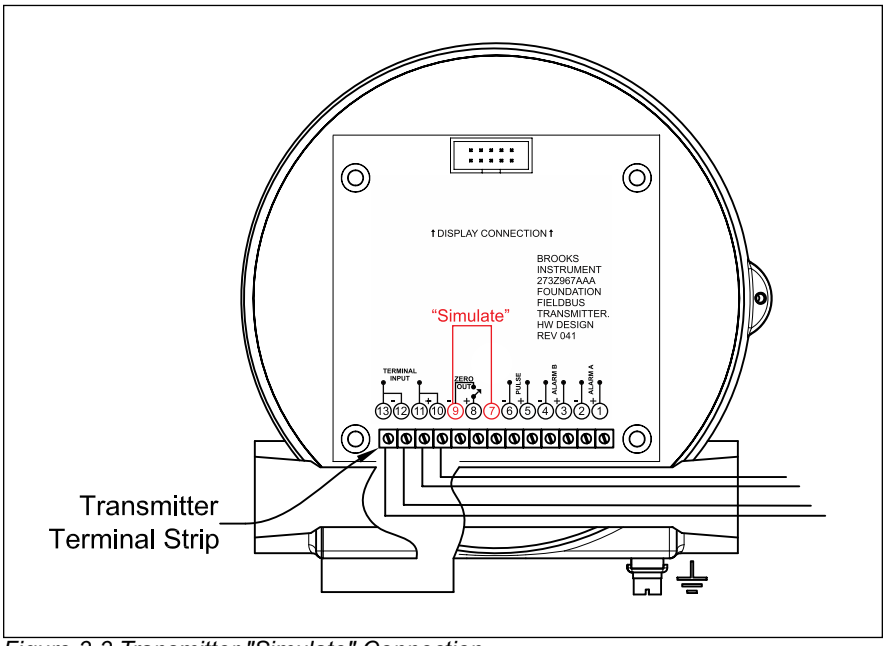


Figure 3-3 Transmitter "Simulate" Connection

Left LOI button = Scroll through options.
Right LOI button = Activate option.

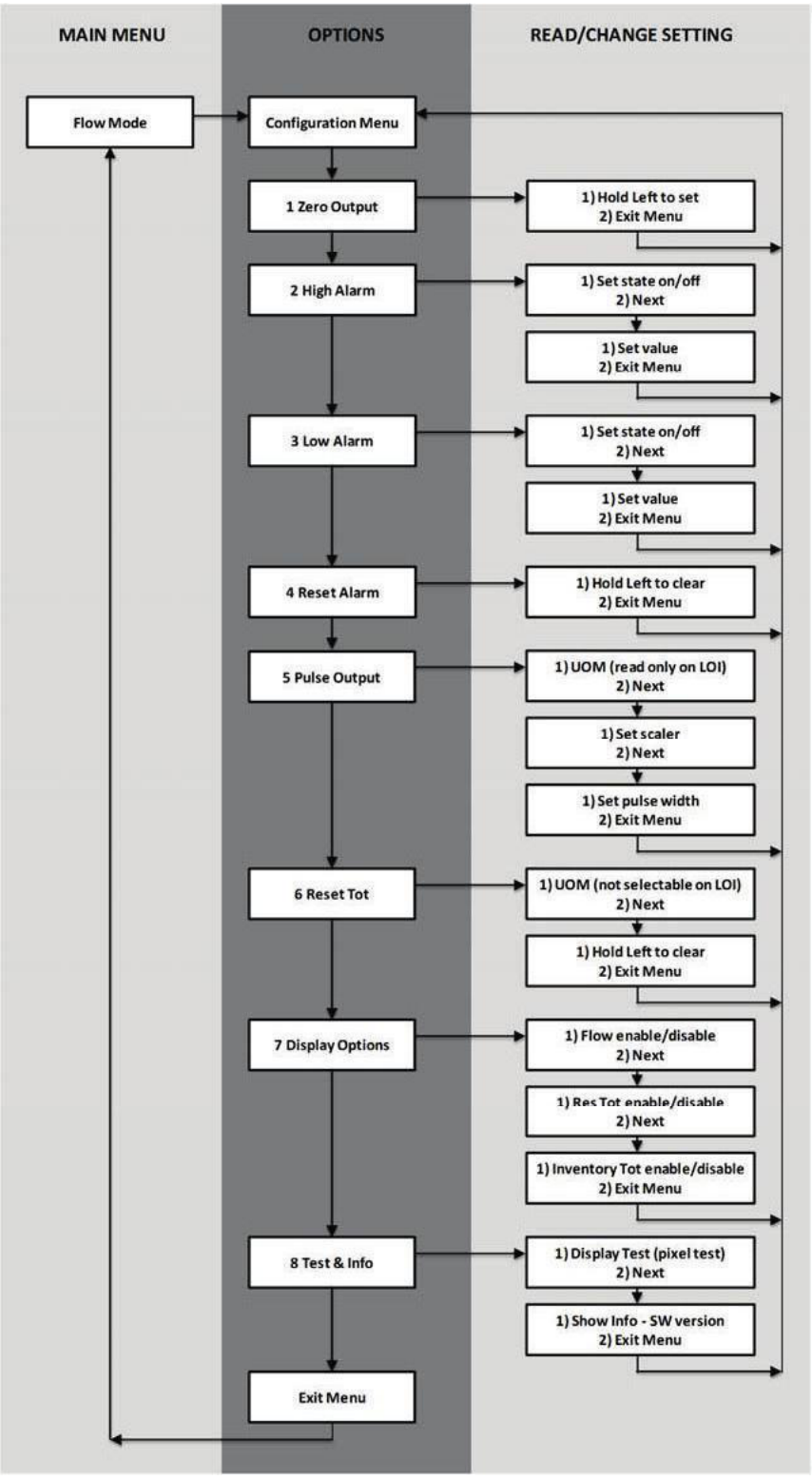


Figure 3-4 Model MT3809 Electronics LOI Chart Menu

General Service Information

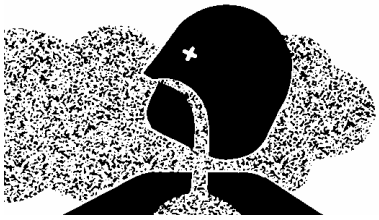
There is no routine maintenance required for the Models MT3809 and MT3810 flowmeters. However should it become necessary to replace, adjust or remove components of the flowmeter, specific recommendations must be followed.

⚠ CAUTION

It is important that this device only be serviced by properly trained and qualified personnel.

⚠ WARNING

If this equipment is not properly serviced, serious personal injury and/or damage to the equipment can result from potentially high operating pressures. Process line pressure should be removed prior to servicing.



⚠ WARNING

METER SEAL COMPATIBILITY

It is the "user's" responsibility to select gasket materials that are corrosion resistant and compatible with their process and process conditions. Using materials that are not compatible with the process or process conditions could result in the Meter leaking process fluid outside the pressure boundary of the device, resulting in personnel injury or death.

It is recommended that the user check the Meter on a regular schedule to ensure that it is leak free as both metal and elastomeric seals, gaskets and O-rings may change with age, exposure to process fluid, temperature, and /or pressure.

⚠ WARNING

If it becomes necessary to remove the instrument from the system power to the device is disconnected at the power supply.

⚠ WARNING

If it becomes necessary to remove the flowmeter from the system after exposure to toxic, pyrophoric, flammable or corrosive fluid, purge the flowmeter thoroughly with a dry inert gas such as Nitrogen before disconnecting the process connections. Failure to correctly purge the flowmeter could result in fire, explosion or death. Corrosion or contamination of the flowmeter upon exposure to air, may also occur.

Meter Float Cleaning (MT3809 & MT3810)

Float replacement procedures are dependent on the meter size, connection type and fluid (gas vs. liquid) application. Please refer to the appropriate section below for instructions along with Figures 4-1 thru 4-4.

1. FLANGED CONNECTION

a. Size 0 to 5 (½") flanged, liquid or gas service

1. It is NOT recommended to disassemble these meters. Contact Service for repair.

b. Size 7 (½") flanged, liquid or gas service

1. Remove the meter from the process line and lay the meter horizontal on a table.
2. Remove the gasket support ring. A bearing puller of the correct size is recommended to remove the gasket support ring.
3. Push the entire float assembly slowly downward and out of the meter inlet by pushing from the top with a round bar stock (3/4" or 19 mm diameter).
4. Remove the float snap-ring to clean individual float assembly parts.
5. Reassemble the meter by reassembling the float assembly and inserting it into the bottom of the meter. Replace the spiral retaining ring in the meter inlet.

c. Size 8 (½") flanged, liquid service

1. Remove the meter from the process line and lay the meter horizontal on a table.
2. Remove the gasket support ring. A bearing puller of the correct size is recommended to remove the gasket support ring
3. Loosen the float assembly with two screwdrivers one on each end of the meter and turn to loosen the inlet and outlet screws. Remove inlet screw at the bottom of the meter.
4. Remove the guide vane at the bottom of the meter and gently push the float assembly up and out the top/outlet side.
5. Reassemble by inserting the float assembly into the top of the meter. Replace the guide vane and secure the float assembly by tightening the inlet and outlet screws. Replace the spiral retaining ring in the meter inlet.

d. Size 8 (½") flanged, gas service

1. Remove the meter from the process line and lay the meter horizontal on a table.
2. Remove the gasket support ring. A bearing puller of the correct size is recommended to remove the gasket support ring.
3. Secure the damper from turning by inserting a 1/8” pin through the top guide cartridge. While holding the damper in place, remove the top/outlet screw.
4. Push the float assembly out through the inlet/bottom.
5. To clean the gas damper, unscrew the cylinder head. Then remove the bolt and carefully take out the small piston so as to not damage the critical surfaces.
6. Reassemble the meter by assembling the damper with float assembly. Insert the float assembly with damper into the inlet/bottom of the meter. Secure the inlet/bottom screw. While holding the damper in place with a pin(1/8” diameter), insert and secure the top/outlet screw. Replace the spiral retaining ring.

e. Sizes 10 (1"), 12 (1½"), 13 (2") flanged, liquid service

1. Remove the meter from the process line and lay the meter horizontal on a table.
2. Remove the gasket support ring. A bearing puller of the correct size is recommended to remove the gasket support ring.
3. Loosen the inlet and outlet screws. Remove inlet screw at the bottom of the meter.
4. Remove the guide vane at the bottom of the meter and gently push the float assembly up and out the top/outlet side.
5. Reassemble by inserting the float assembly into the top of the meter. Replace the guide vane and secure the float assembly by tightening the inlet and outlet screws.

f. Sizes 10 (1"), 12 (1½"), 13 (2") flanged, gas service

1. Remove the gasket support ring. A bearing puller of the correct size is recommended to remove the gasket support ring.
2. Secure the damper from turning by inserting a 1/8” pin through the top guide cartridge. While holding the damper in place, remove the top/outlet screw.
3. Push the float assembly out through the inlet/bottom.
4. To clean the gas damper, unscrew the cylinder head. Then remove the bolt and carefully take out the small piston so as to not damage the critical surfaces.
5. Reassemble the meter by assembling the damper with float assembly. Insert the float assembly with damper into the inlet/bottom of the meter. Secure the inlet/bottom screw. While holding the damper in place with a pin (1/8” diameter), insert and secure the top/outlet screw. Replace the spiral retaining ring.

g. Sizes 15 and 16 (3" and 4") flanged, liquid or gas service (size 15 only)

1. Remove the meter from the process line and lay the meter horizontal on a table.
2. Loosen the float assembly by fixating two pliers one on each end of the float assembly inlet guide cartridge. Turn to loosen with the help of a pin wrench.
3. Carefully remove the complete float assembly and conical taper as well as the spacer bushing (size 16 only) out the inlet/bottom of the meter.
4. Reassemble by inserting the float assembly inside the conical taper (as well as the spacer bushing, size 16 only). Then insert the complete float assembly into the bottom of the meter. Replace the float assembly inlet guide cartridge and tighten the float assembly into place.

2. THREADED CONNECTION

a. Size 0 to 5 (½") threaded, liquid or gas service

1. It is NOT recommended to disassemble these meters. Contact Service for repair.

b. Size 7 (½") Threaded, liquid or gas service

1. Remove the meter from the process line and lay the meter horizontal on a table.
2. Unscrew the inlet fitting at the bottom of the meter.
3. Push the entire float assembly slowly downward and out of the meter inlet by pushing from the top with a round bar stock (3/4” or 19 mm

diameter).
4. Remove the float snap-ring and clean individual float assembly parts.
5. Reassemble the meter by reassembling the float assembly and inserting it into the bottom of the meter. Reinstall and secure the inlet fitting.

c. Size 8 (½"), 10 (1"), 12 (1½") 13 (2") Threaded liquid service

1. Remove the meter from the process line and lay the meter horizontal on a table.
2. Unscrew the inlet fitting at the bottom of the meter.
3. Loosen the float assembly with two screwdrivers one on each end of the meter and turn to loosen the inlet and outlet screws. Remove inlet screw at the bottom of the meter.
4. Remove the guide vane at the bottom of the meter and gently push the float assembly up and out the top/outlet side.
5. Reassemble by inserting the float assembly into the top of the meter. Replace the guide vane and secure the float assembly by tightening the inlet and outlet screws. Reinstall and secure the inlet fitting.

d. Size 8 (½") Threaded gas service

1. Remove the meter from the process line and lay the meter horizontal on a table.
2. Unscrew the outlet fitting at the top/outlet of the meter and remove the gas damper.
3. Unscrew the inlet/bottom fitting and slowly remove the float assembly.
4. To reassemble the meter, insert the float assembly into the inlet/ bottom of the meter. Secure the inlet/bottom fitting. Replace the gas damper and secure the outlet/top fitting.

e. Size 10 (1"), 12 (1½"), 13 (2") Threaded, gas service

1. Remove the meter from the process line and lay the meter horizontal on a table.
2. Remove the top/outlet screw.
3. Loosen the float assembly by holding the damper in place with a pin (1/8" diameter) in the top while loosening the inlet/bottom fitting. Gently push the float assembly out through the inlet/bottom.
4. To clean the gas damper, unscrew the cylinder head. Then remove the bolt and take out the small piston carefully so as to not damage the critical surfaces.
5. Reassemble the meter by inserting the float assembly with damper into the inlet/bottom of the meter. Secure the inlet/bottom screw by holding the damper in place with a pin (1/8" diameter). Replace and secure the top/outlet screw. Reinstall and secure the inlet fitting.

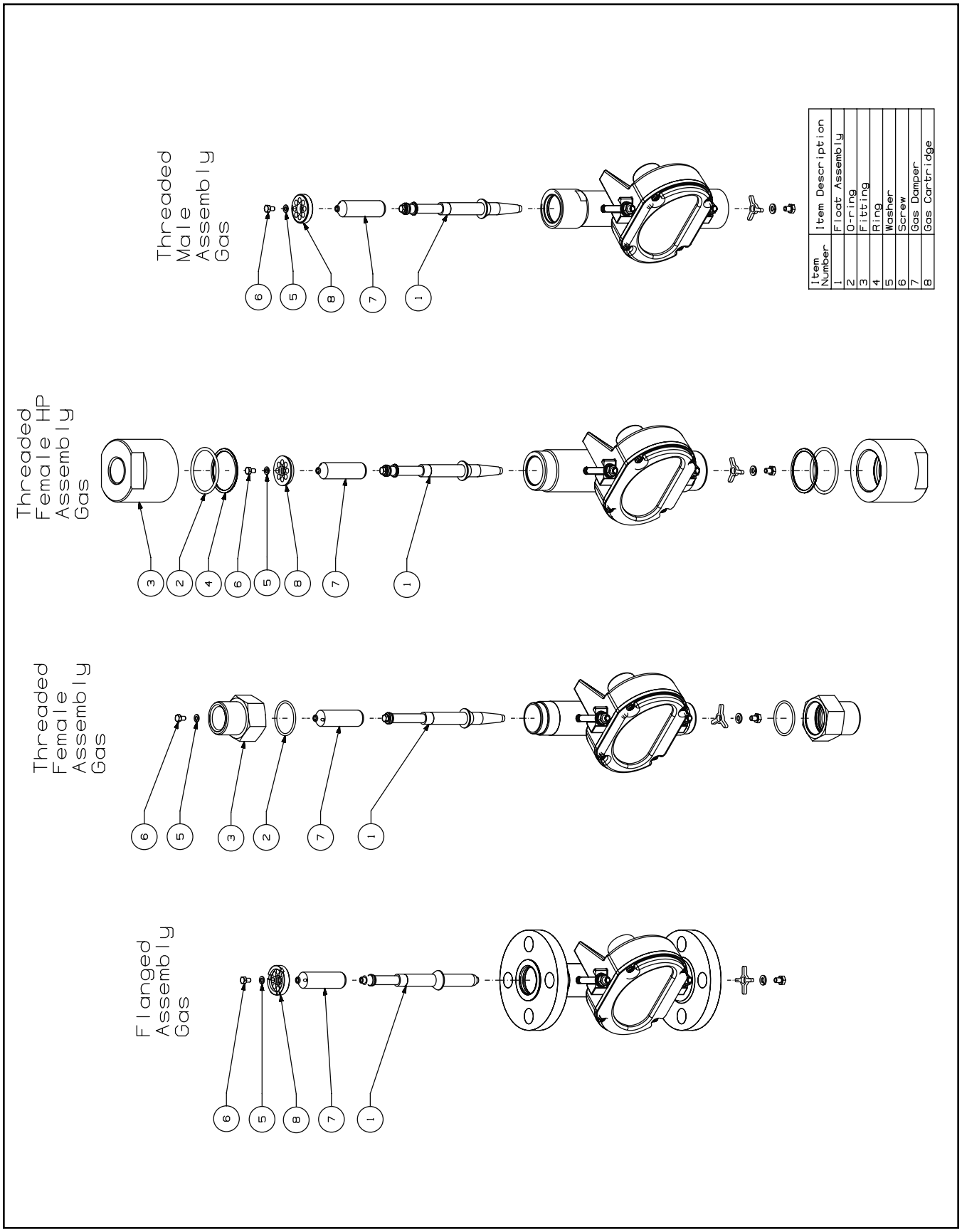


Figure 4-1 Exploded View, Model MT3809G and MT3810G - Gas Service

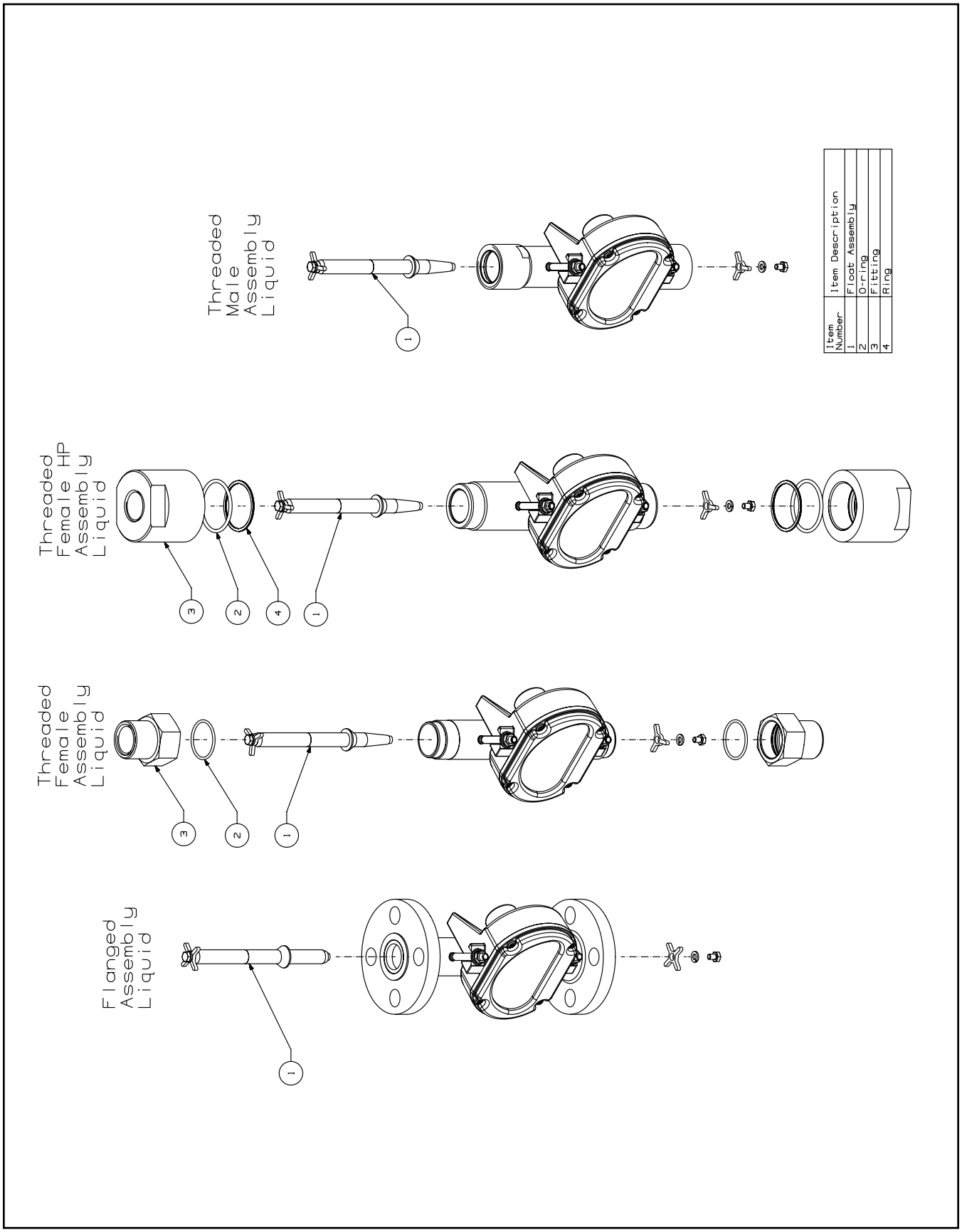


Figure 4-2 Exploded View, Model MT3809G and MT3810G - Liquid Service

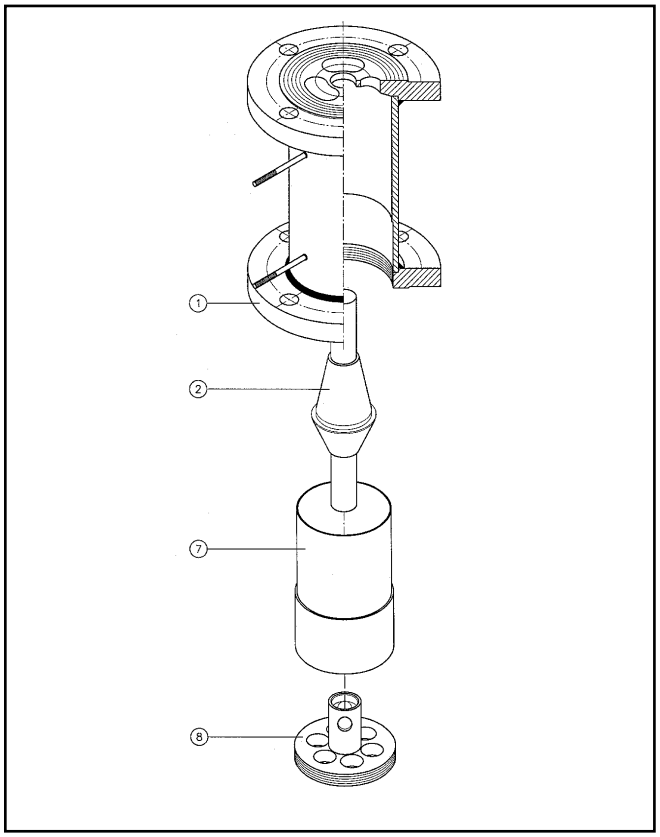


Figure 4-3 Exploded View, Model MT3809G, Size 15 (Gas or Liquid Service)

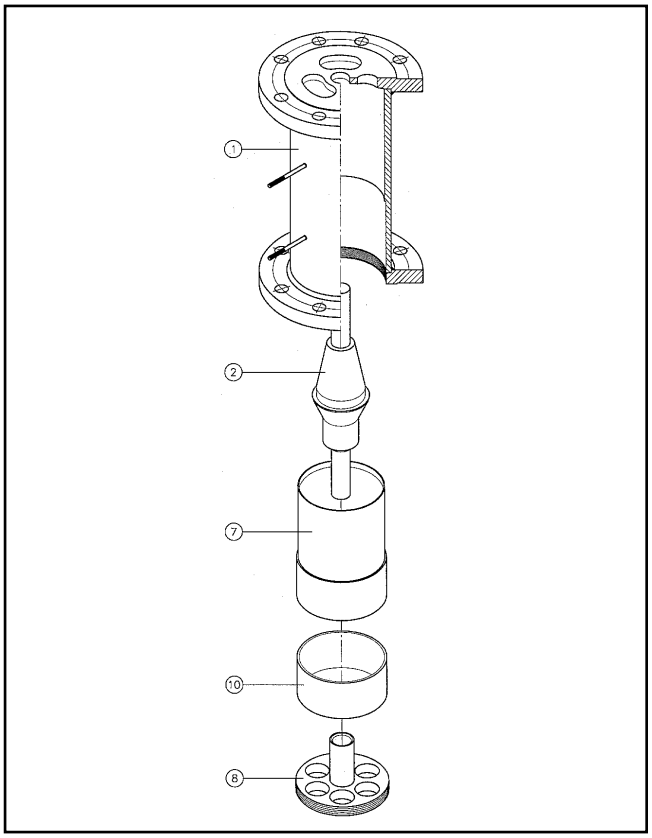


Figure 4-4 Exploded View, Model MT3809G, Size 16 (Liquid Service Only)

Meter Float Cleaning (MT3809 ETFE Option)

Flanged connections, all sizes, liquid or gas.
a. Flush only. Contact factory.

Meter Indicator Reference Mark (zero) Adjustment

This adjustment is performed with no process flow with the float resting on the guide vane or the inlet end fitting.

a. Completely stop fluid flow through the flowmeter.
b. See Section 2-5-1 on how to remove indicator housing and expose the pointer assembly.
c. Turn the slotted screw on the bottom of the point until the pointer is in line with the reference (zero) mark on the scale.
d. Replace the indicator housing cover with gasket and secure, see Section 2-5-1 for details.

Transmitter Replacement with or without Alarms and Pulse Output

All transmitters are self contained units matched specifically to the associated flowmeter. If there is a need to replace, please contact your nearest authorized Brooks service representative.

Inductive Alarm Replacement

a. Remove the front cover of the indicator housing, refer to Section 2-5-1.

b. The wires from the alarm switch(es) are wired into the alarm terminal connector.
c. Loosen the two screws securing the scale, with the alarm switches attached, and remove the scale.
d. Remove the two screws securing the wire cover.
e. Turn the wire cover over to expose the alarm terminal blocks.
f. Remove the wires from the terminal blocks
g. Turn the scale over and locate the screw centered in the green alarm switch. Remove the screw being careful not to lose the nut on the outside of the alarm set bracket. Remove the alarm switch from support.
h. Place the switch on the bracket with the open end facing towards the center of the scale plate and the wires facing away from the scale plate.
i. Place the switch screw through the opening in the switch, and the support bracket. Use the nut to secure the screw and tighten.
j. Connect the alarm switch wires to the terminal block.
Refer to Alarm Wiring Diagrams Figures 2-6a & 2-6b, 2-7a & 2-7b, 2-8a & 2-8b and 2-9a & 2-9b.
k. Replace the scale and tighten two clamping screws. Make sure that the alarm switch wires do not interfere with the alarm cam. Insure that the pointer is aligned with the ‘R’ or zero mark. If not, refer to Section 4-3, indicator reference mark (zero) adjustment.
l. Set the alarm position, by loosening the two pointer screws, moving the point of the desired alarm setting, and tightening the screws.
m. Connect the field wiring.
n. Replace the indicator housing cover and secure with four screws.

Transmitter Replacement with Inductive Alarms

The transmitter is a self contained unit matched specifically to the associated flowmeter. If there is a need to replace, please contact your nearest authorized Brooks service representative. However, the inductive alarms may be replaced according to the procedure in Section 4.6

Digital Display Replacement

If there is a need to replace, please contact your nearest authorized Brooks service representative.

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PATENTS
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Installation-Manual-MT3809G-MT3810G-EN/541B182AAG/B/2024-02

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Calibration Procedure	
Model:	**Model MT3809 (un-lined and ETFE lined and ELF) & MT3810**

1. Scope

1.1 P.D.S./I.O.M. of in Header of this document mentioned Models.

2. Purpose

2.1 To calibrate, against a certified calibration installation, VA type Flow meters series: MT3809, (both un-lined and ETFE Lined and ELF) and MT3810. Including the range of 2-100 cubic m^3 per hour (size #15 and #16).

3. Equipment

3.1 The liquid calibration can be executed with a reference measurement on a comparison stand or measuring by weighing. For both methods the test fluid is water at ambient temperature. For gas service the Vol-U-Meter, 3750 cal stand, and the Bell-Prover type calibration units can be used (for sizes 1 inch and smaller). The calibration benches must have a valid certificate.

4. References

4.1 The VASE (or other) computer program for saving the information and/or to calculate to other units/conditions.

5. Standards

5.1 VDI/VDE 3513 Accuracy class 1.6, 2.5, 4 or 2%, 3%, 5% FS and from maximum flow. Optional is 1% from maximum flow (not for ELF execution).

At all test points within the range of the instrument the maximum error must be within the tolerances mentioned in the particular class.

Example: Accuracy ± 1.6 or ± 2% of max. flow.

At all test points within the range of the instrument the maximum allowed error must be less than ± 1,6 or ± 2% of max. flow.

Rev.	No.	Description	Revised by	Chk.	Date
J	EZ53	Update for ELF, & ETFE lined options	JC	JvL	02-12-15
H	ER82	Update for 38xxG and add #15/16	RB	JvL	24-07-13
G	DS66	Reduce of calibration points	AL	JvL	21-07-08
F	DR25	Format update	JvL	JvL	20-03-08
E	DC84	Replace"x" by accuracy	RH	JW	01-12-04

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Document no.: **834P054** Rev. **J**

6. Qualifications

6.1 N.A.

7. Responsibilities

7.1 The operator is responsible to carry out the test according the procedures.

In case of discrepancies or doubt concerning the measuring results, the responsible engineer must be consulted.

8. Instructions for MT3809 size 7-13 and 3809 ELF sizes 0-5

8.1 Mount a degree test scale towards the instrument and adjust the pointer at zero. The instrument must be leveled during calibration. The wandering of the float assembly must be tested prior to the calibration, by turning the float 360 degrees and checking the pointer movement.

8.2 Measure the flow at degree readings as indicated at section 8.3 a and b. Number of the positions are a minimum of 5 points, but depend on the requested accuracy and customer conditions.

8.3 a) Class 4 VDI/VDE & 3% FS: First calibration point is the maximum water or gas value as specified on the order, following readings must be taken 20 or 30 degrees apart, in decreasing trend from maximum value. The calibration points must be taken considering that the last calibration point must be between 5 to 10% of max flow, and that there should be at least 5 calibration points.

b) Class 1.6, 2.5 VDI/VDE & 1% FS: First reading point is the maximum water or gas value as specified on the order. Next calibration point is 10 or 20 degree below the maximum value. Further calibration points must be taken 20 or 30 degrees apart, in decreasing trend from maximum value. The calibration points must be taken considering that the last calibration point must be below 5 to 10% of max flow, and that there should be at least 5 calibration points.

8.4 Instructions for #15 and #16:

Connect the hoses to the calibration stand towards the pump/tank. Fix the calibration stand to the ground by means of the four supports. Connect the RFT main cable. Put the device to be tested into the calibration stand. Fix it by bolting the two brass rings down.
Close the valve at the outlet side of the instrument. Open the valve on the inlet side to let the water into the device by exhausting with the valve underneath the pressure gauge.
When the system is filled, the outlet valve can be opened. Pump the water through the instrument until there is no air left in the water. Stop pumping and close the outlet valve. Zero the Coriolis reference instrument (needs only to be done when main was disconnected).

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Open the valve and adjust the flow until the maximum flow of the instrument (to be read on the production copy) is reached. Take the first higher step e.g. 110 degree scale reading and read the value on the RFT. Decrease the flow in scale reading steps of 20 degree, the last point to be tested must be below the 10% from full scale flow. Put the data into the VASE system for calculation and scale engraving. Close the outlet valve and vent the system, when the lower sight true indicator is empty the device can be removed.

8.5 All instruments with a transmitter, after engraving and mounting the customer scale, the mA readings must be tested at 100%, 10% and on 50%. Readings must be: 100% - 20mA, 10% - 5.6mA, 50% - 12mA.

9. Reports/Records

9.1 Calibration information must be saved in an electronic file system or serial number file.

10. Flow Charts

10.1 N.A.

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1.2.8 INSPECTION AND TEST PLAN (ITP)

Base Load Power Hub (BLPH)

INSPECTION AND TEST PLAN

Document Number: 1724000791-QC-ITP-00002

ROSETTI MARINO	
1	NO COMMENTS - APPROVED - WORK MAY PROCEED
2	MINOR COMMENTS - REVISE AND RESUBMIT - WORK MAY PROCEED
3	MAJOR COMMENTS – REJECTED – DO NOT PROCEED
4	APPROVAL NOT REQUIRED
NOTE: Approval doesn't relieve the supplier from mandatory compliance with contractual documents and specifications. Comments made do not imply acceptance of any cost or delivery impact.	
Sign	Date
ROSETTI MARINO S.p.A.	10/12/2024

Document Class: 2

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00	16/05/2024	Issue for Review (IFR)	Róbert Seres	Mária Poór	Zsanett Molnár
Rev.	Date	Description	Prepared	Reviewed	Approved

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Revision / Change Log

Rev.	Description
00	Issue for Review (IFR)
01	Accepted for construction (AFC)
02	Accepted for construction (AFC)
03	Accepted for construction (AFC)

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

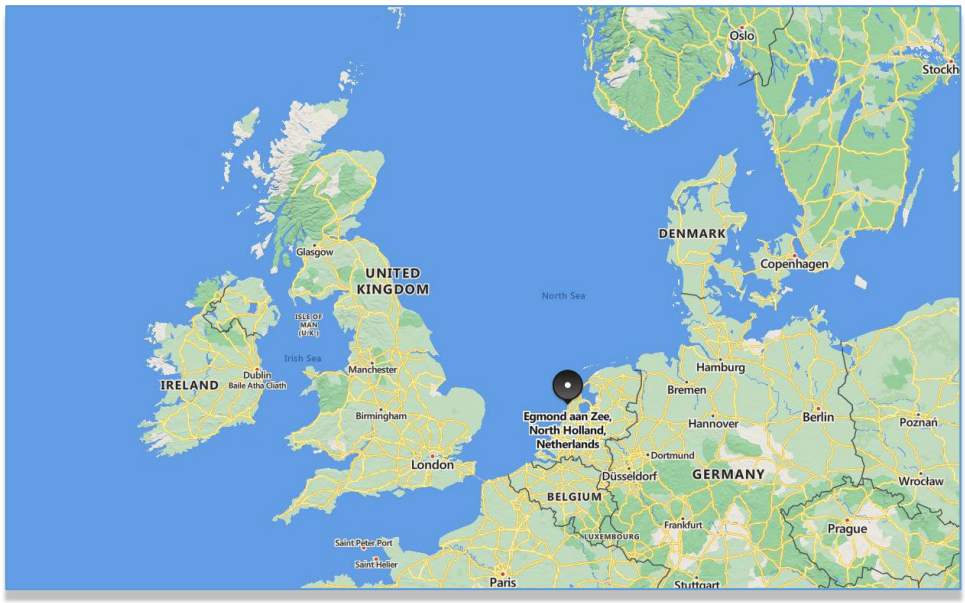


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

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Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

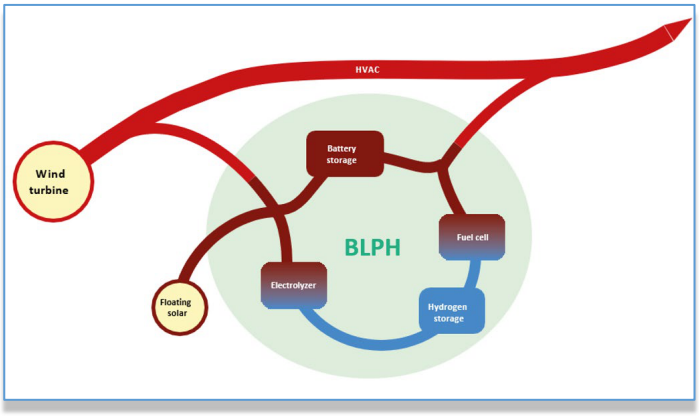


Figure 3 – BLPH Concept

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Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

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2 DOCUMENT PURPOSE AND SCOPE

This plan defines inspections and tests to be carried out to verify quality requirements identified in all contractual documents: Drawings, Specification, Codes and Standards latest revisions.

This document shall be applied to structural fabrication and erection activities for Base Load Power Hub (BLPH), including sea fastening and grillage. Disciplines other than structural are covered by dedicated project ITPs.

2.1 REFERENCES

Doc. No.	Description
1724000791-IN-DA-00003	GENERAL ARRANGEMENT DRAWINGS
1724000791-IN-DS-00004	INSTRUMENT DATA SHEETS and SIZING CALCULATION
1724000791-NDT-PRO-00005	NDE PROCEDURE
1724000791-MAT-PRO-00006	PAINTING PROCEDURE
1724000791-QC-PRO-00007	PRESSURE TEST PROCEDURES
1724000791-QC-PRO-00008	FAT PROCEDURES
1724000791-QC-PRO-00014	PREPARATION FOR SHIPPING WITH HANDLING AND STORAGE PROCEDURES
010-X-900-QSP	Receiving goods
012-B-100-QSP	Verification of Purch. Prod. / Nonconformance Reporting (NCR)
ASME IX	Welding, Brazing, and Fusing Qualifications
EN ISO9712	Non-destructive testing
ASME V	Nondestructive examination
ASME B31.3	Process Piping
EN ISO 5817	Welding – Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) – Quality levels for imperfections
502-Z-631	Documentation tag
123A90-DDL-MAT-SP-60006 Rev.02	Coating and Painting Specification
ISP063	Visual and dimensional inspection of completed instruments
014-J-100-QSP	Verification of Documented Evidence
EN 10204	Metallic Products: Types of Inspection Documents
ISO 10474	Steel and steel pruducts

Table 1 - Reference Documents

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2.2 DEFINITIONS AND ABBREVIATIONS

ASME	American Society of Mechanical Engineers
BESS	Battery energy storage system
BLPH	Base Load Power Hub
CA	Certification Agency
COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
DFT	Dry Film Thickness
DP	Dye Penetrant
DS	Surveyor
EN	European
EXP	Expediting dept.
HAZ	Heat Affected Zone
HKN	Hollandse Kust Noord
ISO	International Organization for Standardization
ITP	Inspection and Test Plan
LOG	Logistic Dept.
NCR	Nonconformance Reporting
NDE	Non Destructive Examination
NDT	Non Destructive Testing
PED	Pressure Equipment Directive
PMI	Positive Material Identification
PO	Purchase Order
PQR	Procedure Qualification Record
PQR	Procedure Qualification Record
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project
PV	Photovoltaics
QA	Quality Assurance
QC	Quality Control Dept.

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QCI	Quality Control Inspector
RAL	Reichs-Ausschuß für Lieferbedingungen colour management system
RM	Rosetti Marino S.p.A
RT	Radiographic testing
SC	Sub-contractor
WI	Welding Inspector
WLD	Welding Dept.
WPS	Welding Procedure Specification
WQR	Welder Qualification Record

Table 2 - Definitions and Abbreviations

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3 RESPONSIBILITIES

3.1 PROJECT QUALITY MANAGER

The PQM shall assure that :

- the project quality requirements are implemented through all phase of the project;
- project works are properly controlled, inspected, tested and documented.
- The required documentation for certification purpose is submitted to CPY for review and signature on continuous basis;
- fabrication facilities are properly maintained and/or calibrated according to contractors and project quality standards ; all personnel holds required competence level and training in compliance with project specifications

3.2 QC INSPECTOR (QCI) / WELDING INSPECTOR (WI)

QCI / WI shall:

- perform the checks and tests as stated in responsibility column of this ITP;
- document the inspections issuing proper inspection reports;
- produce daily welding monitoring reports
- supervise and monitor the activities on site;
- interface with the CPY QA/QC site representative for the management of the inspection;
- notify the inspections to be attended to the CPY QA/QC site representative.
- coordinate all NDE activities;
- mark-up repairs area to be excavated in line with NDE report and control weld repairs (mark-up of areas to be repaired should be managed and independently performed by the NDE operator. Judgement of welds including characteristics of any repair shall be ensured the sole responsibility of the NDE operator).

3.3 NDE OPERATOR

The NDE operator shall:

- be suitably qualified (certified) in accordance with project requirements
- perform NDE according to the project requirements and applicable procedure, and ensure that NDE results shall be concluded subsequently after the inspection (at least daily), ensuring that inspection results are preserved and maintained
- prepare inspection reports within 48 hours from the inspection

3.4 DIMENSIONAL CONTROL ENGINEER

The dimensional control engineer shall:

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- carry out dimensional check
- issue dimensional reports, including relevant mark-up drawing
- Surveys will be carried out for the following items and steps :
  - Upper grillage subassemblies as-built
  - Upper grillage assembly, positioning and as-built
  - Topside structure subassemblies, as-built
  - Topside structure assemblies (by level), as built
  - Primary nodes at fit-up stage
  - Primary nodes as-built
  - Overall structure, including interfaces, as-built

3.5 SUB-CONTRACTOR

Subcontractor (1) shall:

- provide resources suitable for the required quality level, in terms of both personnel and equipment; RM has the right to reject or ask for replacement at any time in case of inadequate resources
- comply with instructions and coordination by RM construction supervisors
- execute the work in accordance with project requirements, by applying RM procedures and CPY specifications referenced in this document, supported by RM construction and inspection personnel

(1) for the purpose of this document "subcontractor" is intended as the organization providing resources and executing fabrication activities, with supervision by RM Construction Dept. and Quality Control by RM QC Dept. Such subcontractors may execute the work both within RM premises (yard, workshop) or in external workshops.

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4 NOTIFICATION FOR INSPECTION

CPY and CA site surveyor shall be notified for inspection attendance by means of "Notification for Inspection" form, containing all details on the inspection, sent by e-mail to the CPY QA/QC site representative and CA surveyor. The notification shall be issued to CPY and CA at least 24 hours in advance for site inspections and 48 hours in advance for local off-site inspections. In case of emergencies, such notification can be sent even with shorter notice, provided it has been previously agreed upon.

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5 INSPECTION RECORDS

Inspection records shall be made available for CPY and CA in due time after completion of activities. Original records shall be filed in the CTR QC dept. and made available for CPY and CA re-view at any time.

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6 INTERVENTION POINTS DESCRIPTION

Code	Description
M	Routine intervention (Monitoring). Activities concerned shall be continuously monitored. Monitoring activities are not formalised.
S	Percentage intervention (Spot). Activities shall be monitored in percentage. The intervention is formalised by issuing a document related to the specific activity (report, certificate or control report).
R	Documentation review (Review). Certificates, reports and documents issued for the specific activity foreseen by the Quality Control Plan shall be checked. Personnel in charge of controls shall formalise the review by signing relevant documents.
W	Witnessed intervention (Witness). CPY and\or CA shall be notified in written; should CPY and\or CA not be present at notified date and time, the activity may proceed.
H	Hold point (Hold). CPY and\or CA shall be notified in written; should CPY and\or CA decide not to witness the activity, the waiver shall be in written. In case the activity is not waived, it shall not proceed until CPY and\or CA are present.

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7 INSPECTION AND TEST

BR	BROOKS
CPY	CROSSWIND
CTR	RM

Step	Step Description	Inspection/Test Requirement	Resp.	Reference Document	Acceptance Criteria	Ref. Record	Intervention Point			
								BR	CPY	CTR
1.0	MATERIALS									
1.1	Materials certificates check	Check of: Heat, Batch, Grade, Type, Thickness, Size, NDE, Chemical & Mechanical Properties, certificate type	QC	PO 010-X-900-QSP 012-B-100-QSP	Applicable ASTM Material Standards	Material Certificates /Test report (for pressure boundary material 3.1)		H	R	R
2.0	WELDING AND WELDERS QUALIFICATION									
3.1	WPS Approval	Check approval of WPS's	WLD/WI	ASME IX	ASME IX	Welding sketch including WPS and PQR (with test reports)		H	R	R
3.2	PQR Approval	Check approval of PQR's	WLD/WI	ASME IX	ASME IX	Welding sketch including WPS and PQR (with test reports)		H	R	R

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Step	Step Description	Inspection/Test Requirement	Resp.	Reference Document	Acceptance Criteria	Ref. Record	Intervention Point			
								BR	CPY	CTR
3.3	Welder Qualification (WQR)	Check approval of WPQ's	WLD/WI	ASME IX	ASME IX	WPQ certificates (issue after welding)		H	R	R
4.0	**NDT PROCEDURES AND OPERATORS QUALIFICATION**									
4.1	NDT operators qualifications	Rewiev for compliance with project specs	QC	EN ISO9712		NDE operators qualifications (issue after NDE tests)		H	R	R
4.2	NDT Procedures	Verify NDE procedures have been approved by CPY and CTR	QC	AMSE V, ASME IX, ASME B31.3	NDT Procedures Approval by CPY and CTR	NDT Procedures 1724000791-NDT-PRO-00005		H	R	R
5.0	**WELDING**									
5.1	Visual examination after welding completion	Verify weld of Pipe to Flange is free of defects	WLD	ASME IX, EN ISO 5817	EN ISO5817	Documentation tag 502-Z-631		H	R	R
6.0	**NDT**									

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Step	Step Description	Inspection/Test Requirement	Resp.	Reference Document	Acceptance Criteria	Ref. Record	Intervention Point			
								BR	CPY	CTR
6.1	DP (Dye Penetrant)	Detect weld of Pipe to Flange and HAZ defect	NDE operator	1724000791-NDT-PRO-00005	ASME B31.3	NDT report		H	R	R
6.2	PMI	Measure the material elements (Weight %)	NDE operator	1724000791-NDT-PRO-00005	ASME II	PMI report		H	R	R
6.2	RT	Detect weld of Pipe to Flange defect	NDE operator	1724000791-NDT-PRO-00005	ASME B31.3	NDT report		H	R	R
7.0	PRESSURE TEST									
7.1	Pressure test	- Check of material and welds leakage against the test pressure	PROD	1724000791-QC-PRO-00007	No visual leakage	Documentation tag 502-Z-631		H	W	W
8.0	PAINTING									
8.1	Painting	Verify the painted layer thickness (DFT) and RAL colour	QC	1724000791-MAT-PRO-00006 123A90-DDL-MAT-SP-60006 (rev. 02)	DFT and RAL colour according to specification	Painting report		H	W	W
9.0	CALIBRATION									

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Step	Step Description	Inspection/Test Requirement	Resp.	Reference Document	Acceptance Criteria	Ref. Record	Intervention Point			
								BR	CPY	CTR
9.1	Calibration	Verify the flow and the transmitter accuracy	PROD	1724000791-QC-PRO-00008 1724000791-IN-DS-00004	Accuracy 1% Full Scale for flow Accuracy 0,5% Full Scale Flow output signal for transmitter	Calibration report		H	W	W
10.0	VISUAL AND DIMENSIONAL CHECK									
10.1	Final visual and dimension check	Measure overall dimensions and perform visual inspection based on the approved drawing a	QC	Approved drawing 1724000791-IN-DA-00003, 1724000791-QC-PRO-00008	Dimensions and visual performance according to approved drawing	Visual and dimensional inspection report (ISP063)		H	W	W
11.0	DOCUMENT REVIEW									
10.1	Prepare certificates, declaration	Review and verify of test reports and records , certificates Any Punch List items will be rectified prior to inspection release.	QC	Verification of Documented Evidence - 014-J-100-QSP PO	EN10204 / ISO10474 / ATEX / PED	Certificates with test reports, declarations		H	R	R
11.0	CUSTOMER INSPECTION									

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Step	Step Description	Inspection/Test Requirement	Resp.	Reference Document	Acceptance Criteria	Ref. Record	Intervention Point			
								BR	CPY	CTR
11.1	Customer inspection at vendor site	Verify and witnessed the tests as per ITP by CTR/CPY	CTR/CPY	Applicable procedures and drawing	Customer requirements	Inspection Release Note		H/R	R	H
12.0	**PACKING**									
12.1	Prepare goods for dispatch according to Customer requirement	Verify the packing method	Shipping	1724000791-QC-PRO-00014	Packing and marking requirements	Packing list / Invoice / Certificate of Origin		H	R	R
13.0	**FINAL RECORDS**									
13.1	Review of final records	Check of all construction records	Project coordinator	Final Record Book Index 1724000791-QC-LIS-00010	Final Record Book Index Approval	Final Record Book 1724000791-QC-DB-00009		H	R	R

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1.2.9 PREPARATION FOR SHIPPING WITH HANDLING AND STORAGE PROCEDURES

Base Load Power Hub (BLPH)

PREPARATION FOR SHIPPING WITH HANDLING AND STORAGE PROCEDURES

Document Number: 1724000791-QC-PRO-00014

Document Class: 3

ROSETTI MARINO

1	APPROVED - WORK MAY PROCEED
2N	REVISE AND RE-SUBMIT - DO NOT PROCEED
2Y	REVISE AND RE-SUBMIT - WORK MAY PROCEED
3	REJECTED
4	APPROVAL NOT REQUIRED

NOTE: Approval doesn't relieve the supplier from mandatory compliance with contractual documents and specifications. Comments made do not imply acceptance of any cost or delivery impact.

Sign	Date
Rosetti Leonardo	24/05/2024

Rev.	Date	Description	Prepared	Reviewed	Approved
01	24/5/2024	ISSUE FOR INFORMATION (IFI)	Judit Schaller	Mária Poór	Zsanett Molnár
00	22/5/2024	ISSUE FOR INFORMATION (IFI)	Judit Schaller	Mária Poór	Zsanett Molnár

BROOKS INSTRUMENT Beyond Measure

File: Cover_Packing
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Table of Contents

SH.	DESCRIPTION	REVISIONS							
		00							
1	Cover	X							
2	Table of Contents	X							
3	Revision / Change Log	X							
4	PREPARATION FOR SHIPPING WITH HANDLING AND STORAGE PROCEDURES	X							

File: Cover_Packing
This document undergoes an issuance cycle within EDMS "Fusionlive".
Its distribution is electronically controlled. Once printed shall be considered as "NOT CONTROLLED" copy

Revision / Change Log

Rev.	Description
00	ISSUE FOR INFORMATION (IFI)
01	ISSUE FOR INFORMATION (IFI)

HOLDS LIST

No.	Description
1.	
2.	
3.	
4.	

File: Cover_Packing
This document undergoes an issuance cycle within EDMS "Fusionlive".
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SCOPE

Brooks Instrument Kft's Székesfehérvár site places great emphasis on the packaging of goods leaving the site. The packaging protects the goods from damage and allows the goods to be transported safely. The packaging must contain the appropriate goods. A well-designed packaging process ensures that packaging needs are met quickly and efficiently, thus supporting on-time delivery (OTD). An important aspect is to take into account the different customer needs, which include the packaging material, the placement of the packing list, the marking of the package, etc.

PURPOSE

This procedure is valid for Brooks Instrument's Hungarian site. The purpose of the procedure is to describe the packaging process on site and to define responsibilities. The description mainly includes the description of the work in the field of packaging.

EQUIPMENT

Foaming machine, strapping machine, hand strapping machine, forklift, hand lift

STANDARDS

ISO 9001

RESPONSIBILITIES

The correct packaging, placing the packing list on the right box, placing the consignment note on the right box, handing over the right shipment to the carrier is basically the responsibility of the packer.

PROCEDURE

1. Terms:

 OTD: On time delivery, that is, timely delivery. The primary consideration is delivery within the promised day. A secondary consideration is the consideration of the deadline requested by the buyer.

 Traveler:The document accompanying the goods

 Delivery request form: other delivery requests must be indicated on this form, the product to be delivered must be sent to the packer with this form (S:\Forms\Shipping)

 Delivery Schedule: Table containing weekly consolidated deliveries

 TMF card: If an order is partially completed, but brought to the packaging area, a card accompanies the instruments. This is called “Packing Card”. This contains the following: order number, quantity of the meters on the order, modetypel, and on the back the final inspector writes which item was sent to packing area. Document number: PAK060-01

 Manifest: End-of-day closing, a report made with the carrier's program, containing the deliveries of the given day.

 Acknowledgment of receipt: documentation certifying the receipt of the goods by the forwarder

2. Process:

1. Delivery of goods to be packed to the packaging area:

a. It is important to ensure a continuous flow of material to the packaging area. Everyone is

expected not to get the goods on the packaging at the same time, “dumped”.

b. Shipping department has a weekly delivery schedule that includes regular deliveries. This table is made available by the Shipping department to the parties concerned (production planning, final inspection, quality administrator, packaging, warehouse) and, in the event of a change, the parties concerned are notified. When delivering the goods to the packaging area, it is advised to schedule the pre-packaging processes according to the table.

c. For same-day delivery outside the European Union, the goods to be packed by 10 am.

d. In the case of transport within the European Union, the goods to be packed must reach the packer by 12 am.

e. Packers only pack items having documentation. Documentation refers primarily to the traveler. If the goods do not have a traveler, a delivery request form must be attached to the goods. In lack of these items will not be packed.

2. Partial orders at the packaging area:

a. Partial orders from the TMF area have a card and are sent to the packaing area with these cards.These instruments must be packed, but they must not be placed on the shelves where the ready-packed goods awaiting delivery are stored, but on a shelf specially designed for this purpose (semi-finished).

b. As soon as the certificates, documentation and missing instruments belonging to the order are completed, the traveler of the order will be placed in the packaging area. Packing is completed and goods are included amongst the final packed goods waiting to be delivered.

3. Packing

1. Caps and plugs:

 Caps and plugs should be used to seal holes to be protected from the environment. Caps and plugs must be clean and free of visible dirt. Packers ensure that caps and plugs are in place before products are packed. The bore of the flanges is protected with self-adhesive sheets.

2. Pre-packing:

 In the case of TMF instruments, we can talk about pre-packaging. For goods arriving from the TMF production area, the order number, type and, in part, the picklist will be checked. The instruments are placed in Korvu boxes (part number GDOB1103 [small] and GDOB1105 [large]). Calibration sheets and declarations are placed into boxes taking into account individual customer needs. The order number and quantity of the goods taken to the packing area will be added to a list (K, common, drive) together with the date, which is a great help in case of any complaints.

 The box used to pack the device is selected according to the table in the PAK060 instruction.

The goods are packed in this way and are taken to the packaging area for the final packaging.

 In the VA area, we can talk about pre-packing of the 3750 instruments. The instruments are placed in Korvu boxes (article number: GDOB1103 [small]) by the packaging colleagues and then these boxes are final packed.

3. Packing:

 The packer packs the goods. During packaging, care must be taken to ensure that the goods are protected from shocks and vibrations. It is important that the parts packed in one box do not collide or cause surface damage to each other. The goods to be packed are primarily packed in a box by the packer, the goods being surrounded by a moldable foam which is still malleable when hot and takes on the shape of the goods. This protects against impact. If necessary (for VA instruments), preformed protective sponge is applied to the devices. In the case of packing components, in addition to the foam, in some cases a sponge must be used, which separates and protects the parts from impact.

 The packaging must pack the goods in such a way that the packaging protects the goods from::

i. damages

ii. surface damages, scratches

iii. break

iv. box damages

v. unintended discard of components together with the packing foam (person unpacking not realizing that small components got sticked to the packing foam)

 When packaging the instruments, make sure that there is at least 2 cm of foam between the instrument and the cardboard box.

 For heavier instruments packed in boxes of 38*33*30 cm and 46*38*38 cm, it is recommended to use an extra reinforcement sheet, article numbers GZOM0020 and GZOM0021. The extra reinforcement is used if a 2 cm thick foam between the instrument and the carton cannot be provided and for the following packing weights: from 8 kg for a 38*33*30 cm box and from 12 kg for a 46*38*38 cm box.

 When packaging parts, care should be taken to use preformed sponge for transport, where possible.

 The small parts are wrapped in blister foil and placed in a small folding box to avoid accidental ejection when unpacking.

 In the case of goods packaged for Brooks Hatfield, care must be taken during packaging that the parts do not touch each other..

4. Materials used for packing:

1. Carton box:

 Dimensions / Maximum weight

36x15x15 cm 3 kg

43x29x21 cm 8 kg

38x33x30 cm 13 kg

46x38x38 cm 20 kg

61x21x21 cm 12 kg

72x27x27 cm 13 kg

56x44x42 cm 35 kg

38x20x20 cm 20 kg

27x24x8 cm prepacking only

22x20x7 cm prepacking only

2. Pallet:

i. We use 80x65 cm wooden pallets, ie half EUR pallets and 120x80 cm EUR pallets.

ii. If the instrument to be packed is so large / heavy that it does not fit in any of the cardboard boxes, or if it does fit in, but is not well protected during shipping, it must be screwed onto a pallet. In this case, the use of Teflon washers is required

3. Cloak:

i. The boxes packed on pallets are covered with a mantle, which is available in 3 sizes

 60 cm high

 80 cm high

 100 cm high

ii. It is also possible to build pallets of different heights. Different sizes can be achieved by raising and breaking the mantle.

4. Wooden crate:

1. It is possible to use seaproof packaging at the request of the customer. A wooden crate is used for this. We do not keep wooden boxes in stock, the shipping department orders the required quantity and size of wooden boxes separately for each delivery.

2. In the case of sea packaging, the goods are packed in a wooden box. The wooden box must be lined with foil and the goods packed in the usual way must be inserted. The use of a desiccant is possible at the customer's request and also meters can be wrapped into foil if requested. Signs will be placed on the outside of the wooden box according to the customer request. In the case of both wooden crates and pallets, the presence and condition of the required markings must be checked (wheat mark - IPPC logo).

3. Wooden crates are marked with the usual international symbols (fragile, dry, vertical storage, away from heat, indoor storage). Upon customer's request, we also provide the delivery note of the customer:

 the delivery sign can be placed on a wooden panel which can be attached to the box

or

- can be attached to the wooden box by a laminated paper
- upon special request, we can provide vacuum packaging of the goods, this is done by our external partner

5. Foam (foaming machine):

1. By pressing the button for the appropriate box size on the control panel of the foaming machine, the required amount of foam for that box can be obtained. (For example, pressing box 2 puts enough foam in box 2). You can deviate from this. Foam must be placed both below and above the instrument so that the foam also protects the side of the instrument.

2. Preformed sponge:

1. For glass-covered instruments, the use of preformed sponge is necessary to protect the glass cover. After applying the sponge, the instrument should be packed in the usual way.

6. Air bubble wrap, pouch:

1. To protect glass products, the product should be covered with bubble foil before packaging.

2. Small parts should also be wrapped in foil or placed in a pouch before being placed in a box lined with foam to avoid sticking the parts to the foam..

7. Preformed foams

1. In the case of packing components, it is also possible to use preformed foams of different shapes in order to prevent the forces acting on the material during transport..

8. Strap:

1. With the strapping machine, the boxes that do not end up in a larger packaging unit (pallet, wooden crate) must be strapped in two directions once, or in up to 3-3 places, depending on the size..

2. Shipping department determines which orders are palletized. Boxes placed on pallets must be covered with a suitably sized mantle and the prepared pallets must be strapped in two places with the manual strapping machine..

9. Marking:

1. After unpacking, the packer displays the following information on the box so that the goods can continue to be identified both in-house and by the customer.

- internal order number
- customer order number
- weight
- in case of multiple orders, "ST" marking
- other customer requirements are communicated by the shipping department (exampl ¾)

 Brooks logo will be shown on the boxes

 Our cardboard boxes are marked with the following international symbols: fragile, keep dry, store vertically

 Place the packing list in a plastic bag outside the box

10. Storage of packed items

1. The goods are waiting to be delivered in a box. The packed goods must be placed on shelves in the packing area.

11. Delivery of the order

1. The packlist is prepared by the shipping department and printed on the printer in the packaging area. The packer places the printed packlist in a plastic bag placed on the packed box. The ready-delivered orders are grouped according to the carrier (this is indicated on the package list).

2. If several boxes are delivered together on a pallet, the delivery will provide the packer with the number of orders and packaging details (box number, size, weight) to be prepared on a pallet. In this case, it is sufficient to place the packing lists for pallet orders on top of the pallet, it does not have to be placed on the boxes separately.

3. If necessary (customs consignments), the delivery takes the customs documentation to the packaging area and adds it to the already prepared goods.

4. The shipping label on the boxes / pallets is prepared by the shipping department and handed over to the packaging. The task of the packer and delivery is to affix the label to the appropriate box. In most cases, the label includes the order number. This order number must always be reconciled with the order number on the box, and the delivery address shown on the packlist on the box must be compared with the delivery address on the label in order to avoid swapping.

5. Packages to be shipped by TNT, UPS, DHL Express carriers will be accompanied by a manifest at the end of the day, ie a closing at the end of the day. This documentation shows the total number of pieces shipped that day (how many inches will be shipped). This must be checked by calculation. The manifest is signed by the courier, which proves that the goods have been received. Fedex certifies the pickup with a signed shipping label.

6. In the case of other carriers, an acknowledgment of receipt must be signed with the carrier upon receipt. The receipt is attached to the shipment. The receipt includes the carrier's registration number. The goods can only be handed over to the driver of the vehicle with the given number plate. In case of discrepancy, contact the delivery. Signed documents must be delivered to the shipment, where they will be strapped and retained.

12. Packaging costs

1. The cost of durable or special packaging is an additional cost determined by Brooks Instrument's Packaging and Shipping Department.

13. Customer storage requirements

1. For long-term storage, packed products must be stored indoors or in accordance with the same storage requirements.

2. Adequate protection against fire, water, physical damage or damage must be provided. Adequate ventilation is required to prevent condensation.

5. Examples, schematic packages

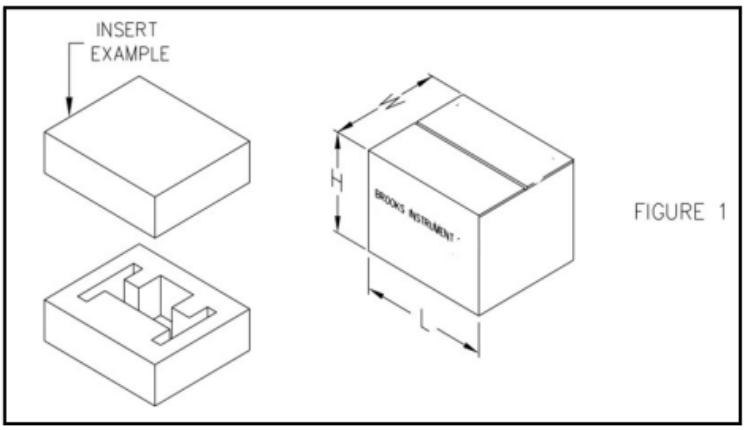
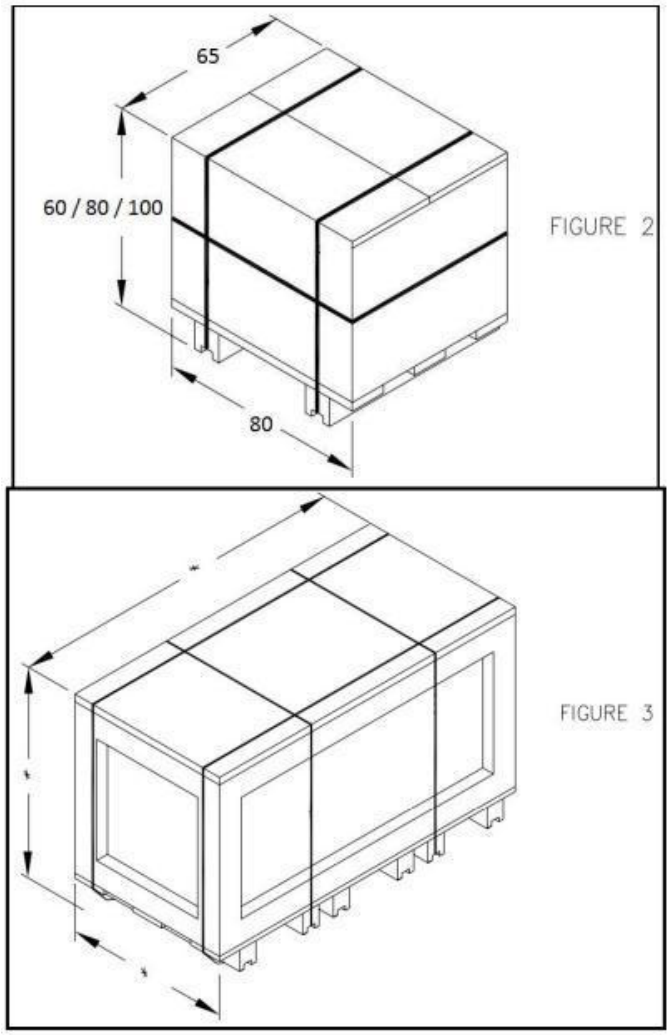
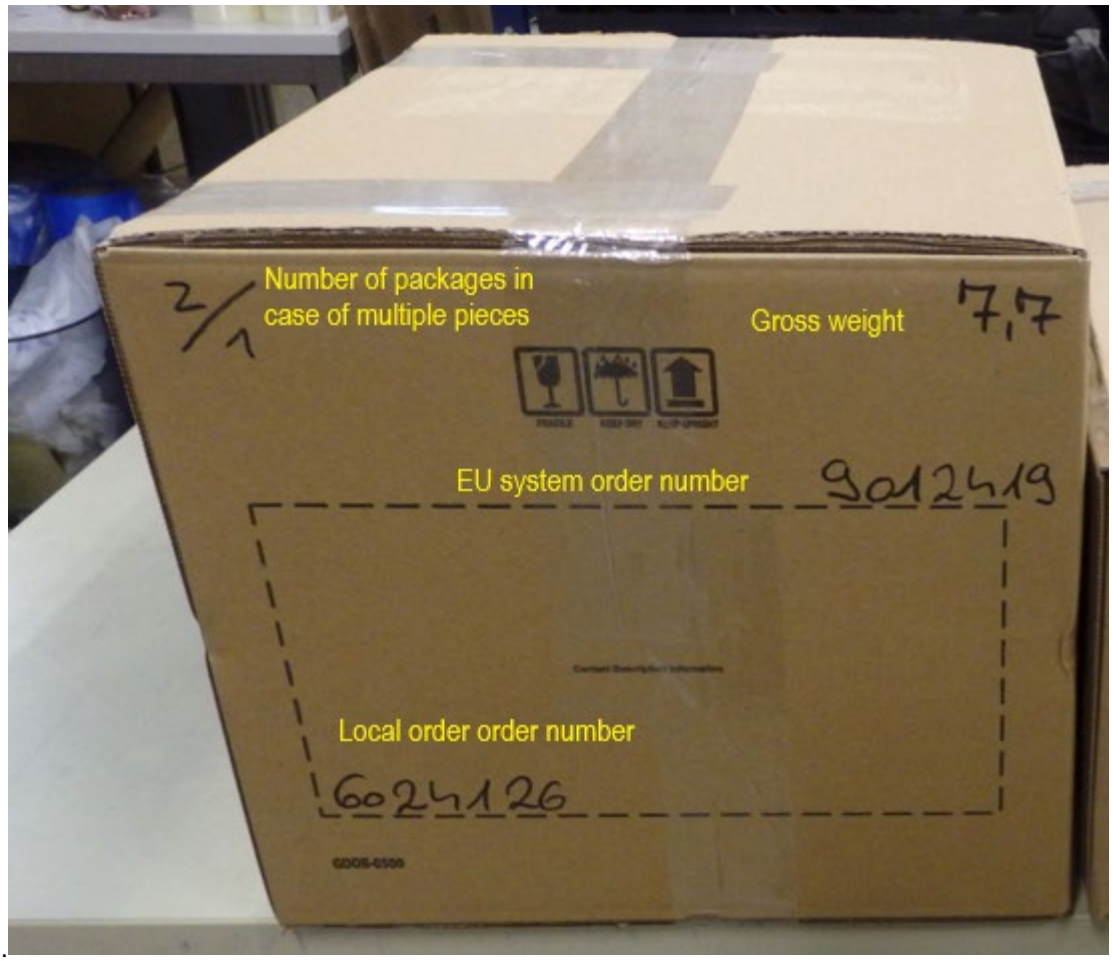


FIGURE 1



1. Box marking

2. 
Number of packages in
case of multiple pieces
2/1
Gross weight
7,7
EU system order number
9012419
Local order order number
6024126

2. Box strap


ups
BROOKS
411

3. Instrument placed into the box (with using of protector foam on the housing)



4. Pallet



5. Wooden case



020-A-100-QAM	Handling Storage Packing Preservation and Delivery
PAK060	Pre-Packaging of TMF devices
PAK062	Common packing procedure

Editor:	**Attila Demeter**	Authorization:	**Attila Demeter** **Petronella Farkas** **Zita Katona-Szollosi**	Effective:	**1997. 01. 28**

Section 2 CERTIFICATION DOSSIER

2.1 MANUFACTURING AND TESTING RECORD

MATERIAL CERTIFICATES

BROOKS INSTRUMENT

"This certificate is produced by an electronic data system and is valid without signature."

Title:	Inspection Certificate 3.1 - Material	Cert No.:	834-M-105-ZZA
Subtitle:	ISO 10474 / EN 10204	Revision Date:	Dec 14, 2012

Issue date: Sept 25, 2024
Customer name: ROSETTI MARINO S.p.A
Country: Italy
Customer ref.: PO 1724000791
Brooks order no.: SOJY007989
Supplier name: Brooks Instrument B.V.

Instrument serial nr.:	Body identification nr.:	Model number:	Tag number:
06C43100310	M495170012	#10-3809	25-FT-031
06C43100311	M495190011	#10-3809	25-FT-032
06C43100312	M495190003	#10-3809	25-FT-033
06C43100314	M495190013	#10-3809	25-FT-036
06C43100315	M495170007	#10-3809	25-FT-038

This is to certify that the instruments supplied on the above referenced order are in accordance with all applicable specifications, forming a part of the subject purchase order.

Verification of inspection results, in accordance with manufacturing standards and the corresponding technical rules, have proven to be in accordance with the requirements.

The listed components are covered by certificates, of which relevant copies are attached.

Description:	Specification:	Document nr.:
Flange Inlet / Outlet	1" ANSI 300 Lbs RF WN	202400010
Flow Tube	Tb. 1 1/4" - Sch. 80	202301665
Welding Filler Mat'l.	Rnd. 0.9 mm	202301269

Name: Andrea Halápi

Title: Quality Technician

BRH-QC 3

BROOKS INSTRUMENT

"This certificate is produced by an electronic data system and is valid without signature."

Title:	Inspection Certificate 3.1 - Material	Cert No.:	834-M-105-ZZA
Subtitle:	ISO 10474 / EN 10204	Revision Date:	Dec 14, 2012

Issue date: Sept 25, 2024
Customer name: ROSETTI MARINO S.p.A
Country: Italy
Customer ref.: PO 1724000791
Brooks order no.: SOJY007989
Supplier name: Brooks Instrument B.V.

Instrument serial nr.:	Body identification nr.:	Model number:	Tag number:
06C43100313	M637560009	#10-3809	25-FT-034

This is to certify that the instruments supplied on the above referenced order are in accordance with all applicable specifications, forming a part of the subject purchase order.

Verification of inspection results, in accordance with manufacturing standards and the corresponding technical rules, have proven to be in accordance with the requirements.

The listed components are covered by certificates, of which relevant copies are attached.

Description:	Specification:	Document nr.:
Flange Inlet / Outlet	1" ANSI 300 Lbs RF WN	202302843
Flow Tube	Tb. 1 1/4" - Sch. 80	202303446
Welding Filler Mat'l.	Rnd. 0.9 mm	202400386

Name: Andrea Halápi

Title: Quality Technician

BRH-QC 3

BROOKS INSTRUMENT

"This certificate is produced by an electronic data system and is valid without signature."

Title:	Inspection Certificate 3.1 - Material	Cert No.:	834-M-105-ZZA
Subtitle:	ISO 10474 / EN 10204	Revision Date:	Dec 14, 2012

Issue date: Sept 25, 2024
Customer name: ROSETTI MARINO S.p.A
Country: Italy
Customer ref.: PO 1724000791
Brooks order no.: SOJY007989
Supplier name: Brooks Instrument B.V.

Instrument serial nr.:	Body identification nr.:	Model number:	Tag number:
06C43100316	M647510002	#8-3809	64-FG-001

This is to certify that the instruments supplied on the above referenced order are in accordance with all applicable specifications, forming a part of the subject purchase order.

Verification of inspection results, in accordance with manufacturing standards and the corresponding technical rules, have proven to be in accordance with the requirements.

The listed components are covered by certificates, of which relevant copies are attached.

Description:	Specification:	Document nr.:
Flange Inlet / Outlet	1" ANSI 150 Lbs RF WN	202301194
Flow Tube	Tb. 27 x 3.5 mm	202302488
Welding Filler Mat'l.	Rnd. 0.9 mm	202400386

Name: Andrea Halápi

Title: Quality Technician

BRH-QC 3

HERTECANT
FLANGES

Tel.: +32 (0) 15 22 49 10
www.hertecantflanges.com

CERTIFICATE	No		Date	Your order	Our order
EN 10204 - 3.1	23705152-5	/	14/12/2023	P021508-00	64775

Buyer:	Requirements:	
BROOKS INSTRUMENT KFT BERÉNYI ÚT 100 H-8000 SZÉKESFEHERVAR Hungary	ASME B16.5 Rockwell HRC acc to NACE MR 01-75/01-03 - ISO15156 ASME SA 182 SECT II PART A ED 2021, YEAR ASTM 2021	

Grade:	Heat treatment:	Brand mark	Inspectors stamp
F316L/F316 ASTM A 182 / ASME SA 182	solution annealed at 1050 °C quenched in water	H S	P P

Marking: **Quantity:** 50

Heat + Prod.number / Description / Mark + Inspector stamp

292020 P89542 WELDING NECK 1" SOL CLASS 300 316L R.F. FORGINGS

Mechanical properties:

	Rp 0,2 % [N/mm2]	Rp 1,0 [N/mm2]	Rm [N/mm2]	Elongation (4D) %	Elongation (5D) %	Reduction of area [%]	Impact test 20° [J]			Avg	Lateral expansion
TANG	301	349	566	58.1		71	176	216	195	196	2.31-2.48-2.46
	HARDNESS HB BRINELL 2.5/187.5 KG RESULTS:						153-155				

DOCUMENT NR.
202400010

Chemical analysis (%) :

C	Si	Mn	P	S	Cr	Mo	Ni	Ti	N	Cu	Al
0.019	0.51	1.79	0.032	0.026	16.51	2.08	10.14		0.085		
B	Co	Nb	W	V	Ta	Fe					

Melting process / Producer E+AOD/VALBRUNA

Inspection and gauge measurement: No remarks

100% PMI test: Result :No remarks

IGC test : ASTM A262 Pract. E: No remarks

Certified acc. PED 2014/68/EU Annex 1, § 4.3 by certification Body -0036- of TÜV SÜD Industrie Service GMBH - Certificate Nr. 286/2006/MUC

The product mentioned herein complies with the specification and customers requirements.

Materials are free from mercury. Country of origin of the flanges is Belgium.

Materials are free of radio-active contamination.

Works inspector:
QUALITY CONTROL DEPARTMENT

Vets

TERMS AND CONDITIONS OF SALES ON OUR WEBSITE

HERTECANT FLANGES N.V.
Lossing 22
2260 Heultje - Westerlo (Belgium)
BTW/VAT/TVA N° BE 0466 169 726

Tel.: +32 (0) 15 22 49 10
www.hertecantflanges.com

Bank Belgium:
ING Lummen
IBAN BE89 3630 8481 1685
SWIFT-code: BBRUBEBB

KBC Westerlo
IBAN BE34 7330 4069 7590
SWIFT-code: KREDBEBB

Alleima

CERTIFICATE

A03/Z02
No. A/23-144587 **Rev** 00
Date 2023-02-16 **Page** 1/3

DOCUMENT NR.
202301665

A02/Z03
INSPECTION CERTIFICATE acc to
EN 10204 3.1

INSPECTION STAMP
QA-TUBE

A06
MERINOX
KLEINE BEER 18
2952 AS ALBLASSERDAM
THE NETHERLANDS

Customer References A07
ORDER 2023011
Customer order 2023-02-07

230-00991 MERIALBL-W

Alleima References A08

Order No.	Subs No.	Dispatch note
595096	717820	29020/54

Suppl. No	C.Code
300-51404	68

Material description B01/B04
SEAMLESS STAINLESS HOT FINISHED

Metallurgical process C70
Electric furnace

Steel/material Designations B02

Alleima	AISI
3R65	TP316L/TP316

EN no
1.4404/1.4401

Technical requirements B03
ASTM A-312-21, ASME SA-312-ED-21
ASTM A-376-19, ASME SA-376-ED-19
NACE MR0175/ISO 15156-3:-2015, NACE MR0103/ISO 17945-1:-2015
PED 2014/68/EU EN 10216-5 TC1
TOLERANCES ACC. ASTM A-999

EXTENT OF DELIVERY B07-B13

It	Product designation	Heat	Lot	Pieces	Kg	M
01	TST-E-316L-11/4-SCH80 42.16 X 4.85	566573	52650	24	716.0	163.10
			Total	24	716.0	163.10

TEST RESULTS
Chemical composition (weight%)

Heat	C	Si	Mn	P	S	Cr	Ni	Mo
566573	0.014	0.37	1.76	0.029	0.007	16.77	11.17	2.03

Heat	Co	Cu	N
566573	0.10	0.26	0.060

Chemical composition, product (weight%)

Heat	C	Si	Mn	P	S	Cr	Ni	Mo
566573	0.017	0.39	1.81	0.032	0.007	16.79	11.43	2.06

Heat	Co	Cu	N
566573	0.10	0.27	0.069

Quality assurance - Helen Jämtemyr / QA-manager A05/Z02
MTC Service / Certificates

A01 Alleima Tube AB
SE-81181 SANDVIKEN SWEDEN
Reg No. 556234-6832 VAT No. SE556234683201
www.alleima.com mtc_service@alleima.com

Tensile test at room temperature

	Yield strength		Tensile strength	Elongation	
	MPa	MPa	MPa	%	%
Lot	Rp0.2	Rp1.0	Rm	A	2"
52650	304	337	603	53	52

Hardness test

	Min	Max
Lot	HRB	HRB
52650	75	78

Following controls/tests have been satisfactorily performed:
- Flattening test.
- Flaring test
- 100% PMI-test.
- Intergranular corrosion test acc to ASTM A-262 PR.E
- Leak test: Eddy current test acc to EN ISO 10893-1 and ASTM Pr.E426 with drilled hole as reference standard in lieu of hydrostatic test.
- Visual inspection and dimensional control.

Heat Treatment:
Solution annealed at a temperature of Min 1040° C and quenched.

Marking:
ALLEIMA 3R65 ASTM A312/A376 ASME SA312/SA376 EN10216-5 TC1 TP 316/TP 316L EN 1 .4404/EN 1.4401 HFD SML ET 42.16 X 4.85 MM 1 1/4 SCH 80S HT 566573 SS LOT 5265 0 *QA-TUBE* MADE IN SWEDEN

The raw material is free from radioactive contamination.

Material free from mercury contamination.

No welding or weld repair.

DOCUMENT NR.
202301665

Surface condition:
Sizes
Below 1" Bright annealed polished.
From 1" and greater pickled and passivated in acc. to ASTM A380

Approved acc. AD 2000-Merkblatt W0 and certified acc. to Pressure Equipment Directive (2014/68/EU, Annex 1 para 4.3) by TUEV NORD; notified body, reg.no. 0045.

The number of tests are based on the size of the manufacturing lot before cutting to finished lengths.

The delivered products comply with the specifications and requirements of the order.

The material is manufactured according to a Quality system, approved and registered to ISO 9001:2015.

No unauthorized alterations. The contents of this Inspection Certificate may not be modified or revised in any way without the prior written approval of Alleima.
Unauthorized alterations to the Inspection Certificate, including introduction of false, fictitious or fraudulent statements or entries, may be punishable by fines, imprisonment, or both. This Inspection Certificate may be copied only in the manner and for the purposes specified in Section 6 of EN 10204:2004. Contravention of this notice will be prosecuted to the fullest extent of applicable law.

The certificate is produced with EDP and valid without signature.

DOCUMENT NR.
202301665

Alleima Tube AB
SE-81181 SANDVIKEN SWEDEN
Reg No. 556234-6832 VAT No. SE556234683201
www.alleima.com mtc_service@alleima.com

MERINOX
TUBING SPECIALIST

Merinox B.V.
Kleine Beer 18, 2952 AS Alblasserdam
PO box 23, 2950 AA Alblasserdam
The Netherlands

Phone | **+31 (0)78-691 78 00**
E-mail | info@merinox.nl
Web | www.merinox.eu

PACKINGLIST 20230815

Delivery address:
Brooks Instrument kft
Berényi út 72-100
8000 Székesfehérvár
Hungary

Packinglist date : 31-03-23
Order no. : 20230804
Delivery terms : Ex works Alblasserdam
Handled by : Marijke den Hartog
Account no. : 2660
Client reference : P016176
Ordered by : A. Sziklásiné Nagy

Quantity	Unit	Description	Country of origin	Commodity code	Heatno.	
6,20	Mtr.	St. st. smls. pipe tp 316/L acc. ASTM A 312 Size: 1.1/4" Sch 80s	Sweden	73041100	564831	184,66
6,88	Mtr.	St. st. smls. pipe tp 316/L acc. ASTM A 312 Size: 1.1/4" Sch 80s	Sweden	73041100	566573	163,10
6,90	Mtr.	St. st. smls. pipe tp 316/L acc. ASTM A 312 Size: 2" Sch 80s	Austria	73041100	372370	142,82
1,00	Pcs.	Certificate EN 10204/3.1 free of charge	-		-	

DOCUMENT NR.
202301665

Nett. weight : 112 kgs.
Dispatched by : Customer Transport

Op al onze aanbiedingen en alle met ons af te sluiten overeenkomsten zijn onze algemene verkoopvoorwaarden van toepassing. Voor het raadplegen en downloaden daarvan zie www.merinox.nl/nl/voorwaarden.

Our general terms and conditions shall apply to all our offers and all contracts to be concluded. To consult and download them, see www.merinox.nl/nl/voorwaarden.

Nos conditions générales de vente s'appliquent à toutes nos offres et à tous les contrats à conclure avec nous. Pour les consulter et les télécharger, rendez-vous sur www.merinox.nl/nl/voorwaarden.

Auf unsere Angebote und mit uns zu schließende Verträge finden durchweg unsere Allgemeine Verkaufsbedingungen Anwendung. Sie finden diese zum Nachlesen und Downloaden auf www.merinox.nl/nl/voorwaarden.

ARCOS INDUSTRIES, LLC
394 ARCOS DRIVE
MT. CARMEL, PA 17851
(570) 339-5200
arcos@arcos.us

CERTIFICATION OF TESTS

EN 10204 3.1

DATE 1/24/2023

GRADE	316/316L
LOT NO.	XU1193
HEAT NO.	564427
SIZE	.035"
CLASS	ER316/316L
SPECIFICATION	AWS A5.9-2012
	ASME SFA 5.9, Section II, Part C
	2021 Edition

DOCUMENT NR.
202301269

ACTUAL CHEMICAL ANALYSIS: WIRE

C	Mn	Si	S	P	Cr	Ni	Mo	Nb+Ta	Ti	Co	Cu	Fe	V
0.01	1.5	0.40	0.001	0.011	18.4	12.1	2.18	0.03	0.003	0.03	0.05	BAL	0.05
N	Others												
0.02	<0.50												

FERRITE ANALYSIS:
8 FN WRC

UNS Number: S31680/31683
Lot Classification: S1
Intensity of Testing: Schedule F

MANUFACTURED IN THE USA.

THIS MATERIAL IS FREE FROM MERCURY, RADIUM, OR ALPHA PARTICLE CONTAMINATION.
We hereby affirm that the reported results on this certification are correct and accurate. All tests and results and operations performed by Arcos or its subcontractors are in compliance with the applicable material/customer specification, and purchase order requirements.

ARCOS

Sean Williams
Sean Williams
QA Manager
Quality Assurance Department

HERTECANT
FLANGES

Tel.: +32 (0) 15 22 49 10

www.hertecantflanges.com

CERTIFICATE

No	Date	Your order	Our order
EN 10204 - 3.1	23702698-2 / 6/07/2023	P018016-00	62470

Buyer:	Requirements:	
BROOKS INSTRUMENT KFT BERÉNYI ÚT 100 H-8000 SZÉKESFEHERVAR Hungary	ASME B16.5 Rockwell HRC acc to NACE MR 01-75/01-03 - ISO15156 ASME SA 182 SECT II PART A ED 2021, YEAR ASTM 2021	

Grade:	Heat treatment:	Brand mark	Inspectors stamp
F316L/F316 ASTM A 182 / ASME SA 182	solution annealed at 1050 °C quenched in water	H I S	P P

Marking: **Quantity:** 50

Heat + Prod.number / Description / Mark + Inspector stamp

E221769 P85783 WELDING NECK 1" SOL CLASS 300 316L R.F. FORGINGS

Mechanical properties:

	Rp 0,2 % [N/mm2]	Rp 1,0 [N/mm2]	Rm [N/mm2]	Elongation (50mm) %	Elongation (5D) %	Reduction of area [%]	Impact test 20° [J]			Avg	Lateral expansion
TANG	353	394	606	52.8		64	152	146	157	152	2.16-2.14-2.24
	HARDNESS HB BRINELL 2.5/187.5 KG RESULTS:						187				

DOCUMENT NR.

20230283

Chemical analysis (%) :

C	Si	Mn	P	S	Cr	Mo	Ni	Ti	N	Cu	Al
0.023	0.45	1.68	0.031	0.027	16.87	2.05	10.09		0.078		
B	Co	Nb	W	V	Ta	Fe					
0.0005	0.32										

Melting process / Producer	EAF+AOD OUTOKUMPU

Inspection and gauge measurement:	100% PMI test:	IGC test :
No remarks	Result :No remarks	ASTM A262 Pract. E: No remarks

Certified acc. PED 2014/68/EU Annex 1, § 4.3 by certification Body -0036- of TÛV SÛD Industrie Service GMBH - Certificate Nr. 286/2006/MUC

The product mentioned herein complies with the specification and customers requirements.

Materials are free from mercury. Country of origin of the flanges is Belgium.

Materials are free of radio-active contamination.

Works inspector:

QUALITY CONTROL DEPARTMENT

Vets

TERMS AND CONDITIONS OF SALES ON OUR WEBSITE

HERTECANT FLANGES N.V.
Lossing 22
2260 Heultje - Westerlo (Belgium)
BTW/VAT/TVA N° BE 0466 169 726

Tel.: +32 (0) 15 22 49 10
www.hertecantflanges.com

Bank Belgium:
ING Lummen
IBAN BE89 3630 8481 1685
SWIFT-code: BBRUBEBB

KBC Westerlo
IBAN BE34 7330 4069 7590
SWIFT-code: KREDBEBB

Alleima

CERTIFICATE

A03/Z02 **No. A/23-164268** **Rev** 00
Date 2023-08-23 **Page** 1/3

DOCUMENT NR.
20230344 6

A02/Z03
INSPECTION CERTIFICATE acc to
EN 10204 3.1

INSPECTION STAMP
QA-TUBE

A06
MERINOX
KLEINE BEER 18
2952 AS ALBLASSERDAM
THE NETHERLANDS

Customer References A07
2023093
Customer order 2023-08-22

230-00991 MERIALBL-W

Alleima References A08

Order No.	Subs No.	Dispatch note
601180	721699	36485/54
Suppl. No	**C.Code**	
300-55227	69	

Material description B01/B04
SEAMLESS STAINLESS HOT FINISHED

Metallurgical process C70
Electric furnace+AOD

Steel/material Designations B02

Alleima	AISI
3R65	TP316L/TP316
UNS	**EN no**
S31600/S31603	1.4404/1.4401

Technical requirements B03
ASTM A-312-21, ASME SA-312-ED-21.
ASTM A-376-22, ASME SA-376-ED-19.
NORSOK M-630:2020, NORSOK MDS S11 REV.1
IOGP S-563 DEC 2018, MDS IS101/101S REV 01, ISO 17781:2017
NACE MR0175/ISO 15156-3:-2015, NACE MR0103/ISO 17945-1:-2015
PED 2014/68/EU EN 10216-5 TC1, TOLERANCES ACC. ASTM A-999

EXTENT OF DELIVERY B07-B13

It	Product designation	Heat	Lot	Pieces	Kg	M
01	TST-E-316L-11/4-SCH80 42.16 X 4.85	566787	52787	19	581.0	128.26
			Total	19	581.0	128.26

TEST RESULTS

Chemical composition (weight%)

Heat	C	Si	Mn	P	S	Cr	Ni	Mo
566787	0.012	0.39	1.62	0.031	0.009	16.73	11.21	2.02

Heat	Co	Cu	N
566787	0.12	0.30	0.061

Chemical composition, product (weight%)

Heat	C	Si	Mn	P	S	Cr	Ni	Mo
566787	0.015	0.40	1.63	0.032	0.009	16.74	11.32	2.03

Heat	Co	Cu	N
566787	0.12	0.31	0.060

Quality assurance - Helen Jämtemyr / QA-manager A05/Z02
MTC Service / Certificates

A01 Alleima Tube AB
SE-81181 SANDVIKEN SWEDEN
Reg No. 556234-6832 VAT No. SE556234683201
www.alleima.com mtc_service@alleima.com

Tensile test at room temperature acc. to ASTM A370/ISO 6892-1
Longitudinal

	Yield strength		Tensile strength	Elongation	
	Mpa	MPa	Mpa	%	%
Lot	Rp0.2	Rp1.0	Rm	A	2"
52787	267	296	580	48	46

Hardness test acc to ASTM A-370

	Min	Max
Lot	HRB	HRB
52787	78	79

Following controls/tests have been satisfactorily performed:
- Flattening test according to ASME SA-999.
- Flaring test according to EN ISO 8493.
- 100% PMI-test.
- Intergranular corrosion test acc to ASTM A-262 PR.E and EN ISO 3651-2A
- Leak test: Eddy current test acc to EN ISO 10893-1 and ASTM Pr.E426 with drilled hole as reference standard in lieu of hydrostatic test.
- Visual inspection and dimensional control.

Heat Treatment:
Solution annealed at a temperature of Min 1040° C and quenched.

Marking:
ALLEIMA 3R65 ASTM A312/A376 ASME SA312/SA376 EN10216-5 TC1 TP 316/TP 316L EN 1 .4404/EN 1.4401 HFD SML ET 42.16 X 4.85 MM 1 1/4 SCH 80S HT 566787 SS LOT 5278 7 *QA-TUBE* MADE IN SWEDEN

The raw material is free from radioactive contamination.

Material free from mercury contamination.

Surface condition:
Sizes
Below 1" Bright annealed polished.
From 1" and greater pickled and passivated in acc. to ASTM A380

Approved acc. AD 2000-Merkblatt W0 and certified acc. to Pressure Equipment Directive (2014/68/EU, Annex 1 para 4.3) by TUEV NORD; notified body, reg.no. 0045.

The number of tests are based on the size of the manufacturing lot before cutting to finished lengths.

The delivered products comply with the specifications and requirements of the order.

The material is manufactured according to a Quality system, approved and registered to ISO 9001:2015.

DOCUMENT NR.
202303446

No unauthorized alterations. The contents of this Inspection Certificate may not be modified or revised in any way without the prior written approval of Alleima.
Unauthorized alterations to the Inspection Certificate, including introduction of false, fictitious or fraudulent statements or entries, may be punishable by fines, imprisonment, or both. This Inspection Certificate may be copied only in the manner and for the purposes specified in Section 6 of EN 10204:2004. Contravention of this notice will be prosecuted to the fullest extent of applicable law.

The certificate is produced with EDP and valid without signature.

Alleima, formerly Sandvik Materials Technology. During a brand transition period, both Sandvik and Alleima marking on products may exist.

DOCUMENT NR.
202303446

ARCOS INDUSTRIES, LLC
394 ARCOS DRIVE
MT. CARMEL, PA 17851
(570) 339-5200
arcos@arcos.us

CERTIFICATION OF TESTS

EN 10204 3.1

DATE 1/26/2024

GRADE	316/316L
LOT NO.	XU1336
HEAT NO.	E221798-1
SIZE	.035"
CLASS	ER316/316L
SPECIFICATION	AWS A5.9-2022
	ASME SFA 5.9, Section II, Part C
	2023 Edition

DOCUMENT NR.
202400386

ACTUAL CHEMICAL ANALYSIS: WIRE

C	Mn	Si	S	P	Cr	Ni	Mo	Nb+Ta	Ti	Co	Cu	Fe	V
0.02	1.6	0.34	0.011	0.015	18.2	12.0	2.60	0.01	0.001	0.12	0.13	BAL	0.06
N	Others												
0.05	<0.50												

FERRITE ANALYSIS:
7 FN WRC

UNS Number: S31680/31683
Lot Classification: S1
Intensity of Testing: Schedule F

MANUFACTURED IN THE USA.

THIS MATERIAL IS FREE FROM MERCURY, RADIUM, OR ALPHA PARTICLE CONTAMINATION.

We hereby affirm that the reported results on this certification are correct and accurate. All tests and results and operations performed by Arcos or its subcontractors are in compliance with the applicable material/customer specification, and purchase order requirements.

ARCOS

Sean Williams

Sean Williams
QA Manager
Quality Assurance Department

HERTECANT
FLANGES

Tel.: +32 (0) 15 22 49 10
www.hertecantflanges.com

CERTIFICATE	No		Date	Your order	Our order
EN 10204 - 3.1	23700268-2	/	17/01/2023	P014345-00	60349

Buyer:	Requirements:	
BROOKS INSTRUMENT KFT BERÉNYI ÚT 100 H-8000 SZÉKESFEHERVAR Hungary	ASME B16.5 Rockwell HRC acc to NACE MR 01-75/01-03 - ISO15156 ASME SA 182 SECT II PART A ED 2021, YEAR ASTM 2021	

Grade:	Heat treatment:	Brand mark	Inspectors stamp
F316L/F316 ASTM A 182 / ASME SA 182	solution annealed at 1050 °C quenched in water	H S	P P

Marking: **Quantity:** 80

Heat + Prod.number / Description / Mark + Inspector stamp

281716 P80533 WELDING NECK 1" SOL CLASS 150 316L R.F. FORGINGS

Mechanical properties:

	Rp 0,2 % [N/mm2]	Rp 1,0 [N/mm2]	Rm [N/mm2]	Elongation (50mm) %	Elongation (5D) %	Reduction of area [%]	Impact test 20° [J]			Avg	Lateral expansion
TANG	323	373	598	53.7		76	197	273	196	222	2.52-2.55-2.36
	HARDNESS HB BRINELL 2.5/187.5 KG RESULTS:						165-171				

DOCUMENT NR.

202301194

Chemical analysis (%) :

C	Si	Mn	P	S	Cr	Mo	Ni	Ti	N	Cu	Al
0.014	0.42	1.72	0.031	0.017	16.76	2.08	10.12		0.083		
B	Co	Nb	W	V	Ta	Fe					

Melting process / Producer	E+AOD/VALBRUNA	
Inspection and gauge measurement: No remarks	100% PMI test: Result :No remarks	IGC test : ASTM A262 Pract. E: No remarks

Certified acc. PED 2014/68/EU Annex 1, § 4.3 by certification Body -0036- of TÜV SÜD Industrie Service GMBH - Certificate Nr. 286/2006/MUC

The product mentioned herein complies with the specification and customers requirements.

Materials are free from mercury. Country of origin of the flanges is Belgium.

Materials are free of radio-active contamination.

Works inspector:

QUALITY CONTROL DEPARTMENT

Vets

TERMS AND CONDITIONS OF SALES ON OUR WEBSITE

HERTECANT FLANGES N.V.
Lossing 22
2260 Heultje - Westerlo (Belgium)
BTW/VAT/TVA N° BE 0466 169 726

Tel.: +32 (0) 15 22 49 10
www.hertecantflanges.com

Bank Belgium:
ING Lummen
IBAN BE89 3630 8481 1685
SWIFT-code: BBRUBEBB

KBC Westerlo
IBAN BE34 7330 4069 7590
SWIFT-code: KREDBEBB

finetubes AMETEK SPECIALTY METAL PRODUCTS
Plymbridge Road
Plymouth
PL6 7LG
UNITED KINGDOM
tel +44 (0) 1752 735851
sales +44 (0) 1752 876418
email sales.finetubes@ametek.com
www.finetubes.com

Test Certificate Number 182536

Customer Order Number 2022067*001 **Fine Tubes Reference Number** 249227 **Works Order Number** T249227*1 **Customer Part/Drawing**	**Customer** Merinox BV Indust Vinkenwaard Postbus 23 AA Alblasserdam The Netherlands **Dimensions** O.D. : 27.000 mm Wall : 3.500 mm	**Material Designation** UNS S31603/316L Stainless Steel **Form** Cold Drawn Seamless Tube **Temper** Bright Solution Annealed **Quantity** 294.000 MTR in 98 pieces

Specification

FT2184 Latest Issue
Complying To ASTM A269/A269M-15a(2019)
& ASTM A213/A213M-21b Average Wall
Non-Standard Tolerances
100% Eddy Current Tested

Raw/Starting Material

Cast/Heat Number → RM183
Melt Method EAF+VOD
Origin/Source/Country of Melt France
Origin/Country of Manufacture France

	C %	Mn %	P %	S %	Si %	Ni %	Cr %	Mo %	N2 %
Top	0.016	1.86	0.019	0.0080	0.39	11.10	16.80	2.10	0.06

Mechanical Properties

Tensile Stress (Rm) (MPa)	0.2% Proof Stress (Rp:0.2) (MPa)	% Elongation 2"	Hardness HV/30.0	Hardness HRB Converted Value
596	292	64	176-177	76.9-77.3

DOCUMENT NR.
202302488

Tests Performed And Accepted

Flattening	Satisfactory	**Eddy Current Test**	Satisfactory
Flare Test	Satisfactory	**Visual Assessment/Dimensions**	Satisfactory

Declaration of Conformity

This is to certify that, unless otherwise stated above, the whole of the tubing detailed hereon has been manufactured, tested and inspected in the United Kingdom. The material complies with the terms of the contract/order applicable thereto and fully conforms in all respects to the specifications listed and released
In accordance with BS EN 10204:2004 Type 3.1 / DIN EN 10204:2004 Type 3.1.
In accordance with PED 2014/68/EU - Certificate Number 07/202/1326/WZ/2541/21
& AD 2000-Merkblatt W0 - Certificate Number 07/203/1326/WP/2541/21.

Continued on Page 2

I.Olney 30/03/23

Registered in England No. 381169 Reg Office, Fine Tubes Ltd, PO Box 38, 2 New Star Road, Leicester, LE4 9JD VAT Reg GB 143 3561 19

finetubes AMETEK SPECIALTY METAL PRODUCTS
Plymbridge Road
Plymouth
PL6 7LG
UNITED KINGDOM
tel +44 (0) 1752 735851
sales +44 (0) 1752 876416
email sales.finetubes@ametek.com
www.finetubes.com

Test Certificate Number
182536

Customer Order Number
2022067*001

Fine Tubes Reference Number
249227

Works Order Number
T249227*1

Customer Part/Drawing

Customer
Merinox BV
Indust Vinkenwaard
Postbus 23

AA Alblasserdam
The Netherlands

Dimensions
O.D. : 27.000 mm
Wall : 3.500 mm

Material Designation
UNS S31603/316L Stainless Steel

Form
Cold Drawn Seamless Tube

Temper
Bright Solution Annealed

Quantity
294.000 MTR in 98 pieces

Additional Information

Material free from mercury and radioactive contamination.
Compliant with ANSI/NACE MR0175/ISO15156 & ANSI/NACE MR0103/ISO17945.

DOCUMENT NR.
202302488

Nadcap

I.Olney 30/03/23

PED COMPLIANCE CERTIFICATION

FULL QUALITY ASSURANCE CERTIFICATE

Certificate No.:
10000454590-PA-ACCREDIA-NLD

Initial date:
2002-07-03

Validity:
05 July, 2023 - 04 July, 2026

This certificate consists of 2 pages

This is to certify that the quality system of:

Brooks Instrument LLC

407 West Vine Street, PA 19440 Hatfield, United States of America

has been assessed and found to comply with respect to the conformity assessment procedure described in:

ANNEX III MODULE H OF DIRECTIVE 2014/68/EU ON PRESSURE EQUIPMENT

This certificate is valid for the following scope:

Type of Pressure Equipment	**Pressure Accessories**
Product Name	**Precision fluid measurement and control instruments**

Place and date:
Vimercate, 04 July 2023

Check Validity

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

SGQ N° 003 A
SGA N° 003 D
SGE N° 007 M
SCR N° 004 F
EMAS N° 009 P
PRD N° 003 B
PRS N° 094 C
SSI N° 002 G

Membro di MLA EA per gli schemi di accreditamento SGQ, SGA, PRD, PRS, ISP, GHG, LAB e LAT, di MLA IAF per gli schemi di accreditamento SGQ, SGA, SSI, FSM e PRD e di MRA ILAC per gli schemi di accreditamento LAB, MED, LAT e ISP

For the issuing office:
Notified Body 0496, Italy
DNV Business Assurance Italy S.r.l.

Maurizio Bellina
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.

DMSP-5-PA-PED-05-A9 rev.0

NOTIFIED BODY 0496: DNV Business Assurance Italy S.r.l. Via Energy Park, 14, 20871 Vimercate (MB), Italy. Tel: 039 68 99 905., www.dnv.com

Jurisdiction

Application of Directive 2014/68/EU and Decreto Legislativo n. 26 of 15 February 2016.

Certificate history:

Revision	Description	Issue Date
02-SKM-H-146535-00	Certification Brooks Instrument B.V. by DNV, PED 97/23/EC, Module H	2002-07-03
05-PED-ROT-H-05.3960-00	Re-Certification	2005-11-16
08-PED-ROT-H-08.4390-01	Re-Certification Brooks Instrument LLC by DNV	2008-06-06
11-PED-ROT-H-11.007820-01	Re-Certification	2011-07-03
14-PED-ROT-H-14.A0006826-01	Re-Certification	2014-07-03
14-PED-ROT-H-14.A0006826-01, R1	Revision DNV GL entity	2016-07-19
17-PED-ROT-H-16.Z0553001-01	Re-certification	2017-07-04
17-PED-ROT-H-16.Z0553001-01 R1	Location Veenendaal removed from certificate, ISO 9001:2015 certificate reference updated	2019-03-13
20-PED-ROT-H-16.Z0553001-01	Re-certification	2020-09-03
10000454590-PA-ACCREDIA-NLD rev. 0	Transfer of certificate to EU-CAB 0496	2021-10-04
10000454590-PA-ACCREDIA-NLD rev. 1	Re-certification	2023-07-04

Products covered by this Certificate:

Product Name	Product Description	Type of material	Applied product standard
Pressure Accessories	Precision fluid measurement and control instruments	Austenitic stainless steels Nickel Chrome alloys Titanium alloys	AD 2000 Merkblätter ASME B31.3 ASME VIII, div. 1

Sites covered by this certificate

Site Name	Site Address	Audited by	Date	Report ref
Central Office - Brooks Instrument LLC Manufacturing by assembly and testing	407 West Vine Street, Hatfield, PA, 19440, USA	R-J Kaagman	2023-06-29&30	SC239685-2023-AP-RC-00
Manufacturing location - Brooks Instrument Kft Manufacturing by welding, assembly and testing	Berényi út 72-100, Székesfehérvár, Hungary	Peter Éros	2023-06-21&22	239685-2023/06/21–RP/RC-00

Terms and conditions

Valid terms and conditions are found in the DNV´s PED Certification Requirements

End of Certificate

MANUFACTURERS DECLARATION OF CONFORMITY

BROOKS INSTRUMENT
Beyond Measure

CE

EU Declaration of Conformity
EU-Konformitätserklärung/ Déclaration UE de conformité
No: BID 054 Rev. N

We/ Wir/ Nous,
Brooks Instrument LLC, 407 West Vine Street, Hatfield, PA 19440, USA

declare under our sole responsibility that the product,
erklären in alleiniger Verantwortung, dass das Produkt/ déclarons sous notre seule responsabilité que le produit,

manufactured by/ Hergestellt durch /fabriqué par
Brooks Instrument LLC, 407 West Vine Street, Hatfield, PA 19440, USA

MT 3809G Series Flow Meters

to which this declaration relates, is in conformity with the provisions of the European Community Directives, including the latest amendments, as shown in the attached schedule.
auf das sich diese Erklärung bezieht, in Übereinstimmung mit den Bestimmungen der Richtlinien der Europäischen Gemeinschaft, den letzten Änderungen einschließlich, wie in der beigefügten Tabelle angegeben.
à laquelle se réfère cette déclaration, est conforme aux dispositions des directives communautaires européennes, y compris les dernières modifications, comme indiqué dans l'annexe ci-jointe.

Conformity assessment is based on the application of the applied standards and when applicable or required, a European Community notified body certification, as shown in the attached schedule.
Die Konformitätsbewertung beruht auf der Anwendung der anzuwendenden Standards und, falls erforderlich, auf einer Zertifizierung durch eine durch die Europäische Gemeinschaft benannten Stelle, wie in der beigefügten Tabelle angegeben.
L'Évaluation de la conformité est basée sur l'application des normes standards applicables et le cas échéant ou nécessaire, d'un organisme certifié par la Communauté Européenne, comme le montre le tableau ci-joint.

August 22, 2023
(Date of issue)

John Ruszkowski
Approvals Engineer

Brooks Instrument | 407 West Vine Street | Hatfield, PA 19440 | USA | T : 1-215-362-3500 | F : 1-215-362-3745
www.BrooksInstrument.com

BROOKS INSTRUMENT
Beyond Measure

EU Declaration of Conformity
EU-Konformitätserklärung/ Déclaration UE de conformité
No: BID 054 Rev. N

Directive/ Richtlinie/ Directive		harmonized standards harmonisierte Normen normes harmonisées	Marking Kennzeichen Repères
2014/30/EU	Electromagnetic Compatibility Elektromagnetische Verträglichkeit Compatibilité électromagnétique	EN 61326-1: 2013	CE
2011/65/EU 2015/863	RoHS Directive RoHS-Richtlinie Directive RoHS	EN 63000:2018	CE

Directive/ Richtlinie/ Directive		Category Kategorie Catégorie	Certificate Zertifikat Certificat	harmonized standards harmonisierte Normen normes harmonisées	Marking Kennzeichen Repères
2014/34/EU	ATEX Directive ATEX Richtlinie Directive ATEX	II 2 G II 2 D	DEKRA 13ATEX 0086 X	EN IEC 60079-0:2018 EN 60079-1:2014, EN 60079-31:2014	CE 0344
		II 1 G II 2 G II 2 D	DEKRA 13ATEX 0086 X	EN IEC 60079-0:2018 EN 60079-11:2012	CE 0344
		II 3 G II 3 D	DEKRA 21ATEX0326 X	EN IEC 60079-0:2018 EN 60079-7:2015+A1:2018 EN 60079-11:2012, EN 60079-31:2014	CE
		II 2 G II 2 D	DEKRA 203104000-1604 X	EN ISO 80079-36:2016 EN ISO 80079-37:2016	CE

EC type Examinations and Quality Assurance
Notified Body/ Benannte Stelle/ Organisme notifié :
DEKRA Certification B.V. (CAB no. 0344)
Meander 1051, 6825 MJ Arnhem/ PO Box 5185, 6802 ED Arnhem, The Netherlands
Certificate: DEKRA 13ATEXQ0134

2014/68/EU	Pressure Equipment Directive/ Druckgeräterichtlinie/ Directive équipements sous pression				
Assessment Konformitätsbewertung Eval. de conformité	Category Kategorie Catégorie	Model Code Position Modell Code Position Produit Position Code modèle	harmonized standards/ harmonisierte Normen normes harmonisées		Marking Kennzeichen Repères
			Weld-Neck Flange or Male/Female Threaded Conn.	Welded slip-on Flange	
Module H	I, II, III	8 & 9 = 10, 12, 13, 15, 16	ASME B31.3	AD 2000 Merkblatter	CE 0496
Module H	I, II, III	5 & 6 = GZ			
Art 4.3 SEP	Art 4.3	8 & 9 = 00, 01, 02, 03, 04, 05, 06, 07, 08	ASME B31.3	AD 2000 Merkblatter	n.a

Notified Body/ Benannte Stelle/ Organisme notifié :
DNV Business Assurance Italy S.r.l Via Energy Park, 14, 20871 Vimercate (MB), Italy.
Certificate: 10000454590-PA-ACCREDIA-NLD

BROOKS INSTRUMENT
Beyond Measure

EU-verklaring van overeenstemming
Declaración de conformidad de la UE/ Declaração de Conformidade da UE
No: BID 054 Rev. N

Wij/ Nosotros/ Nós,
Brooks Instrument LLC, 407 West Vine Street, Hatfield, PA 19440, USA

verklaren onder eigen verantwoordelijkheid dat het product,
declaramos bajo nuestra única responsabilidad que el producto/ declaramos sob nossa única responsabilidade que o produto,

gemaakt door/ fabricado por/ fabricado por
Brooks Instrument LLC, 407 West Vine Street, Hatfield, PA 19440, USA

MT 3809G Series Flow Meters

waarop deze verklaring betrekking heeft, in overeenstemming is met de bepalingen in de richtlijnen van de Europese Gemeenschap, met inbegrip van de meest recente wijzigingen, zoals weergegeven in onderstaand schema.
a la que se refiere esta declaración, está de acuerdo con las disposiciones de las directivas comunitarias europeas, incluidas las últimas modificaciones, como se muestra en el anexo.
a que se refere esta declaração, está em conformidade com as disposições das directivas comunitárias europeias, incluindo as últimas alterações, como mostra a tabela anexa.

Beoordeling van de conformiteit is gebaseerd op de toepassing van de geharmoniseerde normen en, indien van toepassing of vereist, certificering door een aangemelde instantie van de Europese Unie, zoals weergegeven in onderstaand schema.
Evaluación de la conformidad se basa en la aplicación de las normas aplicadas y cuando corresponda o se requiera, una Comunidad Europea notificó a la certificación del cuerpo, como se muestra en el anexo.
Avaliação da conformidade é baseada na aplicação das normas aplicadas e, quando aplicável ou necessário, a Comunidade Europeia certificação do organismo notificado, como mostra a tabela anexa.

BROOKS INSTRUMENT
Beyond Measure

EU-verklaring van overeenstemming
Declaración de conformidad de la UE/ Declaração de Conformidade da UE
No: BID 054 Rev. N

Richtlijn / Directiva / Directiva		geharmoniseerde normen normas armonizadas normas harmonizadas	Markering Calificación marca
2014/30/EU	Elektromagnetische compabiliteit Compatibilidad electromagnética Compatibilidade eletromagnética	EN 61326-1: 2013	CE
2011/65/EU 2015/863	RoHS-richtlijn Directiva RoHS Directiva RoHS	EN 63000:2018	CE

Directive/ Richtlinie/ Directive		Category Kategorie Catégorie	Certificate Zertifikat Certificat	harmonized standards harmonisierte Normen normes harmonisées	Marking Kennzeichen Repères
2014/34/EU	ATEX Directive Directiva ATEX Directiva ATEX	II 2 G II 2 D	DEKRA 13ATEX 0086 X	EN IEC 60079-0:2018 EN 60079-1:2014, EN 60079-31:2014	CE 0344
		II 1 G II 2 G II 2 D	DEKRA 13ATEX 0086 X	EN IEC 60079-0:2018 EN 60079-11:2012	CE 0344
		II 3 G II 3 D	DEKRA 21ATEX0326 X	EN IEC 60079-0:2018 EN 60079-7:2015+A1:2018 EN 60079-11:2012, EN 60079-31:2014	CE
		II 2 G II 2 D	DEKRA 203104000-1604 X	EN ISO 80079-36:2016 EN ISO 80079-37:2016	CE

EC type Examinations and Quality Assurance
Notified Body/ Cuerpo notificado/ Organismo notificado :
DEKRA Certification B.V. (CAB no. 0344)
Meander 1051, 6825 MJ Arnhem/ PO Box 5185, 6802 ED Arnhem, The Netherlands
Certificate: DEKRA 13ATEXQ0134

2014/68/EU	Richtlijn Drukapparatuur / Directiva de Equipos a Presión / Directiva de Equipamentos de Pressão				
Beoordeling Evaluación avaliação	Categorie Categoría Categoria	Product Model Code Position Producto Código del modelo Posición Produto Modelo Código Posição	geharmoniseerde normen/ normas armonizadas/ normas harmonizadas		Markering Calificación marca
			Weld-Neck Flange or Male/Female Threaded Conn.	Welded slip-on Flange	
Module H	I, II, III	8 & 9 = 10, 12, 13, 15, 16	ASME B31.3	AD 2000 Merkblatter	CE 0496
Module H	I, II, III	5 & 6 = GZ			
Art 4.3 SEP	Art 4.3	8 & 9 = 00, 01, 02, 03, 04, 05, 06, 07, 08	ASME B31.3	AD 2000 Merkblatter	n.a

Notified Body/ Cuerpo notificado/ Organismo notificado:
DNV Business Assurance Italy S.r.l Via Energy Park, 14, 20871 Vimercate (MB), Italy.
Certificate: 10000454590-PA-ACCREDIA-NLD

DIMENSIONAL CHECK RECORDS

BROOKS® INSTRUMENT

Visual and Dimensional Inspection Report

Project name:	HOLLANDSE KUST NOORD WIND PARK Project
Name of owner:	ROSETTI MARINO S.p.A
Purchase order nr.:	PO 1724000791
Reference nr.:	SOJY007989
Subject:	Visual and Dimensional check
Quantity:	7 pcs
Reference Document nr.:	1724000791-IN-DA-00003 Rev. 03

Serial number	Tag number
06C43100310	25-FT-031
06C43100311	25-FT-032
06C43100312	25-FT-033
06C43100313	25-FT-034
06C43100314	25-FT-036
06C43100315	25-FT-038
06C43100316	64-FG-001

Test	Result	Remarks
Visual	Acceptable / Pass	-
Dimensional	Acceptable / Pass	-

Date of inspection: 2024.09.26.

Inspection by (stamp):



Form no.: ISP063-01 (Rev 1)

NDE REPORTS AND NDE OPERATORS QUALIFICATIONS

BROOKS INSTRUMENT

"This certificate is produced by an electronic data system and is valid without signature."

Title:	Inspection Certificate 3.1 - Liquid Dye Penetrant	Cert No.:	834-M-110-ZZA
Subtitle:	ISO 10474 / EN 10204	Revision Date:	June 9, 2017

Issue date: Sept 25, 2024
Customer name: ROSETTI MARINO S.p.A
Country: Italy
Customer ref.: PO 1724000791
Brooks order no.: SOJY007989
Supplier name: Brooks Instrument B.V.

Instrument serial nr.:	Body identification nr.:	Tag nr.:	Document nr.:
06C43100310	M495170012	25-FT-031	202402212
06C43100311	M495190011	25-FT-032	202402214
06C43100312	M495190003	25-FT-033	202402209
06C43100313	M637560009	25-FT-034	202402213
06C43100314	M495190013	25-FT-036	202402211
06C43100315	M495170007	25-FT-038	202402210
06C43100316	M647510002	64-FG-001	202402208

This is to certify that the instruments supplied on the above referenced order are in accordance with all applicable specifications forming a part of the subject purchase order.

Inspection and specific testing, carried out as per applicable procedure, have proven to be in accordance with the requirements.

Applicable test-results are attached with reference Document nrs., as listed above.

Name: Andrea Halápi

Title: Quality Technician



BROOKS® INSTRUMENT

Liquid Penetrant

Test Report

Report nr: BR_L_24_0412

Brooks Instrument Kft
Berényi str 72-100
8000 Székesfehérvár

Object id. nr:	M495170012		**Examination Standard:**	ASME V, Art. 6			
Client order nr:	6032967		**Acceptance Standard:**	ASME B31.3			
Size and Model	#10 - 3809G		**Examination Procedure:**	ISP041			Rev. 8
Quantity:	1		**Acceptance Procedure:**	ISP041			Rev. 8
Parent material thickness:	3.3 mm		**Equipment:**	LX1330B		**Technique:**	**Brush**
Parent material:	316L	**Heat treated**	**Serial no.:**	03135/001		**Calibration exp.:**	**3.2025**
Welding procedure:	GTAW	No	**Material**	**Nomination**	**Batch no.**		**Time (min)**
Weld material:	316L		**Pre & Post cleaning:**	KD-Check PR-2	6420		5
Temp. obj.:	25.1 °C		**Penetrant:**	KD-Check RDP-1	5822		30
Surface:	Acceptable		**Penetrant remover:**	KD-Check PR-2	6420		5
Object:	Body		**Developer:**	KD-Check SD-1	6568		20

DOCUMENT NR.
202402212

Purpose of examination: detection of surface defects

Items examined: All Welds Outside, 100%.

Result: Object Acceptable according to "Acceptance Standard".

Defect(s): -

Operator:	**Signature:**		**Accepted by QA:**	Signature:	
	Name:	Mong Balázs		Name:	HALÁPI ANDREA
	Level:	PT level II EN ISO 9712 / SNT-TC-1A			
Page(s): 1 of 1			**Date:**	**2024.08.07.**	

Form nr: ISP041-01 (Rev 5)

BROOKS® INSTRUMENT

Liquid Penetrant

Test Report

Report nr: BR_L_24_0414

Brooks Instrument Kft
Berényi str 72-100
8000 Székesfehérvár

Object id. nr:	M495190011	**Examination Standard:**	ASME V, Art. 6		
Client order nr:	6032967	**Acceptance Standard:**	ASME B31.3		
Size and Model	#10 - 3809G	**Examination Procedure:**	ISP041		Rev. 8
Quantity:	1	**Acceptance Procedure:**	ISP041		Rev. 8

Parent material thickness:	3,3 mm		**Equipment:**	LX1330B		**Technique:**	**Brush**
Parent material:	316L	**Heat treated**	**Serial no.:**	03135/001		**Calibration exp.:**	**3.2025**
Welding procedure:	GTAW	No	**Material**	**Nomination**	**Batch no.**		**Time (min)**
Weld material:	316L		**Pre & Post cleaning:**	KD-Check PR-2	6420		5
Temp. obj.:	25.1	°C	**Penetrant:**	KD-Check RDP-1	5822		30
Surface:	Acceptable		**Penetrant remover:**	KD-Check PR-2	6420		5
Object:	Body		**Developer:**	KD-Check SD-1	6568		20

DOCUMENT NR.
20240214

Purpose of examination: detection of surface defects

Items examined: All Welds Outside, 100%.

Result: Object Acceptable according to "Acceptance Standard".

Defect(s): -

Operator:	**Signature:**		**Accepted by QA:**	Signature:	
	Name:	Mong Balázs		Name:	HALÁPI ANDREA
	Level:	PT level II EN ISO 9712 / SNT-TC-1A			
Page(s): 1 of 1			**Date:**	**2024.08.07.**	

Form nr: ISP041-01 (Rev 5)

BROOKS® INSTRUMENT

Liquid Penetrant

Test Report

Report nr: BR_L_24_0409

Brooks Instrument Kft
Berényi str 72-100
8000 Székesfehérvár

Object id. nr:	M495190003	**Examination Standard:**	ASME V, Art. 6		
Client order nr:	6032967	**Acceptance Standard:**	ASME B31.3		
Size and Model	#10 - 3809G	**Examination Procedure:**	ISP041		Rev. 8
Quantity:	1	**Acceptance Procedure:**	ISP041		Rev. 8
Parent material thickness:	3.3 mm	**Equipment:**	LX1330B	**Technique:**	**Brush**
Parent material:	316L **Heat treated**	**Serial no.:**	03135/001	**Calibration exp.:**	**3.2025**
Welding procedure:	GTAW No	**Material**	**Nomination**	**Batch no.**	**Time (min)**
Weld material:	316L	**Pre & Post cleaning:**	KD-Check PR-2	6420	5
Temp. obj.:	25.1 °C	**Penetrant:**	KD-Check RDP-1	5822	30
Surface:	Acceptable	**Penetrant remover:**	KD-Check PR-2	6420	5
Object:	Body	**Developer:**	KD-Check SD-1	6568	20

DOCUMENT NR.
20240209

Purpose of examination: detection of surface defects

Items examined: All Welds Outside, 100%.

Result: Object Acceptable according to "Acceptance Standard".

Defect(s): -

Operator:	**Signature:**		**Accepted by QA:**	Signature:	
	Name:	Mong Balázs		Name:	HALAPI ANDREA
	Level:	PT level II EN ISO 9712 / SNT-TC-1A			
Page(s): 1 of 1			**Date:**	**2024.08.07.**	

Form nr: ISP041-01 (Rev 5)

BROOKS® INSTRUMENT

Liquid Penetrant

Test Report

Report nr: BR_L_24_0413

Brooks Instrument Kft
Berényi str 72-100
8000 Székesfehérvár

Object id. nr:	M637560009	**Examination Standard:**	ASME V, Art. 6		
Client order nr:	6032967	**Acceptance Standard:**	ASME B31.3		
Size and Model	#10 - 3809G	**Examination Procedure:**	ISP041		Rev. 8
Quantity:	1	**Acceptance Procedure:**	ISP041		Rev. 8
Parent material thickness:	3,3 mm	**Equipment:**	LX1330B	**Technique:**	**Brush**
Parent material:	316L **Heat treated**	**Serial no.:**	03135/001	**Calibration exp.:**	**3.2025**
Welding procedure:	GTAW No	**Material**	**Nomination**	**Batch no.**	**Time (min)**
Weld material:	316L	**Pre & Post cleaning:**	KD-Check PR-2	6420	5
Temp. obj.:	25.1 °C	**Penetrant:**	KD-Check RDP-1	5822	30
Surface:	Acceptable	**Penetrant remover:**	KD-Check PR-2	6420	5
Object:	Body	**Developer:**	KD-Check SD-1	6568	20

DOCUMENT NR.
202402213

Purpose of examination: detection of surface defects

Items examined: All Welds Outside, 100%.

Result: Object Acceptable according to "Acceptance Standard".

Defect(s): -

Operator:	**Signature:**		**Accepted by QA:**	Signature:	
	Name:	Mong Balázs			
	Level:	PT level II EN ISO 9712 / SNT-TC-1A		Name:	HALAPI ANDREA
Page(s): 1 of 1			**Date:**	**2024.08.07.**	

Form nr: ISP041-01 (Rev 5)

BROOKS® INSTRUMENT

Liquid Penetrant

Test Report

Report nr: BR_L_24_0411

Brooks Instrument Kft
Berényi str 72-100
8000 Székesfehérvár

Object id. nr:	M495190013	**Examination Standard:**	ASME V, Art. 6		
Client order nr:	6032967	**Acceptance Standard:**	ASME B31.3		
Size and Model	#10 - 3809G	**Examination Procedure:**	ISP041		Rev. 8
Quantity:	1	**Acceptance Procedure:**	ISP041		Rev. 8
Parent material thickness:	3.3 mm	**Equipment:**	LX1330B	**Technique:**	**Brush**
Parent material:	316L **Heat treated**	**Serial no.:**	03135/001	**Calibration exp.:**	**3.2025**
Welding procedure:	GTAW No	**Material**	**Nomination**	**Batch no.**	**Time (min)**
Weld material:	316L	**Pre & Post cleaning:**	KD-Check PR-2	6420	5
Temp. obj.:	25.1 °C	**Penetrant:**	KD-Check RDP-1	5822	30
Surface:	Acceptable	**Penetrant remover:**	KD-Check PR-2	6420	5
Object:	Body	**Developer:**	KD-Check SD-1	6568	20

DOCUMENT NR.
20240211

Purpose of examination: detection of surface defects

Items examined: All Welds Outside, 100%.

Result: Object Acceptable according to "Acceptance Standard".

Defect(s): -

Operator:	**Signature:**		**Accepted by QA:**	Signature:	
	Name:	Mong Balázs		Name:	HALAPI ANDREA
	Level:	PT level II EN ISO 9712 / SNT-TC-1A			
Page(s): 1 of 1			**Date:**	**2024.08.07.**	

Form nr: ISP041-01 (Rev 5)

BROOKS® INSTRUMENT

Liquid Penetrant

Test Report

Report nr: BR_L_24_0410

Brooks Instrument Kft
Berényi str 72-100
8000 Székesfehérvár

Object id. nr:	M495170007	**Examination Standard:**	ASME V, Art. 6		
Client order nr:	6032967	**Acceptance Standard:**	ASME B31.3		
Size and Model	#10 - 3809G	**Examination Procedure:**	ISP041		Rev. 8
Quantity:	1	**Acceptance Procedure:**	ISP041		Rev. 8
Parent material thickness:	3.3 mm	**Equipment:**	LX1330B	**Technique:**	**Brush**
Parent material:	316L **Heat treated**	**Serial no.:**	03135/001	**Calibration exp.:**	**3.2025**
Welding procedure:	GTAW No	**Material**	**Nomination**	**Batch no.**	**Time (min)**
Weld material:	316L	**Pre & Post cleaning:**	KD-Check PR-2	6420	5
Temp. obj.:	25.1 °C	**Penetrant:**	KD-Check RDP-1	5822	30
Surface:	Acceptable	**Penetrant remover:**	KD-Check PR-2	6420	5
Object:	Body	**Developer:**	KD-Check SD-1	6568	20

DOCUMENT NR.
202402210

Purpose of examination: detection of surface defects

Items examined: All Welds Outside, 100%.

Result: Object Acceptable according to "Acceptance Standard".

Defect(s): -

Operator:	**Signature:**		**Accepted by QA:**	Signature:	
	Name:	Mong Balázs		Name:	HALAPI ANDREA
	Level:	PT level II EN ISO 9712 / SNT-TC-1A			
Page(s): 1 of 1			**Date:**	**2024.08.07.**	

Form nr: ISP041-01 (Rev 5)

BROOKS® INSTRUMENT

Liquid Penetrant

Test Report

Report nr: BR_L_24_0408

Brooks Instrument Kft
Berényi str 72-100
8000 Székesfehérvár

Object id. nr:	M647510002	**Examination Standard:**	ASME V, Art. 6		
Client order nr:	6032967	**Acceptance Standard:**	ASME B31.3		
Size and Model	#8 - 3809G	**Examination Procedure:**	ISP041		Rev. 8
Quantity:	1	**Acceptance Procedure:**	ISP041		Rev. 8
Parent material thickness:	2.8 mm	**Equipment:**	LX1330B	**Technique:**	**Brush**
Parent material:	316L **Heat treated**	**Serial no.:**	03135/001	**Calibration exp.:**	**3.2025**
Welding procedure:	GTAW No	**Material**	**Nomination**	**Batch no.**	**Time (min)**
Weld material:	316L	**Pre & Post cleaning:**	KD-Check PR-2	6420	5
Temp. obj.:	25.5 °C	**Penetrant:**	KD-Check RDP-1	5822	30
Surface:	Acceptable	**Penetrant remover:**	KD-Check PR-2	6420	5
Object:	Body	**Developer:**	KD-Check SD-1	6568	20

DOCUMENT NR.
20240220 8

Purpose of examination: detection of surface defects

Items examined: All Welds Outside, 100%.

Result: Object Acceptable according to "Acceptance Standard".

Defect(s): -

Operator:	**Signature:**		**Accepted by QA:**	Signature:	
	Name:	Mong Balázs		Name:	HALAP ANDREA
	Level:	PT level II EN ISO 9712 / SNT-TC-1A			
Page(s): 1 of 1			**Date:**	**2024.08.06.**	

Form nr: ISP041-01 (Rev 5)

BROOKS INSTRUMENT

"This certificate is produced by an electronic data system and is valid without signature."

Title:	Inspection Certificate 3.1 - Radiographic Examination	Cert No.:	834-M-136-ZZA
Subtitle:	ISO 10474 / EN 10204	Revision Date:	June 9, 2017

Issue date: Sept 25, 2024
Customer name: ROSETTI MARINO S.p.A
Country: Italy
Customer ref.: PO 1724000791
Brooks order no.: SOJY007989
Supplier name: Brooks Instrument B.V.

Instrument serial nr.:	Body identification nr.:	Tag nr.:	Document nr.:
06C43100310	M495170012	25-FT-031	202402217
06C43100311	M495190011	25-FT-032	202402220
06C43100312	M495190003	25-FT-033	202402218
06C43100313	M637560009	25-FT-034	202402221
06C43100314	M495190013	25-FT-036	202402216
06C43100315	M495170007	25-FT-038	202402219
06C43100316	M647510002	64-FG-001	202402215

This is to certify that the instruments supplied on the above referenced order are in accordance with all applicable specifications forming a part of the subject purchase order.

Inspection and specific testing, carried out as per applicable procedure, have proven to be in accordance with the requirements.

Applicable test-results are attached with reference Document nrs., as listed above.

Name: Andrea Halápi

Title: Quality Technician



AGMI Material Testing and Quality Management Pte Co. Ltd.
Nondestructiv Testing Laboratory
H-1211 Budapest, Duna lejáró 5-9
☎: +361 277 1555, Fax: +361 277 0902, e-mail: agmindt@agmi.hu

Radiographic Test Report

Job no.:	24-340-L-00/1021-1102R
Contact:	Sós Gábor
PO no.:	P026317-00
Contact:	Tímea Üveges

Client: BROOKS Instrument Kft.
H-8001 Székesfehérvár, Berényi u. 72-100., Hungary

Object id. nr:	M495170012	Examination Standard:	ASME V. Art. 2
Object:	#10-3809G Body weldment	Acceptance Standard:	ASME B31.3 Table 341.3.2
Client order no.:	6032967/M658960	Examination Procedure:	AGMI NDT Written Procedure No. 004 Rev. 07
Quantity:	1	Acceptance Procedure:	AGMI NDT Written Procedure No. 004 Rev. 07
Material:	316/316L	Type of Film:	Carestream T200
Weld method:	GTAW	Welder id.:	B2
I.Q.I Type:	ASTM 1B	Screen Front:	0,02 Back: 0,02

Source:	x	Seifert ERESCO 300	Focus: 0,3x3		Ir-192	Focus:		Co-60	Focus:

No.	Film: Sign.	Film: Size (cm)	Film: Quantity in casette	Film: Single (1) or double (2) wall	Material thickness (mm)	Source-Object Distance (mm)	Object-Film Distance (mm)	Energy: kV	Energy: mA	Energy: Activity (GBq)	Energy: Time (min)	I.Q.I-wire: Density	I.Q.I-wire: Side	I.Q.I-wire: Visible	Discontinuity: Type	Discontinuity: Local	Judgement: Acceptable	Judgement: Not Acceptable
1	W1A	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
2	W1B	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
3	W1C	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
4	W2A	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
5	W2B	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
6	W2C	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
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DOCUMENT NR.
20240217

AGMI
Anyagvizsgáló és Minőségellenőrző ZRt
Anyagvizsgálati Üzletág
Roncsolásmentes Vizsgálati
Laboratórium
1.

Defects in Welds

CR	Cracks	PI	Incomplete penetration	SI	Slag, inclusions	CC	Concave root surface (suck up)
LF	Lack of fusion	IP	Internal porosity	UC	Undercutting	TI	Tungsten inclusions

Date:	Prepared and reviewed by:	Interpreted and evaluated by:	Accepted by:
12.08.2024	Erika Nánai Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Erika Nánai Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Gábor Sós (Head of lab.)
Page(s): 1 of 1			

agmi	**AGMI Material Testing and Quality Management Pte Co. Ltd.** Nondestructiv Testing Laboratory H-1211 Budapest, Duna lejáró 5-9 ☎: +361 277 1555, Fax: +361 277 0902, e-mail: agmindt@agmi.hu	**Radiographic Test Report** Job no.: 24-340-L-00/1021-1105R Contact: Sós Gábor
Client:	**BROOKS Instrument Kft.** H-8001 Székesfehérvár, Berényi u. 72-100., Hungary	PO no.: P026317-00 Contact: Tímea Üveges

Object id. nr:	M495190011		Examination Standard:	ASME V. Art. 2	
Object:	#10-3809G Body weldment		Acceptance Standard:	ASME B31.3 Table 341.3.2	
Client order no.:	6032967/M658960		Examination Procedure:	AGMI NDT Written Procedure No. 004	Rev. 07
Quantity:	1		Acceptance Procedure:	AGMI NDT Written Procedure No. 004	Rev. 07
Material:	316/316L		Type of Film:	Carestream T200	Screen
Weld method:	GTAW	Welder id. B2	I.Q.I Type:	ASTM 1B	Front: 0,02 Back: 0,02

Source:	x	Seifert ERESCO 300	Focus: 0,3x3		Ir-192	Focus:		Co-60	Focus:

No.	Film				Material thickness (mm)	Source-Object Distance (mm)	Object-Film Distance (mm)	Energy				I.Q.I-wire			Discontinuity		Judgement	
	Sign.	Size (cm)	Quantity in casette	Single (1) or double (2) wall				kV	mA	Activity (GBq)	Time (min)	Density	Side	Visible	Type	Local	Acceptable	Not Acceptable
1	W1A	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
2	W1B	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
3	W1C	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
4	W2A	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
5	W2B	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
6	W2C	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
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DOCUMENT NR.
20240220

AGMI
Anyagvizsgáló és Minőségellenőrző ZRt
Anyagvizsgálati Üzletág
Roncsolásmentes Vizsgálati
Laboratórium
1.

Defects in Welds

CR	Cracks	PI	Incomplete penetration	SI	Slag, inclusions	CC	Concave root surface (suck up)
LF	Lack of fusion	IP	Internal porosity	UC	Undercutting	TI	Tungsten inclusions

Date:	Prepared and reviewed by:	Interpreted and evaluated by:	Accepted by:
12.08.2024	Erika Nánai Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Erika Nánai Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Gábor Sós (Head of lab.)
Page(s): 1 of 1			

AGMI Material Testing and Quality Management Pte Co. Ltd.
Nondestructiv Testing Laboratory
H-1211 Budapest, Duna lejáró 5-9
☎: +361 277 1555, Fax: +361 277 0902, e-mail: agmindt@agmi.hu

Radiographic Test Report

Job no.:	24-340-L-00/1021-1103R
Contact:	Sós Gábor
PO no.:	P026317-00
Contact:	Tímea Üveges

Client:	BROOKS Instrument Kft.		Examination Standard:	ASME V. Art. 2	
	H-8001 Székesfehérvár, Berényi u. 72-100., Hungary		Acceptance Standard:	ASME B31.3 Table 341.3.2	
Object id. nr:	M495190003		Examination Procedure:	AGMI NDT Written Procedure No. 004	Rev. 07
Object:	#10-3809G Body weldment		Acceptance Procedure:	AGMI NDT Written Procedure No. 004	Rev. 07
Client order no.:	6032967/M658960		Type of Film:	Carestream T200	Screen Front: 0,02 Back: 0,02
Quantity:	1		I.Q.I Type:	ASTM 1B	
Material:	316/316L				
Weld method:	GTAW	Welder id.: B4			

Source:	x	Seifert ERESCO 300	Focus: 0,3x3		Ir-192	Focus:		Co-60	Focus:

No.	Film: Sign.	Film: Size (cm)	Film: Quantity in cassette	Film: Single (1) or double (2) wall	Film: Material thickness (mm)	Film: Source-Object Distance (mm)	Film: Object-Film Distance (mm)	Energy: kV	Energy: mA	Energy: Activity (GBq)	Energy: Time (min)	I.Q.I-wire: Density	I.Q.I-wire: Side	I.Q.I-wire: Visible	Discontinuity: Type	Discontinuity: Local	Judgement: Acceptable	Judgement: Not Acceptable
1	W1A	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
2	W1B	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
3	W1C	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
4	W2A	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
5	W2B	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
6	W2C	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
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DOCUMENT NR.
20240221 8

AGMI
Anyagvizsgáló és Minőségellenőrző ZRt
Anyagvizsgálati Üzletág
Roncsolásmentes Vizsgálati
Laboratórium
1.

Defects in Welds

CR	Cracks	PI	Incomplete penetration	SI	Slag, inclusions	CC	Concave root surface (suck up)
LF	Lack of fusion	IP	Internal porosity	UC	Undercutting	TI	Tungsten inclusions

Date:	Prepared and reviewed by:	Interpreted and evaluated by:	Accepted by:
12.08.2024	Erika Nánai Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Erika Nánai Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Gábor Sós (Head of lab.)
Page(s): 1 of 1			

agmi	**AGMI Material Testing and Quality Management Pte Co. Ltd.** Nondestructiv Testing Laboratory H-1211 Budapest, Duna lejáró 5-9 ☎: +361 277 1555, Fax: +361 277 0902, e-mail: agmindt@agmi.hu	**Radiographic Test Report** Job no.: 24-340-L-00/1021-1106R Contact: Sós Gábor
Client:	**BROOKS Instrument Kft.** H-8001 Székesfehérvár, Berényi u. 72-100., Hungary	PO no.: P026317-00 Contact: Tímea Üveges

Object id. nr:	**M637560009**		**Examination Standard:**	ASME V. Art. 2	
Object:	#10-3809G Body weldment		**Acceptance Standard:**	ASME B31.3 Table 341.3.2	
Client order no.:	6032967/M658960		**Examination Procedure:**	AGMI NDT Written Procedure No. 004	Rev. 07
Quantity:	1		**Acceptance Procedure:**	AGMI NDT Written Procedure No. 004	Rev. 07
Material:	316/316L		**Type of Film:**	Carestream T200	**Screen** Front: 0,02 Back: 0,02
Weld method:	GTAW	**Welder id.** B6	**I.Q.I Type:**	ASTM 1B	

Source:	x	Seifert ERESCO 300		Focus: 0,3x3		Ir-192		Focus:		Co-60		Focus:						

No.	Film				Material thickness (mm)	Source-Object Distance (mm)	Object-Film Distance (mm)	Energy				I.Q.I-wire			Discontinuity		Judgement	
	Sign.	Size (cm)	Quantity in casette	Single (1) or double (2) wall				kV	mA	Activity (GBq)	Time (min)	Density	Side	Visible	Type	Local	Acceptable	Not Acceptable
1	W1A	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
2	W1B	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
3	W1C	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
4	W2A	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
5	W2B	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
6	W2C	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
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DOCUMENT NR.
20240221

AGMI
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Anyagvizsgálati Üzletág
Roncsolásmentes Vizsgálati
Laboratórium
1.

Defects in Welds

CR	Cracks	PI	Incomplete penetration	SI	Slag, inclusions	CC	Concave root surface (suck up)
LF	Lack of fusion	IP	Internal porosity	UC	Undercutting	TI	Tungsten inclusions

Date:	**Prepared and reviewed by:**	**Interpreted and evaluated by:**	**Accepted by:**
12.08.2024	Erika Nánal Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Erika Nánal Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Gábor Sós (Head of lab.)
Page(s): 1 of 1			

AGMI Material Testing and Quality Management Pte Co. Ltd.
Nondestructiv Testing Laboratory
H-1211 Budapest, Duna lejáró 5-9
☎: +361 277 1555, Fax: +361 277 0902, e-mail: agmindt@agmi.hu

Radiographic Test Report

Job no.:	24-340-L-00/1021-1101R
Contact:	Sós Gábor
PO no.:	P026317-00
Contact:	Tímea Üveges

Client:	BROOKS Instrument Kft.		
	H-8001 Székesfehérvár, Berényi u. 72-100., Hungary		
Object id. nr:	M495190013	Examination Standard:	ASME V. Art. 2
Object:	#10-3809G Body weldment	Acceptance Standard:	ASME B31.3 Table 341.3.2
Client order no.:	6032967/M658960	Examination Procedure:	AGMI NDT Written Procedure No. 004 Rev. 07
Quantity:	1	Acceptance Procedure:	AGMI NDT Written Procedure No. 004 Rev. 07
Material:	316/316L	Type of Film:	Carestream T200
Weld method:	GTAW	Welder id.:	B2
		I.Q.I Type:	ASTM 1B
		Screen Front:	0,02
		Screen Back:	0,02

Source:	x	Seifert ERESCO 300	Focus: 0,3x3		Ir-192	Focus:		Co-60	Focus:

No.	Film: Sign.	Film: Size (cm)	Film: Quantity in casette	Film: Single (1) or double (2) wall	Material thickness (mm)	Source-Object Distance (mm)	Object-Film Distance (mm)	Energy: kV	Energy: mA	Energy: Activity (GBq)	Energy: Time (min)	I.Q.I-wire: Density	I.Q.I-wire: Side	I.Q.I-wire: Visible	Discontinuity: Type	Discontinuity: Local	Judgement: Acceptable	Judgement: Not Acceptable
1	W1A	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
2	W1B	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
3	W1C	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
4	W2A	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
5	W2B	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
6	W2C	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
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DOCUMENT NR.
20240216

AGMI
Anyagvizsgáló és Minőségellenőrző ZRt
Anyagvizsgálati Üzletág
Roncsolásmentes Vizsgálati
Laboratórium
1.

Defects in Welds

CR	Cracks	PI	Incomplete penetration	SI	Slag, inclusions	CC	Concave root surface (suck up)
LF	Lack of fusion	IP	Internal porosity	UC	Undercutting	TI	Tungsten inclusions

Date:	Prepared and reviewed by:	Interpreted and evaluated by:	Accepted by:
12.08.2024	Erika Nánai Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Erika Nánai Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Gábor Sós (Head of lab.)
Page(s): 1 of 1			

agmi	**AGMI Material Testing and Quality Management Pte Co. Ltd.** Nondestructiv Testing Laboratory H-1211 Budapest, Duna lejáró 5-9 ☎: +361 277 1555, Fax: +361 277 0902, e-mail: agmindt@agmi.hu	**Radiographic Test Report** Job no.: 24-340-L-00/1021-1104R Contact: Sós Gábor
Client:	**BROOKS Instrument Kft.** H-8001 Székesfehérvár, Berényi u. 72-100., Hungary	PO no.: P026317-00 Contact: Tímea Üveges

Object id. nr:	**M495170007**		**Examination Standard:**	ASME V. Art. 2	
Object:	#10-3809G Body weldment		**Acceptance Standard:**	ASME B31.3 Table 341.3.2	
Client order no.:	6032967/M658960		**Examination Procedure:**	AGMI NDT Written Procedure No. 004	Rev. 07
Quantity:	1		**Acceptance Procedure:**	AGMI NDT Written Procedure No. 004	Rev. 07
Material:	316/316L		**Type of Film:**	Carestream T200	**Screen** Front: 0,02 Back: 0,02
Weld method:	GTAW	**Welder id.** B2	**I.Q.I Type:**	ASTM 1B	

Source:	x	Seifert ERESCO 300	Focus: 0,3x3		Ir-192	Focus:		Co-60	Focus:

No.	Film				Material thickness (mm)	Source-Object Distance (mm)	Object-Film Distance (mm)	Energy				I.Q.I-wire			Discontinuity		Judgement	
	Sign.	Size (cm)	Quantity in cassette	Single (1) or double (2) wall				kV	mA	Activity (GBq)	Time (min)	Density	Side	Visible	Type	Local	Acceptable	Not Acceptable
1	W1A	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
2	W1B	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
3	W1C	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
4	W2A	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
5	W2B	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
6	W2C	10x16	1	2	8	659	<0,5	180	2	-	1	2,8	F	6	-	-	x	-
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DOCUMENT NR.
20240219

AGMI
Anyagvizsgáló és Minőségellenőrző ZRt
Anyagvizsgálati Üzletág
Roncsolásmentes Vizsgálati
Laboratórium
1.

Defects in Welds

CR	Cracks	PI	Incomplete penetration	SI	Slag, inclusions	CC	Concave root surface (suck up)
LF	Lack of fusion	IP	Internal porosity	UC	Undercutting	TI	Tungsten inclusions

Date:	Prepared and reviewed by:	Interpreted and evaluated by:	Accepted by:
12.08.2024	Erika Nánal Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Erika Nánal Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Gábor Sós (Head of lab.)
Page(s):			
1 of 1			

AGMI Material Testing and Quality Management Pte Co. Ltd.
Nondestructiv Testing Laboratory
H-1211 Budapest, Duna lejáró 5-9
☎: +361 277 1555, Fax: +361 277 0902, e-mail: agmindt@agmi.hu

Radiographic Test Report

Job no.:	24-340-L-00/1021-1100R
Contact:	Sós Gábor
PO no.:	P026318-00
Contact:	Tímea Üveges

Client: BROOKS Instrument Kft.
H-8001 Székesfehérvár, Berényi u. 72-100., Hungary

Object id. nr:	M647510002	Examination Standard:	ASME V. Art. 2
Object:	#8-3809G Body weldment	Acceptance Standard:	ASME B31.3 Table 341.3.2
Client order no.:	6032967/M658970	Examination Procedure:	AGMI NDT Written Procedure No. 004 Rev. 07
Quantity:	1	Acceptance Procedure:	AGMI NDT Written Procedure No. 004 Rev. 07
Material:	316/316L	Type of Film:	Carestream T200
Weld method:	GTAW	Welder id.:	B2
I.Q.I Type:	ASTM 1A	Screen Front:	0,02 Back: 0,02

Source:	x	Seifert ERESCO 300	Focus: 0,3x3		Ir-192	Focus:		Co-60	Focus:

No.	Film					Energy					I.Q.I-wire			Discontinuity		Judgement	
	Sign.	Size (cm)	Quantity in casette	Single (1) or double (2) wall	Material thickness (mm)	Source-Object Distance (mm)	Object-Film Distance (mm)	kV	mA	Activity (GBq)	Time (min)	Density	Side	Visible	Type	Local	Acceptable	Not Acceptable
1	W1A	10x16	1	2	7	673	<0,5	180	2	-	0,9	2,8	F	4	-	-	x	-
2	W1B	10x16	1	2	7	673	<0,5	180	2	-	0,9	2,8	F	4	-	-	x	-
3	W1C	10x16	1	2	7	673	<0,5	180	2	-	0,9	2,8	F	4	-	-	x	-
4	W2A	10x16	1	2	7	673	<0,5	180	2	-	0,9	2,8	F	4	-	-	x	-
5	W2B	10x16	1	2	7	673	<0,5	180	2	-	0,9	2,8	F	4	-	-	x	-
6	W2C	10x16	1	2	7	673	<0,5	180	2	-	0,9	2,8	F	4	-	-	x	-
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20																		

DOCUMENT NR.
20240215

AGMI
Anyagvizsgáló és Minőségellenőrző ZRt
Anyagvizsgálati Üzletág
Roncsolásmentes Vizsgálati
Laboratórium
1.

Defects in Welds

CR	Cracks	PI	Incomplete penetration	SI	Slag, inclusions	CC	Concave root surface (suck up)
LF	Lack of fusion	IP	Internal porosity	UC	Undercutting	TI	Tungsten inclusions

Date:	Prepared and reviewed by:	Interpreted and evaluated by:	Accepted by:
12.08.2024	Erika Nánai Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Erika Nánai Benkóné RT II, AGMI DPE/SNT-TC-1A/13/2021)	Gábor Sós (Head of lab.)
Page(s): 1 of 1			

BROOKS INSTRUMENT

"This certificate is produced by an electronic data system and is valid without signature."

Title:	**Inspection Certificate 3.1 - Positive Material Identification**	Cert No.:	**834-M-139-ZZA**
Subtitle:	**ISO 10474 / EN 10204**	Revision Date:	**June 9, 2017**

Issue date: Sept 25, 2024
Customer name: ROSETTI MARINO S.p.A
Country: Italy
Customer ref.: PO 1724000791
Brooks order no.: SOJY007989
Supplier name: Brooks Instrument B.V.

Instrument serial nr.:	Body identification nr.:	Tag nr.:	Document nr.:
06C43100310	M495170012	25-FT-031	202402207
06C43100311	M495190011	25-FT-032	202402207
06C43100312	M495190003	25-FT-033	202402207
06C43100313	M637560009	25-FT-034	202402207
06C43100314	M495190013	25-FT-036	202402207
06C43100315	M495170007	25-FT-038	202402207
06C43100316	M647510002	64-FG-001	202402206

This is to certify that the instruments supplied on the above referenced order are in accordance with all applicable specifications forming a part of the subject purchase order.

Inspection and specific testing, carried out as per applicable procedure, have proven to be in accordance with the requirements.

Applicable Positive Material Identification (PMI), test-results per element are attached with reference Document nrs., as listed above.

Name: Andrea Halápi

Title: Quality Technician

BRH-QC 3

BROOKS® INSTRUMENT

DOCUMENT NR.
202402207

Brooks Instrument Kft
Berényi str 72-100
8000 Székesfehérvár
Hungary

PMI TEST REPORT

Report nr: BR_P_24_0152 Page 2 of 1

Client order nr:	6032967	Procedure nr:	ISP042 / rev. 7
Test equipment:	Olympus Vanta C Series analyzer XRF spectrometer	Test equipment Last test date:	82000/002 2024.08.06.
Date of examination:	2024.08.06.	Specification:	316
Place of examination:	Szekesfehervar		

Object id. nr:	Model description	Part Description	%Cr Min 16 Max 18 Weldmax 19	%Ni Min 10 Max 14	%Mo Min 2 Max 3			
M495190011	3809G	Flange W1	16.58	10.52	2.08			
		Flange W2	16.55	10.00	2.06			
		Tube	16.74	11.62	2.00			
		Weld W1	17.20	10.62	2.00			
		Weld W2	16.88	10.68	2.00			
M495170012	3809G	Flange W1	16.39	10.00	2.09			
		Flange W2	16.88	10.68	2.00			
		Tube	16.64	11.20	2.02			
		Weld W1	16.71	11.01	2.00			
		Weld W2	17.41	11.55	2.00			
M637560009	3809G	Flange W1	16.94	10.13	2.00			
		Flange W2	16.67	10.00	2.09			
		Tube	17.03	11.05	2.00			
		Weld W1	16.77	11.13	2.00			
		Weld W2	17.18	11.54	2.00			
M495190013	3809G	Flange W1	16.71	10.00	2.05			
		Flange W2	16.71	10.30	2.04			
		Tube	16.96	11.61	2.05			
		Weld W1	17.31	11.50	2.00			
		Weld W2	17.20	10.93	2.00			

Analysis done by:	Signature		Accepted	Signature	
	Name	Balázs Mong	by QA	Name	HALÁPI ANDREA

Results in accordance with specification: Yes

Above mentioned items are marked with low stress dye-stamp: Yes

Remarks: ND - Not Detectable

Form nr: ISP042-01 (Rev. 4)

BROOKS® INSTRUMENT

DOCUMENT NR.
20240220 7

Brooks Instrument Kft
Berényi str 72-100
8000 Székesfehérvár
Hungary

PMI TEST REPORT

Report nr: BR_P_24_0152

Client order nr:	6032967	Procedure nr:	ISP042 / rev. 7
Test equipment:	Olympus Vanta C Series analyzer XRF spectrometer	Test equipment Last test date:	82000/002 2024.08.06.
Date of examination:	2024.08.06.	Specification:	316
Place of examination:	Szekesfehervar		

Object id. nr:	Model description	Part Description	%Cr Min 16 Max 18 Weldmax 19	%Ni Min 10 Max 14	%Mo Min 2 Max 3			
M495170007	3809G	Flange W1	16.51	10.50	2.00			
		Flange W2	16.56	10.00	2.09			
		Tube	16.51	10.50	2.00			
		Weld W1	17.25	10.63	2.00			
		Weld W2	17.12	10.28	2.00			
M495190003	3809G	Flange W1	16.29	10.42	2.05			
		Flange W2	16.23	10.02	2.05			
		Tube	16.82	11.42	2.01			
		Weld W1	17.20	10.83	2.00			
		Weld W2	16.67	11.46	2.00			

Analysis done by:	Signature		Accepted	Signature	
	Name	Bajázs Mong	by QA	Name	HALAPI ANDREA

Results in accordance with specification: Yes

Above mentioned items are marked with low stress dye-stamp: Yes

Remarks: ND - Not Detectable

Form nr: ISP042-01 (Rev. 4)

BROOKS® INSTRUMENT

DOCUMENT NR.
202402206

Brooks Instrument Kft
Berényi str 72-100
8000 Székesfehérvár
Hungary

PMI TEST REPORT

Report nr: BR_P_24_0151 Page 1 of 1

Client order nr:	6032967	Procedure nr:	ISP042 / rev. 7
Test equipment:	Olympus Vanta C Series analyzer XRF spectrometer	Test equipment Last test date:	82000/002 2024.08.06.
Date of examination:	2024.08.06.	Specification:	316
Place of examination:	Szekesfehervar		

Object id. nr:	Model description	Part Description	%Cr Min 16 Max 18 Weldmax 19	%Ni Min 10 Max 14	%Mo Min 2 Max 3			
M647510002	3809G	Flange W1	16.77	10.37	2.09			
		Flange W2	16.35	10.47	2.08			
		Tube	16.9	10.78	2.13			
		Weld W1	16.76	12.25	2.02			
		Weld W2	17.02	11.52	2.06			

Analysis done by:	Signature		Accepted	Signature	
	Name	Balazs Mong	by QA	Name	HALAPI ANDREA

Results in accordance with specification: Yes

Above mentioned items are marked with low stress dye-stamp: Yes

Remarks: ND - Not Detectable

Form nr: ISP042-01 (Rev. 4)

Hungarian Association for Nondestructive Testing

206, Üllői Str., B / II, IV / 422, H-1191 Budapest

NDT PERSONNEL

CERTIFICATE

Certificate ID: RT2202039901

Name and surname: Benkóné Nánai Erika

Place and date of birth: Budapest, 1971.10.02.

MAROVISZ ID: 976

Benkóné Wéner Erika

Signature of certified individual

NDT method(s): RT

Level of certificate: 2

Product sector: c, w

Industrial sector: A

Basis of certification: MSZ EN ISO 9712:2013

Date of issue of certificate: 2020.06.19.

Beginning of validity: 2020.06.19.

Date of expiry: 2025.06.19.

Special applications / limitations:

MAGYAR RONCSOLÁSMENTES VIZSGÁLATI SZÖVETSÉG I. VIZSGÁZTATÓ

Examiner

MAGYAR RONCSOLÁSMENTES VIZSGÁLATI SZÖVETSÉG SZEMÉLYTANÚSÍTÁSI IRODA

Certification Body

Certification validity renewed until:

.....

Date of renewal:

Certification Body

Certification body for Persons accredited by NAH under No NAH-5-0017/2018.

RT: radiographic testing; **UT**: ultrasonic testing; **PT**: penetrant testing; **MT**: magnetic testing; **VT**: visual testing. **c**: castings (ferrous and nonferrous materials); **ET**: eddy current testing; **LT**: leak testing (hydraulic pressure tests excluded); **B**: pressure method; **C**: tracer gas method; **f**: forgings (all types of forgings: ferrous and nonferrous materials); **w**: welds (all types of welds, including soldering, for ferrous and nonferrous materials); **wp**: wrought products (e.g. plates, bars rods) except forgings; t: tube and pipe (seamless, welded, ferrous and non-ferrous materials, including flat products for the manufacture of welded pipes).
A: manufacturing; **B**: pre and in-service testing, including manufacturing; **C**: railway maintenance.

MAGYAR HEGESZTÉSTECHNIKAI ÉS ANYAGVIZSGÁLATI EGYESÜLÉS
(HUNGARIAN ASSOCIATION OF WELDING TECHNOLOGY AND MATERIAL TESTING)
(Certification Body)

RONCSOLÁSMENTES ANYAGVIZSGÁLÓ TANÚSÍTVÁNY*
(Certificate of NDT personnel)

Azonosító szám: (Identification No.): **PT20102160204**

A tanúsított neve: (The name and forename of the certificated individual): ***Mong Balázs***

Születési hely/idő: (Place and date of birth): ***Székesfehérvár,1978.12.21***

A tanúsított személy aláírása
(The signature of the certificated individual)

Vizsgálati eljárás(ok): (The NDT method(s): ***Folyadékbehatolásos vizsgálat (Penetrant testing)***

Ipari terület: (Industrial sector): A - Gyártás (Manufacturing)

Termék terület(ek): ** (Product sector(s): ***(w)***

A minősítés fokozata: (The level of certification): ***PT2***

A tanúsítás és kiadásának időpontja: (The date of certification and it's issue): ***Budapest,2016.07.05***

A tanúsítás érvényes: (The date upon which certification expires): ***2021.07.04***

Tanúsító Testület nevében
(On behalf of certifying body)

Takács Csaba sk.
36.sz.Vizsgáztató
(Examiner)

Az ipari és/vagy termék terület érvényesség kiterjesztve (The industrial and/or product sector has been expanded to) :

Dátum (Date): _____

Tanúsító Testület nevében
(On behalf of certifying body)

A tanúsítás érvényessége **2026.07.04** **-ig megújítva (MSZ EN ISO 9712 10.):**
(Renewed the validity of the certification until (MSZ EN ISO 9712 10.):)

Dátum (Date): **2021.05.18**

Tanúsító Testület nevében
(On behalf of certification body)

A Magyar Hegesztéstechnikai és Anyagvizsgálati Egyesülés, mint „A NAH által **NAH-5-0013/2018** számon akkreditált személytanúsító szervezet" a nevezett személyt tanúsítja az MSZ EN ISO 9712 szerint eredményes vizsgája alapján a fentiek szerint:
(The Hungarian Association of Welding Technology and Material Testing as an „accredited certification body for person an by National Accreditation Board under N° **NAH-5-013/2018**", on the basis of his/her successful examination under the standard MSZ EN ISO 9712, hereby certifies the named individual according to the above:)

**
c- öntvények (castings); f - kovácsolt termékek (forgings); w - hegesztett és forrasztott termékek (welded products); t - csövek és csővezetékek (tubes); wp - alakított termékek (wrought products); p - kompozit anyagok (composites products).

* **Ez a tanúsítvány az MHtE tulajdona! (The MHtE is the owner of this certificate!)**

BROOKS® INSTRUMENT

Minősítés – PMI vizsgálat

Qualification – PMI test

Minősített személy / Certified person:	Balázs Mong
Dolgozói azonosító / Employee ID:	1201
Érvényesség / Vaild till (YYYY/MM):	2025/09

Fentebb megnevezett dolgozót, igazolt gyakorlati és elméleti ismerete alapján PMI vizsgálat elvégzésére minősítem. A minősítés az ISP042 utasítás alapján történt. A minősítés 5 évig érvényes, feltételezve a vizsgálatok rendszeres elvégzését, melynek tényét a minősítés hátlapján évente a munkáltató igazolja.

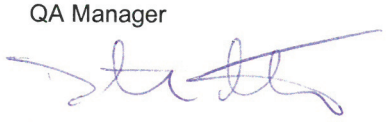
Based on the proven practical and theoretical knowledge, I qualify the employee named above to perform the PMI tests. Qualification was performed according to instruction ISP042. The qualification is valid for 5 years, assuming the tests are carried out on regular basis, the fact of which is confirmed annually by the employer on the back of this qualification.

Minősítette / Qualified by

Name: Attila Demeter

Function: QA Manager

Signature:



Date: 8th of Sep, 2020

Brooks Instrument Kft. | 8000 Székesfehérvár | Berényi út 72-100 | Magyarország | Hungary
T +36 22 539 600 | F +36 22 539 659 | BrooksInstrument.com

BROOKS INSTRUMENT

Minősítés – PMI vizsgálat

Qualification – PMI test

Minősített személy / Certified person: Balázs Mong

Dolgozói azonosító / Employee ID: 1201

Év / Year	Dátum / Date	Aláírás / Signature
2020	2020/09/08	
2021	2021/01/15	
2022	2022/01/21	
2023	2023/01/10	
2024	2024/01/08	

Brooks Instrument Kft. | 8000 Székesfehérvár | Berényi út 72-100 | Magyarország | Hungary
T +36 22 539 600 | F +36 22 539 659 | BrooksInstrument.com

WPS/WPQR AND WELDER QUALIFICATIONS

Welding Operator Performance Qualification (WOPQ) ASME IX

Welding Operator's Boda, Attila István Identification No. B6

Test Description (Information Only)

Identification of WPS followed	WM158 Rev. 5 25/02/2022 ☒	Test ☐	Production
Specification and type/grade or UNS Number of base	ASME SA-213, TP316L to TP316L	Thickness	4,3 mm
Base Metal P-Number	P8 to P-Number P8	Position(s)	1G rotated

☐ Plate ☒ Pipe (enter diameter, if pipe or tube): 71,5 mm (2,81 inch)

Filler metal (SFA) specification SFA 5.9 Filler metal or electrode classification ER316/316L

Testing Variables and Qualification Limits when using Automatic Welding Equipment

Welding Variables (QW-361.1)	Actual Values	Range Qualified
Type of welding (Automatic)		
Welding process		
Filler metal used (Yes or No) (EBW or LBW)		
Type of laser for LBW (CO_2 to YAG, etc.)		
Continuous drive or inertia welding (FW)		
Vacuum or out of vacuum (EBW)		

Testing Variables and Qualification Limits when using Machine Welding Equipment

Welding Variables (QW-361.2)	Actual Values	Range Qualified
Type of welding (Machine)	Weldlogic PWL15-27	
Welding process	GTAW	GTAW
Direct or remote visual control	Direct	Direct
Automatic arc voltage control (GTAW)	Without	With and without
Automatic joint tracking	No joint tracking	With and without joint tracking
Position(s)	1G rotated	Flat
Consumable inserts (GTAW or PAW)	No inserts used	No inserts
Backing (with or without)	With gas backing	With gas backing
Single or multiple passes per side	Multiple	Single and multiple

Results

Visual Examination of Completed Weld (QW-302.4) acceptable

☒ Bend Test; ☒ Transverse root and face [QW-462.3(a)]; ☐ Longitudinal root and face [QW-462.3(b)]; ☐ Side (QW-

☐ Pipe bend specimen, corrosion-resistant overlay [QW 462.5(c)] ☐ Plate bend specimen, corrosion-resistant overlay [QW-

☐ Pipe Specimen Macro test for fusion [QW-462.5(b)]: ☐ Plate Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result
QW-462.3(a) face	satisfactory	QW-462.3(a) root	satisfactory	-	
QW-462.3(a) face	satisfactory	QW-462.3(a) root	satisfactory	-	

Alternative volumetric examination results (QW-191) acceptable RT ☒ or UT ☐ (check one)

Fillet weld – fracture test (QW-181.2) acceptable Length and percent of -

☐ Fillet welds in plate (QW- ☐ Fillet welds in pipe (QW-

Macro examination (QW-184) acceptabl Fillet size (in./mm) - x - Concavity or convexity -

Other tests -

Film or specimens evaluated by Balogh, József Company Csöszerlabor Kft.

Mechanical tests conducted by Koszta, György Laboratory test no. BHQ 076/22 04/4484

Welding supervised by Penzes, Laszlo

We certify that the statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code Ed. 2021.

Date of welding: 25 August 2022 Date issued: 09 November 2022

Organisation's Representative Seres, Robert

Organisation

LRQA Austria GmbH
Name: Andreas Altendorfer
Date: 09 November 2022
Ref No.: AUT2200445/8
Office: Vienna

Andreas Altendorfer for L Penzes and himself
Surveyor to LRQA Austria GmbH

Signature:

A subsidiary of LRQA Group Limited

A member of the LRQA Group Limited

LRQA003 11.2021

LRQA Group Limited, its affiliates and subsidiaries and their respective officers, employees or agents are, individually and collectively, referred to in this clause as 'LRQA'. LRQA assumes no responsibility and shall not be liable to any person for any loss, damage or expense caused by reliance on the information or advice in this document or howsoever provided, unless that person has signed a contract with the relevant LRQA entity for the provision of this information or advice and in that case any responsibility or liability is exclusively on the terms and conditions set out in that contract.

Form 4104 (2022.03)

Confirmation of validity by employer/welding coordinator for the following 6 months

Date	Signature	Position or Title
22-05-2023	Penzes László	Laszlo Penzes LRQA Magyarország Kft
11-10-2023	Penzes László	LRQA Verification Ltd
13-05-2024	Penzes László	13-05-2024 LRQA Verification Ltd

Prolongation for qualification by the examining body for the following 2 years

Date	Signature	Position or Title

Welding Operator Performance Qualification (WOPQ) ASME IX

Welding Operator's Name: Nemes, Edmond — Identification No.: B4

Test Description (Information Only)

Identification of WPS followed	WM158 Rev. 5 25/02/2022 ☒	Test coupon ☐	Production
Specification and type/grade or UNS Number of base metal(s)	ASME SA-213, TP316L to ASME SA-213,TP316L	Thickness	4,3 mm
Base Metal P-Number P8	to P -Number P8	Position(s)	1G rotated

☐ Plate ☒ Pipe (enter diameter, if pipe or tube): 71,5 mm (2,81 inch)

Filler metal (SFA) specification: SFA 5.9 — Filler metal or electrode classification: ER316/316L

Testing Variables and Qualification Limits when using Automatic Welding Equipment

Welding Variables (QW-361.1)	Actual Values	Range Qualified
Type of welding (Automatic)		
Welding process		
Filler metal used (Yes or No) (EBW or LBW)		
Type of laser for LBW (CO_2 to YAG, etc.)		
Continuous drive or inertia welding (FW)		
Vacuum or out of vacuum (EBW)		

Testing Variables and Qualification Limits when using Machine Welding Equipment

Welding Variables (QW-361.2)	Actual Values	Range Qualified
Type of welding (Machine)	Weldlogic PWL15-27	
Welding process	GTAW	GTAW
Direct or remote visual control	Direct	Direct
Automatic arc voltage control (GTAW)	Without	With and without
Automatic joint tracking	No joint tracking	With and without joint tracking
Position(s)	1G rotated	Flat
Consumable inserts (GTAW or PAW)	No inserts used	No inserts
Backing (with or without)	With gas backing	With gas backing
Single or multiple passes per side	Multiple	Single and multiple

Results

Visual Examination of Completed Weld (QW-302.4): acceptable

☒ Bend Test; ☒ Transverse root and face [QW-462.3(a)]; ☐ Longitudinal root and face [QW-462.3(b)]; ☐ Side (QW-462.2);

☐ Pipe bend specimen, corrosion-resistant overlay [QW 462.5(c)] ☐ Plate bend specimen, corrosion-resistant overlay [QW-462.5(d)];

☐ Pipe Specimen Macro test for fusion [QW-462.5(b)]: ☐ Plate Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result
QW-462.3(a) face	satisfactory	QW-462.3(a) root	satisfactory	-	
QW-462.3(a) face	satisfactory	QW-462.3(a) root	satisfactory	-	

Alternative volumetric examination results (QW-191): acceptable — RT ☒ or UT ☐ (check one)

Fillet weld – fracture test (QW-181.2): N/A — Length and percent of defects: -

☐ Fillet welds in plate (QW-462.4(b) ☐ Fillet welds in pipe (QW-462.4(c)

Macro examination (QW-184): acceptable — Fillet size (in./mm): - x - — Concavity or convexity (in/mm): -

Other tests: -

Film or specimens evaluated by: Balogh, József — Company: Csöszerlabor Kft.

Mechanical tests conducted by: Koszta, György — Laboratory test no.: BHQ 018/23 08/4639

Welding supervised by: Penzes, Laszlo

We certify that the statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code Ed. 2021.

Date of welding: 28 March 2023

Date issued: 28 July 2023

Organisation's Representative: Seres, Robert

Organisation: LRQA Austria GmbH

Andreas Altendorfer for L. Penzes and himself
Surveyor to LRQA Austria GmbH

Name: Andreas Altendorfer
Date: 28 July 2023
Signature:
Ref No.: AUT2300501
Office: Vienna

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A member of the LRQA Group Limited

LRQA003 11.2021

LRQA Group Limited, its affiliates and subsidiaries and their respective officers, employees or agents are, individually and collectively, referred to in this clause as 'LRQA'. LRQA assumes no responsibility and shall not be liable to any person for any loss, damage or expense caused by reliance on the information or advice in this document or howsoever provided, unless that person has signed a contract with the relevant LRQA entity for the provision of this information or advice and in that case any responsibility or liability is exclusively on the terms and conditions set out in that contract.

Confirmation of validity by employer/welding coordinator for the following 6 months

Date	Signature	Position or Title
04-12-2023	László Penzes	Witnessed ☐ Monitored ☐ Reviewed ☐ LRQA 04-12-2023 Laszlo Penzes LRQA Verification Ltd
13-05-2024	László Penzes	LRQA 13-05-2024 LRQA Verification Ltd

Prolongation for qualification by the examining body for the following 2 years

Date	Signature	Position or Title

Welding Operator Performance Qualification (WOPQ) ASME IX

Welding Operator's Name: Szabo, Ferenc — Identification No.: B2

Test Description (Information Only)

Identification of WPS followed	WM158 Rev. 5 25/02/2022 ☒	Test coupon ☐	Production
Specification and type/grade or UNS Number of base metal(s)	ASME SA-213, TP316L to ASME SA-213,TP316L	Thickness	4,3 mm
Base Metal P-Number P8	to P -Number P8	Position(s)	1G rotated

☐ Plate ☒ Pipe (enter diameter, if pipe or tube): 71,5 mm (2,81 inch)

Filler metal (SFA) specification: SFA 5.9 — Filler metal or electrode classification: ER316/316L

Testing Variables and Qualification Limits when using Automatic Welding Equipment

Welding Variables (QW-361.1)	Actual Values	Range Qualified
Type of welding (Automatic)		
Welding process		
Filler metal used (Yes or No) (EBW or LBW)		
Type of laser for LBW (CO_2 to YAG, etc.)		
Continuous drive or inertia welding (FW)		
Vacuum or out of vacuum (EBW)		

Testing Variables and Qualification Limits when using Machine Welding Equipment

Welding Variables (QW-361.2)	Actual Values	Range Qualified
Type of welding (Machine)	Weldlogic PWL15-27	
Welding process	GTAW	GTAW
Direct or remote visual control	Direct	Direct
Automatic arc voltage control (GTAW)	Without	With and without
Automatic joint tracking	No joint tracking	With and without joint tracking
Position(s)	1G rotated	Flat
Consumable inserts (GTAW or PAW)	No inserts used	No inserts
Backing (with or without)	With gas backing	With gas backing
Single or multiple passes per side	Multiple	Single and multiple

Results

Visual Examination of Completed Weld (QW-302.4): acceptable

☒ Bend Test; ☒ Transverse root and face [QW-462.3(a)]; ☐ Longitudinal root and face [QW-462.3(b)]; ☐ Side (QW-462.2);

☐ Pipe bend specimen, corrosion-resistant overlay [QW 462.5(c)] ☐ Plate bend specimen, corrosion-resistant overlay [QW-462.5(d)];

☐ Pipe Specimen Macro test for fusion [QW-462.5(b)]: ☐ Plate Macro test for fusion [QW-462.5(e)]

Type	Result	Type	Result	Type	Result
QW-462.3(a) face	satisfactory	QW-462.3(a) root	satisfactory	-	
QW-462.3(a) face	satisfactory	QW-462.3(a) root	satisfactory	-	

Alternative volumetric examination results (QW-191): acceptable — RT ☒ or UT ☐ (check one)

Fillet weld – fracture test (QW-181.2): N/A — Length and percent of defects: -

☐ Fillet welds in plate (QW-462.4(b) ☐ Fillet welds in pipe (QW-462.4(c)

Macro examination (QW-184): acceptable — Fillet size (in./mm): - x - — Concavity or convexity (in/mm): -

Other tests: -

Film or specimens evaluated by: Balogh, József — Company: Csöszerlabor Kft.

Mechanical tests conducted by: Koszta, György — Laboratory test no.: BHQ 082/23 04/4820

Welding supervised by: Penzes, Laszlo

We certify that the statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code Ed. 2021.

Date of welding: 12 December 2023 — Date issued: 05 February 2024

Organisation's Representative: Seres, Robert

Organisation

LRQA Verification Limited
Name: Andreas Altendorfer
Date: 05 February 2024
Ref No.: AUT2300517/7
Office: Vienna
Signature:
A member of the LRQA Group Limited

LRQA003 11.2021

Andreas Altendorfer for L. Penzes and himself
Surveyor to LRQA Austria GmbH

A subsidiary of LRQA Group Limited

LRQA Group Limited, its affiliates and subsidiaries and their respective officers, employees or agents are, individually and collectively, referred to in this clause as 'LRQA'. LRQA assumes no responsibility and shall not be liable to any person for any loss, damage or expense caused by reliance on the information or advice in this document or howsoever provided, unless that person has signed a contract with the relevant LRQA entity for the provision of this information or advice and in that case any responsibility or liability is exclusively on the terms and conditions set out in that contract.

Form 4104 (2022.03)

Confirmation of validity by employer/welding coordinator for the following 6 months

Date	Signature	Position or Title
12-08-2024		

LRQA Verification Ltd

Prolongation for qualification by the examining body for the following 2 years

Date	Signature	Position or Title

Form 4104 (2022.03)

PAINT REPORT AND ASSOCIATED SURFACE PREPARATION AND COATING TEST RECORDS

BROOKS INSTRUMENT

"This certificate is produced by an electronic data system and is valid without signature."

Title:	**Paint Test report 2.2 - Coating Thickness (Special painting)**	Cert No.:	**834-M-156-ZZA**
Subtitle:	**ISO 10474 / EN 10204**	Revision Date:	**Dec 4, 2017**

Issue date:	Sept 26, 2024
Customer name:	ROSETTI MARINO S.p.A
Country:	Italy
Customer ref.:	PO 1724000791
Brooks order no.:	SOJY007989
Supplier name:	Brooks Instrument B.V.

Instrument serial nr.:	Model/Part nr.:	Tag nr.:	Report nr.:
06C43100310	#10-3809	25-FT-031	202402225
06C43100311	#10-3809	25-FT-032	202402225
06C43100312	#10-3809	25-FT-033	202402225
06C43100313	#10-3809	25-FT-034	202402225
06C43100314	#10-3809	25-FT-036	202402225
06C43100315	#10-3809	25-FT-038	202402225
06C43100316	#8-3809	64-FG-001	202402225

This is to certify that the instruments/parts supplied on the above referenced order, are in accordance with all applicable specifications forming a part of the subject purchase order.

Inspection and specific testing, carried out as per applicable procedure/instruction, have proven to be in accordance with the requirements.

Applicable test-results are attached with reference Report nrs., as listed above.

Name: Andrea Halápi

Title: Quality Technician

BRH-QC 3

OSTORHÁZI BEVONATTECHNIKA		Megnevezés Title	QMP2024_0052			Munkaszám	243984
		Specifikáció Specification	17002_2024-06-27_ QMP_2024_0052_procedure_V02_OL_TU			Rev	0
Part No. / Termék típus	7 Pcs Body	Serial No. / Széria szám	QMP 2024_0052	Report Nr. / Jegyzőkönyv sz.	243984_24meo_B_0127_1..2	Megrendelés / PO Number	B/2024 21740

Receipt of Goods / Felület előírások		
YES	NO	Degreasing Total parts / Zsírtalanítás
YES	NO	Welds are continuous & no sharp projections, No excessive under cutting, No Spatter, No Pin holes, No Slag / Hegesztések folytonosak, nincsenek éles sarkok, túlzott bevágás
YES	NO	No Contamination, No Laminations, No sharp edges, No Burrs / Nincs szennyeződés, rétegesség, éles sarkok, sorja

Blast Process Control/ Szemcseszórás									
Start date/ Kezdés dátuma	Start time / Kezdés óra:perc	Cleanliness / Tisztaság	Salt Soluble / Sótartalom	Surface Profile / Érdesség	Dust level / Szennyezettség	szemcs. Nyom. Blazz pressure	Blotter test	Abrasive Type Used /	Blasting Batch nr / Szemcse az.
2024.09.11	7:05	Sa 2,5	-	MEDIUM (G)	-	8 bar	-	Corundum R30	500-850 ηm
Finish date / Befejezés	Finish time / Befejezés	Air Temp (°C) / Levegő hőm.	Humidity / Páratartalom	Dew Point / Harmatpont	Surf. Temp(°C) Felületi hőm.	Paint Operative / Szemcseszóró neve		Signature /	
2024.09.11	9:21	24,8°C	49,2%	13,4°C	24,2°C	Góman Alfonz		Góman Alfonz	

Paint Process Control / Festés ellenőrzése					
		1st Coat / 1. réteg	2nd Coat / 2. réteg	3rd Coat / 3. réteg	4th Coat / 4. réteg
Paint Manufacturer / Festék gyártó	Paint Name / Festék	Hempadur 15570 RAL 7032	Hempaprime Multi 500 RAL7032	Hmpel's Pro Acrylic 55883 RAL9002	
	Hardener / Edző	Hempel's Curing Agent 95570	Hempel's Curing Agent 95090	Hempel's Curing Agent 97883	
	Thinners Name / Hígító	Hempel's Thinner 08450	Hempel's Thinner 08450	Hempel's Thinner 08450	
Paint Batch Numbers / Adagszám	Paint / Festék	0444057105	044065578	043067676	
	Hardener / Edző	044027797	044078002	042116970	
	Thinners Name / Hígító	043065557	043065557	043065557	
Shelf life / Lejárati idő	Paint / Festék	06/2027	06/2026	07/2026	
	Hardener / Edző	02/2027	08/2026	12/2024	
	Thinners Name / Hígító	06/2028	06/2028	06/2028	
Thinning % / Hígító %-a		5%	5%	5%	
Time and Date starting / Festés kezdete (dátum, óra:perc)		2024.09.10 9:00	2024.09.11 9:00	2024.09.12 9:00	
Time and Date Finish / Befejezés (dátum, óra:perc)		2024.09.10 11:00	2024.09.11 11:00	2024.09.12 11:00	
Drying time between layers / Száradási idő					
Air Temperature / Levegő hőmérséklet		25,75 C°	24,15 C°	26,71 C°	
Humidity / Páratartalom		58,0%	56,0%	57,0%	
Surface Temperature / Felületi hőmérséklet		24,33 C°	23,35 C°	26,44 C°	
Dew Point Temperature / Harmatpont		17,5 C°	15,5 C°	18,2 C°	
ΔT between surface temp. To dew point (>= 3°C)/ ΔT (felületi h. és harmatpont)		17,1 C°	15 C°	17,8 C°	
WFT (Wet Film Thickness) / Nedves rétegvastagság					
DFT (Dry Film Thickness) / Szárazréteg vastagság		50-100 µm	100-200 µm	75-150 µm	
DFT (Dry Film Thickness)	min. µm	63 µm	159 µm	229 µm	
	átlag érték µm	84 µm	277 µm	301 µm	
	max. µm	98 µm	322 µm	381 µm	
Paint Operative / Festő neve		Kindl Zoltán	Kindl Zoltán	Kindl Zoltán	
Signature /Aláírás		Kindl Zoltán	Kindl Zoltán	Kindl Zoltán	

OSTORHÁZI KFT H-2040 Budaörs, Ipari u. 13. Telefon: +36 (23) 421-100 Adószám: 10666666-2-13 www.ostorhazi.hu No.: 2

Quality Control (Inspection) / Minőség ellenőrzés			
Quality Control verification of completeness and accuracy of paint record sheet including DFT results and Visual inspection / A minőség ellenőrzés hitelesítése a mérési jegyzőkönyv adatai (DFT. vizuális értékelés) alapján.			
Date of Verification / Dátum	2024/09/26	Signature of Inspector / MEO aláírása	
If Required - Adhesion Test completed in accordance with requirements detailed in QP/paint specification (if nothing specified use ISO 4624) / Amennyiben követelmény - tapadás vizsgálat a peifikációban meghatározottak szerint. (ha nincs erre adat, akkor ISO 4624 szeint)			
Adhesion Test Date / Tapadásvizsgálat dátuma	2024.09.25	Adhesion Test Value / Mért átlag érték	12,42 Mpa
Adhesion Test Comments/ Tapadási tulajdonságok	1,2,3 = C/C 50% B/C 50%	Signature / Aláírás	

FROSIO DR. OSTORHÁZI LÁSZLÓ

DOCUMENT NR.
202402225

PRESSURE TEST REPORTS

BROOKS INSTRUMENT

"This certificate is produced by an electronic data system and is valid without signature."

Title:	Inspection Certificate 3.1 - Pressure Test	Cert No.:	834-M-135-ZZA
Subtitle:	ISO 10474 / EN 10204	Revision Date:	Sept 15, 2014

Issue date:	Sept 25, 2024
Customer name:	ROSETTI MARINO S.p.A
Country:	Italy
Customer ref.:	PO 1724000791
Brooks order no.:	SOJY007989
Supplier name:	Brooks Instrument B.V.

Instrument serial nr.:	Tag nr.:
06C43100310	25-FT-031
06C43100311	25-FT-032
06C43100312	25-FT-033
06C43100313	25-FT-034
06C43100314	25-FT-036
06C43100315	25-FT-038

This is to certify that the instruments supplied on the above referenced order, are in accordance with the applicable specifications, forming a part of the subject purchase order.

Verification of inspection results, in accordance with manufacturing standards and the corresponding technical rules, have proven to be in accordance with the requirements.

The maximum allowable test pressure as defined below, has been subjected to the equipment for the specified duration at ambient temperature.

Applicable test results are attached.

Subject:	Medium:	Test press. bar:	Duration min.:
#10-3809 / 300 Lbs	Water	75	2

Tested by: BRH-OP 472
Validated by: BRH-QC 1

Name: Andrea Halápi

Title: Quality Technician

BRH-QC 3

BROOKS INSTRUMENT

"This certificate is produced by an electronic data system and is valid without signature."

Title:	Inspection Certificate 3.1 - Pressure Test	Cert No.:	834-M-135-ZZA
Subtitle:	ISO 10474 / EN 10204	Revision Date:	Sept 15, 2014

Issue date:	Sept 25, 2024
Customer name:	ROSETTI MARINO S.p.A
Country:	Italy
Customer ref.:	PO 1724000791
Brooks order no.:	SOJY007989
Supplier name:	Brooks Instrument B.V.

Instrument serial nr.:	Tag nr.:
06C43100316	64-FG-001

This is to certify that the instruments supplied on the above referenced order, are in accordance with the applicable specifications, forming a part of the subject purchase order.

Verification of inspection results, in accordance with manufacturing standards and the corresponding technical rules, have proven to be in accordance with the requirements.

The maximum allowable test pressure as defined below, has been subjected to the equipment for the specified duration at ambient temperature.

Applicable test results are attached.

Subject:	Medium:	Test press. bar:	Duration min.:
#8-3809 / 150 Lbs	Water	29	2

Tested by: BRH-OP 472
Validated by: BRH-QC 1

Name: Andrea Halápi

Title: Quality Technician

BRH-QC 3

BROOKS
INSTRUMENT B.V.

DOCUMENTATION TAG

Model : WN #10-3809
W.O. : M495170012 item :
S.N. : 06C43100310 item :
Tag no. : 25-FT-031

MATERIAL CERTIFICATION

Part / Description	Heat no.	Doc. no.
Flange In / Out 1" - 300	292020	2024-00010
Tube 1 1/4" SCH80	566573	2023-01665
Fill. mat'l : 0.9 mm	564427	2023-01269
Fill. mat'l :		
Fill. mat'l :		

Welder no.: B2W1 B2W2

PRESSURE TEST

Medium : Water *(amb. temp.)*
Pressure : 75 bar Time : 2 min
Test by : 472 QC1 Date : 2024. 09. 03.

X-Ray exam. report :

Dye Penetrant report :

Hardness Test report :

P.A.M.I. Test report :

502-Z-631-AAA Rev. H

BROOKS
INSTRUMENT B.V.

DOCUMENTATION TAG

Model : WN #10-3809
W.O. : M495190011 item :
S.N. : 06C43100311 item :
Tag no. : 25-FT-032

MATERIAL CERTIFICATION

Part / Description	Heat no.	Doc. no.
Flange In / Out 1" - 300	292020	2024-00010
Tube 1 1/4" SCH80	566573	2023-01665
Fill. mat'l : 0.9 mm	564427	2023-01269
Fill. mat'l :		
Fill. mat'l :		

Welder no.: B2W1 B2W2

PRESSURE TEST

Medium : Water *(amb. temp.)*
Pressure : 75 bar Time : 2 min
Test by : 472 QC1 Date : 2024. 09. 03.

X-Ray exam. report :

Dye Penetrant report :

Hardness Test report :

P.A.M.I. Test report :

502-Z-631-AAA Rev. H

BROOKS
INSTRUMENT B.V.

DOCUMENTATION TAG

Model : WN #10-3809
W.O. : M495190003 item :
S.N. : 06C43100312 item :
Tag no. : 25-FT-033

MATERIAL CERTIFICATION

Part / Description	Heat no.	Doc. no.
Flange In / Out 1" - 300	292020	2024-00010
Tube 1 1/4" SCH80	566573	2023-01665
Fill. mat'l : 0.9 mm	564427	2023-01269
Fill. mat'l :		
Fill. mat'l :		

Welder no.: B4W1 B4W2

PRESSURE TEST

Medium : Water *(amb. temp.)*
Pressure : 75 bar Time : 2 min
Test by : 472 QC1 Date : 2024. 09. 03.

X-Ray exam. report :

Dye Penetrant report :

Hardness Test report :

P.A.M.I. Test report :

502-Z-631-AAA Rev. H

BROOKS
INSTRUMENT B.V.

DOCUMENTATION TAG

Model : VN #10-3809
W.O. : M637560009 item :
S.N. : 06C43100313 item :
Tag no. : 25-FT-034

MATERIAL CERTIFICATION

Part / Description	Heat no.	Doc. no.
Flange In / Out 1" - 300	E221769	2023-02843
Tube 1 1/4" SCH80	566787	2023-03446
Fill. mat'l : 0.9 mm	E221798-1	2024-00386
Fill. mat'l :		
Fill. mat'l :		

Welder no.: B6W1 B6W2

PRESSURE TEST

Medium : Water *(amb. temp.)*
Pressure : 75 bar Time : 2 min
Test by : 472 QC1 Date : 2024. 09. 03.

X-Ray exam. report :

Dye Penetrant report :

Hardness Test report :

P.A.M.I. Test report :

502-Z-631-AAA Rev. H

BROOKS
INSTRUMENT B.V.

DOCUMENTATION TAG

Model : WN #10-3809
W.O. : M495190013 item :
S.N. : 06C43100314 item :
Tag no. : 25-FT-036

MATERIAL CERTIFICATION

Part / Description	Heat no.	Doc. no.
Flange In / Out 1" - 300	292020	2024-00010
Tube 1 1/4" SCH80	566573	2023-01665
Fill. mat'l : 0.9 mm	564427	2023-01269
Fill. mat'l :		
Fill. mat'l :		

Welder no.: B2W1 B2W2

PRESSURE TEST

Medium : Water *(amb. temp.)*
Pressure : 75 bar Time : 2 min
Test by : 472 QC1 Date : 2024. 09. 03.

X-Ray exam. report :

Dye Penetrant report :

Hardness Test report :

P.A.M.I. Test report :

502-Z-631-AAA Rev. H

BROOKS
INSTRUMENT B.V.

DOCUMENTATION TAG

Model : WN #10-3809
W.O. : M495170007 item :
S.N. : 06C43100315 item :
Tag no. : 25-FT-038

MATERIAL CERTIFICATION

Part / Description	Heat no.	Doc. no.
Flange In / Out 1" - 300	292020	2024-00010
Tube 1 1/4" SCH80	566573	2023-01665
Fill. mat'l : 0.9 mm	564427	2023-01269
Fill. mat'l :		
Fill. mat'l :		
Welder no.: B2W1 B2W2		

PRESSURE TEST

Medium : Water *(amb. temp.)*
Pressure : 75 bar Time : 2 min
Test by : 472 QC1 Date : 2024. 09. 03.

X-Ray exam. report :

Dye Penetrant report :

Hardness Test report :

P.A.M.I. Test report :

502-Z-631-AAA Rev. H

BROOKS
INSTRUMENT B.V.

DOCUMENTATION TAG

Model : WN #8-3809
W.O. : M647510002 item :
S.N. : 06c43100316 item :
Tag no. : 64-FG-001

MATERIAL CERTIFICATION

Part / Description	Heat no.	Doc. no.
Flange In / Out 1" - 150	281716	2023-01194
Tube 27 x 3,5	RM183	2023-02488

Fill. mat'l :	0.9 mm	E221798-1	2024-00386
Fill. mat'l :			
Fill. mat'l :			

Welder no.: B2W1 B2W2

PRESSURE TEST

Medium : Water *(amb. temp.)*
Pressure : 29 BAR Time : 2 min
Test by : 472 QC1 Date : 2024. 09. 03.

X-Ray exam. report :

Dye Penetrant report :

Hardness Test report :

P.A.M.I. Test report :

502-Z-631-AAA Rev. H

FLOW ACCURACY CALIBRATION RECORDS

BROOKS INSTRUMENT

"This certificate is produced by an electronic data system and is valid without signature."

Title:	**Inspection Certificate 3.1 - International Certificate of Calibration**	Cert No.:	**834-M-138-ZZA**
Subtitle:	**ISO 10474 / EN 10204**	Revision Date:	Jan 12, 2021

Issue date:	Sept 25, 2024
Customer name:	ROSETTI MARINO S.p.A
Country:	Italy
Customer ref.:	PO 1724000791
Brooks order no.:	SOJY007989
Supplier name:	Brooks Instrument B.V.

Instrument serial nr.:	Tag nr.:
06C43100310	25-FT-031
06C43100311	25-FT-032
06C43100312	25-FT-033
06C43100313	25-FT-034
06C43100314	25-FT-036
06C43100315	25-FT-038
06C43100316	64-FG-001

This certifies that this unit has been calibrated using equipment traceable through the National Institute of Standards and Technology (NIST) of
the United States or VSL (National Metrology Institute Van Swinden Laboratorium of The Netherlands).

Applicable test results are attached

Witnessed by : BRH-QC 7

Name: Andrea Halápi

Title: Quality Technician

BRH-QC 3

Product/Calibration Data Sheet

PPDS: 3.2
VASE: 5.9

Device Information

Serial Number
06C43100310

Model Number
MT3809

Customer Name
ROSETTI MARINO S.p.A

Customer PO Number
6032967

Customer Fluid
N2

Full Scale Flow
62 m3/h

Reference Temperature
0.00 °C

Customer Pressure
3 bar(g)

Customer Viscosity
0.0173cP

Customer Temperature
10.50 °C

Customer Fluid Density
0.0048 GM/CC

Calibration Information

Calibration Fluid
AIR

Calibration Flow Rate
1140.045 lpm

Calibration Pressure
50.78 psig

Calibration Temperature
70.00 °F

Calibration Location
Szekesfehervar

Calibration Procedure
834P054 // CAL038

Calibration Software/Revision
VA CAL.Rev 2.8.5.0 SW PN 805E002

Calibration Date
9/20/2024

Calibration System ID
06000/004

Calibrator Clock Number
472

BIII-QC 7

Mechanical Information

Tube
Size 10-A

Float
10-A, 316L SS

Meter Accuracy
1

Accuracy Scale
% FS

Customer Tag or Part #
25-FT-031

Reference Number
1

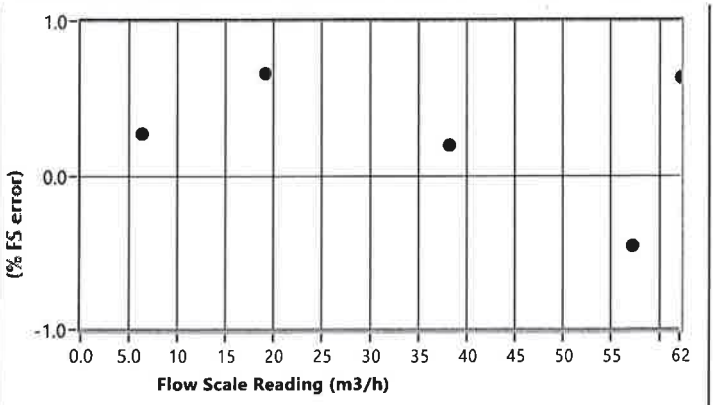
Alternate ID
N/A

Calibration Notes

Scale Check Data

Scale Reading	Flow (m3/h)	Error (% of FS)
62.00	62.394897	0.64
57.00	56.721075	-0.45
38.00	38.125385	0.20
19.00	19.413358	0.67
6.20	6.371203	0.28

Error vs Scale Indicated Value-Error limit acc. 1 % FS



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MT 38XX Transmitter Signal Test Sheet

9/24/2024 7:15:05 AM

Serial No.
06C43100310

Tag No.
25-FT-031

Model No.
3809G

Max Flow
62.000

Units
NM3/H

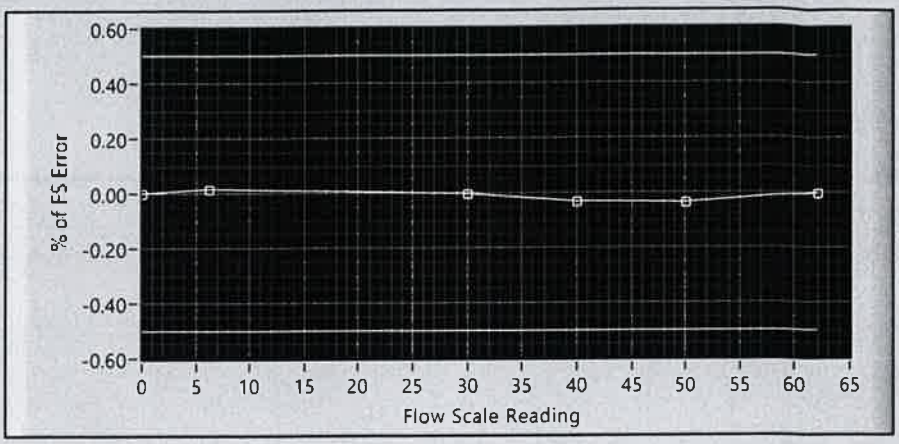
Clear All

Transmitter Type
HART --- 4 to 20 mA

Calibration Procedure
ELE 150 Rev. 3

Form
ELE 150-01

Calibrator ID
509



Flow Scale Reading	Expected % of FS Flow Output Signal	Measured % of FS Flow Output Signal	% of FS Error (+ / - 0.5% FS Limit)
62.0000	100.00	100.00	-0.00
50.0000	80.65	80.61	-0.04
40.0000	64.52	64.48	-0.03
30.0000	48.39	48.38	-0.00
6.2000	10.00	10.02	0.02
0.0000	0.00	0.00	0.00

Product/Calibration Data Sheet

PPDS: 3.2
VASE: 5.9

Device Information

Serial Number
06C43100311

Model Number
MT3809

Customer Name
ROSETTI MARINO S.p.A

Customer PO Number
6032967

Customer Fluid
N2

Full Scale Flow
62 m3/h

Reference Temperature
0.00 °C

Customer Pressure
3 bar(g)

Customer Viscosity
0.0173cP

Customer Temperature
10.50 °C

Customer Fluid Density
0.0048 GM/CC

Calibration Information

Calibration Fluid
AIR

Calibration Flow Rate
1140.045 lpm

Calibration Pressure
50.78 psig

Calibration Temperature
70.00 °F

Calibration Location
Szekesfehervar

Calibration Procedure
834P054 // CAL038

Calibration Software/Revision
VA CAL.Rev 2.8.5.0 SW PN 805E002

Calibration Date
9/20/2024

Calibration System ID
06000/004

Calibrator Clock Number
472

BROOKS QC 7

Mechanical Information

Tube
Size 10-A

Float
10-A, 316L SS

Meter Accuracy
1

Accuracy Scale
% FS

Customer Tag or Part #
25-FT-032

Reference Number
1

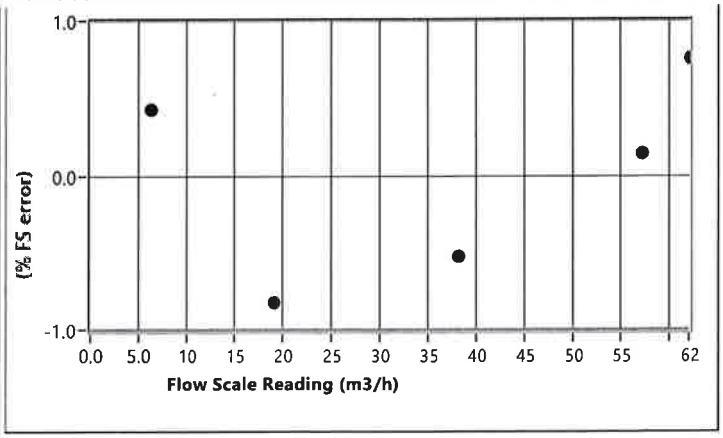
Alternate ID
N/A

Calibration Notes

Scale Check Data

Scale Reading	Flow (m3/h)	Error (% of FS)
62.00	62.472365	0.76
57.00	57.091015	0.15
38.00	37.677956	-0.52
19.00	18.494129	-0.82
6.20	6.467137	0.43

Error vs Scale Indicated Value-Error limit acc. 1 % FS



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MT 38XX Transmitter Signal Test Sheet

9/24/2024 8:58:16 AM

Serial No.
06C43100311

Tag No.
25-FT-032

Model No.
3809G

Max Flow
62.000

Units
NM3/H

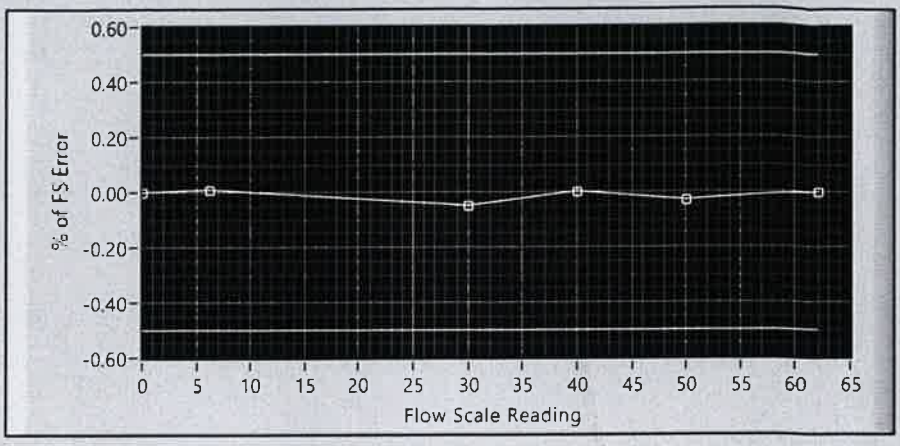
Clear All

Transmitter Type
HART --- 4 to 20 mA

Calibration Procedure
ELE 150 Rev. 3

Form
ELE 150-01

Calibrator ID
509



Flow Scale Reading	Expected % of FS Flow Output Signal	Measured % of FS Flow Output Signal	% of FS Error (+ / - 0.5% FS Limit)
62.0000	100.00	100.00	0.00
50.0000	80.65	80.62	-0.03
40.0000	64.52	64.52	0.00
30.0000	48.39	48.34	-0.05
6.2000	10.00	10.01	0.01
0.0000	0.00	0.00	0.00

BROOKS-QC 2

Product/Calibration Data Sheet

PPDS: 3.2
VASE: 5.9

Device Information

Serial Number
06C43100312

Model Number
MT3809

Customer Name
ROSETTI MARINO S.p.A

Customer PO Number
6032967

Customer Fluid
N2

Full Scale Flow
62 m3/h

Reference Temperature
0.00 °C

Customer Pressure
3 bar(g)

Customer Viscosity
0.0173cP

Customer Temperature
10.50 °C

Customer Fluid Density
0.0048 GM/CC

Calibration Information

Calibration Fluid
AIR

Calibration Flow Rate
1140.045 lpm

Calibration Pressure
50.78 psig

Calibration Temperature
70.00 °F

Calibration Location
Szekesfehervar

Calibration Procedure
834P054 // CAL038

Calibration Software/Revision
VA CAL.Rev 2.8.5.0 SW PN 805E002

Calibration Date
9/20/2024

Calibration System ID
06000/004

Calibrator Clock Number
472

BRUT-QC 7

Mechanical Information

Tube
Size 10-A

Float
10-A, 316L SS

Meter Accuracy
1

Accuracy Scale
% FS

Customer Tag or Part #
25-FT-033

Reference Number
1

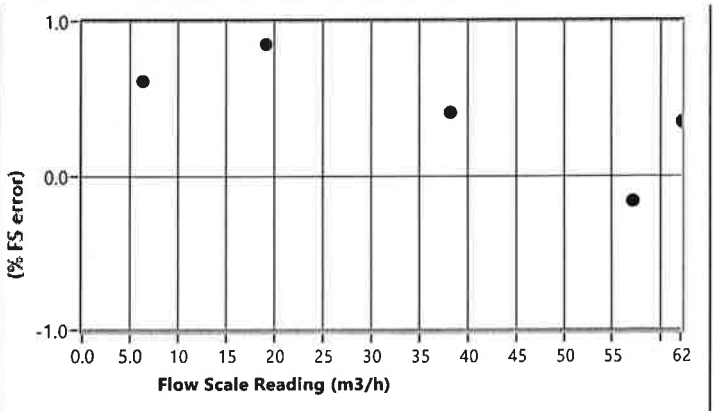
Alternate ID
N/A

Calibration Notes

Scale Check Data

Scale Reading	Flow (m3/h)	Error (% of FS)
62.00	62.217111	0.35
57.00	56.900507	-0.16
38.00	38.255967	0.41
19.00	19.530642	0.86
6.20	6.582601	0.62

Error vs Scale Indicated Value-Error limit acc. 1 % FS



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MT 38XX Transmitter Signal Test Sheet

9/24/2024 10:07:59 AM

Serial No.
06C43100312

Tag No.
25-FT-033

Model No.
3809G

Max Flow
62.000

Units
NM3/H

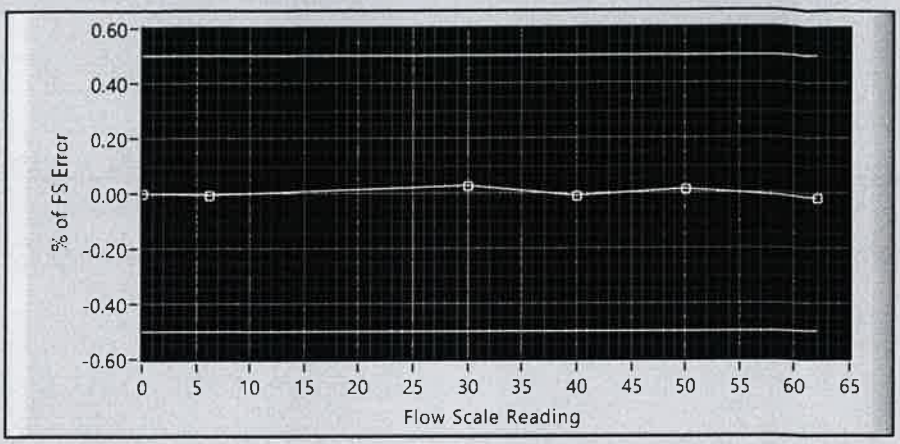
Clear All

Transmitter Type
HART --- 4 to 20 mA

Calibration Procedure
ELE 150 Rev. 3

Form
ELE 150-01

Calibrator ID
509



Flow Scale Reading	Expected % of FS Flow Output Signal	Measured % of FS Flow Output Signal	% of FS Error (+ / - 0.5% FS Limit)
62.0000	100.00	99.98	-0.02
50.0000	80.65	80.66	0.01
40.0000	64.52	64.51	-0.01
30.0000	48.39	48.41	0.03
6.2000	10.00	9.99	-0.01
0.0000	0.00	0.00	0.00

BRI-QC

Product/Calibration Data Sheet

PPDS: 3.2
VASE: 5.9

Device Information

Serial Number
06C43100313

Model Number
MT3809

Customer Name
ROSETTI MARINO S.p.A

Customer PO Number
6032967

Customer Fluid
N2

Full Scale Flow
62 m3/h

Reference Temperature
0.00 °C

Customer Pressure
3 bar(g)

Customer Viscosity
0.0173cP

Customer Temperature
10.50 °C

Customer Fluid Density
0.0048 GM/CC

Calibration Information

Calibration Fluid
AIR

Calibration Flow Rate
1140.045 lpm

Calibration Pressure
50.78 psig

Calibration Temperature
70.00 °F

Calibration Location
Szekesfehervar

Calibration Procedure
834P054 // CAL038

Calibration Software/Revision
VA CAL.Rev 2.8.5.0 SW PN 805E002

Calibration Date
9/20/2024

Calibration System ID
06000/004

Calibrator Clock Number
472

BRH-QC 7

Mechanical Information

Tube
Size 10-A

Float
10-A, 316L SS

Meter Accuracy
1

Accuracy Scale
% FS

Customer Tag or Part #
25-FT-034

Reference Number
1

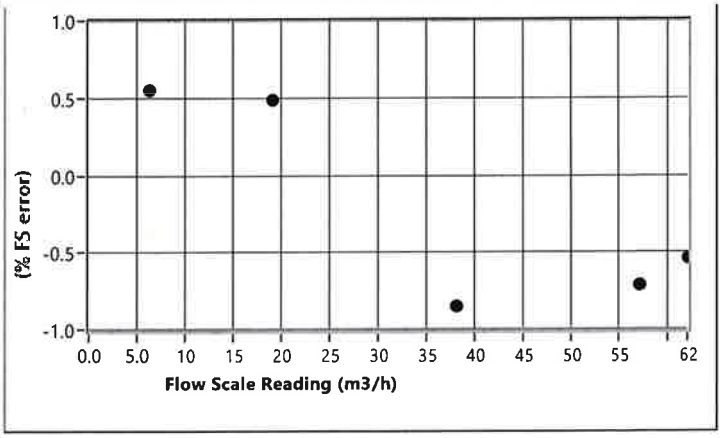
Alternate ID
N/A

Calibration Notes

Scale Check Data

Scale Reading	Flow (m3/h)	Error (% of FS)
62.00	61.669698	-0.53
57.00	56.562102	-0.71
38.00	37.477566	-0.84
19.00	19.305020	0.49
6.20	6.544862	0.56

Error vs Scale Indicated Value-Error limit acc. 1 % FS



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MT 38XX Transmitter Signal Test Sheet

9/24/2024 10:43:16 AM

Serial No.
06C43100313

Tag No.
25-FT-034

Model No.
3809G

Max Flow
62.000

Units
NM3/H

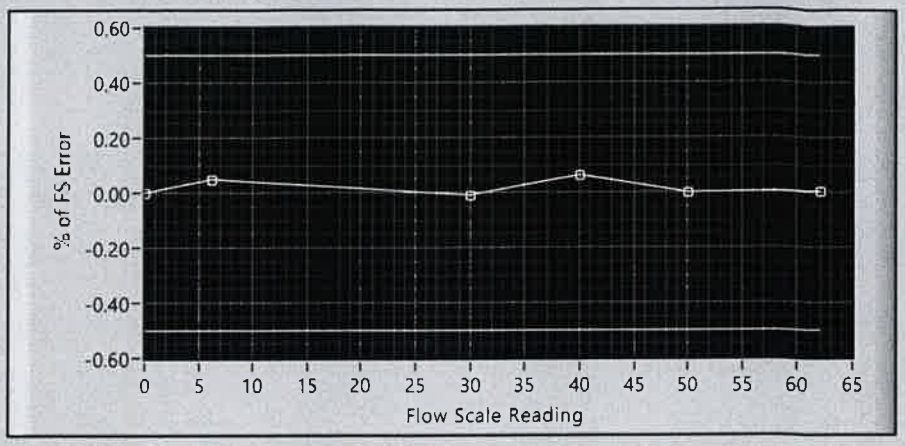
Clear All

Transmitter Type
HART --- 4 to 20 mA

Calibration Procedure
ELE 150 Rev. 3

Form
ELE 150-01

Calibrator ID
509



Flow Scale Reading	Expected % of FS Flow Output Signal	Measured % of FS Flow Output Signal	% of FS Error (+ / - 0.5% FS Limit)
62.0000	100.00	100.00	0.00
50.0000	80.65	80.64	0.00
40.0000	64.52	64.58	0.06
30.0000	48.39	48.38	-0.01
6.2000	10.00	10.05	0.05
0.0000	0.00	0.00	0.00

BRUI-QC 7

Product/Calibration Data Sheet

PPDS: 3.2
VASE: 5.9

Device Information

Serial Number
06C43100314

Model Number
MT3809

Customer Name
ROSETTI MARINO S.p.A

Customer PO Number
6032967

Customer Fluid
N2

Full Scale Flow
62 m3/h

Reference Temperature
0.00 °C

Customer Pressure
3 bar(g)

Customer Viscosity
0.0173cP

Customer Temperature
10.50 °C

Customer Fluid Density
0.0048 GM/CC

Calibration Information

Calibration Fluid
AIR

Calibration Flow Rate
1140.045 lpm

Calibration Pressure
50.78 psig

Calibration Temperature
70.00 °F

Calibration Location
Szekesfehervar

Calibration Procedure
834P054 // CAL038

Calibration Software/Revision
VA CAL.Rev 2.8.5.0 SW PN 805E002

Calibration Date
9/20/2024

Calibration System ID
06000/004

Calibrator Clock Number
472

Mechanical Information

Tube
Size 10-A

Float
10-A, 316L SS

Meter Accuracy
1

Accuracy Scale
% FS

Customer Tag or Part #
25-FT-036

Reference Number
1

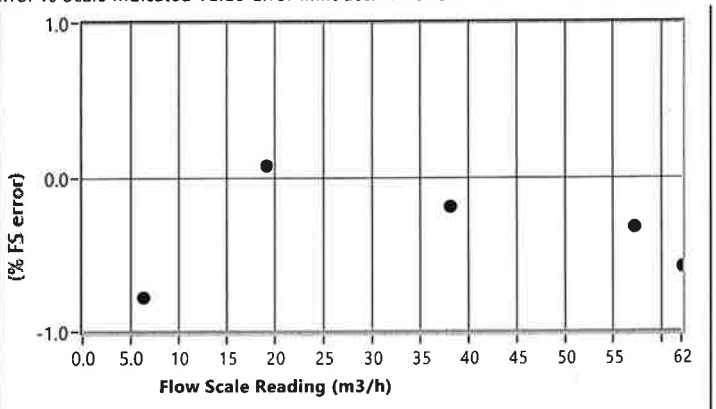
Alternate ID
N/A

Calibration Notes

Scale Check Data

Scale Reading	Flow (m3/h)	Error (% of FS)
62.00	61.642716	-0.58
57.00	56.803325	-0.32
38.00	37.884574	-0.19
19.00	19.050377	0.08
6.20	5.721467	-0.77

Error vs Scale Indicated Value-Error limit acc. 1 % FS



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MT 38XX Transmitter Signal Test Sheet

9/24/2024 12:06:48 PM

Serial No.
06C43100314

Tag No.
25-FT-036

Model No.
3809G

Max Flow
62.000

Units
NM3/H

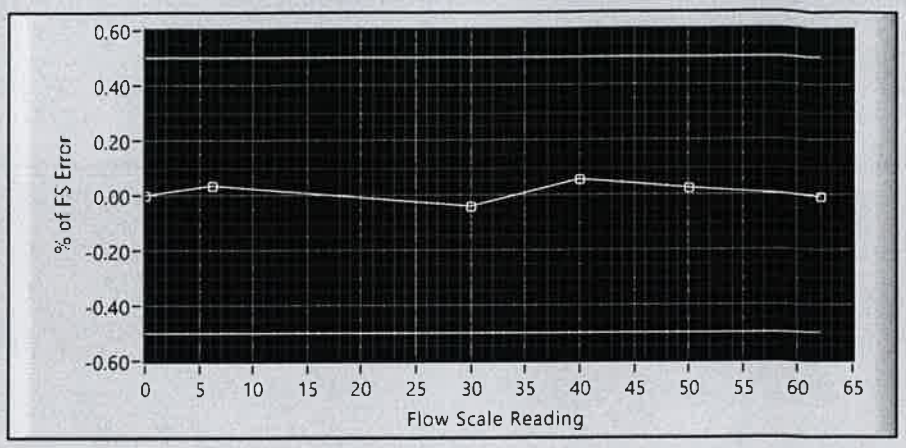
Clear All

Transmitter Type
HART --- 4 to 20 mA

Calibration Procedure
ELE 150 Rev. 3

Form
ELE 150-01

Calibrator ID
509



Flow Scale Reading	Expected % of FS Flow Output Signal	Measured % of FS Flow Output Signal	% of FS Error (+ / - 0.5% FS Limit)
62.0000	100.00	99.99	-0.01
50.0000	80.65	80.67	0.02
40.0000	64.52	64.57	0.06
30.0000	48.39	48.35	-0.04
6.2000	10.00	10.04	0.04
0.0000	0.00	0.00	0.00

DRFT-QC 2

Product/Calibration Data Sheet

PPDS: 3.2
VASE: 5.9

Device Information

Serial Number
06C43100315

Model Number
MT3809

Customer Name
ROSETTI MARINO S.p.A

Customer PO Number
6032967

Customer Fluid
N2

Full Scale Flow
62 m3/h

Reference Temperature
0.00 °C

Customer Pressure
3 bar(g)

Customer Viscosity
0.0173cP

Customer Temperature
10.50 °C

Customer Fluid Density
0.0048 GM/CC

Calibration Information

Calibration Fluid
AIR

Calibration Flow Rate
1140.045 lpm

Calibration Pressure
50.78 psig

Calibration Temperature
70.00 °F

Calibration Location
Szekesfehervar

Calibration Procedure
834P054 // CAL038

Calibration Software/Revision
VA CAL.Rev 2.8.5.0 SW PN 805E002

Calibration Date
9/20/2024

Calibration System ID
06000/004

Calibrator Clock Number
472

BRE-QC 7

Mechanical Information

Tube
Size 10-A

Float
10-A, 316L SS

Meter Accuracy
1

Accuracy Scale
% FS

Customer Tag or Part #
25-FT-038

Reference Number
1

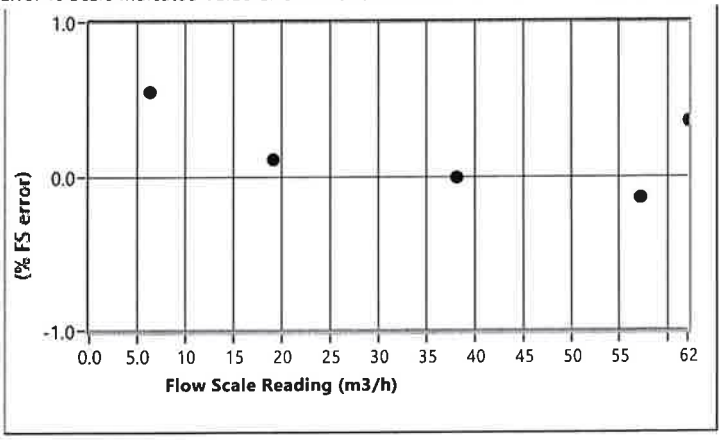
Alternate ID
N/A

Calibration Notes

Scale Check Data

Scale Reading	Flow (m3/h)	Error (% of FS)
62.00	62.223670	0.36
57.00	56.914953	-0.14
38.00	37.996904	-0.00
19.00	19.070287	0.11
6.20	6.542050	0.55

Error vs Scale Indicated Value-Error limit acc. 1 % FS



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MT 38XX Transmitter Signal Test Sheet

9/24/2024 12:35:30 PM

Serial No.
06C43100315

Tag No.
25-FT-038

Model No.
3809G

Max Flow
62.000

Units
NM3/H

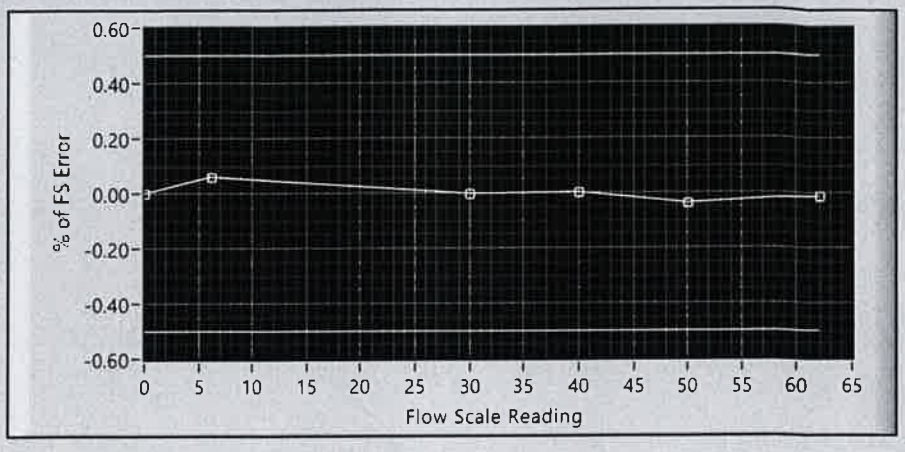
Clear All

Transmitter Type
HART --- 4 to 20 mA

Calibration Procedure
ELE 150 Rev. 3

Form
ELE 150-01

Calibrator ID
509



Flow Scale Reading	Expected % of FS Flow Output Signal	Measured % of FS Flow Output Signal	% of FS Error (+ / - 0.5% FS Limit)
62.0000	100.00	99.99	-0.01
50.0000	80.65	80.61	-0.04
40.0000	64.52	64.52	0.00
30.0000	48.39	48.38	-0.00
6.2000	10.00	10.06	0.06
0.0000	0.00	0.00	0.00

BRU-QC

Product/Calibration Data Sheet

PPDS: 3.2
VASE: 5.9

Device Information

Serial Number
06C43100316

Model Number
MT3809

Customer Name
ROSETTI MARINO S.p.A

Customer PO Number
6032967

Customer Fluid
N2

Full Scale Flow
15 m3/h

Reference Temperature
0.00 °C

Customer Pressure
0.5 bar(g)

Customer Viscosity
0.0174cP

Customer Temperature
15.00 °C

Customer Fluid Density
0.0018 GM/CC

Calibration Information

Calibration Fluid
AIR

Calibration Flow Rate
276.7536 lpm

Calibration Pressure
9.765 psig

Calibration Temperature
70.00 °F

Calibration Location
Szekesfehervar

Calibration Procedure
834P054 // CAL038

Calibration Software/Revision
VA CAL.Rev 2.8.5.0 SW PN 805E002

Calibration Date
9/20/2024

Calibration System ID
06000/004

Calibrator Clock Number
472

Mechanical Information

Tube
Size 8-B

Float
8-B, 316L SS

Meter Accuracy
1

Accuracy Scale
% FS

Customer Tag or Part #
64-FG-001

Reference Number
1

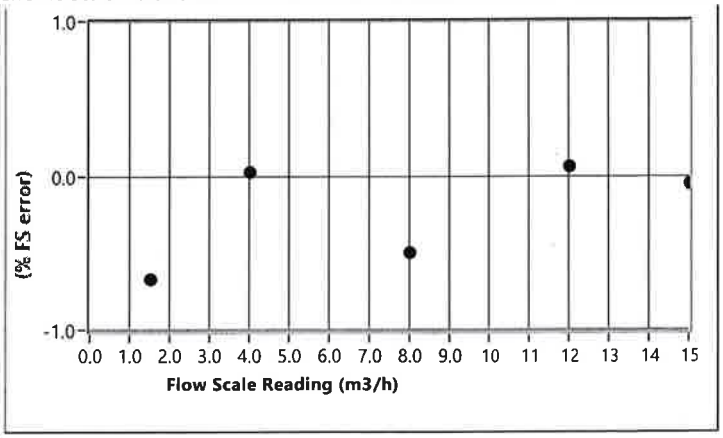
Alternate ID
N/A

Calibration Notes

Scale Check Data

Scale Reading	Flow (m3/h)	Error (% of FS)
15.00	14.993020	-0.05
12.00	12.009563	0.06
8.00	7.925932	-0.49
4.00	4.004604	0.03
1.50	1.400178	-0.67

Error vs Scale Indicated Value-Error limit acc. 1 % FS



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Ref. OPN-001

INSPECTION RELEASE NOTES (IRN)

ROSETTI MARINO	**RELEASE NOTE**	**Nr.** RN-0791-BRO-01	Sheet **1** of **2**
		DATA *Date* 16/10/2024	**Rev**. 00

PROGETTO *Project*	**CLIENTE** *Client*	**COMMESSA** *Job*
HOLLANDSE KUST NOORD WIND PARK	CROSSWIND	***123A90***

FORNITORE *Vendor*	**NUMERO D' ORDINE** *Purchase Order No.*
Brooks Instruments	1724000791

Release Note	☐ FOR PAYMENT	☒ FOR SHIPMENT

RELEASE NOTE FOR PAYMENT

PO Art.	

RELEASE NOTE FOR SHIPMENT

POS. *Item*	**QTÀ** *Quantity*	**DESCRIZIONE** *Description*	**Nr. TAG** *TAG No.*	**TIPO DI ISPEZIONE** *Kind of Inspection*	**ESITO** *Result*
10	10	Flow Transmitter Case in SS	25-FT-031	N/A	N/A
20	20	Flow Transmitter Case in SS	25-FT-032	N/A	N/A
30	30	Flow Transmitter Case in SS	25-FT-033	N/A	N/A
40	40	Flow Transmitter Case in SS	25-FT-034	N/A	N/A
50	50	Flow Transmitter Case in SS	25-FT-036	N/A	N/A
60	60	Flow Transmitter Case in SS	25-FT-038	N/A	N/A
70	70	Flow Transmitter Case in SS	64-FG-001	N/A	N/A
80	80	Spare Parts (Item 10)	N/A	N/A	N/A
90	90	Spare Parts (Item 20)	N/A	N/A	N/A

Warehouse open Monday to Friday from 08.00 to 12.00 and from 13.00 to 17.00.
Contact Mr Rota +39 3451608099

DOCUMENTI APPLICABILI / *APPLICABLE DOCUMENTS*

POSIZIONE *Items*	**TIPO DI DOCUMENTO** *Type of Document*	**NUMERO DI DOCUMENTO** *Document Number*	**Rev.**	**COD. DI APPROV.** *Approval Code*
N/A	PO	1724000791	01	N/A
N/A	Packing List	123A90 CROSSWIND BLPH PACKING LIST	N/A	N/A

PUNCH LIST:
☐ **SI** / *YES* **VEDI PUNCH LIST ALLEGATA N°** / *REFER TO ATTACHED PUNCH LIST N°*
☒ **NO**/ *NO*

CONTROLLO VALIDITA' FIDEJUSSIONE / *PERFORMANCE or WARRANTY BOND expiration date check*
Estensione Fidejussione Richiesta / *Performance or Warranty Bond Extension of Validity required*
☐ **SI** / *YES* ☒ **NO**/ *NO*
Acceptance Method: Performance or Warranty Bond valid if actually delivery date it's not greater than two weeks from contractual delivery date.

INCARICATO *Person in charge* **ROSETTI MARINO** *Supply Management dept.*		**RAPPR. DEL CLIENTE** *Client Representative*	**FORNITORE** *Vendor*	**CONSTRUCTION MANAGER** *Only requested for Punch List to be closed at Yard*
Nome Cognome *Name Surname*	**Firma** *Signature*			
Leonardo PASQUALI		N/A	N/A	N/A

QUESTO DOCUMENTO NON SOLLEVA IL FORNITORE DALLA RESPONSABILITA' DI EVENTUALI DIFETTI E/O MALFUNZIONAMENTI RILEVATI DURANTE L'USO / *The present RELEASE NOTE does not relieve the Supplier of the responsibility of any possible defects and/or malfunctioning arising during the utilisation.*

ROSETTI MARINO	**RELEASE NOTE**	**Nr.** RN-0791-BRO-01	Sheet **2** of **2**
		DATA *Date* 16/10/2024	**Rev**. 00
PROGETTO *Project* **HOLLANDSE KUST NOORD WIND PARK**	**CLIENTE** *Client* CROSSWIND	**COMMESSA** *Job* ***123A90***	
FORNITORE *Vendor* Brooks Instruments	**NUMERO D' ORDINE** *Purchase Order No.* 1724000791		

RELEASE NOTE

RISULTATO *RESULT*	**FORNITURA** *SUPPLY*	**DISTRIBUZIONE A** *DISTRIBUTION TO:*	
☒POSITIVO / *POSITIVE*	☐COMPLETA / *COMPLETE*	☒Project Manager	☒Administration
☐ NEGATIVO / *NEGATIVE*	☐ PARZIALE / *PARTIAL*	☒ Project Quality Manager	☒ Project Eng-/Procurement Coord
☐PUNTI PENDENTI / *PUNCH-LIST*	☒ ULTIMA / *FINAL*	☐ Warehouse	☐ Supplier

NOTE / *NOTES*

None

INCARICATO *Person in charge* **ROSETTI MARINO** *Supply Management dept.*		**RAPPR. DEL CLIENTE** *Client Representative*	**FORNITORE** *Vendor*	**CONSTRUCTION MANAGER** *Only requested for Punch List to be closed at Yard*
Nome Cognome *Name Surname*	**Firma** *Signature*			
Leonardo PASQUALI		N/A	N/A	N/A

QUESTO DOCUMENTO NON SOLLEVA IL FORNITORE DALLA RESPONSABILITA' DI EVENTUALI DIFETTI E/O MALFUNZIONAMENTI RILEVATI DURANTE L'USO / *The present RELEASE NOTE does not relieve the Supplier of the responsibility of any possible defects and/or malfunctioning arising during the utilisation.*