Base Load Power Hub (BLPH)

NON-DESTRUCTIVE EXAMINATIONS PROCEDURES (NDE) including PMI TEST PROCEDURE, NDE OPERATORS LIST and QUALIFICATIONS

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1 – DOCUMENT SCOPE

This procedure describes how to perform the PMI (Positive Material Identification) test using a X-Ray fluorescence (XRF) analyzer.

2 – CODES AND STANDARDS

The chemical content for each element is verified in accordance to the applicable standards' requirements, such as ASTM, ASME, PMA, PED Directive and Clients' specifications.

3 - APPLICABILITY

This procedure applies to all materials shown in table in paragraph 11 .

Chemical analysis of elements with atomic number less than 15 cannot be performed.
Hence, Magnesium, Aluminum and Carbon are to be excluded from this examination.

On the other hand, the following elements are to be considered relevant and they are generally included into PMI test:

Chromium (Cr)	Cobalt (Co)	Copper (Cu)
Niobium (Nb)	Steel (Fe)	Manganese (Mn)
Tungsten (W)	Molybdenum (Mo)	Nickel (Ni)
Titanium (Ti)	Vanadium (V)	Columbium (Cb)

This test shall be performed before using the materials, in order to ensure that chemical elements typical of each alloy are those provided by reference regulation.

4 – EQUIPMENT

The device used to perform this test is the spectrometer AMETEK, model SPECTRO X-SORT, capable of self-calibration.
In case its calibration needs to be verified, it is possible to use the following sample:

n. 001 heat number 261070 material: ASTM A182/A182M 316
ASTM A182/A182M 316L
ASME SA479 S31603

4.1 – CALIBRATION

The SPECTRO X-SORT is a self-calibrating device.
Once you turn it on, the auto-calibration procedure begins.
Every year, the device is checked using the reference sample in paragraph 4.

Whenever during a test the operator suspects that the device is not properly working, the calibration check is to be performed.
In case materials and recorded values (± 3%) are those shown on the Reference Sample Certificate, the device is to be considered properly set.
If detected values are outside the above specified limits, it is necessary to perform a second level calibration (according to the equipment's working and maintenance instructions). Then, another calibration check is to be performed.

A sample of calibration report is attached in Annex 2.

The most recent calibration report is always available to be checked in case of inspections.

5 – SURFACE MATERIAL

The surface of material to be analyzed requires no particular preparation. It just needs to be clean and free from foreign bodies.

6 – ACCEPTABILITY CRITERIA

The material to be conformed shall contain the chemical elements according to table in paragraph 11.

To be accepted the part shall have the alloying elements, as indicated in the table in paragraph 11 of this Procedure, all within ± 10% of the specification range.

7 – NON CONFORMING MATERIAL

The material that is Non-Compliant is managed in accordance with the procedure PG04 " Control of Non-Conforming products".
Whenever a component of the percentage subject to control is found not to meet the required chemical characteristics, all remaining parts (100%) will be subject to the PMI control.

8 – IDENTIFICATION OF PARTS

Components are identified in order to grant the correspondence to the certification.
The components are identified in two ways: as a part to be kept on store or as a part to be used for assembling a specific product with a serial number.

8.1 – IDENTIFICATION OF COMPONENTS ON STORE

The components on store subject to PMI control are identified by a code made with two letters and a number.

8.2 – IDENTIFICATION OF COMPONENTS TO BE USED FOR A SPECIFIC PRODUCT

In this case components are identified with an alphabetical letter and a number which is combined with the serial number of the product. Both the letter and the number are reported on internal process sheet in order to issue the PMI report.

9 – PMI TEST REPORT

The PMI report includes:

- Customer name;
- Order or Customer Reference;
- Number of Technical Job;
- Product's serial number and product's TAG number, when available (just for those components that are used for a specific product);
- Identification of the part;
- Material, heat number;
- Element values and test results.

An example of the PMI report issued by Technical can be found in Annex 1.

10 – PMI AUTHORIZED PERSONNEL LIST

Only trained personnel are authorized to use the equipment.
A copy of the list of authorized personnel is available inside the equipment case.

11 – TABLE OF ELEMENTS REQUIRED FOR PMI TEST

ELEMENTS REQUIRED FOR PMI TEST				ELEMENTS										
	Description	Bar (FORGED) ASTM & UNS GRADE	Casting ASTM & UNS GRADE	Mn	Cr	Ni	Mo	Nb (or Cb)	Ti	Cu	Co	V	W	Fe
ALLOY STEEL	1 Cr - ½ Mo	A182-F12 UNS K11562			X		X							
	1 ¼ Cr - ½ Mo	A182-F11 UNS K11597	A217 – WC6 UNS J12072		X		X							
	2 ¼ Cr - ½ Mo	A182-F22 UNS K21590	A217 – WC9 UNS S21890		X		X							
	5 Cr - ½ Mo	A182-F5 UNS K41545	A217 – C5 UNS SJ42045		X		X							
	9 Cr - 1 Mo	A182-F9 UNS K90941	A217 – C12 UNS J82090		X		X							
STAINLESS STEEL	13 Cr	A182-F6A UNS S41000	A217 – CA15 UNS S J91150											
	TYPE 304	A182-F304 UNS S30400 A182-F304L UNS S30403	A351 CF8 UNS J92600 A351 CF3 UNS J92700		X	X								
	TYPE 309				X	X								
	TYPE 310	A182-F310 UNS S31000			X	X	X							
	TYPE 316	A182-F316 UNS S31600 A182-F316L UNS S31603 A276 316 UNS S31600 A276 F316L UNS S31603 A479 316 UNS S31600 A479 316L UNS S31603	A351 CF8M UNSJ92900 A351 CF3M UNS J92800		X	X	X							
	TYPE 317	A182 F317 UNS S31700			X	X	X							
	TYPE 321	A182-F321 UNS S32100 A276 321 UNS S32100 A479 321 UNS S32100			X	X			X					
	TYPE 347	A182-F347 UNS S34700 A276 347 UNS S34700 A479 347 UNS S34700	A351 – CF8C UNS J92710	X	X	X		X						
	410/410S	A479 UNS S41000		X	X	X			X					
	420	A276 UNS S42000		X	X	X								
	17-4 PH	A564 TYPE 630 UNS S17400	A747 CB7Cu-1 UNS J92180	X	X	X								
DUPLEX STEEL	SUPER DUPLEX	A182 F53 UNS S32750 A182 F55 UNS S32760 A276 UNS S32750 A276 UNS S32760 A479 UNS S32750 A479 UNS S32760	A995 5A (CE3MN) UNS J93404 A995 6A (CD3MWCuN) UNS J93380	X	X	X	X			X				
	DUPLEX	A182 F51 UNS S31803 A276 UNS S31803 A479 UNS S31803	A995 4A (CD3MN) UNS J92205	X	X	X	X							
	254 SMO	A182 F44 UNS S31254	A351 CK-3MCuN UNS J93254	X	X	X	X							

ELEMENTS REQUIRED FOR PMI TEST				ELEMENTS										
	Description	Bar *(FORGED)* *UNS GRADE*	Casting *UNS GRADE*	Mn	Cr	Ni	Mo	Nb (or Cb)	Ti	Cu	Co	V	W	Fe
NICKEL ALLOY	ALLOY 20		B473 UNS N08020		X	X	X	X	X	X				
	ALLOY 625	B446 N06625 *B564 N06625*	A494 CW6MC UNSN26625		X	X	X	X						X
	ALLOY 600	B166 N06600 *B564 N06600*	A494 CY40 UNS N06040		X	X								
	ALLOY 800	B408 N08800 *B564 N08810*	-		X	X			X	X				X
	ALLOY 825	B425 N08825	-		X	X	X		X					X
	ALLOY 400 (Monel 400)	B164 N04400 *B564 N04400*	A494 M35-1 UNS N24135			X				X				
	ALLOY C22	B574 N06022	A494 CX2MW UNS N26022		X	X	X						X	
	ALLOY C276	B574 N10276 *B564 N10276*	A494 CW12MW UNS N30002		X	X	X						X	
	ALLOY 330 (RA 330)	B512 UNS N08330			X	X								
	ALLOY 333 (RA 333)	B719 UNS N06333			X	X	X				X		X	
	Titanium	B348 Gr.2 *B381 F2* *UNS R50400*	B367 C2						X					

technical	**POSITIVE MATERIAL IDENTIFICATION REPORT**	**Certificate n.** 0457 **Date:** XXXX-XX-XX **Sheet** 1 **of** 1

	Order/Job	Procedure
CUSTOMER	**CUSTOMER ORDER N.**	//
TECHNICAL S.r.l.	**TECHNICAL JOB**	**Il 75 Rev. 0**
INSTRUMENT: portable spectrometer XRF – Spectro X-sort AlloyPlus – type: XHH03 - Ametek S/N 12009592		

OBTAINED VALUES

Serial Number	Tag	Code	Description	Part	Material	Heat	Ident.	Elements			Result *
	PSV-CCCC	240-III-SS	Safety valves 20.000 series ¾" 1500RF x 1" 300RF	Body	CF3M	FNH9	A1	Cr% Min. 17,00 Max. 21,00: 16.70	Mo% Min. 2,00 Max. 3,00: 2.22	Ni% Min. 9,00 Max. 13,00: 9.65	Positive
				Nozzle	AISI 316L	271964	B1	Cr% Min. 16,00 Max. 18,00: 16.30	Mo% Min. 2,00 Max. 3,00: 2.02	Ni% Min. 10,00 Max. 14,00: 10.00	Positive
				Disc	AISI 316L	280835	C1	Cr% Min. 16,00 Max. 18,00: 16.50	Mo% Min. 2,00 Max. 3,00: 2.04	Ni% Min. 10,00 Max. 14,00: 9.78	Positive

* Alloys are acceptable if the alloying elements are each within ± 10% of the specified range of values

Test conducted by	Customer Inspector	Third Part Inspector

technical	POSITIVE MATERIAL IDENTIFICATION REPORT	Certificate n. // Date: 2019.04.19 Sheet 1 of 1

	Order/Job	Procedure
SPECTRO X-sort Ametek S/N 12009592 TECHNICAL S.r.l.	CALIBRATION	Il 75 Rev. 0

OBTAINED VALUES

Material	Heat	Serial Number	Code Description	Result *				
				Mn%	Cr%	Ni%	Mo%	Values shown on certificate n.4055/13
ASTM A182/A182M 316 ASTM A182/A182M 316L ASME SA479 S31603	261070	001	REFERENCE SAMPLE	1.44	16.61	10.04	2.07	
		test	analysis	Mn%	Cr%	Ni%	Mo%	Positive
				1.47	16.20	9.77	2.01	

the results are positive, the instrument is calibrated correctly

* Alloys are acceptable if the alloying elements are each within ± 3% of the values shown on the Reference Sample Certificate n. 4055/13

Test conducted by	Customer Inspector	Third Part Inspector

ANNEX 2: sample of PMI calibration certificate

technical VIGNATE – MI - ITALY	WORKING INSTRUCTION	
POSITIVE MATERIAL IDENTIFICATION (PMI)	Procedure	IL 75
	Revision	No. 2
	Date	2021.10.20
	Pag.	Pag. 8 a 8

ATTESTATO di PARTECIPAZIONE

Si attesta che

la Sig.ra Elena Adornato

Della TECHNICAL S.R.L.

ha partecipato al corso di formazione hardware & software su strumento

XSORT

tenuto dalla società AMETEK S.r.l. – Divisione Spectro

Vignate, 18/03/2024

AMETEK S.r.l

SPECTRO

Il Relatore del Corso

Amoruso Paolo

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0	08/02/2024	First issue	RB	PLD	GS
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1 SCOPO

Il presente documento definisce la procedura di prova per la valutazione delle perdite verso l'esterno delle guarnizioni del corpo di valvole di sicurezza destinate a servizi con fluidi pericolosi e sostanze volatili inquinanti. La metodologia adottata prevede l'uso di un rilevatore di perdite di elio, dotato di una sonda di rilevamento (sniffer), per la concentrazione di elio dovuta alle emissioni dalle guarnizioni.
Il fluido di prova è elio.
Le misurazioni sono effettuate, come indicato in ISO 15848-1 Section B1.1, secondo quanto descritto nel metodo EPA 21

. SCOPE

This document defines the testing procedure for evaluation of external leakage of body joints of the safety valves intended for application in volatile air polluants and hazardous fluids. The method specifies the use of a helium leak detector, fitted with a detector probe (sniffer), to measure helium concentration due to emissions from body seals.
The test fluidi s helium
The measurements are made, as indicated in ISO 15848-1 B1.1, according to the principle described in EPA method 21.

2 RIFERIMENTI

Di seguito vengono riportate le normative e i documenti considerati come riferimento.

ISO 15848-1
- Industrial valves – Measurement, test and qualification procedures for fugitive emissions

EPA –METHOD 21
- Environmental Protection Aency,Determination of volatile organic compound leak. Federal Regulations, Title 40, Part 60, Appendix A Reference Method 21, Reference Method 21. Washingon,D.C. U.S. Governemnt Printing Office.

. REFERENCES

Here below is possible to find the standards and the documents used as a reference

3 TERMINI E DEFINIZIONI

- *Concentrazione di definizione della perdita*: concentrazione locale di elio sulla superficie di una fonte di perdita che indica la presenza della perdita. Essa è una lettura specifica dello strumento.
- *Gas di calibrazione*: concentrazione di elio approssimativamente uguale alla concentrazione di definizione della perdita.
- *Nessuna emissione rilevabile:* qualsiasi concentrazione di elio sulla superficie di una potenziale perdita (corretta dalla concentrazione locale di elio nell'ambiente) che è inferiore al valore corrispondente alla specifica di leggibilità dello strumento (il 2,5% della concentrazione di definizione della perdita specificata) e che indica che non è presente una perdita.
- *Precisione di calibrazione:* Grado di convergenza tra le misurazioni dello stesso valore noto, espresso come percentuale relativa della differenza media tra le letture dello strumento e la concentrazione nota rispetto alla concentrazione nota.
- *Tempo di risposta:* Intervallo di tempo che intercorre tra una variazione graduale della concentrazione di elio all'ingresso del sistema di campionamento e il momento in cui viene raggiunto il 90% del valore finale corrispondente, visualizzato sul master di lettura dello strumento.

. TERMS AND DEFINITIONS

- *Leak definition concentration:* local helium concentration at the surface of a leak source that indicates that the leak is present. The leak definition is a specified instrument meter reading.
- *Calibration gas:* concentration of helium approximately equal to the leak definition concentration.
- *No detectable emission*: any helium concentration as a potential leak surface (adjusted for local helium ambient concentration) that is less than a value corresponding to the instrument readability specification (the 2.5 percent of the specified leak definition concentration) and which indicated that a leak is not present
- *Calibration precision:* Degree of agreement between measurement of the same know value, expressed as the relative percentage of the average difference between the meter readings and the known concentration to the known concentration
- *Response time:* Time interval from a step change in helium concentration at the input of the sampling system to the time at which 90% of the corresponding final value is reached as displayed on the instrument readout master

4 STRUMENTO DI RILEVAMENTO DELLE PERDITE

Specifiche

Il tipo di strumento per la rilevazione dell'elio può includere, ma non solo, lo spettrometro di massa, assorbimento infrarosso e screening molecolare.

Sia l'intervallo di risposta lineare che l'intervallo misurabile dello strumento devono comprendere la concentrazione di definizione della perdita specificata in tabella 1.

È possibile utilizzare una sonda di diluizione per portare la concentrazione di elio all'interno di questo intervallo, tuttavia le specifiche relative al diametro della sonda del campione di elio devono essere rispettate.

La scala del misuratore dello strumento deve essere leggibile al ±2,5% della concentrazione di definizione della perdita specificata quando si esegue un'indagine sulle emissioni non rilevabili.

Lo strumento deve essere dotato di una pompa azionata elettricamente per garantire che il fluido campione venga fornito al rilevatore a una portata costante. La portata della sonda deve essere compresa tra 0,5 l min^{-1} e 1,5 l min^{-1}. Il valore tipico della portata della sonda per lo spettrometro di massa ad elio è di 1 cm^3 s^{-1}.

Lo strumento deve essere dotato di una sonda o di una prolunga della sonda per il campionamento con un diametro esterno non superiore a 6,4mm, con un'unica apertura terminale per l'ammissione del campione.

Criteri di prestazione

La pompa dello strumento, la sonda di diluizione, la sonda del campione e il filtro della sonda, utilizzati durante il test, devono essere sul posto durante la determinazione del tempo di risposta.

La precisione della calibrazione deve essere pari o inferiore al 10% del valore del gas di calibrazione.

Valutazione dello strumento

Un test di precisione dello strumento deve essere eseguito prima di utilizzare lo strumento di analisi, e, successivamente, ogni tre mesi o prima dell'utilizzo successivo, se l'utilizzo successivo non sarà entro i tre mesi.

5 GAS DI CALIBRAZIONE

Il rilevatore è calibrato in termini di parti per milione in volume (ppmv).

I gas di calibrazione richiesti per il monitoraggio e la valutazione delle prestazioni dello strumento sono:

- un gas di azzeramento (aria, meno di 10 ppmv di elio)
- una miscela di gas di calibrazione in aria approssimativamente uguale a quella indicata come definizione di perdita specificata nella tabella 1.

In alternativa, il rilevatore può anche essere calibrato in termini di Pa-m^3/s o mbar 1/s di elio. In questo caso, possono essere

. MONITORING INSTRUMENT

Specifications

The helium instrument detector type may include, but is not limited to, mass spectrometry, infrared absorption, and molecular screening.

Both the linear response range and the measurable range of the instrument shall encompass the leak definition concentration specified in table 1.

A dilution probe assembly can be used to bring the helium concentration within this range, however, the specification for helium sample probe diameter shall still met.

The scale of the instrument meter shall be readable to ±2.5% of the specified leak definition concentration when performing a no-detectable emission survey.

The instrument shall be equipped with an electrically driven pump to ensure that a sample is provided to the detector at a constant flow rate. The probe flow rate shall be between 0.5 l min^{-1} and 1.5 l min^{-1}. Typical value of probe flow rate for helium mass spectrometer is 1 cm^3 s^{-1}.

The instrument shall be equipped with a probe or probe extension for sampling not exceed 6.4mm in outside diameter, with a single end opening for admission of sample.

Performance criteria

The instrument pump, dilution probe, sample probe and probe filter, which is used during testing, shall be in place during the response time determination.

The calibration precision shall equal to or less than 10% of the calibration gas value.

Performance evaluation requirement

The calibration precision test shall be completed prior to placing the analyser into service, and at subsequent three-month intervals or at the next use, whichever is later.

. CALIBRATION GASES

The monitoring instrument is calibrated in terms of parts per million by volume (ppmv).

The calibration gases required for monitoring and instrument performance evaluation are:

- a zero gas (air, less than 10 ppmv helium)
- a calibration gas in air mixture approximately equal to the leak definition specified in table 1.

Alternatively, the monitoring instrument can also be calibrated in terms of Pa·m^3/s or mbar 1/s of helium. In this case, calibration leak standards can be either a permeation or

usati degli strumenti con perdita calibrata a permeazione o capillare.

La tipologia di perdita calibrata da utilizzare è scelta in base al tipo di rilevatore o dal requisito di sensibilità richiesto.

- Uno strumento con perdita calibrata di tipo a permeazione è uno strumento con perdita calibrata di tipo a permeazione attraverso vetro fuso o quarzo. Lo standard deve avere un tasso di perdita di elio nell'intervallo compreso tra $1x10^{-6}$ mbar l s^{-1} e $1x10^{-10}$mbar l s^{-1} (da $1x10^{-7}$ Pa m^3s^{-1} a $1x10^{-11}$ Pa-m^3s^{-1}).
- Uno strumento con perdita di tipo capillare deve avere una perdita calibrata di tipo capillare attraverso un tubo. Lo standard deve avere un tasso di perdita uguale o inferiore alla sensibilità di prova richiesta per la concentrazione percentuale effettiva di prova del gas tracciante selezionato.

Se si utilizzano miscele di gas di calibrazione in bombola, queste devono essere analizzate e certificate dal produttore con un'accuratezza di ±2% e devono essere analizzate nuovamente o sostituite al termine della durata di conservazione specificata. In alternativa, i gas di calibrazione possono essere preparati dall'utente secondo qualsiasi procedura di preparazione degli standard gassosi accettata che produca una miscela accurata entro il ±2 %. I campioni di gas preparati per la calibrazione devono essere sostituiti ogni volta che sono stati utilizzati in una giornata, a meno che non si possa dimostrare che la degradazione non si verifica durante la conservazione.

6 REQUISITI PER IL TEST

Effetto della temperatura

Più alta è la temperatura del componente, più alta è la pressione di vapore di saturazione. Di conseguenza, la temperatura può modificare la misurazione della concentrazione. La misurazione deve essere effettuata in un luogo in cui la temperatura rimanga stabile indipendentemente dalle condizioni climatiche esterne.

Effetto delle condizioni atmosferiche

Le misure di tenuta tramite sniffing sono particolarmente sensibili alle variazioni dell'atmosfera gassosa.
Ciò è particolarmente vero per:
- misure all'aperto e
- misure ad alta sensibilità

L'atmosfera all'interno del locale in cui avvengono le perdite deve essere tranquilla e le aperture devono rimanere chiuse per tutta la durata della misurazione.

Sicurezza

Livelli elevati di pressione dell'elio o condizioni di vuoto, insieme a temperature elevate, richiedono l'applicazione di regole di sicurezza da parte degli operatori durante le prove e le misurazioni.

capillary type standard.

The type of leak standard used shall be established by the instrument or system sensitivity requirement.

- A permeation type leak standard shall be a calibrated permeation type leak through fused glass or quartz. The standard shall have a helium leakage rate in the range of $1x10^{-6}$ mbar·l·s^{-1} to 1 x 10^{-10} mbar l s^{-1} ($1x10^{-7}$ Pa·m^3·s^{-1} to $1x10^{-11}$ Pa·m^3-s^{-1}).
- A capillary type leak standard shall be a calibrated capillary type leak through a tube. The standard shall have a leakage rate equal to or smaller than the required test sensitivity times the actual percent test concentration of the selected tracer gas.

If cylinder calibration gas mixtures are used, they shall be analysed and certified by the manufacturer to be within ±2 % accuracy, and a shelf life shall be either reanalysed or replaced at the end or the specified shelf life. Alternatively, calibration gases may be prepared by the user according to any accepted gaseous standards preparation procedure that yields a mixture accurate to within ±2 %.
Prepared standards shall be replaced each day of use unless it can be demonstrated that degradation does not occur during storage.

. REQUIREMENTS FOR THE TEST

Effect of the temperature

The higher the temperature of the component, the higher the saturating vapour pressure. Consequently, the temperature can modify the concentration measurement. This should be made in a place where the temperature remains stable whatever the external climatic conditions.

Weather effect

The leak measurements by sniffing are particularly sensitive to variations in the gaseous atmosphere.
This is more particularly true for:

- outdoor measurements, and
- low level measurements

The atmosphere within the room where the leaks take place shall be calm and the openings shall remain closed throughout the measurement.

Safety

High helium pressure levels or vacuum conditions in conjunction with high temperatures require safety rules to be applied by operators during testing and measurement.

7 PROCEDURA DI CALIBRAZIONE

Assemblare e mettere in funzione il rilevatore di elio secondo le istruzioni del produttore. Dopo l'appropriato periodo di riscaldamento e azzerata la precedente calibrazione, al momento opportuno, secondo quanto indicato dal produttore, introdurre il gas di calibrazione (Perdita calibrate) nella sonda campione dello strumento. Regolare la lettura del contatore dello strumento in modo che corrisponda al valore del gas di calibrazione.
Il sistema deve essere calibrato facendo passare la punta della sonda del rilevatore da una parte all'altra dell'orifizio dello standard di perdita. La punta della sonda deve essere mantenuta entro 3 mm dall'orifizio della perdita calibrata. La velocità di scansione non deve superare quella in grado di rilevare il tasso di perdita dallo standard di tenuta. Regolare la lettura dello strumento in modo che corrisponda al valore del gas di calibrazione (perdita calibrata). Annotare la lettura dello strumento.
Il tempo necessario per rilevare una perdita stabile dallo standard di perdita è il tempo di risposta e deve essere osservato durante la calibrazione del sistema.
Di solito è auspicabile che questo tempo sia il più breve possibile per ridurre il tempo necessario a individuare le perdite rilevate. Se la lettura del misuratore non può essere regolata sul valore corretto, il rilevatore non può funziona correttamente.

. CALIBRATION PROCEDURES

Assemble and start up the helium analyser according to the manufacturer's instructions. After the appropriate warm-up period and zero internal calibration procedure, introduce the calibration gas (leak standard) into the instrument sample probe. Adjust the instrument meter readout to correspond to the calibration gas value.
The system shall be calibrated by passing the detector probe tip across the orifice of the leak standard. The probe tip shall be kept within 3 mm of the orifice of the leak standard. The scanning rate shall not exceed that which can detect leakage rate from the leak standard. Adjust the instrument meter readout to correspond to the calibration gas (leak standard) value. The instrument meter readout shall be noted.
The time required to detect stable leakage from the leak standard is the response time and it should be observed during system calibration. It is usually desirable to keep this time as short as possible to reduce the time required to pinpoint detected leakage. If the meter readout cannot be adjusted to the proper value, a malfunction of the analyser is indicated.

8 PREPARAZIONE DELLA VALVOLA PER IL TEST

La valvola deve essere preparata per il test solo dopo essere stata montata completamente ed aver passato tutti i test di tenuta previsti.
La valvola non deve essere verniciata
Nell'ingresso della valvola deve essere montata una flangia cieca o se del caso, un tappo filettato sigillato.
Nell'uscita deve essere montata una flangia cieca o tappo sigillato con foro passante di entrata filettato adatto per il collegamento con la tubazione per l'immissione del gas (elio).
Il gas, elio ad una purezza minima pari 97% di volume, deve essere immesso nella valvola dal foro presente nella flangia/tappo di uscita ad una pressione di 1 bar.

. PREPARING THE VALVE FOR THE TEST

The valve shall be prepared for testing only after fully assembling and after passing all the required tightness tests.
The valve shall not be painted
A blind flange or, if applicable, a sealed threaded plug must be mounted at the valve inlet.
A blind flange or sealed plug with a threaded through-hole suitable for connection to the gas (helium) feed pipe shall be fitted at the outlet.
The gas, helium with a minimum purity of 97% by volume, must be fed into the valve through the hole in the outlet flange/plug at a pressure of 1 bar.

9 RILEVAMENTO DELLE PERDITE

Avviare lo spettrometro di massa ad elio secondo le istruzioni del produttore e il riscaldamento dell'elettronica. Eseguire le seguenti operazioni.
a) Calibrazione
b) Immettere nella valvola il gas (elio) ad una pressione di 1 bar ed attendere 10min per valvole con entrata DN ≤50(2") e 15min per valvole DN>50(2") prima di procedere con il punto d.
c) Misura di fondo: prima di ogni misurazione, la concentrazione di elio nell'ambiente intorno alla sorgente viene determinata spostando la sonda in modo casuale a una distanza di 1 o 2 m dalla sorgente. In caso di interferenze nella misurazione con una perdita nelle vicinanze, la concentrazione

. MEASUREMENT

Start the helium mass spectrometer as instructed by the manufacturer and electronics heating. Carry· out the following.
a) Calibration
b) Fill the valve with gas(helium) at a pressure of 1 bar and wait 10min for valves with inlet DN ≤50(2") and 15 min for valves DN>50(2") before proceeding with step d.
c) Background measurement: prior to each measurement, the ambient helium concentration around the source is determined by moving the probe randomly at a distance of 1m or 2m from the source. When there is interference in the measurement with a leak nearby, the ambient concentration

ambientale può essere determinata più vicino alla sorgente, ma la distanza non dovrà in nessun caso essere inferiore a 25 cm.
d) La sonda viene posizionata il più vicino possibile alla potenziale fonte di perdita, ossia sul bordo esterno delle guarnizioni.
e) La distanza della sonda dalla sorgente deve essere pari alla distanza utilizzata dalla procedura di calibrazione dell'analizzatore in ogni caso non superiore a 3 mm.
f) Muovere la sonda lungo la periferia dell'interfaccia osservando la lettura dello strumento. La velocità di scansione non deve superare la velocità di scansione determinata durante la calibrazione con lo standard di perdita (che dipende dal tempo di risposta, dalla portata della pompa e dalle dimensioni della sonda).
g) Se si osserva un aumento della lettura del misuratore, campionare lentamente l'interfaccia in cui è indicata la perdita fino a ottenere la lettura massima del misuratore.
h) Lasciare l'ingresso della sonda in questa posizione di massima lettura per circa due volte il tempo di risposta dello strumento.
i) L'operatore legge il valore massimo e lo registra facendo rimanere la sonda nello stesso punto per un periodo di tempo pari a circa il doppio del tempo di risposta dello strumento (ad esempio, alcuni secondi per una sonda standard da 5 metri).
j) La differenza tra questa misura e la misura di fondo determina se vi sono emissioni non rilevabili.
k) Le emissioni rilevabili dalla fonte di emissione impongono un livello di fondo inferiore al livello di emissione accettabile. Il livello di fondo deve essere inferiore a 50 ppmv.

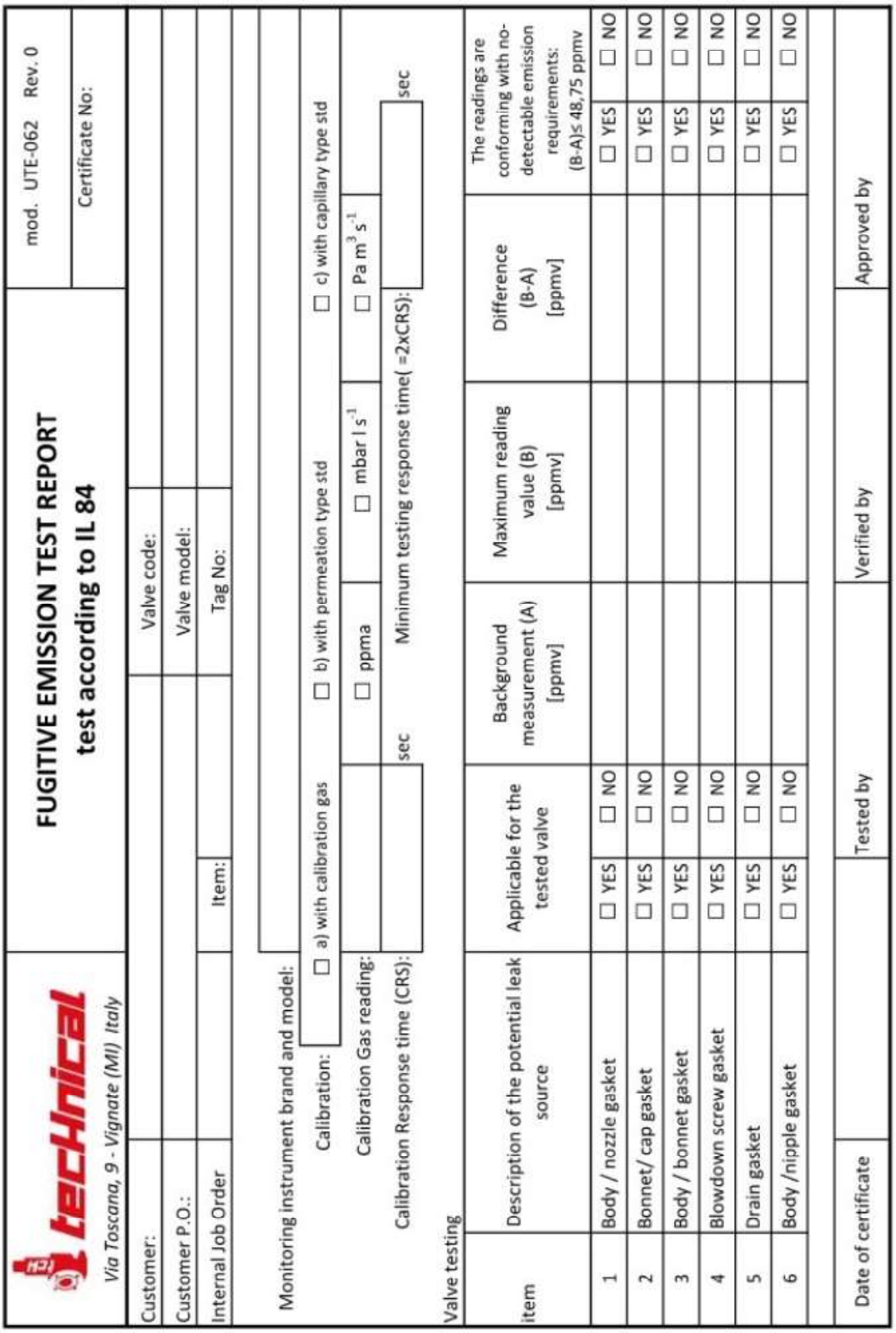
can be determined closer to the source, but the distance should in no case be smaller than 25 cm.
d) The probe is positioned as close as possible to the potential leak source, namely at the outer edge of the seals.
e) The distance of the probe to the source shall be equal to the distance used by the calibration procedure for the analyser not exceeding 3 mm.
f) Move the probe along the interface periphery while observing the instrument readout. The scanning rate shall not exceed the scanning rate determined during calibration to the leak standard (which depends on the response time, the flow rate of the pump and the. probe dimension).
g) If an increased meter reading is observed, slowly sample the interface where leakage is indicated until the maximum meter reading is obtained.
h) Leave the probe inlet at this maximum reading location for approxi1narely two times the instrument response time.
i) The operator reads the maximum value and records it by making the probe remain in the same place during a period of time about twice the instrument response time (e.g. a few seconds for a 5·m standard probe).
j) The difference between this measurement and the background noise determines whether there are no detectable emissions.
k) Detectable emissions from emission source impose the background level to be lower than the acceptable emission level. Background level shall be lower than 50 ppmv.

Tabella 1

Definizione	***Reading***
Concentrazione di definizione della perdita *Leak definition concentration*	50 ppmv
Nessuna emissione rilevabile *No detectable emission*	≤ 48.75 ppmv

Annex 1
Fugitive emission test report

ANNEX 1



tecHnical
Via Toscana, 9 - Vignate (MI) Italy

FUGITIVE EMISSION TEST REPORT
test according to IL 84

mod. UTE-062 Rev. 0

Certificate No:

Customer:		Valve code:	
Customer P.O.:		Valve model:	
Internal Job Order	Item:	Tag No:	

Monitoring instrument brand and model:

Calibration: ☐ a) with calibration gas ☐ b) with permeation type std ☐ c) with capillary type std

Calibration Gas reading: ☐ ppma ☐ mbar $l\ s^{-1}$ ☐ Pa $m^3\ s^{-1}$

Calibration Response time (CRS): sec Minimum testing response time(=2xCRS): sec

Valve testing

item	Description of the potential leak source	Applicable for the tested valve		Background measurement (A) [ppmv]	Maximum reading value (B) [ppmv]	Difference (B-A) [ppmv]	The readings are conforming with no-detectable emission requirements: (B-A)≤ 48,75 ppmv	
1	Body / nozzle gasket	☐ YES	☐ NO				☐ YES	☐ NO
2	Bonnet/ cap gasket	☐ YES	☐ NO				☐ YES	☐ NO
3	Body / bonnet gasket	☐ YES	☐ NO				☐ YES	☐ NO
4	Blowdown screw gasket	☐ YES	☐ NO				☐ YES	☐ NO
5	Drain gasket	☐ YES	☐ NO				☐ YES	☐ NO
6	Body /nipple gasket	☐ YES	☐ NO				☐ YES	☐ NO

Date of certificate		Tested by		Verified by		Approved by	

INDEX

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6 – CONFORMITY NAMEPLATE DATA

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8 – EXAMPLE OF CONSTRUCTION DECLARATION

9 – EXAMPLE OF NAMEPLATE
- ASME
- PED

3	04.07.2022	REVISION OF PED NAMEPLATES AND ADDITION OF UKCA NAMEPLATES	GZ	CS	GS/EA
2	14.09.2020	GENERAL REVIEW	PLD	CS	GS
1	01-11-2001	GENERAL REVIEW	LDV	PLD	GS
0	07-04-1995	FIRST EMISSION	RC	PLD	GS
REV	**DATE**	**DESCRIPTION**	**PREPARED**	**CHECKED**	**APPROVED**

1 – APPLICATION

Safety relief valves

2 – TECHNICAL DOCUMENTATION

ALL VALVE SERIES: drawing taken out from the technical sheets

3 – EQUIPMENTS AND ACCESSORY MATERIALS

None

4 – CONSTRUCTION DECLARATION CHECK

Before beginning the valve control, the operator checks that the Construction Declaration would be filled in correctly and clearly in all its essential parts.

See the Construction Declaration sample to find the positions that must be always filled in and checked by the operator; other filled parts will be checked anyway.
See the nameplate drawing to find the corresponding position on the nameplate

5 – VISUAL INSPECTION

The control is performed looking for:

-damages or other defects on valve surface;
-damages on flange tightness face or screwed connections;
-defects on painted surface or rust presence;
-other defects

6 – CONFORMITY NAMEPLATE DATA

The nameplate must show the data equal to those reported on the Construction Declaration.
The nameplate varies depending on applicable standard (PED, ASME, UKCA) and on valve series.

7 – CONFORMITY DIMENSIONS CHECK

After having checked the valve surface and nameplate data check according to applicable documents (i.e declaration of conformity), verify:
-the inlet and outlet flange dimensions, according to norms or TecHnical's documents;
-centre-to-face dimensions (inlet and outlet);
-overall dimensions.

8 – EXAMPLE OF CONSTRUCTION DECLARATION

tecHnical Srl

Dich. interna SERIE: 20.000

Dichiarazione n° 20/0315-2-391

MARZO 2020 PROCEDURA N° IL 42

Matricola 248171 Anno 2020 Posizione: 391
Cod./Mod. 240-0C0-12 Classe 12
Ingresso 1" NPT-F Fluido: GAS
Uscita 1" NPT-F Corrispondenza aria
Orifizio Ø mm. 3/8"
Taratura 275 barg Tipo: d

Collaudo
P E D
CE 0496

Sigla DRRVO421322750
Lotto di n° 1 valvola

material list	n° colata	n° HTA
Corpo A216 WCB	SOLO X SERIE 4.000	
Nipplo A216 WCB		
Boccaglio AISI 431		
Otturatore 17-4PH		
Molla 50-1237-00 ACC. LEGATO		

note

banco prova

Press. Idr. Bocc. 420,00 bar
Press. Idr. Corpo 30,00 bar
Press. Taratura 275,00 bar

verniciatura: ZINCATURA VERDE

accessori

DA COMPILARE DA PARTE DEL COLLAUDO
Prova tenuta sede 90% pressione di taratura bolle/minuto _____

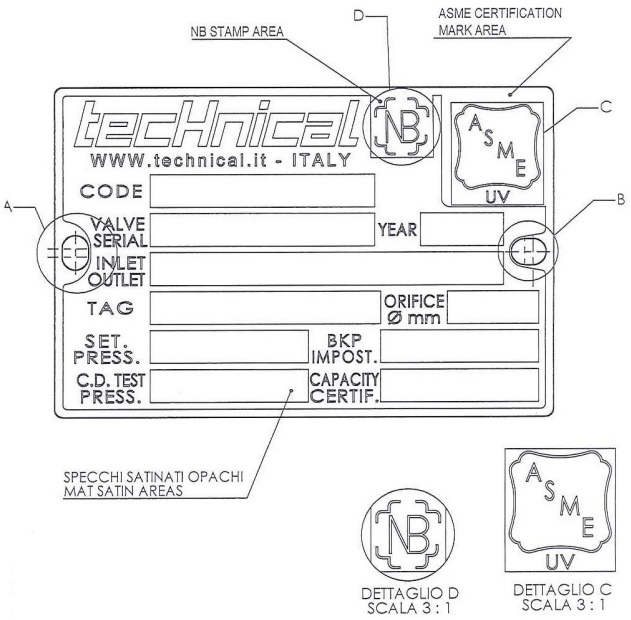
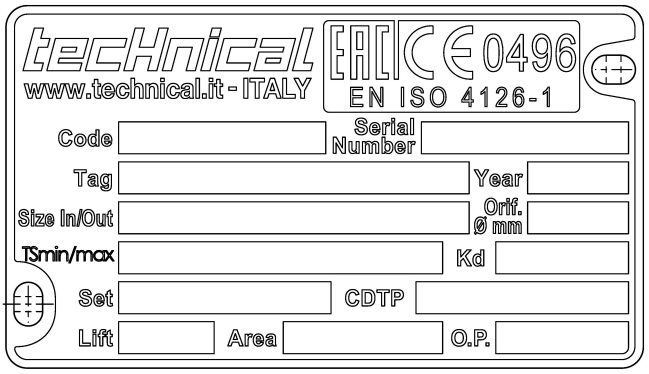
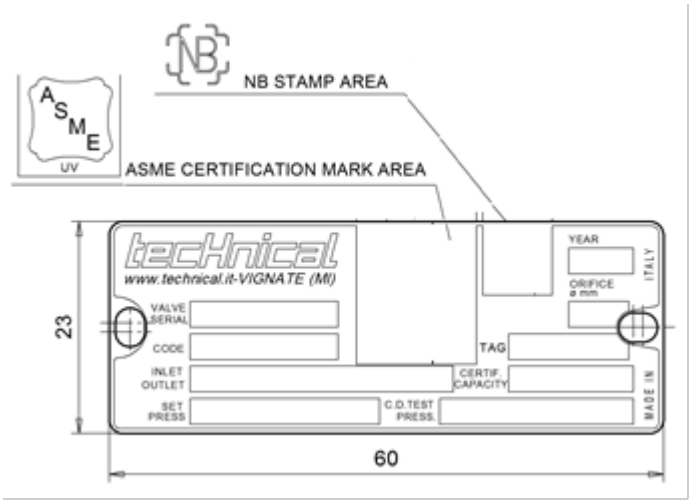
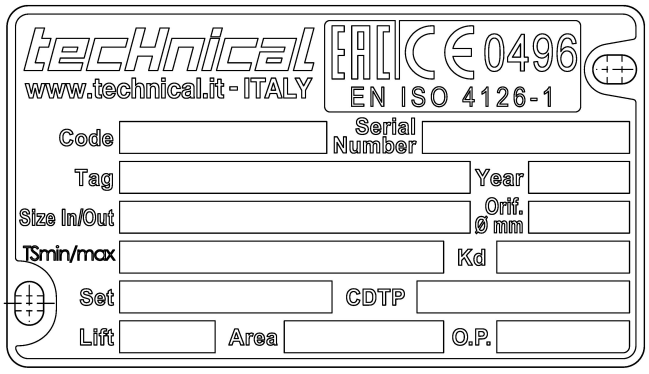
Strumento da utilizzare per la verifica della taratura C23-005-xx

Cliente CUBOGAS Srl Ordine 7700055122
Commessa 20/0315-2 Cons. prevista 06/03/2020 Processo 28/01/2020

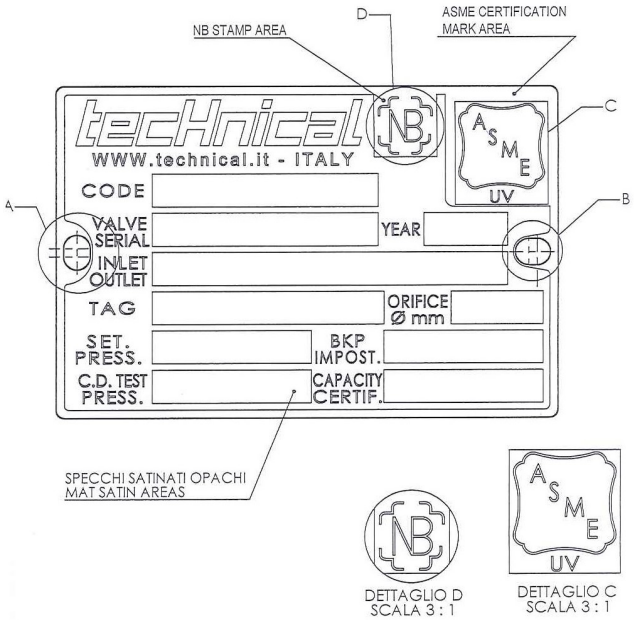
ANNOTAZIONI INTERNE
RIPORTARE SU IMBALLO: PER COMMESSA 2807

Compilatore 28/01/2020 _____
Controllo __/__/____ _____
Montaggio __/__/____ _____
Collaudo __/__/____ _____
Imballaggio __/__/____ _____

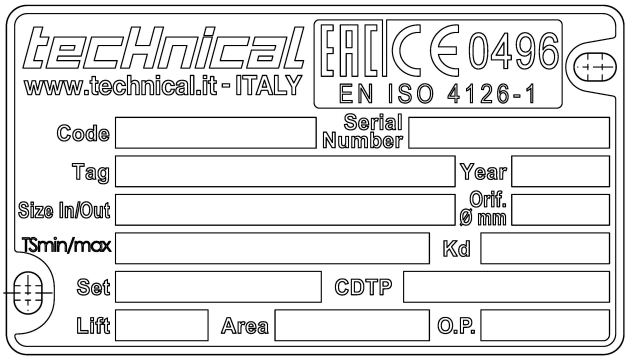
9 – EXAMPLE OF NAMEPLATE

SERIE 30000 – ASME	**SERIE 30000 / 30000P – PED** (00-0217-00 Rev.5 60x34)
	
SERIE 20000 – ASME	**SERIE 20000 – PED** (00-0217-00 Rev.5 60x34)
	

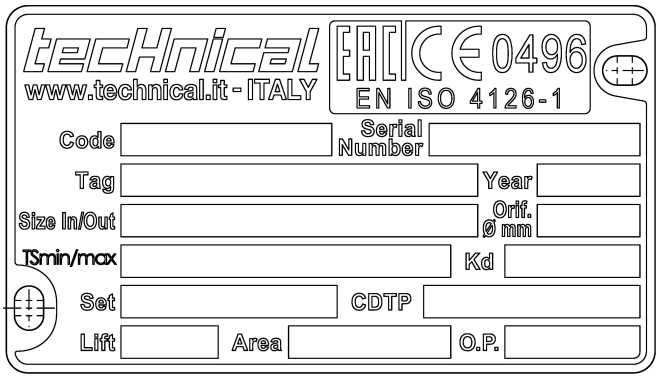
SERIE 10000 – ASME



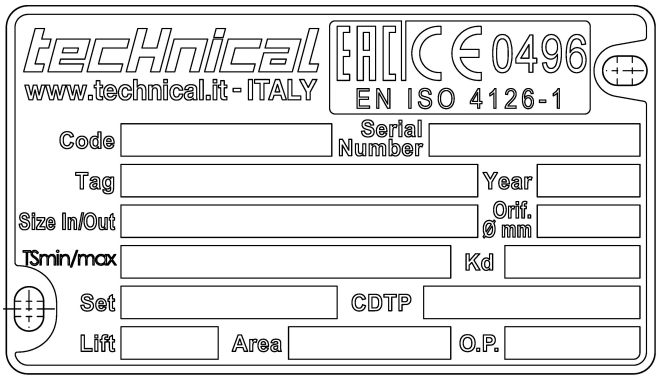
SERIE 10000 – PED
(00-0217-00 Rev.5 60x34)

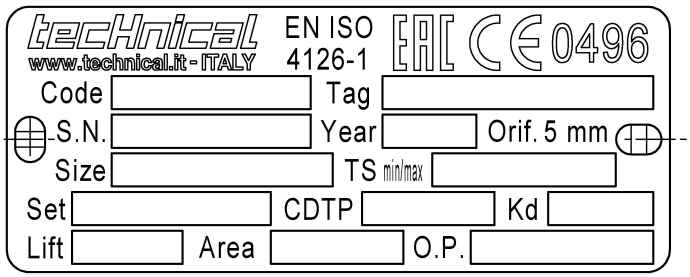
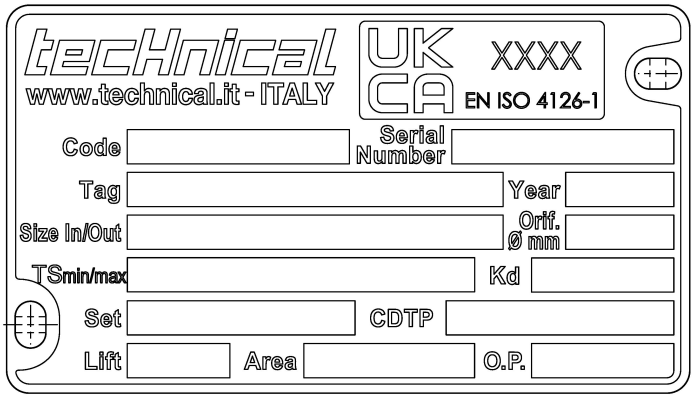
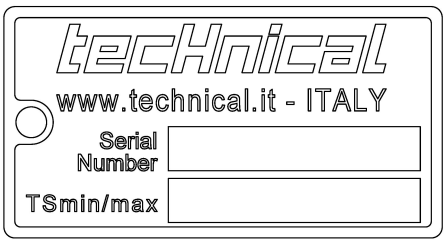


SERIE 4000 – PED
(00-0217-00 Rev.5 60x34)



SERIE SV10001 – PED
(00-0217-00 Rev.5 60x34)



SERIE SV-5001 – PED (00-0225-00 Rev.0 60x24)	**SERIE 30000 - 10000 - 20000 – UKCA** (00-0217-UK Rev.1 60x34)
	
TARGA AGGIUNTIVA **ADDITIONAL NAMEPLATE** (99-0383-00 Rev.0 40x21)	
	

CONTENTS

1 - GENERAL

2 - DEFINITION

3 - CONTENTS

3.1 – Expiry of calibration validity
3.2 – Calibration validity
3.3 – Test report
3.4 – Responsibility

1 - GENERAL

Technical deems necessary to have a procedure for the control of the measurement tools used to take a decision on the product's Quality.

2 - DEFINITION

None

3 - CONTENTS

3.1 - Expiry of calibration validity

As indicated in the Calibration instructions IT01 Tools Codification, each measurement tool is registered in a registry card, in which is reported the calibration expiry date, which is 12 months for the tool in use starting from the date of the calibration certificate. This date is also reported on the tool label, which can be fixed to the tool or to the relative case.

Using the print **"VALIDITÀ STRUMENTI"** (Instrument Validity) is possible to separate the tools according to the expiry date and consequently to plan the calibration interventions.

For those tools which have the calibration validity close to the expiry date, the quality assurance, after having agreed their withdrawal with the involved offices, provides the calibration test or sends the tools to a metrological lab of an external society whose quality system has been approved by a third party.

3.2 – Calibration validity

The calibration validity limits for each type of tool are defined according to the following table:

Measurement tool	Variance
Vernier caliper usable 150 mm	± 0.03 mm
Vernier caliper usable 300 mm	± 0.03 mm
Outside micrometer	± 0.01 mm
Back square	± 0°15'
Depth gauge	± 0.03 mm
Height gage	± 0.1 mm
Hardness testing machine	± 1.50 HRC
Portable Hardness testing machine	± 0,5 HRC
Dial indicator resolution. 0,01 mm	± 0.015 mm
Dial indicator resolution. 0,001 mm	± 0.002 mm
Smooth gauge	Ref. to the construction standard
Smooth ring	Ref. to the construction standard
Threaded gauge	Ref. to the construction standard

Measurement tool	Variance
Ring	Ref. to the construction standard
Inside micrometer	± 0.005 mm
Micrometer heads	± 0.03 mm
Quick inside gauge resolution 0,025 mm	± 0,025 mm
Goniometer	± 0°75’
Quick inside gauge resolution 0,05 mm	± 0,075 mm
Manometer	± (precision class x scale end)/100
Surface roughness machine	± 5%
Vernier caliper usable 1000 mm	± 0.075 mm
Voltmeter	± (precision class x scale end)/100
Ammeter	± (precision class x scale end)/100
3D measuring machines	± 5,00 µm
Thermocouple quenching oven	± 5°C
Altimeter	± 5 µ (0.005 mm)

The tools, in order to be considered valid for their use and consequently sent to the user offices, must have test values according to the above table.

3.3 – Test report

All the report tests, both internal and external, in order to be considered valid must have the following data:

- Report’s number and date;
- Code and description of the checked tool:
- Code and description of the sample tool;
- Data relative to the test:
- Operator and responsible signature

3.4 - Responsibility

The quality assurance is responsible for the control of the measurement tools.

LIQUID PENETRANT EXAMINATION
(WATER WASHABLE OR SOLVENT REMOVABLE PENETRANT)
ACCORDING TO ASME CODE

I.R.T.E.C. s.r.l.

LIQUID PENETRANT TESTING PROCEDURE

IR TEC SRL
SISTEMA DI QUALITA'
CERTIFICATO ISO 9001:2015

LIQUID PENETRANT EXAMINATION
(WATER WASHABLE OR SOLVENT REMOVABLE PENETRANT)
ACCORDING TO ASME CODE

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1. SCOPE (T-610)
2. REFERENCE DOCUMENTS
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4. MISCELLANEOUS REQUIREMENTS (T-640)
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9. EXAMINATION RECORDS (T-692)
10. REPAIR REQUIREMENTS
11. PROCEDURE QUALIFICATION (T-621.2)

APPENDIX A
APPENDIX B

By signature and date on the front sheet of this Procedure by the relevant persons, the signature on each page of this Procedure are waived

Em.	Rev.	Data - Date	Descrizione - Description
4	7a	2020/03/17	Revised according to comments
4	6a	2020/01/15	Revised according to ASME BPVC.V-2019 and comments
4	5	2016/09/16	Revised according to ASME SECT. V – 2015 Ed.
4	4	2014/09/01	Revised according to ASME SECT. V – 2013 Ed.- Added acceptance standards according to ASME Sect. VIII Div. 2
4	3	2012/03/30	Revised according to ASME SECT. V – 2010 Ed. + 2011 Add.
4	2	2011/03/30	Revised according to ASME SECT. V – 2010 Ed.
4	1	2009/09/30	Valid according to ASME SECT. V – 2007 Ed. + A09
4	0	2009/01/15	Table B modified

REVISIONS

Issued by :

IRTEC SRL ISTITUTO DI RICERCHE TECNOLOGIE E COLLAUDI

Checked/Approved by :
NDE LEVEL III
dott. Ing. G. GROSSI

LIQUID PENETRANT EXAMINATION (WATER WASHABLE OR SOLVENT REMOVABLE PENETRANT) ACCORDING TO ASME CODE

1. SCOPE (T-610)

1.1. This procedure describes the method to be followed for water washable or solvent removable, visible liquid penetrant examination

2. REFERENCE DOCUMENTS

2.1. This procedure satisfies the requirements of the following specifications :

2.2. NGWK-0001-QAQC-PRND-0001-D02; NGL3200 Liquid penetrant test Procedure

2.3. ASME Section V article 6 - 2019 edition

2.4. ASTM SE-165 – 12

2.5. ASNT – SNT-TC-1A Edition 2011. “Recommended Practice for Personnel Qualification and certification in nondestructive testing

1. APPLICABILITY

1.1. This procedure is applicable to :

1.2. Not sintered metallic materials.

1.3. Butt and fillet welds

1.4. Claddings by weld

1.5. This procedure is applicable to parts of any dimension

2. PERSONNEL

2.1. The personnel who are performing the liquid penetrant testing to this procedure shall be qualified and certified in accordance with the requirements of ASNT Recommended Practice No. SNT-TC-1A level I, as a minimum or UNI EN ISO 9712 level 1. Interpretation must be carried out by inspectors holding at least a valid certificate to SNT-TC-1A level II, UNI EN ISO level 2.

3. EQUIPMENT (T-630)

3.1. Penetrant materials (T-631)
The term “penetrant materials” is intended to include all penetrants, , solvents or cleaning agents, developers, etc., used in the examination process.

4. MISCELLANEOUS REQUIREMENTS (T-640)

4.1. Control of Contaminants (T-641)

4.1.1. All the penetrant materials shall be certified to satisfy the control of contaminant s. These certifications shall include the penetrant manufacturers’ batch numbers and the test results obtained in accordance with Mandatory Appendix II of ASME sect. V Article 6.

4.1.2. These certifications shall be available for review.

4.2. **Surface Preparation** (T-642)

4.2.1. In general, satisfactory results may be obtained when the surfaces of the part is in the as-welded, as-rolled, as-cast or as-forged condition. Surface preparation by grinding, machining, or other methods may be necessary where surface irregularities could mask indications.

4.2.2. Prior to each liquid penetrant examination, the surface to be examined and all adjacent areas within at least 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 the examination.

4.2.3. Typical cleaning agents which may be used are organic solvents.

4.2.4. leaning solvents shall meet the requirements of 5.1. The cleaning method employed is an important part of the examination process.

4.2.5. Solvent cleaning after machining is a correct method of cleaning.

4.2.6. Grinding is a correct method of cleaning

4.2.7. Is also correct perform examination after welding (it is only necessary to remove the slag and grind where necessary).

4.3. **Drying After Preparation** (T-643)

4.3.1. After cleaning, drying of the surface to be examined shall be accomplished in the following way :

4.3.1.1. Solvent cleaning – dry cloths and/or normal evaporation

4.3.1.2. Minimum evaporation time shall be 2 minutes.

5. **TECHNIQUE** (T-650)

5.1. **Techniques** (T-651)

5.1.1. A color contrast (daylight visible) penetrant shall be used (the penetrant materials to be used are listed in Table A).
The penetrant shall be used with one of the following penetrant processes :

5.1.1.1. Water washable

5.1.1.2. Solvent Removable

5.1.2. Welds and clads by welding shall be examined by means of medium sensitivity penetrant.

5.1.3. Materials shall be examined by means of high sensitivity penetrant.

5.1.4. The developing materials to be used are listed in Table A.

5.1.5. When solvent cleaning is required, the solvents in Table A shall be used.

5.2. **Techniques for Standard Temperatures** (T-652)

5.2.1. As a standard technique, the temperature of the penetrant and the surface of the part to be processed shall not be below 5°C nor above 52°C throughout the examination period. Local heating or cooling is permitted provided the temperature remains in the range 5 ÷ 52°C during the examination.

5.2.2. Where is not practical to comply with these temperature limitations, other temperatures and times may be used, provided the procedures are qualified as specified in 7.3.

5.3. **Techniques for Nonstandard Temperatures** (T-653)

5.3.1. When it is not practical to conduct a liquid penetrant examination within the temperature range of 5 to 52°C, the examination procedure at the proposed lower or higher temperature range requires qualification of the penetrant materials and processing in accordance with ASME Sect. V Art. 6 Mandatory Appendix III.

5.4. **Technique Restrictions** (T-654)

5.4.1. Intermixing of penetrant materials from different families or different manufacturers is not permitted.

6. EXAMINATION (T-670)

6.1. **Penetrant Application** (T-671)

6.1.1. The penetrant will be applied by a pressurized spray can, by brushing or by dipping.

6.2. **Penetration time** (T-672)

6.2.1. Penetration time is critical. The minimum penetration time shall be as required by TABLE B.

6.2.2. Regardless of the length of the dwell time, the penetrant shall not be allowed to dry. If for any reason the penetrant does dry, the examination procedure shall be repeated, beginning with a cleaning of the examination surface

6.3. **Excess penetrant removal** (T673)

6.3.1. **Water-Washable Penetrants** (T-673.1) – Excess water-washable penetrant shall be removed by wiping with a dry cloth repeating the operation until most traces of penetrant have been removed. The remaining traces shall be removed by lightly wiping the surface with wet clothes or by a water spray. The water pressure shall not exceed 3.5 bar. The water temperature shall not exceed 43°C.

6.3.2. **Solvent Removable Penetrants** (T673.3) - Excess solvent removable penetrants shall be removed by wiping with a dry cloth, repeating the operation until most traces of penetrant have been removed. The remaining traces shall be removed by lightly wiping the surface with cloth moistened with solvent. To minimize removal of penetrant from discontinuities, care shall be taken to avoid the use of excess solvent.

Flushing the surface with solvent, following the application of the penetrant and prior to developing, is prohibited.

6.4. **Drying After Excess Penetrant Removal** (T-674)

6.4.1. For the water washable technique, the surfaces may be dried by blotting with clean cloths and/or by using circulating air, provided the temperature of the surface is not raised above 52°C.

6.4.2. For the solvent removable technique, the surfaces may be dried by normal evaporation, blotting, wiping, or forced air.

6.4.3. For both 8.4.1 and 8.4.2 points the maximum allowable time is 20 minutes.

6.5. **Developing** (T-675)

6.5.1. The developer shall be applied by spraying as soon as possible after penetrant removal. In every case the time interval after drying shall be not less than 10 minutes and shall not exceed exceed 30 minutes.

6.5.2. Wet Developer Application (T-675.2) – Prior to applying solvent suspension type wet developer to the surface, the developer must be thoroughly agitated to ensure adequate dispersion of suspended particles.

6.5.3. Developer shall be applied only to a dry surface. It shall be applied by a pressurized spry can. Drying shall be by normal evaporation.

6.5.4. The developer shall be applied only to a dry surface in a thin and uniform layer.

6.5.5. The developer shall not be applied over a dry layer of developer.

6.5.6. (T-675.3) Developing time begins when the developer coating is dry.

6.5.7. The maximum permitted developing time is 1 hour (for solvent suspension developer)

6.6. **Interpretation** (T-676)

6.6.1. **Final Interpretation** (T-676.1) - Final interpretation shall be made within 10 to 60 minutes of developing time (see 8.5.6). If bleed out does not alter the examination results, longer periods are permitted. If the surface to be examined is large enough to preclude complete examination within the prescribed or established time, the examination shall be performed in increments.

6.6.2. **Characterizing Indication(s)** (T-676.2) – The type of discontinuities are difficult to evaluate if the penetrant diffuses excessively into the 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).

6.6.3. **Color Contrast Penetrants** (T-676.3) – With a color contrast penetrant, the developer forms a reasonably uniform white coating. Surface discontinuities are indicated by bleed-out of 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.

6.6.4. A minimum light intensity of 1076 lx is required on the surface to be examined to ensure adequate sensitivity during the examination and evaluation of indications. This light intensity may be obtained by :

6.6.4.1. Lamp BEGHELLI 8616 PROIETTORE SEF LED IP65 30W at a distance of not more than 1 meter

6.6.4.2. An incandescence bulb 220V 100W transparent glass at a distance not greater than 300 mm

6.6.4.3. Lighting has been actually measured by means of a calibrated luxmeter.

6.6.5. **Post-Examination Cleaning** (T-677) – When post-examination cleaning is required, it should be conducted as soon as practical after Examination and Documentation. Cleaning shall be performed by brushing and dry cloths.

7. EVALUATION (T-680)

7.1. All indications shall be evaluated in term of the acceptance standards of the referencing Code Section.

7.1.1. Acceptance criteria, if not otherwise specified, shall be in accordance with ASME Section VIII Division 1 Appendix 8. See the Appendix A of this procedure.

7.2. Broad areas of pigmentation which could mask indications of discontinuities are unacceptable. Such areas shall be cleaned and reexamined using the same type of penetrant.

7.3. Discontinuities at the surface will be indicated by bleed-out of penetrant; however, localized surface irregularities due to machining marks or other surface conditions may produce false indications.

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

8. DOCUMENTATION (T-690)

8.1. **Recording of Indications** (T-691)

8.1.1. Nonrejectable Indications (T691.1) – Nonrejectable indications shall be recorded as specified by the referencing Code Section.

8.1.2. Rejectable Indications (T691.2) - Rejectable indications shall be recorded. As minimum, the type of indications (linear or rounded), location and extent (length or diameter or aligned) shall be recorded.

9. EXAMINATION RECORDS (T-692)

9.1. For each examination, the following information shall be recorded :

9.1.1. identification of the weld, part, or component examined including weld number, serial number, or other identifier

9.1.2. procedure identification and revision

9.1.3. liquid penetrant type : visible (color contrast)

9.1.4. type (number or letter designation) of each penetrant, penetrant remover, developer used

9.1.5. examination personnel identity, qualification level and signature

9.1.6. map or record of indications per 9.1

9.1.7. material and thickness

9.1.8. lighting equipment

9.1.9. date of examination

9.1.10. results of the examination

10. REPAIR REQUIREMENTS

10.1. Whenever a defect is removed and subsequent welding is not required because the removed material does not reduce the wall thickness below the drawing requirements, the affected area shall be blended into the surrounding surface so as to avoid sharp notches, crevices or corners.

10.2. If the welding is required, prior to weld repair the excavated area shall be examined again by this specification. The weld repair shall be performed, if necessary, by applicable welding specification and shall be authorized, if necessary, by Quality Control Department. In any case, after repair, the surface shall be examined by the methods required by this procedure with the same acceptance criteria.

11. **PROCEDURE QUALIFICATION** (T-621.2)

11.1. When procedure qualification is specified by the reference Code Section, a change of a requirement in table B (table T-621) identified as an essential variable shall require requalification of the written procedure by demonstration. A change of a requirement identified as a nonessential variable does not require requalification of the written procedure. All changes of essential or nonessential variables from those specified within the written procedure shall require revision of, or an addendum to, the written procedure.

LIQUID PENETRANT EXAMINATION
(WATER WASHABLE OR SOLVENT REMOVABLE PENETRANT)
ACCORDING TO ASME CODE

TABLE A		
PENETRANT MATERIALS	**C.G.M.**	**MET-L-CHECK**
SOLVENT (For cleaning and penetrant removal)	VELNET SOLNET	E 59 A
MEDIUM SENSITIVITY PENETRANT	RED W	//
HIGH SENSITIVITY PENETRANT	ROTVEL AVIO B	VP-30
DEVELOPER (solvent suspension)	ROTRIVEL U	D 70

TABLE B			
MINIMUM DWELL TIMES (minutes) For temperature range from 10 to 52°C			
Material	Form	Type of discontinuity	Penetrant
Aluminum, Magnesium, Steel, Brass, Bronze, Titanium, High temperature alloys	Castings and welds	Cold shuts, porosity, lack of fusion, cracks	5
	Wrought materials, extrusions, forgings, plates	Laps, cracks	10
Remark : For temperature range from 5° to 10°C, minimum penetrant dwell time shall be 2 times the value listed			

LIQUID PENETRANT EXAMINATION (WATER WASHABLE OR SOLVENT REMOVABLE PENETRANT) ACCORDING TO ASME CODE

APPENDIX A

EVALUATION OF LIQUID PENETRANT INDICATIONS ACCORDING TO ASME SECTION VIII DIVISION 1 APPENDIX 8

1. EVALUATION OF INDICATIONS

1.1. Only indications with major dimensions greater than 1.5 mm shall be considered relevant.

1.1.1. A linear indication is one having a length greater than three times the width.

1.1.2. A rounded indication is one of circular or elliptical shape with the length equal to or less than three times the width.

1.2. Any questionable or doubtful indications shall be reexamined to determine weather or not they are relevant.

2. ACCEPTANCE STANDARDS

2.1. All surfaces to be examined shall be free of :

2.1.1. Relevant linear indications.

2.1.2. Relevant rounded indications greater than 5 mm.

2.1.3. Four or more relevant rounded indications in a line separated by 1.5 mm or less (edge to edge).

LIQUID PENETRANT EXAMINATION
(WATER WASHABLE OR SOLVENT REMOVABLE PENETRANT)
ACCORDING TO ASME CODE

APPENDIX B

REQUIREMENTS OF THIS LIQUID PENETRANT EXAMINATION PROCEDURE

Requirement	Essential Variable	Non essential Variable	Paragraph
Identification of and any change in type or family group of penetrant materials including developers, emulsifiers, etc.	X		6.1.1
Surface preparation (finishing and cleaning, including type of cleaning solvent)	X		5.2, 6.1.1
Method of applying penetrant	X		7.1.1
Method of removing excess surface penetrant	X		7.3
Method of applying developer	X		7.5
Minimum and maximum time periods between steps and drying aids	X		5.3.1.2, 7.2, 7.4.3, 7.5.1, 7.5.6, 7.6.1
Decrease in penetrant dwell time	X		N.A.
Increase in developer dwell time (Interpretation Time)	X		7.6.1
Minimum light intensity	X		7.6.4
Surface temperature outside 5 to 52°C or as previously qualified	X		6.3.1
Performance demonstration, when required	X		13
Personnel qualification requirements		X	12
Materials, shapes,or sizes to be examined and the extent of examination		X	3, 7.6.1
Post examination cleaning technique		X	7.6.5

IRTEC SRL
SISTEMA DI QUALITA' CERTIFICATO ISO 9001:2008

ISTITUTO DI RICERCHE TECNOLOGICHE E COLLAUDI

20056 TREZZO S/A (MI) - VIA F.SANTI, 3
Tel. 02.90.96.15.41 • 2 - Fax 02.90.96.32.92
E-mail : info@irtecsrl.com Web: www.irtecsrl.com

CERTIFICATO No. CERTIFICATE	//
RIF. REF.	//
DATA DATE	//
FOGLIO SHEET	1 DI 1 OF

// // // PT TESTING **CONTROLLO PT**

CLIENTE CUSTOMER	
COMMESSA JOB	
OGGETTO SUBJECT	
MATERIALE MATERIAL	**SPESSORE** THICKNESS
STADIO DI LAVORAZIONE WORKING STEP	**SUPERFICIE** SURFACE
SPECIFICA SPECIFICATION	**DESIGNAZIONE PRODOTTI** PRODUCTS DESIGNATION

PULITORE CLEANER	**LOTTO** BATCH
PENETRANTE PENETRANT	**LOTTO** BATCH
RIVELATORE DEVELOPER	**LOTTO** BATCH
FLUORESCENTE FLUORESCENT	**CONTRASTO DI COLORE** ☐ COLOUR CONTRAST
TEMPERATURA SUPERFICIE SURFACE TEMPERATURE	
PULITURA DELLA SUPERFICIE SURFACE CLEANING	
TEMPO ASCIUGATURA (≥ 2 minuti) DRYING TIME (≥ 2 minutes)	
APPLICAZIONE PENETRANTE PENETRANT APPLICATION **TEMPO DI PENETRAZIONE** PENETRATION TIME	
ASPORTAZIONE PENETRANTE PENETRANT REMOVAL	
TEMPO ASCIUGATURA (≤ 20 minuti) DRYING TIME (≤ 20 minutes)	
APPLICAZIONE RIVELATORE DEVELOPER APPLICATION	
TEMPO DI SVILUPPO DEVELOPMENT TIME	
LIGHT EQUIPMENT	

NOTE REMARKS
OPERATORE PERSONNEL
ESITO RESULT

68 LP1 REV. 2

PT REPORT FORM

PROVE ESEGUITE DA Test conducted by	PER IL LABORATORIO For the laboratory	L'ISPETTORE DEL CLIENTE Customer inspector	IL COLLAUDATORE The inspector

ISTITUTO DI RICERCHE TECNOLOGICHE E COLLAUDI

TREZZO SULL'ADDA (MI)

ATTESTATO DI CERTIFICAZIONE **No. 07**
CERTIFICATION

SI DICHIARA CHE THIS IS TO CERTIFY THAT	***BIANCO DIMITRI***
DIPENDENTE DELLA AN EMPLOYEE OF	IRTEC - ISTITUTO DI RICERCHE TECNOLOGICHE E COLLAUDI S.R.L. TREZZO SULL'ADDA
IN BASE ALLE CAPACITA' PERSONALI, ISTRUZIONE, ESAMI, ESPERIENZA ED IN ACCORDO CON QUANTO PRESCRITTO DA BY VERTUE OF HIS PERSONAL CAPABILITIES, INSTRUCTION, EXAMINATION, EXPERIENCE AND ACCORDING TO THE REQUIREMENTS OF	**IRTEC QUA-02 REV. 10 WRITTEN PRACTICE FOR PERSONNEL QUALIFICATION AND CERTIFICATION IN NON DESTRUCTIVE TESTING, PREPARED ON THE BASIS OF SNT-TC-1A RECOMMENDED PRACTICE, ED. 2016 + ASME BPVC.V-2021ARTICLE 1 – APPENDIX III**
E' QUALIFICATO AL LIVELLO IS QUALIFIED AS LEVEL	II (SECONDO) II (SECOND)
PER LA SEGUENTE TECNICA DI CONTROLLO NON DISTRUTTIVO FOR THE FOLLOWING NON DESTRUCTIVE TESTING TECHNIQUE	CONTROLLO CON LIQUIDI PENETRANTI (PT) LIQUID PENETRANT TESTING (PT)
DATA DI RILASCIO DEL CERTIFICATO DATE	03/06/2022
QUESTO ATTESTATO E' VALIDO FINO AL THIS CERTIFICATE IS VALID UP TO	03/06/2027

III Livello
NDE LEVEL III

Dott. Ing. G. Grossi

dott. Ing. G. GROSSI

IRTEC srl – TREZZO SULL'ADDA
General Manager Mrs. C. Salvi
03/06/2022

I.R.T.E.C. srl
via F. Santi, 3
20056 Trezzo sull'Adda (Mi)
C.F. e P.IVA 02829820154
(Firma del Legale rappresentante)