NLT-220

ワーク比較個別判定方式［特 許］　差圧二次計測リークテスター
Differential Pressure-Type Secondary Measurement Leak Tester with Work Comparison Individual Judgment Method. [Patent]

差圧二次計測型リークテスター

Differential Pressure-Type Secondary Measurement Leak Tester

1. 多品種のワークに対応可能なチャンネルを16点装備
1. Equipped with 16 channels that can adapt to various types of works.

2. 補正機能（マニュアル／オート）、エラーチェック機能、など多種の機能を内蔵
2. Equipped with checking functions, such as correction (Manual/Automatic), and error checking.

3. ワーク2個を測定するので、タクトが短くなる（1.5倍～2倍）
3. Less tact time since it measures two works (Less by 1.5～2 times)

4. 特に温度の影響を受けやすい砲金、肉薄のSPC材、表面積の大きなアルミ材などに効果大
4. Very effective for products that are sensitive to temperature such as gunmetal, thin SPC material and aluminum material that has wider surface area.

5. 多数個取りの場合、ロットアウト数を半分にできる。
5. Number of lot rejection can be reduced by half in case of multi-picking.

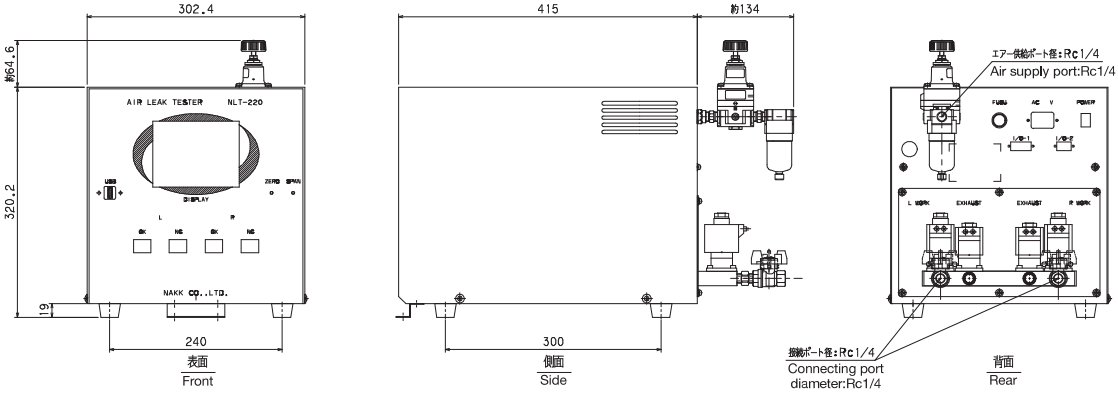
6. OK,NG表示により個別判定できる。
6. Can make individual judgment with the indication of “OK” and “NG”.

7. 作業者が一人でも、複数のテスターを操作できる。
7. It allows one operator to operate several testers.

8. 同じ漏れ量でも、誤判定なく測定できる。
8. Able to measure properly even if the amount of leakage is the same.

タッチパネル部
Touch screen section

外観図 Appearance



機能 Functions	
オートゼロ	計測直前の値をゼロ補正します。
補　正	測定ワークにより計測ノイズを補正します。マニュアル／オート
判定信号	判定後のOK,NG信号をパルス出力します。
各種チェック機能	バルブ、センサー、テスト圧力などのセルフチェック
表示言語	英語／中国語／日本語
キーロック機能	作業者によるデータ書換えなどを防止します。
出　力	USBポート: 判定結果（OK,NG）、時刻、チャンネル番号
I/O チェック機能	入出力信号をモニター出来ます。
オプション	電空レギュレーター 、フィルター

Automatic Zero Adjustment	The reading just before measurement is automatically adjusted to zero.
Noise Compensation	The measuring noise from the object to be measured is compensated. Manual/Automatic
Judgment Signal	The OK/NG signal after judgment is output in a form of pulse.
Check Functions	Self diagnosis functions for valve, sensor, test pressure, etc.
Display language	English/Chinese/Japanese
Key Lock	Prevent the data from rewriting by operator.
Output	The judgement (OK/NG) can be output via USB port, time, channel number
I/O check function	You can monitor the input and output signals.
Option	Electric pneumatic regulator, filter

仕様 Specifications	
電　源	AC100V 50/60Hz　オプション:AC220Vなど
消費電流	1450mA
圧力レンジ	L: 5～200kPa M: 50～700kPa H: 0.1～1.7MPa V:-95～0kPa
設定差圧	1Pa
チャンネル数	16CH（0～15CH）
タイマー	0～999.9秒
供給圧力	テスト圧力 +100kPa
配管接続径	Rc（PT）1/4
I/O	制御用 OK,NG、スタート、ストップ、チャンネル選択など
温度範囲	0～50℃
湿　度	80%RH以下（結露しないこと）
外形寸法・重量	H: 385mm W: 302mm D: 549mm 19kg（低圧仕様）
ディスプレイ	カラータッチパネル 5.6インチ

Power	100VAC 50/60Hz Option:220 VAC,etc.
Current consumption	1450mA
Pressure range	L: 5～200kPa M: 50～700kPa H: 0.1～1.7MPa V:-95～0kPa
Differential Pressure	1Pa
No. of Channels	16CH（0～15CH）
Timer	0～999.9sec.
Supply pressure	Test pressure +100kPa
Piping Diameter	Rc（PT）1/4
I/O	For control OK/NG, Start, Stop, Channel selection, etc.
Temperature Range	0～50℃
Humidity	80% RH or less (no condensation)
Dimention/Weight	H: 385mm W: 302mm D: 549mm 19kg(Low pressure specification)
Display	Color touch panel 5.6inch

形式表示方法　NLT-220 ① ②　表示例 NLT-220 L F

①圧力レンジ Pressure range		②オプション Option	
L	5～200kPa	E	電空レギュレータ Electro-pneumatic regulator 2～100kPa /5～500kPa / 5～900kPa
M	50～700kPa		
H	0.1～1.7MPa		
V	-95～0kPa	F	フィルター Filter

■NLT-220（差圧式二次計測） NLT-220 (Differential Pressure Type Secondary Measurement Leak Tester)

差圧式リークテスターは、一般的に切り替えバルブ、高精度差圧センサー、高精度アンプなどから構成されています。
リークテスターの測定原理から物理的に最もノイズ（外乱）となるものは下記の通りです。

The differential pressure-type leak tester generally consists of selector valves, a high-precision differential pressure sensor, and a high-precision amplifier.
Considering the measurement principle of leak testers, the following factors can be the major physical causes of noise (disturbance).

1. 温度による要因 Factor due to temperature change

温度差による体積変化（膨張、収縮）で差圧センサー内の圧力が変化する場合。
温度が上がれば体積が増えて圧力が上がる。温度が下がれば反対に圧力が下がります。

There may be a case where the pressure in the differential pressure sensor changes with the volume change (expansion or contraction) caused by change in temperature.
In such a case, when the temperature rises, the volume increases and the pressure rises. In contrast, the pressure decreases when the temperature lowers.

2. 季節の室温による要因
Factor due to seasonal change of room temperature

冬季、夏季 → 始業時、空調を入れることにより室温が変化する。
ライン上のワーク、リークテスター、マスターが室温に変化する。
代表的な被試験体（ワーク）：薄肉で表面積が大きく熱伝導率（比熱）が大きなワーク。パイプ、アルミ、ラジエーターなど

Room temperature changes, when the air conditioner is operated, at the start of work of the day in winter or summer. The temperatures of the object to be tested, the leak tester, and the master on the line change according to the change of the room temperature.
Typical objects(work) liable to be affected: Objects of a thin wall, large surface area and high thermal conductivity and large specific heat, such as pipes, aluminum products and radiators.

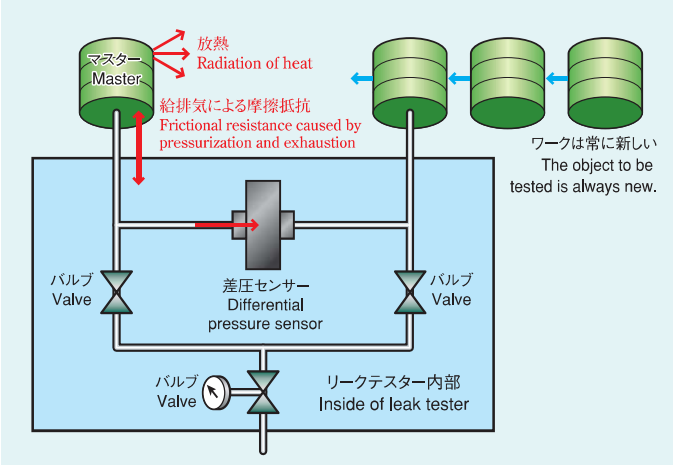
3. 体積変化による要因 Factor due to change of object volume

体積の増減によって差圧センサー内の圧力が変化する場合。
ワークに圧力を封入した場合、その圧力でワークが膨張（収縮）してしまうワーク。
代表的な被試験体（ワーク）：風船のように膨らんでしまうワーク。ペットボトル、樹脂容器、フレキホースなど

There may be a case where the pressure in the differential pressure sensor changes with the increase or decrease of the volume of the object. This pressure change is caused by expansion or contraction of the object when the inside is pressurized.
Typical objects(work) liable to be affected: Objects which swell like balloons, plastic bottles, plastic containers and flexible hoses

このような場合マスター比較による測定では、温度差、体積変化のノイズを防ぐことができません。なぜなら、マスターはリークテスターに常に接続されていてテスト圧力の給排気が連続的に行われ、マスター側の温度が圧力の給排気による摩擦抵抗で変化します。これに対して、ワーク側は常に新しいものが入ってくるので温度変化があまりおきません。従って、マスター側、ワーク側の温度差によるばらつきが大きく、NGの規格を小さくできないので微少リークを検出することは難しくなります。
そこで、これらの要因をできる限り受けなくするには、次のような方法があります。

Under such conditions, the noise due to the difference in temperature and change in volume cannot be avoided in the measurement by comparison with the master. Because the master is always connected to the leak tester and continuously subjected to application and releasing of the test pressure, and thus the temperature on the master side changes due to the frictional resistance caused by pressurization and exhaustion.



On the other hand, no temperature change occurs on the side of the object to be tested, since a new object is provided at every test. Therefore, the instability due to the difference in temperature between the master side and the object side is so great that the range of the criterion for rejection (NG) cannot be set small. That is, it is difficult to detect a small amount of leak.
To minimize the disturbances caused by these factors, the following means is available.

4. マスター比較方式［NLT-330］一般的なリークテスター
A system comparing object with object in place of master using NLT-330 General purpose leak tester

常に新しいワーク同士に入れ替わる為、温度変化はおきないので安定した測定が可能です。
しかし、この方法の最大の問題点は、漏れ品同士が重なった場合、差圧が出ないので良品になってしまいます。この方法を説明するときによく言われることは、「歩留まりが良い製品」の場合にのみ選択してくださいと言われますが、実際のところどんなに歩留まりが良い製品であっても、製造上の問題でNG品が発生するときは連続して発生する可能性が非常に高いのです。
従って品質を保証する方法としては、良い方法ではありません。

Since always a pair of new objects are replaced with the tested ones, temperature change does not occur, thus the measurement is made with a stable accuracy.
However, the biggest problem with this means is that when both objects in a pair have a leak, pressure difference does not appear, thus they will pass the test as conforming(that is, acceptable) articles. It is often said that this means should be selected only for the products having high inspection pass rate. Even during production with high inspection pass rate, it is highly possible that non-conforming articles may be produced in succession owing to a problem with the manufacturing process.
Therefore, this means is not suitable to assure high quality of the products.

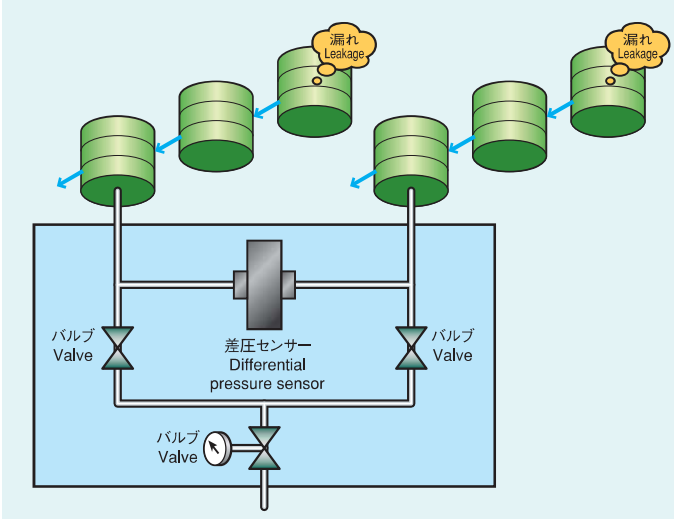
NGをOK判定する可能性
Cases where an article to be rejected as "NG" can be accepted as "OK" by misjudgment:

1）リークがほぼ同じ場合（判定値が50Paの場合）
左ワーク50Paで右ワーク50Pa＝差圧は0Pa
判定結果：左右ともOK

1）Where both objects have leaks of almost the same amount.
Example: Assume that the criterion value is 50 Pa,
if the left object shows 50 Pa and the right one 50 Pa,
the differential pressure is 0 Pa.
Judgment: Both right and left objects are accepted as "OK".

2）リークが判定値以内の差の場合（判定値が50Paの場合）
左ワーク40Paで右ワーク50Pa＝差圧は10Paしか出ない。
これに関しては無数の組み合わせが考えられます。
判定結果：左右ともOK

2）Where the difference in leakage is smaller than the criterion value.
Example: Assume that the criterion is 50 Pa,
if the left object shows 40 Pa and the right one 50 Pa,
the differential pressure is only 10 Pa.
A countless number of other pairs can be included in this case.
Judgment: Both of the right and the left objects are accepted as "OK".



計測工程：加圧、バランス、計測の3工程
Measuring process: Consisting of three sub-processes of pressurization, balancing, and measurement

5. ワーク比較二次計測方式［NLT-220］

System based on comparison of an object with another object and secondary measurement using NLT-220

ワーク比較方式と同じで温度変化がおきないので、安定した検査が可能。
この方式の重大な欠点を解消した測定方式です。

In this system, temperature change does not occur in the same way as in a system of comparing an object with another object in a pair. Therefore, the inspection can be made with a stable accuracy.
This measuring system eliminates the critical fault in the general object comparison method.

NGをNGとするのは

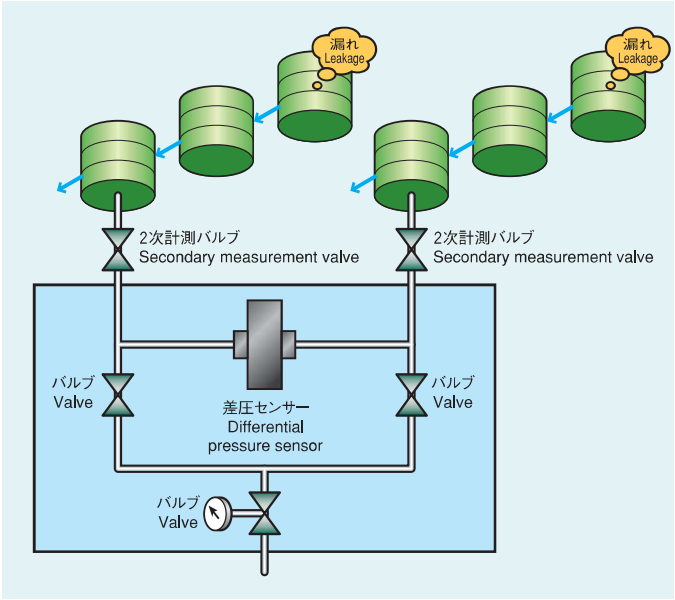
Cases where objects to be rejected as "NG" are judged as "NG" correctly are as follows:

1）リークがほぼ同じ場合（判定値が50Paの場合）
一次計測：左ワーク50Paで右ワーク50Pa＝差圧は0Pa
二次計測：一次計測で差圧の大きく出たワーク側だけを測定
「二次計測バルブ」を片方閉じる。差圧は50Pa
判定結果：左右ともNG

1）Where both objects leak almost to the same degree.
Assume that the criterion value is 50 Pa.
Primary measurement: When left object shows 50 Pa and right one 50 Pa and thus the differential pressure is 0 Pa.
Secondary measurement: Measure only the object which showed the larger pressure difference at the primary measurement. Close the appropriate one of the secondary measurement valves. Assume that the differential pressure is 50 Pa.
Judgment: Both right and left objects are rejected as "NG".

2）リークが判定値以内の差の場合（判定値が50Paの場合）
一次計測：左ワーク60Paで右ワーク50Pa=差圧は10Pa
二次計測：右ワークの「二次計測バルブ」が閉じる。
（左ワークを測定） 差圧は60Pa
判定結果：左右ともNG

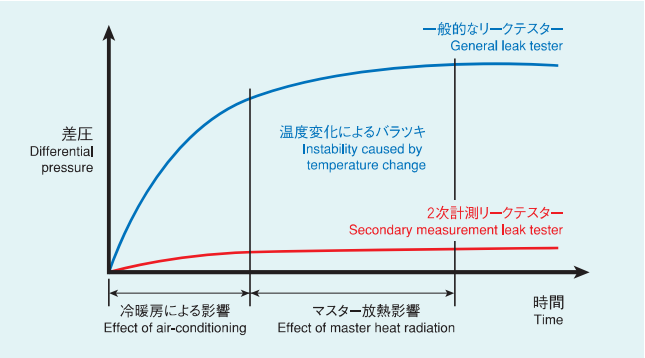
2）Where the difference in leakage is smaller than the criterion value
Assume that the criterion value is 50 Pa.
Primary measurement: Assume that left object shows 60 Pa and right one 50 Pa and thus the differential pressure is 10 Pa.
Secondary measurement: Close the secondary measurement valve for the right object. (The left object is measured.)
The differential pressure is 60 Pa.
Judgment: Both right and left objects are rejected as "NG".



計測工程：加圧、バランス、一次計測、二次計測の4工程
二次計測時、一次計測で差圧が出なかった側の「二次計測バルブ」が閉じる。

Measuring process: Consisting of four sub-processes of pressurization, balancing, primary measurement and secondary measurement
At the secondary measurement, the secondary measurement valve on the side where the differential pressure did not appear at the primary measurement is closed.

季節による室温変化とマスター放熱変化
Change in differential pressure due to seasonal room temperature change and master heat radiation



このように二次計測リークテスターは、ばらつきを小さく抑えられます。
As shown above, the secondary measurement leak tester minimizes the instability.

6. その他 Other features

1. 2個同時比較なので検査時間の短縮
2. 多品種のワークを検査するとき、わずらわしいマスター調整の必要がない。
3. 多品種のワークに対応、チャンネルは16種類

1. Since two objects are compared at the same time, the inspection time is shortened.
2. When inspecting various types of objects, no troublesome adjustment of masters is required.
3. Sixteen channels are provided for use with various types of objects.

7. 動作方法 How to judge

ワーク Objects ＼ 検査 Inspection	1次計測 Primary measurement		2次計測 Secondary measurement		判定表示 Judgment	
	L	R	L	R	L	R
L、Rとも漏れなし Both L and R no leak	○	○	○	／	○	○
L漏れ、R漏れなし L leak but R no leak	×	○	／	○	×	○
R漏れ、L漏れなし R leak but L no leak	○	×	○	／	○	×
L、Rとも同じ漏れ L and R an equal amount of leak	○	○	×	／	×	×
L、Rとも漏れ 漏れL＞R Both L and R leak; amount of leak L>R	×	○	／	×	×	×
L、Rとも漏れ 漏れL＜R Both L and R leak; amount of leak L<R	○	×	×	／	×	×
L、R大漏れ Both L and R a large amount of leak	／	／	／	／	×	×
L小漏れ、R大漏れ L a small amount of leak and R a large amount of leak	／	／	×	／	×	×
R小漏れ、L大漏れ R a small amount of leak and L a large amount of leak	／	／	／	×	×	×
L漏れなし、R大漏れ L no leak but R a large amount of leak	／	／	○	／	○	×
R漏れなし、L大漏れ R no leak but L a large amount of leak	／	／	／	○	×	○

上記において、○良品、×不良、／計測しないを示す。
In the above, ○ denotes "accepted", × "rejected" and / "not measured".

※二次計測目で遮断するワークは、下記の条件により決まります。
NOTE: The secondary measurement valve to be closed at the secondary measurement is determined as follows:

	1次計測内で At primary measurement
L側を遮断する場合 L side valve is to be closed.	両ワークとも良品範囲内で、ゼロまたはR側に差圧が出た場合 When both objects were accepted and the differential pressure was zero or appeared on the R side.
	L側のワークが不良の場合 When the object on the L side was defective.
R側を遮断する場合 R side valve is to be closed.	両ワークとも良品範囲内で、L側に差圧が出た場合 When both objects were accepted and the differential pressure appeared on the L side.
	R側のワークが不良の場合 When the object on the R side was defective.