



RESPIREX™

GTL Gas-Tight Suit Instructions for use

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General Information

The Respirix GTL is a limited-use chemical protective gas-tight suit manufactured from Chemprotex™ 400, a high performance barrier laminate material engineered for use in chemical protective clothing. The combination of the barrier laminate layer and a polymer layer provide a particle-tight material with excellent resistance to penetration and permeation by many liquids and gases. The suit is for use within certain contaminated environments only and you should carefully read and follow these operating instructions closely.

All Respirix GTL gas-tight suits are CE Marked to indicate compliance with the EC Directive 89/686/EEC on personal protective equipment (PPE). The suit has been tested and marked in accordance with EN 943-2:2002, this standard specifies performance requirements both for materials of construction and for the suit as a whole.

Worn in combination with safety boots meeting the requirements of clause 5.3.2 of EN 943-2:2002 (EN 345-2:1996 (Type FPA) or equivalent), the Respirix GTL gas-tight suit manufactured from Chemprotex™ 400 meets the performance requirements of a TYPE 1a-ET limited-use "gas-tight" chemical protective suit for emergency teams.

Respirix GTL suits must be worn in conjunction with self-contained open-circuit compressed air breathing apparatus conforming to EN 137:1993.

The barrier laminate, offers protection in a wide range of applications including:

- Chemical handling
- Hazardous waste clean-up
- Emergency response services, spill clean-up and accident interventions

The GTL gas-tight suit is a one-piece coverall designed to enclose the wearer's whole body and self-contained breathing apparatus (SCBA).

Suit features include:

- A large semi-rigid visor that provides the wearer with an excellent field of vision produced from materials designed to be resistant to permeation against the battery of 15 chemicals listed in EN943-2:2002.
- Twin exhalation valves which ensure that the pressure within the suit does not exceed 400 Pa.
- A 122cm (48") long gas-tight zipper fitted to the right hand side of the suit that enables easy donning or doffing. The zipper is shrouded by an outer flap complete with hook and loop fastening which must be sealed down whilst the suit is in use.
- Integral booties (sock like extension of the suit leg that encapsulates the entire foot) intended to be worn inside separate (i.e. not attached) protective safety boots. Outer splash guards that prevent liquid ingress into the wearer's safety boots are also attached to the legs.
- Respirix laminate glove liners complying with EN374-1:2003, EN388:2003 & EN420:2003 permanently bonded to the suit. **NOTE:** The laminate glove liners do not offer any mechanical and thermal protection, outer neoprene gloves should be worn over the glove liner. As an option suits can be supplied with outer neoprene gloves permanently bonded to the laminate glove liners or a laminate glove liner/Neoprene dual glove system fitted by means of the Respirix locking cuff system.
- Sleeves fitted with elasticated splash guards intended to prevent liquid ingress into the wearer's outer neoprene gloves.
- An internal belt to support the waist of the suit.
- As an option the suit can be fitted with a fully rotating pass-thru that enables supplementary air to be passed to the ancillary airline connection of the wearer's self-contained breathing apparatus. The pass-thru will withstand the working pressure of a two-stage breathing apparatus. On the inside of the suit is a short length of airline hose with a coupling that connects to the ancillary airline connection on the wearer's self-contained breathing apparatus. The maximum working pressure of this unit is 10 bar.
- If required the suit can be fitted with an attachment point intended to carry a distress signal units (DSU).

Warnings & Limitations

- Respirix GTL gas-tight suits should only be worn by persons who have been fully trained and are familiar with suit equipment. It is essential to ensure that the suit you are wearing is made from a material that will give you adequate protection against the chemical hazard you are about to encounter.
- GTL gas-tight suits are designed as single-use garments only. Respirix cannot guarantee the integrity or performance characteristics of a suit that has seen multiple cycles of use.
- Never modify or alter this product.
- Before selecting appropriate protective clothing, a detailed assessment of the nature of the hazard and the working environment should be undertaken. There are different factors such as concentration, temperature, pressure and other environmental influences that have significant influence on the barrier properties of GTL gas-tight suits.
- Please ensure that you have chosen suitable PPE for your application. The end user shall be the sole judge for the correct combination of full body protective coverall and ancillary equipment (gloves, boots, respiratory equipment etc) and how long a GTL gas-tight suit can be worn on a specific application with respect to its protective performance, wear comfort or heat stress.
- Materials that may come into contact with the wearer's skin are not known to cause allergic reactions to the majority of individuals. These products contain no components made from natural rubber latex.
- GTL gas-tight suits should not be worn in a potentially flammable or explosive environment.
- GTL gas-tight suits may not be suitable for use where there is a high risk of puncture occurring.
- Continuous contact with certain chemicals may adversely effect the field of vision and protection offered by the visor. If any discolouration of the visor is apparent the suit should be removed from use immediately.
- Always use compatible PPE, e.g. gloves and safety boots advised by Repirex.
- Caution: Chemprotex™ 400 is a non-breathable material and the wearer's body temperature may rise whilst wearing the suit, particularly during periods of intense physical activity. Wherever possible operational procedures should be planned to minimise the risk of heat stress occurring. The wearer should leave the work area and doff the suit before becoming distressed.
- If the suit is heavily contaminated or mechanically damaged in any way it **MUST NOT** be used and **MUST** be disposed of.

For any enquiries please contact the Respirix customer services department on

Tel : +44 (0)1737 778600 or Fax : +44 (0)1737 779441.

Physical Properties Of Chemprotex™ 400 Suit Material

Material tested in accordance with Table 1 of EN943-2:2002 - Minimum performance requirements of chemical protective clothing materials for limited-use suits.

Property	Test Method	Property value of Chemprotex™400	Performance class	Minimum performance class required for EN 943-2:2002
Abrasion resistance	EN 530:2010 Meth 2 (inc. pressure drop)	2000 cycles	6	4
Flex cracking resistance	EN ISO 7854:1997 Method B (inc. pressure drop)	MD 1000 cycles CD 1000 cycles	1	1
Flex cracking resistance at low temperatures (-30°C)	EN ISO 7854:1997 Method B at -30°C (inc. pressure drop)	MD 200 cycles CD 200 cycles	2	2
Trapezoidal tear resistance	EN ISO 9073-4:1997	MD 99 N CD 74 N	4	3
Puncture resistance	EN 863:1995	27 N	2*	2
Tensile Strength	EN ISO 13934-1:1999	MD 451 N CD 376 N	4	4
Resistance to flame	EN 13274-4:2001 Meth 3 modified (inc. pressure drop)	No part ignited or continued to burn on removal from the flame	1	1
Seam strength	EN ISO 13935-2:1999	>300 N	5	5

Key: MD=Machine direction CD=Cross direction

* The suit may not be suitable for use where there is a high risk of puncture.

Fitting Gloves Into The Optional Respirax Locking Cuff System

1. Turn the sleeves of the suit inside out.
2. Carefully slide the tapered cone inside the Respirax laminate glove liner/Neoprene gloves so that they stretch over the cone (see Fig. 1 and Fig. 2).



Fig. 1



Fig. 2

3. Push the gloves and cone into the cuff body with the little finger of the gloves at 90° to the seam at the rear of the sleeve (see Fig. 3).
4. Make sure that the gloves and cone are pushed into the cuff body with equal pressure all around its circumference (see Fig. 4).



Fig. 3



Fig. 4

5. Locate the locking ring over the gauntlet of the gloves and screw into the cuff body (see Fig. 5). If necessary the gauntlet section of the gloves can be cut down if they are causing interference with the locking ring.
6. Turn the sleeve the correct way out by carefully pulling on the glove (see Fig. 6).

Check that there are no creases in the outer neoprene glove around the cuff seal. If there are any creases or the glove is pinched in any way it should be removed and re-fitted. If the cuff and gloves have been assembled as described there should now be a gas tight wrist seal.



Fig. 5



Fig. 6

Recommended Dressing Procedure

It is good practice for a second person to assist the wearer in donning and doffing the suit. This will simplify the process and help the wearer to avoid stumbling or tripping which may result in personal injury or damage to the suit.

1. Unfasten the suit zipper by pulling approximately 61cm (24") at a time, keeping the zipper straight with one hand as you pull the slider with the other. Repeat this exercise for the whole length of the zip. FAILURE TO FOLLOW THIS PROCEDURE MAY RESULT IN THE ZIP BECOMING JAMMED.
2. Remove all personal affects which may result in damage to the suit (e.g. pens, badges, jewellery etc.).
3. Remove shoes or boots and tuck trousers into socks to make donning of suit legs and bootees easier; the integral bootees are not designed to accommodate footwear.
4. Whilst seated, place both legs into the suit then fold the outer legs (splash guards) upwards approximately 20-23cms (8"-9").
5. Don safety boots. It is strongly recommended that you wear a larger size of boot than normal (ideally at least one size larger), not only to accommodate the surplus fabric of the integral bootee, but also to ease in the donning process.
6. Carefully fold down the outer legs of the suit over the exterior of the safety boots. Once folded down it is important to ensure that the seam where the outer leg joins the suit is flat and does not form a 'channel' where liquid could collect. Liquid will not be able to enter the safety boots once the outer leg is fully folded down.
7. Stand up and with the aid of the assistant lift the suit to waist level, making sure the crotch is positioned comfortably. The suit waist belt should be fastened firmly ensuring that it is not twisted (see Fig. 7 and Fig. 8).



Fig. 7



Fig. 8

8. With the aid of the assistant don a self-contained breathing apparatus set (SCBA) in the usual manner but without starting up. At this stage the face mask of the SCBA should remain hanging by its strap around the wearer's neck. The assistant should lift the pod at the rear of the suit up and over the SCBA cylinder. All necessary SCBA pre-checks should now be carried out.
9. Next, the SCBA cylinder should be switched on in accordance with the manufacturer's instructions and the face mask donned in the usual manner. The assistant can help the wearer to adjust the head straps of the face mask until comfortable; a firefighter's safety helmet may also be donned by the wearer if necessary.
10. The wearer's arms should be folded across the chest (see Fig. 9) whilst the assistant lifts the suit up and over the wearer's shoulders and head. The dressing assistant should fasten the zipper carefully following the reverse of the procedure outlined in stage 1 and seal down the outer flap. Ensure that both halves of the hook and loop fastening are firmly and evenly joined together, leaving no gaps or ridges for possible fluid ingress.

Both arms can now be inserted into the sleeves of the suit until the hands are placed comfortably into the attached Respirax laminate glove liners (it is recommended that cotton gloves are worn inside the laminate glove liners attached to the suit). Where necessary a pair of neoprene outer gloves should now be donned to provide greater mechanical protection to the integral laminate gloves; the elasticated outer sleeves should be folded down over the exterior of the outer gloves (see Fig. 10).



Fig. 9



Fig. 10

Decontamination for removal of suit

Preliminary washing by means of a high pressure shower will remove most of the contaminant from the outer surface of the suit sufficient to allow the wearer to undress from the garment.

Should you not have access to a high pressure shower, the suit can be sprayed with copious quantities of water and a suitable detergent and neutralizer for a minimum period of 5 minutes.

If the garment has been used in acid the recommended neutralizer is a solution of bicarbonate of soda and water (6% bicarbonate of soda w/v). Water will neutralize alkali contamination.

Recommended doffing procedure

Firstly the suit must be decontaminated sufficiently to safely remove the wearer from the garment (see Decontamination for removal of suit). It is necessary for an assistant to aid the wearer in removing the suit (it is ESSENTIAL that the assistant wears suitable protective clothing).

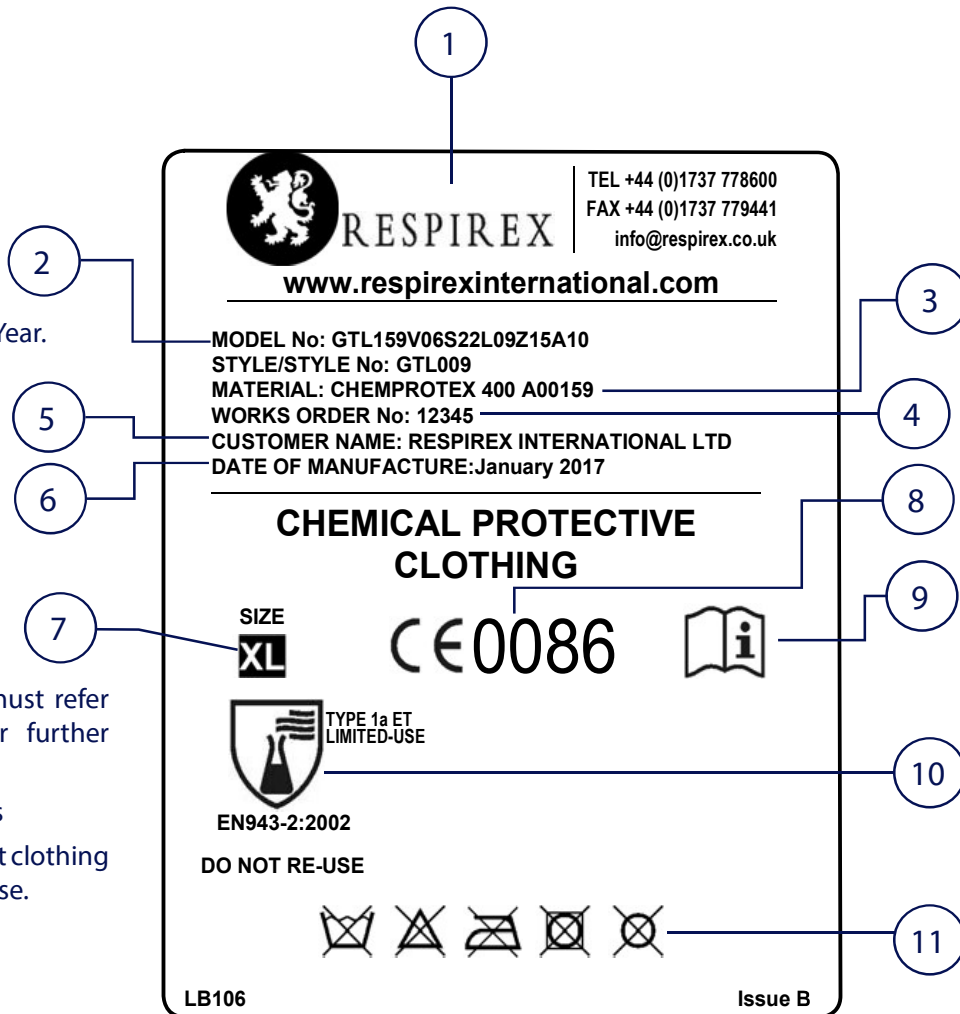
1. The wearer's arms should be removed from the sleeves and folded across the chest.
2. The assistant should unseal the hook and loop fastening on the outer flap and carefully open the zipper (following the procedure outlined in the dressing instructions).
3. Fold the suit over the wearer's head and off the SCBA down to the waist. **THE OUTER SURFACES OF THE SUIT MUST BE KEPT AWAY FROM THE WEARER AT ALL TIMES.**
4. Remove the wearer's face mask and shut down the SCBA cylinder according to the manufacturer's instructions. With the help of the assistant the SCBA can now be removed in the usual way.
5. Unfasten the suit waist belt.
6. Fold the suit down to the top of the integral booties to enable the wearer to step out of the suit.

Note: Extreme care should always be taken when handling contaminated suits.

Product labelling

1. Manufacturer of garment; Respirex International Ltd.
2. Manufacturer's Model number
3. Material of Manufacture.
4. Manufacturer's Order No.
5. Customer Name.
6. Date of manufacture; Day/Month/Year.
7. Garment Size

Size	Chest (cms)
S	88-96
M	96-104
L	104-112
XL	112-124
XXL	124-136
8. CE Mark and notified Body code.
9. "Open Book Pictogram"; wearer must refer to the "Instructions for use" for further information.
10. Protection against liquid chemicals
11. Five care pictograms indicating that clothing is not suitable for cleaning and reuse.
 - Pictogram 1 Do not wash
 - Pictogram 2 Do not bleach
 - Pictogram 3 Do not iron
 - Pictogram 4 Do not machine dry
 - Pictogram 5 Do not dry clean



Storage

Respirex GTL suits should be stored under the following conditions:

In dry conditions above ground level; away from direct sunlight and in an environment free from harmful gases and vapours. Temperature range of -5°C* to +30°C

*Care should be taken when storing GTL suits at extreme temperatures. At sub-zero temperatures the flexibility of the material may be reduced, resulting in a potential lowering of the protection offered.

Based on the results of accelerated ageing tests, the projected shelf life of GTL suits is five years.

Only remove the GTL suit from its original packaging when intending to use.

Disposal

Contaminated garments should be handled as contaminated waste in accordance with local and national regulations.

Incineration is acceptable as no halogens are present or used in manufacture of Chemprotex™400. The calorific value is the same as oil; however uncontrolled combustion can lead to noxious fumes and un-burnt hydrocarbons. All components are thermoplastic and can be recycled as mixed polyolefin where facilities exist.

Chemprotex™400 is comprised mainly from ethylene gas which is a by-product of oil production and refining which was once flared. No formal carbon footprint has been made on Chemprotex™400, however provided it is not incinerated overall carbon dioxide release to the atmosphere during production and disposal will be low.

Chemical Permeation Testing At Respirex

At its headquarters at the Kingsfield Business Centre in Redhill Respirex operate a chemical testing laboratory equipped with the latest technology. All the testing is carried out by fully qualified chemists who are able to test Respirex's own fabrics against any challenge chemical that the customer requests. In this way the customer can be advised and recommended of the most suitable material to use against any challenging chemical encountered in the workplace.

Permeation is the process by which a chemical moves through protective clothing material on a molecular level. Permeation tests are carried out according to the European standards EN 374-3 and EN ISO 6529 and the American standard ASTM F739 using pure chemicals. The clothing material is exposed to the challenging chemical in a permeation cell so that breakthrough times and permeation rates can be measured. Breakthrough time is the time taken for the chemical to permeate through the material after continuous contact with the outer surface of a chemical protective suit. Permeation rates, measured in $\mu\text{g}(\text{min} \cdot \text{cm}^2)$, are an indication of the amount of chemical reaching the wearer inside the suit after breakthrough occurs.

A normalised breakthrough time of >480 minutes indicates that the permeation rate did not reach the defined rate of $0.1\mu\text{g}(\text{min} \cdot \text{cm}^2)$ (ASTM F739-07) or $1.0\mu\text{g}(\text{min} \cdot \text{cm}^2)$ (EN374-3:2003). Permeation however may still have occurred at lower rates; and depending upon the chemical toxicity, it is possible that a chemical may be permeating the material and a level of toxicity reached within a protective clothing garment long before the reportable breakthrough of 480 minutes. Breakthrough alone therefore is only a means of comparing different material performances and does not indicate safe protection for up to the number of minutes reported.

The "safe wear time" of chemical protective clothing depends upon a number of factors such as:

- Temperature
- Type of exposure
- Toxicity of chemical

The determination of suitability of chemical protective clothing for an application should be based upon end user risk assessment.

For advice on chemical permeation or decontamination please contact the Respirex testing laboratory on Tel : +44 (0)1737 778600 or Fax : +44 (0) 1737 779441 (Mon-Fri 9am - 5pm).

Permeation Performance

The table below indicates the resistance to permeation by chemicals of Chemprotex™400 clothing material, suit seams, Respirix glove liners and suit visor as required by EN943-2: 2002.

All tests carried out under laboratory conditions by independent accredited laboratories in accordance with EN ISO 6529:2001 unless otherwise stated.

Table shows average breakthrough times in minutes.

Chemical	Result Chemprotex™400 material	Result Respirix Laminate Glove Liner*	Visor**	Suit Seams
Acetone 100%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
Acetonitrile 99.9%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
Ammonia Gas 99.9%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
Carbon Disulphide 99.9%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
Chlorine Gas 99.5%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
Dichloromethane 99.9%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
Diethylamine 99.5%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
Ethyl Acetate 99.7%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
n-Heptane 99%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
Hydrogen Chloride Gas 99.9%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
Methanol 99.9%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
Sodium Hydroxide 40%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
Sulphuric Acid 95-98%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
Tetrahydrofuran 99.9%	> 480 mins	> 480 mins	> 480 mins	> 480 mins
Toluene 99.9%	> 480 mins	> 480 mins	> 480 mins	>240 mins

*Glove chemical barrier construction is identical to chemical barrier of the Chemprotex™400.

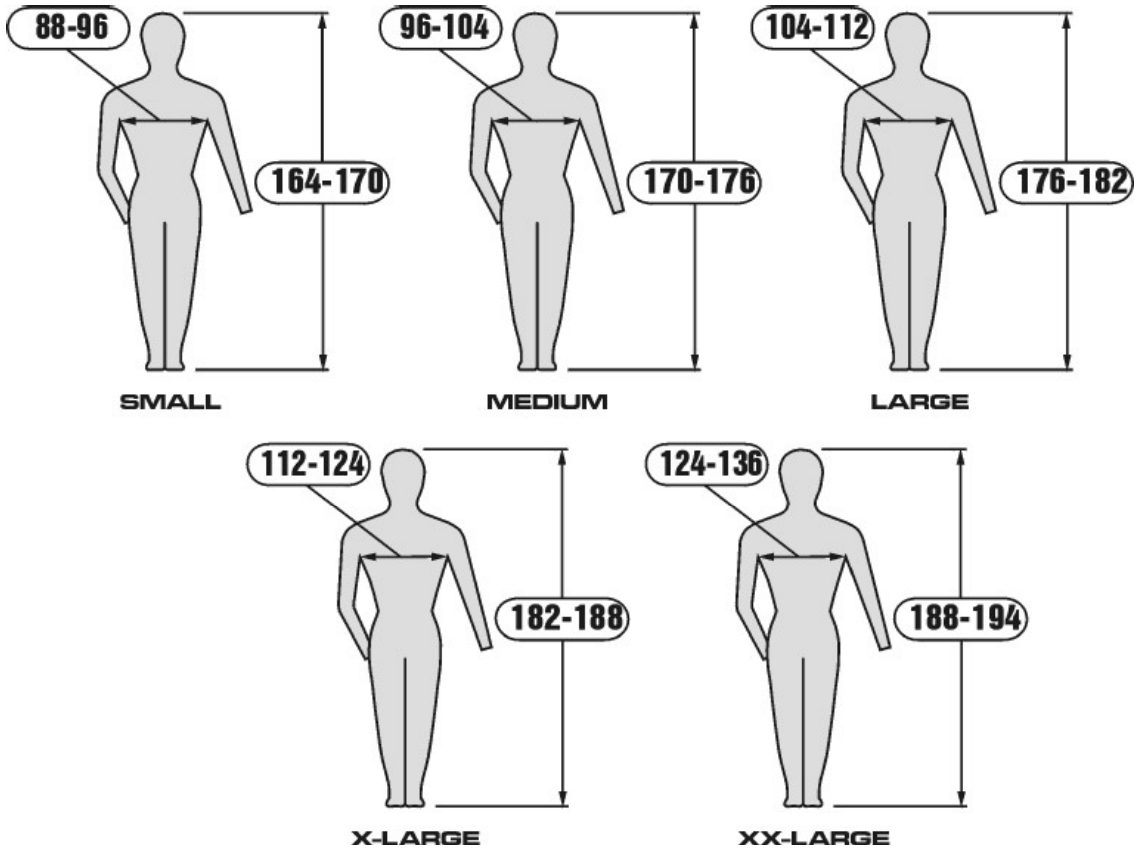
**Visor tests performed in accordance with EN 369:1993 except n-Heptane performed in accordance with EN 374-3:2003.

Classification of permeation resistance

Class	Breakthrough time (mins)
6	>480
5	>240
4	>120
3	>60
2	>30
1	>10

Sizing

The following pictograms designate the range of height & chest sizes suitable for the GTL suit, check your body measurements to make sure you are suitable. Body measurements in cm.



Size	Height	Chest
S	163-175	88-96
M	169-182	96-104
L	176-188	104-112
XL	182-194	112-124
XXL	188-200	124-136

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