



# **INNER THERMAL/ WARMER** **TROUSER**

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**PROMULGATION ORDER**

1. This specification is hereby approved and promulgated for information, guidance and compliance by the relevant person.
2. The details contained in the specification are to be studied, interpreted and implemented with due regards to the interest of the Service.

**SUGGESTIONS FOR AMENDMENT**

1. The specification has been prepared to bring the test methods and procedures in line with up-to-date PN requirements and facilities held in Pakistan. CINS may request to amend any test requirement/ test procedure in light of the experience emanating from its inspection history, through the feedback form placed at Annex G. However, such an alteration will be effective when the amendment is promulgated by this Directorate, and will be effective on the contracts which materialize after the promulgation date of respective amendment.

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PN SPECIFICATION NO 11/2022

**PN SPECIFICATION 11/2022**  
**(INNER THERMAL/ WARMER TROUSER)**

**0101 DESIGNATION**

1. Inner Thermal/ Warmer Trouser.

**0102 USAGE**

1. Inner Thermal/ Warmer Trouser will be worn by CPOs/ Sailors of Pakistan Navy serving at North.

**0103 INTRODUCTION**

1. This specification is promulgated by Directorate of Indigenous Technical Development, Karachi, to provide necessary guidance to the potential manufacturers/ suppliers of the items mentioned herein. This specification is to be used for testing and deciding upon acceptance, or otherwise, of the items mentioned. Any alteration or addition in this specification can be suggested to ITD Wing Directorate. However, it cannot be implemented without prior approval of DITD. This specification supersedes and replace all other PN Specifications promulgated earlier in relation to the items mentioned herein.

2. This specification includes **07** Annexes and consists **24** pages, including the cover.

**0104 SCOPE**

1. This specification covers manufacturing/ inspection requirements of Inner Thermal/ Warmer Trouser. This specification lays down the standards to which the store shown under designation above should conform to. It defines and lays down the quality, standards and details of materials, manufacturing, workmanship and finish. It also lays down the details of testing, inspection, rejection, marking, packing and delivery of item.
2. The supplier/ manufacturer shall comply in every respect with the terms of this specification and ensure that the stores conform to it, in all respects.

**0105 RELATED DOCUMENTS**

1. The latest standards and documents that have been referred to in this specification are:

a.	AATCC-20A	Fiber Quantitative analysis
b.	AATCC 79-2010	Absorbency drop test
c.	ASTM D-1230	Flammability of Apparels
d.	BS EN ISO-13938-1	Bursting strength
e.	BS EN ISO-12945-2	Determination of fabric propensity to surface fuzzing and to pilling
f.	BS EN-6330	Dimension Stability
g.	BS ISO-16322-1	Determination of Spirality after laundering.
h.	ISO-7211/2	Determination of number of Threads per unit Length
j.	ISO-7211/5	Determination of linear density of yarn removed from fabric
k.	ISO-105-C10 (C3)	Color fastness to Washing

l.	ISO-105-E02	Color fastness to Seawater test
m.	ISO-105-X12	Color fastness to Rubbing test
n.	ISO-105-X18	Phenolic yellowing effect
o.	ISO-105-E04	Color fastness to Perspiration
p.	ISO105 J03	Calculation of Color Difference
q.	ISO-3801	Determination of Mass per unit Length and Mass per unit Area
r.	ISO-13934-1	Determination of Elasticity or breaking strength of waist band

#### 0106 **DEFINITIONS & ABBREVIATIONS**

1. Definitions & Abbreviations for the terms used in this standard are given at Annex A.

#### 0107 **TECHNICAL DETAILS OF INNER THERMAL/ WARMER TROUSER**

1. The technical details of Inner Thermal/ Warmer Trouser are given at Annex B of this specification.

#### 0108 **TECHNICAL DRAWING OF INNER THERMAL/ WARMER TROUSER**

1. All Dimensions of Drawing is given at Annex C.

#### 0109 **MEASUREMENT AND DIMENSIONS OF INNER THERMAL/ WARMER TROUSER**

1. All measurement and Dimension of Inner Thermal/ Warmer Trouser.is given at Annex D.

#### 0110 **GARMENT MANUFACTURING GUIDE LINE**

1. The Inner Thermal/ Warmer Trouser (Knitted) shall be manufactured from the specified knitted fabric to the shape and design of the sealed pattern/ sample or as shown in the separate drawing.
2. The Inner Thermal/ Warmer Trouser shall be manufactured with side seam.
3. The Inner Thermal/ Warmer Trouser shall conform to the technical detail and measurements as given in Annexure 'B and D' respectively, attached to this specification.
4. The seams shall be secured with over lock stitching having four threads using Sewing Thread Polyester 3/14 Tex.
5. The Welt 10 cm wide at bottom of trouser, having 5% Lycra (40 denier) shall be stitched as shown in the drawing. No of stitches per 25 mm should be 10 to 12.
6. The Inner Thermal/ Warmer Trouser and its accessories (Welt / stitching thread) shall be properly bleached and should be same in color. The Inner Thermal/ Warmer Trouser shall be washed after dyeing and must be free from soap, Oil, Grease and Stains etc.
7. Tape textile of same fabric 10-12 mm wide (one side) at inner and outer flyer should be double stitched. No of stitches per 25 mm should be 9 to 10.

8. Waist band should be 02 cm wide. No of stitches per 25 mm should be 7 to 9.
9. Finished product of Inner Thermal/ Warmer Trouser will be as per Annex B, C & D of this Specification.
10. Strict AQL standard shall be implemented for Internal Audit/ Inspection of finished product/ garment.
11. Guide line for fabric Inspection is given at Annex F for ease of fabric manufacturer/ supplier and Inspection team.
12. A standard pattern Inner Thermal/ Warmer Trouser may be requested/ obtained from DNS/ PNCSD/ CINS to provide the criteria for all materials, components or manufacturing features that may not be fully defined in this Specification i.e. feel/ finish, etc.

**Note:** Fabric for Welt & Inner Thermal/ Warmer Trouser should be bleached and dyed with same facility. Good quality violet dyes from good manufacturer CIBA, Clariant, SDC or equivalent are to be used for dyeing of fabric. Color of Inner Thermal/ Warmer Trouser does not have any gross change after 15 home launderings w.r.t ISO 105 C08 and BS EN ISO 6330.

#### 0111 **QUALITY OF WORKMANSHIP AND FINISH**

1. Workmanship and finish of the Inner Thermal/ Warmer Trouser shall be equal to the approved sample/ sealed pattern. It shall be the best of its class and to the entire satisfaction of the INS. The Inner Thermal/ Warmer Trouser shall confirm the parameters defined at Annex B of this specification. All properties and qualities which may not be defined in this specification i.e. feel/ finish etc. should be as per sealed/ approved sample.

#### 0112 **TESTING**

1. The material shall be subjected to tests laid down in this specification at Annex B of this specification and related documents. Inner Thermal/ Warmer Trouser along with accessories for manufacturing will be required to complete all the tests mentioned at Annex B of this specification. The material may also be subjected to such tests which are deemed necessary by the Inspection Authority in order to determine their suitability. Inspecting Authority reserves the right to get any B/R samples tested from any reputable Laboratory other than PN. Test other than Annex B may also be conducted in order to check its suitability/ quality. Firm is liable to pay all the testing charges.

#### 0113 **BATCH/ LOT SIZE AND NO OF SAMPLE**

1. No of samples drawn from bulk quantity/ offered store are as per instruction of Inspecting Officer or according to following table for the testing:

<b>Lot Size</b>	<b>No. Sample</b>
300 ≥ 500	03
501 ≥ 800	05
801 ≥ 1300	07
1301 ≥ 3200	10

3201≥8000	15
8001≥22000	30
22001≥110000	40

**0114 TENDER SAMPLE**

1. For each contract following material shall be supplied by the manufacturer at the time of tendering.

a.	Finished Product	05 Nos.
b.	Base Cloth	03 Meter
c.	Stitching Thread	50 Grams
d.	Welt fabric	03 Meter
e.	Tape Textile	03 Meter
f.	Polythene Bag	02 Bags
g.	Cartons Corrugated Card Board	02 Cartons

**0115 ADVANCE SAMPLE**

1. Advance sample or pre-production sample, when required, shall be submitted in accordance with terms of the contract for inspection and testing as per Annex B, C and D and approved by CINS. The minimum quantities required are 05 x Inner Thermal/ Warmer Trouser along with accessories used in manufacturing of Inner Thermal/ Warmer Trouser for inspection as mentioned above.

2. Whenever Tender, Advance or pre-production sample is not required, the suppliers/ manufacturer are advised in their own interest to submit to the Inspecting Officer or his representative an initial delivery of 01 % of the contract or 05 x Inner Thermal/ Warmer Trouser for PN Personnel along with accessories used in the manufacturing of the garment.

3. The approval of Tender, Advance or pre-production sample, authorizes the commencement of bulk production but does not relieve the suppliers/ manufacturers from compliance with all the provisions of this specification. One approved sample after rectification of all observations highlighted by Inspecting Officer shall be properly sealed by INS and returned to the firm for guidance; rest of the approved sample shall be retained by INS for future use in bulk Inspection.(If deemed necessary).

4. The Pre-production sample shall be manufactured by the manufacturer with the same facilities which will be used for manufacturing of the bulk items.

5. Firm shall provide advance sample along with quality verification reports from an accredited laboratory, whenever asked/ required by Inspecting authority to ensure compliance of quality assurance parameters during production/ final internal inspection.

**0116 INSPECTION**

1. **Bulk representative sample.** B/R random sampling will be carried out as per rules in vogue.

2. **Bulk Inspection.** Bulk inspection will be carried out after satisfactory completion of Visual Examination and Testing of B/R Sample.



3. **Inspection of Inner Thermal/ Warmer Trouser.** 100% of the offered store shall be inspected or as per predefined AQL standards.
4. Stage inspection/ third party inspection for Inner Thermal/ Warmer Trouser may be carried out (if desired) by Inspection Authority. However, Inspecting Authority have the right to accept/ reject sample or portion of the consignment if found NOT CONFORMING the parameters laid down in this specification.
5. **Acceptance and Rejection of Stores.** Inspection/ acceptance is to be carried out to the entire satisfaction of Chief Inspector of Naval Stores and also as per instruction/ procedure laid down in International Standard/ unit procedure.
6. Common defects in knitted fabric/ garment and Acceptance Quality Level (AQL) for Inner Thermal/ Warmer Trouser are enclosed as Annex E & F respectively for consultation/ guideline. However, these guide lines may be considered by inspecting officer in addition to unit procedure or as per order of Inspecting Authority.
7. The Inner Thermal/ Warmer Trouser shall be examined for the correctness of material, shape, design, dimension, size, workmanship and finish.
8. All Inner Thermal/ Warmer Trouser shall be inspected w.r.t defective shape, fading, pinholes, puckering.
9. CINS reserves the right to reject the whole supply in case, upon examination, material or packing of Inner Thermal/ Warmer Trouser any sample or portion of the consignment is found NOT CONFORMING the parameters laid down in this specification or the quality of product does not seem up to the mark.
10. If on examination of 5% of any delivery, 20% of those examined from bulk supply are found NOT CONFORMING to this specification in respect of the pattern, dimensions, workmanship and finish, the whole consignment may be rejected without any compromise.
11. All stores and packing NOT fully in accordance with this specification shall be rejected.
12. **Responsibility for Compliance.** The inspection set forth in this specification shall become a part of the supplier's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to PN for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements. However, this does not authorize submission of known defective material, either indicated or actual, nor does it commit PN to acceptance of defective stores (material).
13. **Replacement by the Contractor.** The supplier/ manufacture is responsible for replacement of the consignment or any part thereof whenever it is found to be not conforming to this specification or does not sustain its quality till the useful life of an item. The supplies so tendered in replacement, shall be subjected to testing/ Inspection and acceptance by the Inspecting Officer.
14. **Responsibility for Safety.** The supplier/ manufacture is wholly responsible for the safety of supplies during inspection, storage at firm's premises, proper packing, dispatch and delivery up to consignee.

15. The CINS is the authority in all matters pertaining to Inspection.

16. **Stamping Of Accepted/ Rejected Stores By The Inspector** Following instructions are to be followed:

- a. **Stamping of Accepted Stores.** Each acceptable Inner Thermal/ Warmer Trouser shall be stamped with Inspector's Individual Acceptance Mark or as per instructions of Inspecting Authority. The stamping shall be legible.
- b. **Stamping of Rejected Stores.** The rejected Inner Thermal/ Warmer Trouser shall be marked with Inspector's Rejection Mark at the back/ visible place of Inner Thermal/ Warmer Trouser to avoid re-submission by the supplier.

#### 0117 **SPECIAL INSTRUCTIONS**

1. **Care Instructions** Care instructions in English and Urdu shall be attached with each Inner Thermal/ Warmer Trouser as indicated in the drawing and have minimum requirement as follows:

- a. Washing procedure.
- b. Ironing Procedure.
- c. Drying procedure.
- d. Any Prohibition i.e. do not use bleach/ chlorinated water.

#### 0118 **PACKING DETAILS**

1. The store when ordered to be delivered 'PACKED' shall be packed as per following instructions:

- a. Each Inner Thermal/ Warmer Trouser shall be properly folded length wise.
- b. The Inner Thermal/ Warmer Trouser shall be packed in a neat, dry and clean condition in polyethylene bag of suitable size.
- c. 25 x Inner Thermal/ Warmer Trouser shall be further packed in a thick card board box/ flouting/ carton of 07 ply.
- d. Naphthalene Balls in suitable quantity (or minimum 05/ carton) shall be distributed/ placed in each carton to prevent pesticides/ insects.
- e. Each card board box packing shall be securely/ properly packed or wrapped with plastic sheet to ensure additional safety.
- f. Each box board shall consist of same size.

#### 0119 **IDENTIFICATION LABEL**

1. Each Inner Thermal/ Warmer Trouser shall bear following minimum information attached Inner Thermal/ Warmer Trouser:

- a. Item name/ Item description with NSN/ Pattern No.
- b. Material Composition.
- c. Contract number and Date.
- d. Year of manufacturing.
- e. Contractor's name, initials, or trade mark.
- f. Batch no.

**0120 PACKING LIST**

1. Firm is bound to provide a packing list of store offered for inspection along with the challan and each packed box giving full, which include complete details about the store i.e. Pattern No., Description of Store, size, quantity, Contract No, & date, challan No & date, I/Note No. or Voucher No. with date, Consignee, Firm's Name, Date of packing, Packer's Signature and Storage/ Stacking Instruction.

**0121 MARKING OF STORES**

1. In addition to any special marking required by contract or order, the marking of packages shall be stenciled with quick drying Black ink/ Paint in accordance with Specification No. NS/MISC/002/80 with clearly defined characters as described below:

a. On Front and Top:

- (1) Consignee Address.
- (2) Contract No and date.
- (3) Description of Stores Packed and NSN/ Patt no.
- (4) Stowage / Stacking Instruction.
- (5) Quantity of the Item/ Inner Thermal/ Warmer Trouser packed.
- (6) Weight of the Carton.

b. On Back:

- (1) Manufacturers name /Firm's name.
- (2) Voucher No. or Inspection Note No. and date.
- (3) The No. of individual Package and the total No of Packages in the consignment joined by the word 'of 'e.g. 2 of 300.
- (4) Weight of the package.
- (5) Month and year of packing.

**0122 DELIVERY**

1. The consignment of store will be delivered in accordance with the terms of contract.
2. The store shall be delivered in Brand new, clean and dry condition.
3. The contractor/ manufacturer is fully responsible for the safety of the supplies during inspection, storage at firms and consignee premises proper packing, dispatch and delivery up to consignee.

**MOAZZAM ARIF**

Captain Pakistan Navy  
Director

**Annexes:**

- |    |   |    |
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PN SPECIFICATION 11/2022

## **DEFINITIONS & ABBREVIATIONS**

### 1. **DEFINITIONS**

- a. Following definitions are used in this specification and will be adopted for use:
- (1) **Inspector**. The term inspector shall include the “Inspection Authority”, Inspecting Officers and their representatives, duly authorized for the purpose of discharging inspection duties involved.
  - (2) **Inspection Authority**. Chief Inspector of Naval Stores (CINS). His verdict in respect of Sealed Inspection matters is to be taken as final.
  - (3) **Inspecting Officers**. An Officers nominated by the CINS for carrying out inspection of stores supplied by the supplier, against a specified contract or order, in accordance with the particulars stipulated therein.
  - (4) **Acceptance Quality Level (AQL)**. It represent allowable limit/ tolerance of defects or non-conformities in an offered store/ lot/ batch. It represent in percentage, also known as Allowable Quality Limits.
  - (5) **Minor Defects**. They are small insignificant issues that don't affect the function or form of the item. Highest tolerance of AQL has been set for minor defects.
  - (6) **Major Defects**. They would likely result in product return but don't poses safety risk. AQL tolerance depend upon the description/ quality of finished product.

### 2. **ABBREVIATIONS**

- a. Following abbreviations are used in this specification and will be adopted for use:
- (1) CINS: Chief Inspector of Naval Stores
  - (2) DITD: Directorate of Indigenous Technical Development
  - (3) DNS: Directorate of Naval Store
  - (4) PNCS D: Pakistan Navy Clothing Store Depot
  - (5) PNCTA: Pakistan Navy Central Testing Authority

### **TECHNICAL DETAILS OF INNER THERMAL/ WARMER TROUSER**

<b><u>S.NO</u></b>	<b><u>ITEM</u></b>	<b><u>STANDARD</u></b>	<b><u>REQUIREMENT</u></b>
1.	<b><u>FABRIC OF INNER THERMAL/ WARMER TROUSER</u></b>		
	a. Material (1) Cotton (2) Polyester (3) Lycra	AATCC-20A	75 ± 5% 20 ± 5% 5 ± 2%
	b. Berger Value	ISO-105 J03	100 ± 10
	c. Linear Density (1) Cotton  (2) Polyester (3) Lycra	ISO-7211/5	30 Single ± 2 ccc (Compact Combed Cotton) 75 Denier 70 Denier
	d. Finishes	Chemical analysis	Mercerized and OBA
	e. Fabric Type	Visual Analysis	Interlock
	f. Weight of Fabric (gm/m <sup>2</sup> )	ISO-3801	270 ± 10 gms
	g. Thread per 2.5cm (1) Wales (2) Course	ISO-7211/2	16± 3 21 ± 3
2.	<b><u>PERFORMANCE CRITERIA OF TROUSER FABRIC</u></b>		
	a. Appearance after washing (1) Seam puckering	Visual Analysis	Do not puckered
	b. Absorbency drop test	AATCC 79-2010	Face: 05 Sec Inner: 01 Sec
	c. Color fastness to Washing (1) Change in shade (2) Staining on cotton	ISO-105-C10 C(3)	GS: 4 or better GS: 4 or better
	d. Color fastness to perspiration (1) Change in shade (2) Staining on cotton	ISO-105-E04	GS: 4 or better GS: 4 or better
	e. Bursting strength	BS EN ISO-13938-1	380 ± 30 KPa
	f. Flame Spread Time (class:1)	ASTM D-1230	<3.5 sec
	g. Pilling and Fuzzing (2,000 cycles)	BS EN ISO-12945-2	Grade:3 or better
3.	<b><u>FABRIC OF WELT AT BOTTOM OF TROUSER</u></b>		
	a. Material (1) Cotton (2) Polyester (3) Lycra	AATCC-20A	90 ± 5% 5 ± 2% 5 ± 2%
	b. Linear Density (1) Cotton	ISO-7211/5	

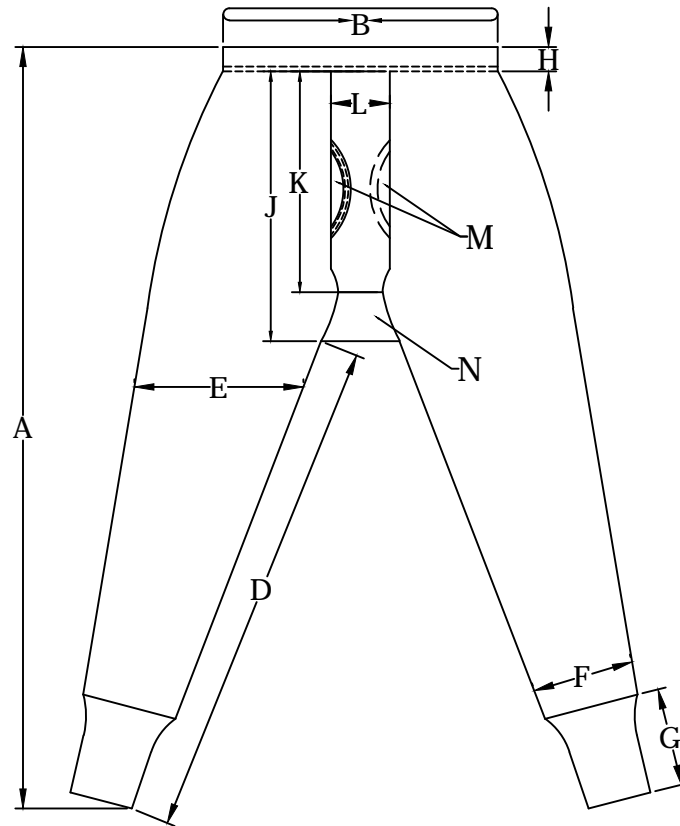
	(2) Polyester (3) Lycra		30 Single $\pm$ 2 ccc(Compact Combed Cotton) & Mercerized 40Denier 40 Denier
	c. Shade	Visual analysis	Match with base fabric
	d. Finishes	Chemical analysis	Mercerized and OBA
	e. Fabric Type	Visual Analysis	Interlock
	f. Weight of Fabric (gm/m <sup>2</sup> )	ISO-3801	280 $\pm$ 10 grams
4.	<b><u>PERFORMANCE CRITERIA OF TROUSER WELT</u></b>		
	a. Appearance after washing (1) Wrinkle (2) Color change ( after 10 washes)	Visual Analysis Visual Analysis	Do not pucker Fade slightly
	b. Absorbency drop test	AATCC 79-2010	02 Sec
	c. Color fastness to Washing (1) Change in shade (2) Staining on cotton	ISO-105-C10 C(3)	GS: 4 or better GS: 4 or better
	d. Color fastness to perspiration (1) Change in shade (2) Staining on cotton	ISO-105-E04	GS: 4 or better GS: 4 or better
	e. Bursting strength	BS EN ISO-13938-1	200 $\pm$ 20 KPa
	f. Pilling and Fuzzing (2,000 cycles)	BS EN ISO-12945-2	Grade 3 or better
5.	<b><u>ACCESSORIES (Material Used)</u></b>		
	a. Thread for stitching	AATCC-20A	100% Polyester
	b. Color	Visual Analysis	Match with main fabric
	c. Linear Density (Thread Count)	ISO 7211/5	3/14 Tex
6.	a. Elastic (1) Material a) Inner b) Outer (2) Elasticity a) Extension @20N upto 2 cycles b) Unrecovered elongation after 01 Min (relax) c) Unrecovered elongation after 30 Min (relax) d) Recovered elongation after 01 Min (relax) e) Recovered elongation after 30 Min (relax)	AATCC-20A     ISO-13934-1	Rubber Polyester  128.1% 5.0% 2.0% 95% 98%

	(3) Elastic Width	Visual analysis	2 ± 0.5 cm
7.	<b><u>PERFORMANCE CRITERIA OF COMPLETE GARMENT</u></b>		
	a. Dimension Stability	BS EN 6330	± 5 %
	b. Spirality/ Skewness	ISO 16322-1	± 2 %
	c. Phenolic Yellowing	ISO 105 X-18	GS: 4 or better

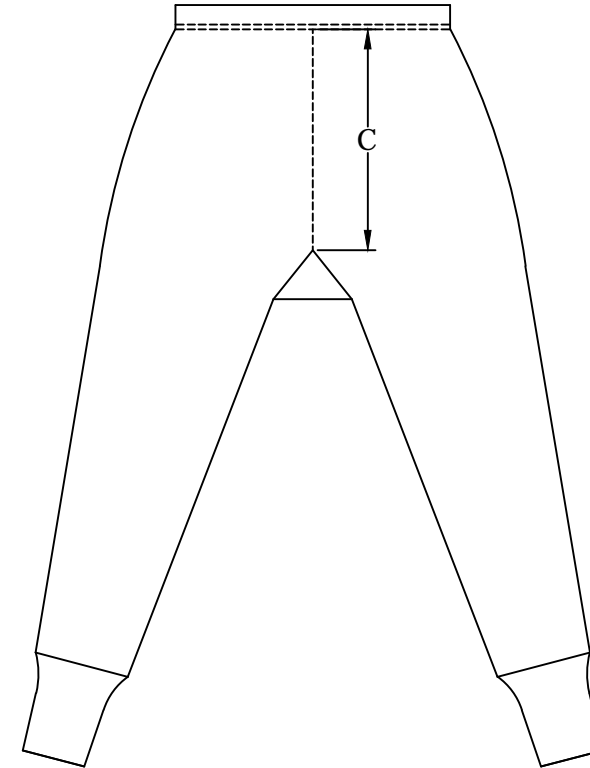


# TECHNICAL DRAWING

ANNEX C TO  
PN SPECIFICATION NO 11/2022



FRONT VIEW



BACK VIEW

1449

NOTE:  
FOR FURTHER DETAILS SEE STOCK / APPROVED SAMPLE.

N	GUSSET
M	FLYER OPENING
L	FLYER WIDTH
K	FLYER LENGTH
J	FRONT RISE
H	BELT
G	DEPTH OF LEG/WELT
F	WIDTH OF LEG ABOVE THE/WELT WIDTH
E	WIDTH OF THIGH
D	INNER SEAM/LENGTH OF LEG
C	LENGTH OF BACK/ BACK RISE
B	RELAX WAIST WITH ELASTIC
A	OVERALL LENGTH

DESCRIPTION

**DITD KARACHI**

TITLE:

**THERMAL / WARMER TROUSER**

SIZE: LARGE

DWG.NO. TD-2641/2022	DIMENSIONS: INCHES	
DATE: 11-04-2022	SCALE: NTS	
REVISION NO. 00	DATE OF REVISION: 00-00-2022	
DRAWN BY --SD-- H D/M M. ASGHAR I/c DWG	CHECKED BY --SD-- LT CDR SANA KANWAL SO. TEXTILE	APPROVED BY --SD-- CAPTAIN MOAZZAM ARIF DID

## **MEASUREMENT AND DIMENSIONS OF INNER THERMAL/ WARMER TROUSER**

<b><u>SCHEDULE OF MEASUREMENTS FOR INNER THERMAL/ WARMER TROUSER</u></b>							
<b>S. No</b>	<b>Part Description</b>	<b>S</b>	<b>M</b>	<b>L</b>	<b>XL</b>	<b>XXL</b>	<b>TOLERANCES</b>
A.	Overall Length	96	101	106	110	115	$\pm 2$
B.	Relax Waist with Elastic	70	73	76	80	84	$\pm 1$
C.	Length of Back/ Back Rise	30	32	35	38	40	$\pm 1$
D.	Length of Leg/ Inner Seam	65	67	70	73	75	$\pm 1$
E.	Width of Thigh	20	22	24	25	26	$\pm 0.5$
F.	Width Leg above the Welt Width	11	13	14	15	16	$\pm 0.5$
G.	Depth of Leg/ Welt	10	10	10	10	10	$\pm 0.5$
H.	Belt	2	2	2	2	2	$\pm 0.5$
J.	Front Rise	As per approved sample and size of trouser					
K.	Flyer Length						
L.	Flyer Width						
M.	Flyer Opening						
N.	Gusset						

Note: All Measurements sizes are in cm.

### **COMMON DEFECTS IN KNITTED FABRIC/ GARMENT**

<b><u>S. No</u></b>	<b><u>Defects</u></b>	<b><u>Possible Cause</u></b>	<b><u>Type of Defects</u></b> <b><u>Major/Minor</u></b>
<b>1. <u>KNITTING FABRIC</u></b>			
a.	Barré: horizontal stripes of uniform or variable width in Fabric or periodic lateral irregularity	<ul style="list-style-type: none"> <li>Possible due to lower tension in one of the feeders, loops formed in the knitted cycle initiated by that particular feeder were slightly larger than the rest thus causing an embossed appearance in the form of stripes.</li> <li>Individual yarns differ w.r.t count properties or structure.</li> <li>Different course Length.</li> </ul>	Major
b.	Skewed fabric: The shape of the fabric is distorted. Wales and courses are angular.	<ul style="list-style-type: none"> <li>This can be a result of uneven take down roller setting. It is a generic feature of circular knits because of the spiral movement of the needles.</li> </ul>	Within allowable limit then minor otherwise major.
c.	Foreign Fly between loops of constructed fabric	<ul style="list-style-type: none"> <li>Unclean environment or improper maintenance of machine can cause fly to end up in the knitting zone where it becomes part of the fabric.</li> </ul>	Major if it is visible.
d.	Thin Yarn/ Thick yarn	<ul style="list-style-type: none"> <li>One of the feeder is receiving yarn from a spool that has finer yarn or coarser yarn.</li> </ul>	Major
e.	Horizontal band of different color	<ul style="list-style-type: none"> <li>This happens due to a change of bobbin in the knitting machine. Different lots of yarn can have slight shade variations which can produced shade differences in fabric.</li> </ul>	Major
f.	Laddering: Vertical stripes can be observed as longitude lineal gap in fabric	<ul style="list-style-type: none"> <li>Continued knitting with a broken needle.</li> <li>Incorrect closing of the hook by the latch.</li> <li>Shift latches and needles.</li> </ul>	Major
g.	Deliberate cut placed in fabric	A rib defect occurred during knitting which was detected by QC who placed a cut on the defect to ensure that the garment does not go through further stages.	Major

h.	Hole: Crack of yarn or breakage	<ul style="list-style-type: none"> <li>High yarn irregularity, poorly lubricated yarn, weak knot or slub present in yarn.</li> </ul>	Depend upon the size. If it's visible and larger in size then its major.
<b>2. <u>PRE-TREATMENT</u></b>			
a.	Pinhole	<ul style="list-style-type: none"> <li>The presence of <math>\text{Fe}^{2+}</math> ions accelerates peroxide bleaching. If the fabric has just residue on it or localized iron contamination the bleaching process will damage the fibers causing a hole.</li> </ul>	Depend upon the frequency of the fault, if it occur frequently then its major.
<b>3. <u>DYEING</u></b>			
a.	Shade difference	<ul style="list-style-type: none"> <li>This occur due to the variation in dye or dyeing procedure.</li> <li>Improper cutting of pieces, bundling and numbering.</li> <li>Different batch mixing.</li> </ul>	Major
b.	Stain of oil, food, drink, ink etc.	<ul style="list-style-type: none"> <li>This occur due to spill of oil, ink, food, drinks on the garment.</li> </ul>	If it is easily washable then minor.
<b>4. <u>STITCHING</u></b>			
a.	Seam puckering: gathering of a seam either just after sewing or after laundering.	<ul style="list-style-type: none"> <li>Due to uneven stitching on to plies of fabric, improper thread tension, wrong sewing thread etc.</li> </ul>	Minor when it is not visible
b.	Open Seam or broke seam: Portion of garment that has not been covered by sewing thread.	<ul style="list-style-type: none"> <li>Due to improper handling of the part/ piece of fabric, improper setting and timing between needle and looped or rook etc.</li> </ul>	Major
c.	Broken Stitch: Non continuous Sewing thread	<ul style="list-style-type: none"> <li>Due to improper timing or machine usage.</li> </ul>	Minor
d.	Drop stitched/ skipped Stitched Irregular stitching along the seam	<ul style="list-style-type: none"> <li>It appears due to improper handling of cut pieces or machine usage.</li> </ul>	Minor

### **ACCEPTABLE QUALITY LEVELS (AQLS)**

1. Acceptable Quality Level (AQL) is maximum average defective items in a lot or limit/ percentage of defective items in product /offered store. It is expressed in a percentage. Number of average defective items is determined by following formula:

$$\text{Average defective item} = \frac{\text{No.of defective item found during inspection}}{\text{Total no.of item to be inspected}} \times 100$$

2. AQL process: it is used for inspection of finished product by the QC professionals. AQL standard is depend on the quality of the product to be inspected, random sampling, and experience of inspector Following AQL table is used to determine lot size/ offered store quantity, least No. of sample to be inspected, AQL%, and acceptance & rejection points:

<b><u>Lot/Batch Size</u></b>	<b><u>Sample Size</u></b>	<b><u>Materials</u></b>		<b><u>Finished Inner Thermal/ Warmer Trouser</u></b>					
				<ul style="list-style-type: none"> <li>Acceptable/ Allowable defective sample (Ac)</li> <li>Rejected/ Exceed allowable limit of defective item (Re)</li> </ul>					
				<b><u>Critical Defects</u></b>		<b><u>Major Defects</u></b>		<b><u>Minor Defects</u></b>	
		<b><u>Ac</u></b>	<b><u>Re</u></b>	<b><u>Ac</u></b>	<b><u>Re</u></b>	<b><u>Ac</u></b>	<b><u>Re</u></b>	<b><u>Ac</u></b>	<b><u>Re</u></b>
2 - 8	2	0	1	0	1	0	1	0	1
9 ~ 15	3	0	1	0	1	0	1	0	1
16 ~ 25	5	0	1	0	1	1	2	1	2
26 ~ 50	8	0	1	0	1	1	2	1	2
51 ~ 90	13	1	2	1	2	1	2	2	3
91 ~ 150	20	1	2	1	2	2	3	3	4
151 ~280	32	2	3	2	3	3	4	5	6
281 ~ 500	50	3	4	3	4	5	6	7	8
501 ~ 1200	80	5	6	5	6	7	8	10	11
1201 ~ 3200	125	7	8	7	8	10	11	14	15

3201 ~ 10000	200	10	11	10	11	14	15	21	22
10001 ~ 35000	315	14	15	14	15	21	22	21	22
35001 ~ 150000	500	21	22	21	22	21	22	21	22
150001 ~ 500000	800	21	22	21	22	21	22	21	22
500001 ~ Over	1250	21	22	21	22	21	22	21	22

3. If the inspector have time constrain then AQL is beneficial/ helpful in inspection of whole lot/ offered store. It safe time, cost and give effective/ statistical result of product /offered store. e.g. If inspector needs 5 minutes to check the item , the quantity to be inspected is 2,500 items then it took 208 hours to check the whole consignment/ offered store. It means 26 days approx. for one store. Calculation is as follows:

$$\frac{5 \text{ min} \times 1 \text{ hr}}{1 \text{ item} \times 60 \text{ min}} \times 2,500 \text{ items} = 208.33 \text{ hrs} \cong 26 \text{ days}$$

After Implementing AQL standard so the sample taken from the lot/ offered store is 200 items/ sample:

$$\frac{5 \text{ min} \times 1 \text{ hr}}{1 \text{ item} \times 60 \text{ min}} \times 2,00 \text{ items} = 16.66 \text{ hrs} \cong 02 \text{ days}$$

4. Quality parameters/ AQL limits may be defined by Inspecting Authority (if deemed appropriate) and communicate to the manufacturer, so the manufacturer set their quality levels (AQL limits) accordingly for their internal audit. Therefore, good quality product is ready for inspection.

**FEED BACK FORM**

Item Designation: \_\_\_\_\_

Pattern #: \_\_\_\_\_

Parent Equipment: \_\_\_\_\_

PN SPEC #: \_\_\_\_\_

Problem Faced: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Technical Solution: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Financial Effect (if any): \_\_\_\_\_

\_\_\_\_\_

Name Stamp

**COUNTERSIGNED**

Name Stamp

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PN SPECIFICATION 11/2022