THIS SPECIFICATION MEETS AND EXCEEDS THE REQUIREMENTS
ESTABLISHED IN THE FOLLOWING STANDARDS:
-ATT-TP-76461 Issue 4, 01/24/08
-IPC-8497-1, December 2005
-IEC 61300-3-35, Edition 1.0 2099-11

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VISUAL INSPECTION CRITERIA

The user must perform appropriate cleaning before these criteria can be applied. This document describes the end requirements for the polished ferrule/fiber

1) Equipment Requirements

There are two types of inspections when one is discussing visual inspection of end faces. They are optical and video inspections.

Optical microscope inspection primarily depends on the eyepiece magnification and the resolution and type of lens. Operators typically view the end face of the connector through an eyepiece. The optical magnification the operator is viewing is calculated by multiplying the eyepiece magnification times the lens resolution or magnification. The minimum standard is a 10x eyepiece and a 20x objective lens, producing a 200x magnification. The determining factor is the use of a minimum 20x objective to correctly resolve defects on the end face of a connector.

Video inspection has created some additional factors to consider when viewing connector end faces. Video inspection consists of a microscope system, lens only, a CCD camera, and a video monitor. In this type of inspection the operator views the end face on the video monitor, not through the microscope eyepieces. Video magnification is defined as the ratio of monitor size to camera format and is calculated by dividing the diagonal of the monitor by the diagonal of the CCD camera and then multiplying by the objective lens magnification. However, practical experience has shown that this is not always accurate. Probably the easiest method is to measure the fiber diameter on the video monitor and divide by 0.125mm. This method will allow you to calculate the exact magnification for each instrument or setup. The key factor for video inspection is the use minimum 10x objective lens. This choice will produce comparable results to the optical microscope inspection system.

A measurement system employing an interferometer lens is required to determine if the defect is above the surface (protruding) or below the fiber surface (undercut or sub surface).

These systems are used routinely depending on a field, lab, or manufacturing environment. The following table summarizes the requirements.

REV	ECO NO.	DESCRIPTION	DATE	DRAW	CHCK
7	16ECO06903	CORRECT "SCRATCH" DEFINITION IN SHEET 2 AND OTHER SPANISH TRADUCTION ISSUES. CORRECT WIDTH OF ALLOWED SCRATCHES IN MULTI MODE SINGLE FIBER CONNECTOR FROM 3um to 2um.	04/21/16	AJR	JFR
6	15ECO02863	DEFINE SCRATCHES WIDTH IN TABLE 3 AND 4	10/13/15	AJR	JFR
5	ECO-27072	UPDATE TABLE 3 & 4 INSPECTION REGIONS AND DEFECTS FOR SM / MM	05/23/14	VTL	JFR

AFL		GENERAL TOLERANCES	UNITS: SEE DRW	WINDCHILL STATE: Production	
		TOLERANCES TO BE SET IN DRW ALL DIMENSIONS WITHOUT TOLERANCES SHALL BE TAKEN AS REFERENCE	SCALE: SEE DRW		WINDCHILL REV: 7
DATE	03/07/06		PROJECTION TYPE: THIRD ANGLE	DESCRIPTION: VISUAL INSPECTION CRITERIA FOR FIBER OPTIC CONNECTORS (GENERIC)	
DRAW	HCR		SIZE: A	ITEM NO: SEE ORACLE LIST	
CHCK	RFP		WEIGHT (KG):	DRW NO: 207-0184	SHT 1 6 SHTS

COMPONENTS	OPTICAL INSPECTION	VIDEO INSPECTION
MICROSCOPE	REQUIRED	REQUIRED
MIN MAGNIFICATION REQUIREMENT	200X	400X
CALCULATED BY	EYEPIECE MAGNIFICATION TIME PRIMARY LENS MAGNIFICATION.	(FIBER SIZE(mm) ON SCREEN)/0.125mm

SURFACE FINISH
»DEFINITIONS

FIBER SURFACE	
SCRATCH	A SCRATCH TYPICALLY APPEARS WHITE IN COLOR AS VIEWED ON THE FIBER END FACE. WHEN THE IMAGE IS MOVED SLIGHTLY OUT OF FOCUS THE SCRATCH DISAPPEARS FROM VIEW INDICATING IT HAS VERY LITTLE DEPTH ASSOCIATED WITH IT. SCRATCHES ARE TYPICALLY STRAIGHT LINES WITH VARIOUS LENGTHS
CRACK	CRACKS ARE USUALLY IRREGULAR IN SHAPE AND ARE DARK IN COLOR. WHEN THE IMAGE IS MOVED OUT OF FOCUS THE DARK CRACK IS STILL VISIBLE.
CHIPS	LARGE AREAS(>5µm-CORE DIAMETER IN WIDTH) OF GLASS REMOVED FROM FIBER.
PITS/ BLEMISHES	SMALL AREAS OF GLASS REMOVED FROM THE FIBER END FACE (LESS THAN 2µm IN WIDTH)
EPOXY RING	THE INTERFACE BETWEEN THE FIBER EDGE AND THE FERRULE HOLE. THIS INTERFACE TYPICALLY SHOWS A RING OF EPOXY BECAUSE OF EITHER A FIBER TO HOLE MISMATCH AND/OR THE FERULE HOLE EDGE IS CHIPPED.
FIXED CONTAMINATION	ANY CONTAMINATE THAT COULD NOT BE REMOVED AFTER CLEANING 3 TIMES
LOOSE CONTAMINATE	ANY LOSE OR FLOATING CONTAMINATES LIKE DIRT, FIBERS, FILMS, OR FLAKES THAT CAN BE REMOVED BY CLEANING
PROTRUSION	A PROTRUSION IS DEFINED AS A FIXED CONTAMINATE THAT EXTENDS BEYOND THE SURFACE ON THE FIBER AS VIEWED WITH AN INTERFEROMETRIC SYSTEM.

FERRULE SURFACE	
VOIDS / PIN HOLES	A PORE OR HOLE IN THE ZIRCONIA FERRULE
BLACK MARKS/ SURFACE SCRATCHES	MARKS OR SCRATCHES LEFT ON THE SURFACE OF THE FERRULE FROM THE MANUFACTURING PROCESS.

AFL

DATE	03/07/06
DRAW	HCR
CHCK	RFP

GENERAL TOLERANCES

TOLERANCES TO BE SET IN DRW

ALL DIMENSIONS WITHOUT TOLERANCES SHALL BE TAKEN AS REFERENCE

UNITS SEE DRW
SCALE SEE DRW
PROJECTION TYPE THIRD ANGLE
SIZE A
WEIGHT (KG)

WINDCHILL STATE : Production

WINDCHILL REV: 7

DESCRIPTION: VISUAL INSPECTION CRITERIA FOR FIBER OPTIC CONNECTORS (GENERIC)

ITEM NO : SEE ORACLE LIST

DRW NO : 207-0184

SHT 2
6 SHTS

>>PROTRUSION DEFECTS-

THIS CATEGORY DESCRIBES FIXED CONTAMINATION ON THE SURFACE OF THE FERRULE AND FIBER. THE POLISHING TEST, OR CLEANING PROCESS CAN CAUSE THESE DEFECTS.

RULE FOR SINGLEMODE	NO FIXED CONTAMINATION/PARTICULATE IS ALLOWED IN AREAS **A,B,C**
RULE FOR MULTIMODE	NO FIXED CONTAMINATION/PARTICULATE IS ALLOWED IN AREAS **A,B,C**
CORRECTIVE ACTION	MUST BE REMOVED

>>FREE FLOATING DEFECTS-

ANY AIRBORNE DEBRIS OR CONTAMINANTS OR RESIDUE FROM THE CLEANING PROCESS CAN CAUSE THESE DEFECTS.

RULE	NO CONTAMINATION IS ALLOWED ON THE FIBER OR THE CERAMIC END FACE.
CORRECTIVE ACTION	MUST BE REMOVED BY CLEANING

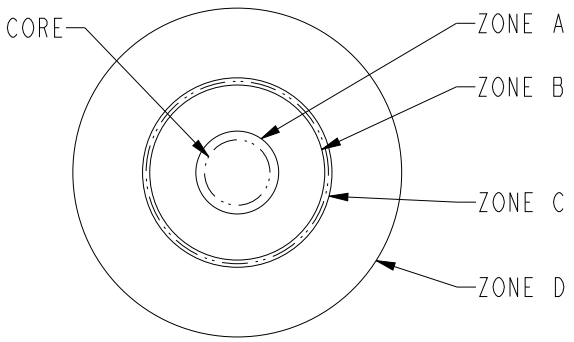
IF AFTER A MINIMUM OF THREE CLEANING ATTEMPTS, THE CONTAMINATE REMAINS FIXED ON THE SURFACE, IT IS DEFINED AS A FIXED PARTICULATE AND THE RULES ABOVE APPLY. OILS OR GREASE THAT AFTER AGING CANNOT BE REMOVED ARE DEFINED AS FIXED CONTAMINATE.

>>SUB-SURFACE DEFECTS-

EXAMPLES OF THIS TYPE OF DEFECTS ARE CHIPS, BLEMISHES AND CRACKS THAT ARE BELOW THE SURFACE OF THE FIBER. THESE DEFECTS ARE TYPICALLY A RESULT OF THE POLISHING PROCESS OR TESTING (END FACE CONTACT).

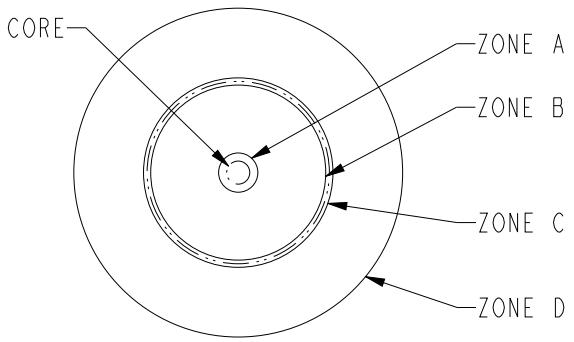
AFL		**GENERAL TOLERANCES**	**UNITS** SEE DRW	**WINDCHILL STATE :** Production	
			SCALE SEE DRW	THE DRAWING, DESIGN AND ALL INFORMATION CONTAINED THEREON IS CONFIDENTIAL AND THE PROPERTY OF AFL AND MAY NOT BE COPIED, REPRODUCED OR DISCLOSED TO ANY THIRD PARTY WITHOUT THE EXPRESS WRITTEN PERMISSION OF AFL.	**WINDCHILL REV:** 7
DATE	03/07/06	*TOLERANCES TO BE SET IN DRW*	**PROJECTION TYPE** THIRD ANGLE	**DESCRIPTION:**	VISUAL INSPECTION CRITERIA FOR FIBER OPTIC CONNECTORS (GENERIC)
DRAW	HCR	ALL DIMENSIONS WITHOUT TOLERANCES SHALL BE TAKEN AS REFERENCE	**SIZE** A	**ITEM NO :**	SEE ORACLE LIST
CHCK	RFP		**WEIGHT (KG)**	**DRW NO :**	207-0184 SHT 3 6 SHTS

TABLE 1 : SINGLE FIBER CONNECTOR ZONE DEFINITION



MULTIMODE ZONE DEFINITION

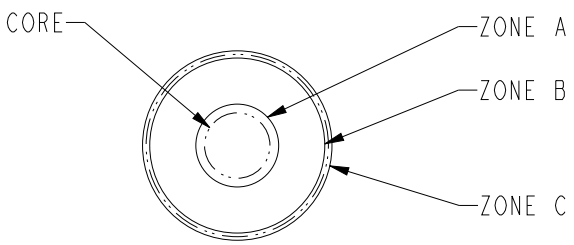
ZONE A Ø	0 - 66 µm
ZONE B Ø	66 - 120 µm
ZONE C Ø	120 - 130 µm
ZONE D Ø	130 - 250 µm
CORE SIZE Ø	50 OR 62.5 µm



SINGLEMODE ZONE DEFINITION

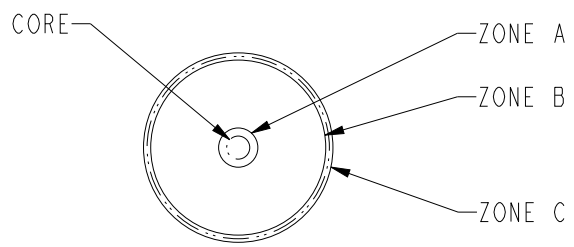
ZONE A Ø	0 - 25 µm
ZONE B Ø	25 - 120 µm
ZONE C Ø	120 - 130 µm
ZONE D Ø	130 - 250 µm
CORE SIZE Ø	8.3 µm

TABLE 2 : MULTI FIBER CONNECTOR ZONE DEFINITION



MULTIMODE ZONE DEFINITION

ZONE A Ø	0 - 66 µm
ZONE B Ø	66 - 120 µm
ZONE C Ø	120 - 130 µm
CORE SIZE Ø	50 OR 62.5 µm



SINGLEMODE ZONE DEFINITION

ZONE A Ø	0 - 25 µm
ZONE B Ø	25 - 120 µm
ZONE C Ø	120 - 130 µm
CORE SIZE Ø	8.3 µm

AFL	GENERAL TOLERANCES	UNITS: SEE DRW	WINDCHILL STATE : Production	
		SCALE: SEE DRW	THE DRAWING, DESIGN AND ALL INFORMATION CONTAINED THEREON IS CONFIDENTIAL AND THE PROPERTY OF AFL AND MAY NOT BE COPIED, REPRODUCED OR DISCLOSED TO ANY THIRD PARTY WITHOUT THE EXPRESS WRITTEN PERMISSION OF AFL.	WINDCHILL REV: 7
DATE 03/07/06	*TOLERANCES TO BE SET IN DRW*	PROJECTION TYPE: THIRD ANGLE	DESCRIPTION: VISUAL INSPECTION CRITERIA FOR FIBER OPTIC CONNECTORS (GENERIC)	
DRAW HCR	ALL DIMENSIONS WITHOUT TOLERANCES SHALL BE TAKEN AS REFERENCE	SIZE: A	ITEM NO : SEE ORACLE LIST	
CHCK RFP		WEIGHT (KG)	DRW NO : 207-0184	SHT 4 6 SHTS

LC SIDE

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TABLE 3: INSPECTION REGIONS AND DEFECTS FOR SINGLE FIBER CONNECTOR

DEFECT/ZONE	A	B	C	D
SCRATCH (SINGLE MODE ONLY)	NOT ALLOWED	5 SCRATCHES ≤ 3µm IN WIDTH ARE ACCEPTABLE. SCRATCHES GREATHER THAN 3µm IN WIDTH ARE NOT ACCEPTABLE.	ANY SCRATCH ≤ 3um IN WIDTH IS ALLOWED	ANY SCRATCH ≤ 3um IN WIDTH IS ALLOWED
SCRATCH (MULTI MODE ONLY)	5 SCRATCHES ≤ 2µm IN WIDTH ARE ACCEPTABLE. SCRATCHES GREATHER THAN 2µm IN WIDTH ARE NOT ACCEPTABLE.	5 SCRATCHES ≤ 3µm IN WIDTH ARE ACCEPTABLE. SCRATCHES GREATHER THAN 3µm IN WIDTH ARE NOT ACCEPTABLE.	ANY SCRATCH ≤ 3um IN WIDTH IS ALLOWED	ANY SCRATCH ≤ 3um IN WIDTH IS ALLOWED
SINGLEMODE DEFECTS) (PIT/BLEMISH/FIXED CONTAMINATION)	NOT ALLOWED	5 DEFECTS ≥ 2µm AND ≤ 5µm IN DIAMETER ARE ACCEPTABLE.DEFECTS GREATHER THAN 5µm IN DIAMETER ARE NOT ACCEPTABLE. DEFECTS LESSTHAN 2µm DON'T COUNT.	DEFECTS ≤ 10um IN DIAMETER ARE ACCEPTABLE. DEFECTS GREATHER THAN 10um IN DIAMETER ARE NOT ACCEPTABLE.	DEFECTS ≤ 10µm IN DIAMETER ARE ACCEPTABLE. DEFECTS GREATHER THAN 10µmIN DIAMETER ARE NOT ACCEPTABLE.
MULTIMODE DEFECTS (PIT/BLEMISH/FIXED CONTAMINATION)	4 DEFECTS ≤ 5µm IN DIAMETER ARE ACCEPTABLE. DEFECTS GREATHER THAN 5µm IN DIAMETER ARE NOT ACCEPTABLE.	5 DEFECTS ≥ 2µm AND < 5µm IN DIAMETER ARE ACCEPTABLE.DEFECTS GREATHER THAN 5µm IN DIAMETER ARE NOT ACCEPTABLE. DEFECTS LESS THAN 2µm DON'T COUNT.	ANY DEFECT IS ALLOWED	DEFECTS ≤ 10µm IN DIAMETER ARE ACCEPTABLE. DEFECTS GREATHER THAN 10µm IN DIAMETER ARE NOT ACCEPTABLE.
REMOVABLE CONTAMINATION	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
CRACK	NOT ALLOWED	NOT ALLOWED	NOT APPLICABLE	NOT APPLICABLE
EPOXY RING	NOT APPLICABLE	NOT APPLICABLE	EPOXY RING ≤ 5µm IN WIDTH IS ACCEPTABLE	NOT APPLICABLE

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MPO SIDE

△6

TABLE 4: INSPECTION REGIONS AND DEFECTS FOR MULTI FIBER CONNECTOR

DEFECT/ZONE	A	B	C
SCRATCH (SINGLE MODE/APC ONLY)	4 SCRATCHES < 2µm IN WIDTH ARE ACCEPTABLE, ONLY IF TRANSMISSION REQUIREMENTS ARE MEET.	4 SCRATCHES < 3µm IN WIDTH ARE ACCEPTABLE. SCRATCHES GREATHER THAN 3µm IN WIDTH ARE NOT ACCEPTABLE.	ANY SCRATCH <3um IN WIDTH IS ALLOWED
SCRATCH (MULTI MODE ONLY)	5 SCRATCHES < 3µm IN WIDTH ARE ACCEPTABLE. SCRATCHES GREATHER THAN 3µm IN WIDTH ARE NOT ACCEPTABLE.	5 SCRATCHES < 3µm IN WIDTH ARE ACCEPTABLE. SCRATCHES GREATHER THAN 3µm IN WIDTH ARE NOT ACCEPTABLE.	ANY SCRATCH <3um IN WIDTH IS ALLOWED
SINGLEMODE DEFECTS) (PIT/BLEMISH/FIXED CONTAMINATION)	NOT ALLOWED	5 DEFECTS > 2µm AND < 5µm IN DIAMETER ARE ACCEPTABLE. DEFECTS GREATHER THAN 5µm IN DIAMETER ARE NOT ACCEPTABLE.DEFECTS LESS THAN 2µm DON'T COUNT.	ANY DEFECT IS ALLOWED
MULTIMODE DEFECTS (PIT/BLEMISH/FIXED CONTAMINATION)	4 DEFECTS < 5µm IN DIAMETER ARE ACCEPTABLE. DEFECTS GREATHER THAN 5µm IN DIAMETER ARE NOT ACCEPTABLE.	5 DEFECTS > 2µm AND < 5µm IN DIAMETER ARE ACCEPTABLE. DEFECTS GREATHER THAN 5µm IN DIAMETER ARE NOT ACCEPTABLE.DEFECTS LESS THAN 2µm DON'T COUNT.	ANY DEFECT IS ALLOWED
REMOVABLE CONTAMINATION	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
CRACK	NOT ALLOWED	NOT ALLOWED	NOT APPLICABLE
EPOXY RING	NOT APPLICABLE	NOT APPLICABLE	EPOXY RING < 5µm IN WIDTH IS ACCEPTABLE
EDGE CHIPPING	NOT APPLICABLE	EDGE CHIPPING < 5um IN WIDTH IS ACCEPTABLE, MEASURED FROM FIBER EDGE.	

AFL

DATE	03/07/06
DRAW	HCR
CHCK	RFP

GENERAL TOLERANCES

TOLERANCES TO BE SET IN DRW

ALL DIMENSIONS WITHOUT TOLERANCES SHALL BE TAKEN AS REFERENCE

UNITS	SEE DRW
SCALE	SEE DRW
PROJECTION TYPE	THIRD ANGLE
SIZE	A
WEIGHT (KG)	

WINDCHILL STATE : Production

WINDCHILL REV: 7

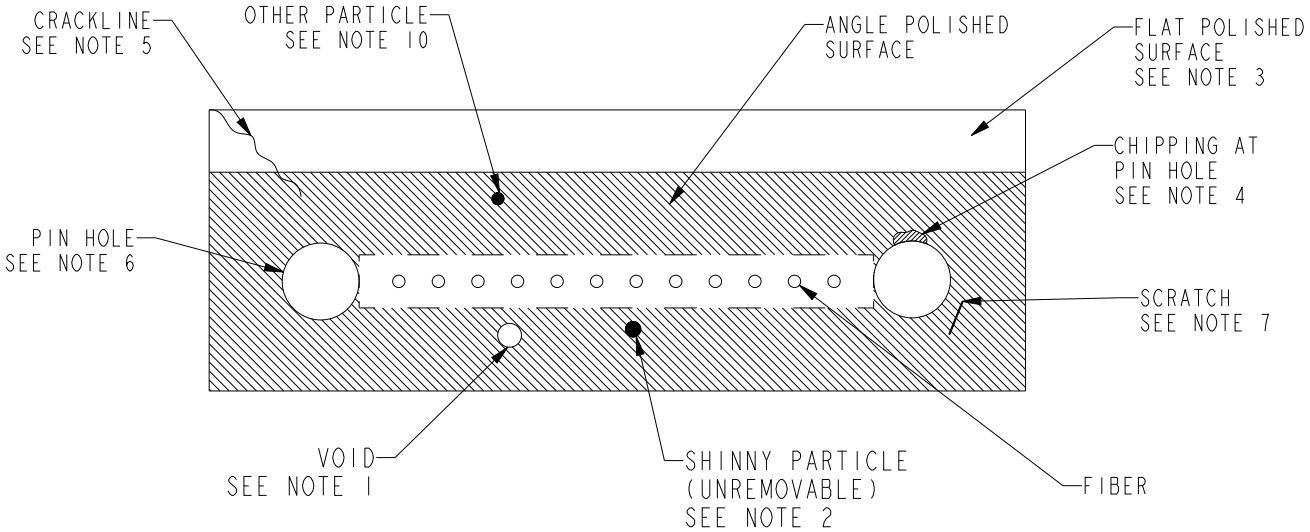
DESCRIPTION: VISUAL INSPECTION CRITERIA FOR FIBER OPTIC CONNECTORS (GENERIC)

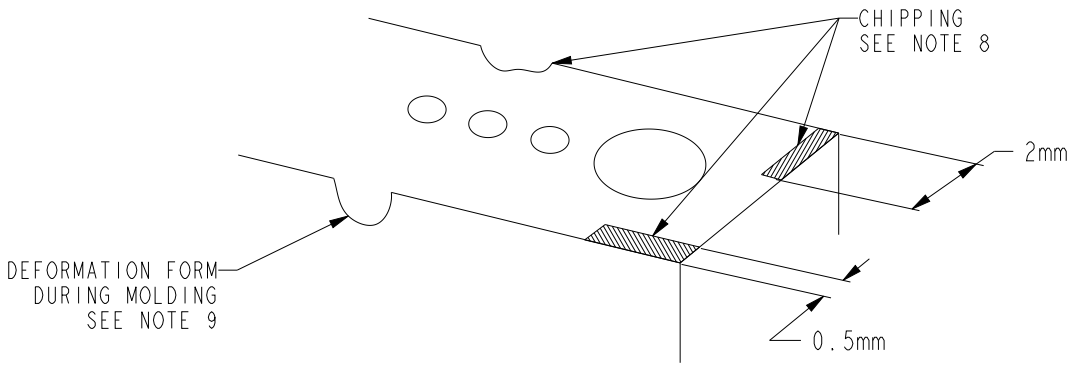
ITEM NO : SEE ORACLE LIST

DRW NO : 207-0184

SHT 5 6 SHTS

MULTIFIBER CONNECTOR FERRULE END FACE (MPO)





NOTES:

1. VOID IN FERRULE IS ACCEPTABLE IF IS 125 µm AWAY FROM ANY FIBER EDGE AND NOT EXCEEDE 0.3 mm IN WIDTH.
2. ONE SHINNY PARTICLE IN FERRULE IS ACCEPTABLE IF IS 125 µm AWAY FROM ANY FIBER EDGE AND NOT EXCEEDE 125 µm IN WIDTH.
3. FLAT POLISHED SURFACE IS ACCEPTABLE IF NOT EXCEEDE 0.8 mm IN WIDTH.
4. CHIPPING AT PIN HOLE IS ACCEPTABLE IF NOT EXCEEDE 0.25 mm.
5. NO CRACKLINE IS ALLOWED ON FERRULE.
6. NO PIN HOLE DEFORMATION IS ALLOWED.
7. SCRATCH ON FERRULE TOWARDS PIN HOLE IS ACCEPTABLE IF NOT EXCEEDE 125 µm.
8. CHIPPING IS ACCEPTABLE IF DIMENSIONS NOT EXCEEDE 2 mm LENGTH AND 0.5 mm WIDTH.
9. DEFORMATION FORMED DURING MOLDING IS NOT CONSIDERED AS CHIPPING. IS ACCEPTABLE IF DIMENSIONS NOT EXCEEDE 2 mm LENGTH AND 0.5 mm WIDTH.
10. OTHER PARTICLE THAT IS NOT SHINNY IS NOT ACCEPTABLE

AFL	GENERAL TOLERANCES	UNITS: SEE DRW	WINDCHILL STATE : Production	
		SCALE: SEE DRW		WINDCHILL REV: 7
DATE: 03/07/06	*TOLERANCES TO BE SET IN DRW*	PROJECTION TYPE: THIRD ANGLE	DESCRIPTION: VISUAL INSPECTION CRITERIA FOR FIBER OPTIC CONNECTORS (GENERIC)	
DRAW: HCR	ALL DIMENSIONS WITHOUT TOLERANCES SHALL BE TAKEN AS REFERENCE	SIZE: A	ITEM NO : SEE ORACLE LIST	
CHCK: RFP		WEIGHT (KG):	DRW NO : 207-0184	SHT 6 6 SHTS