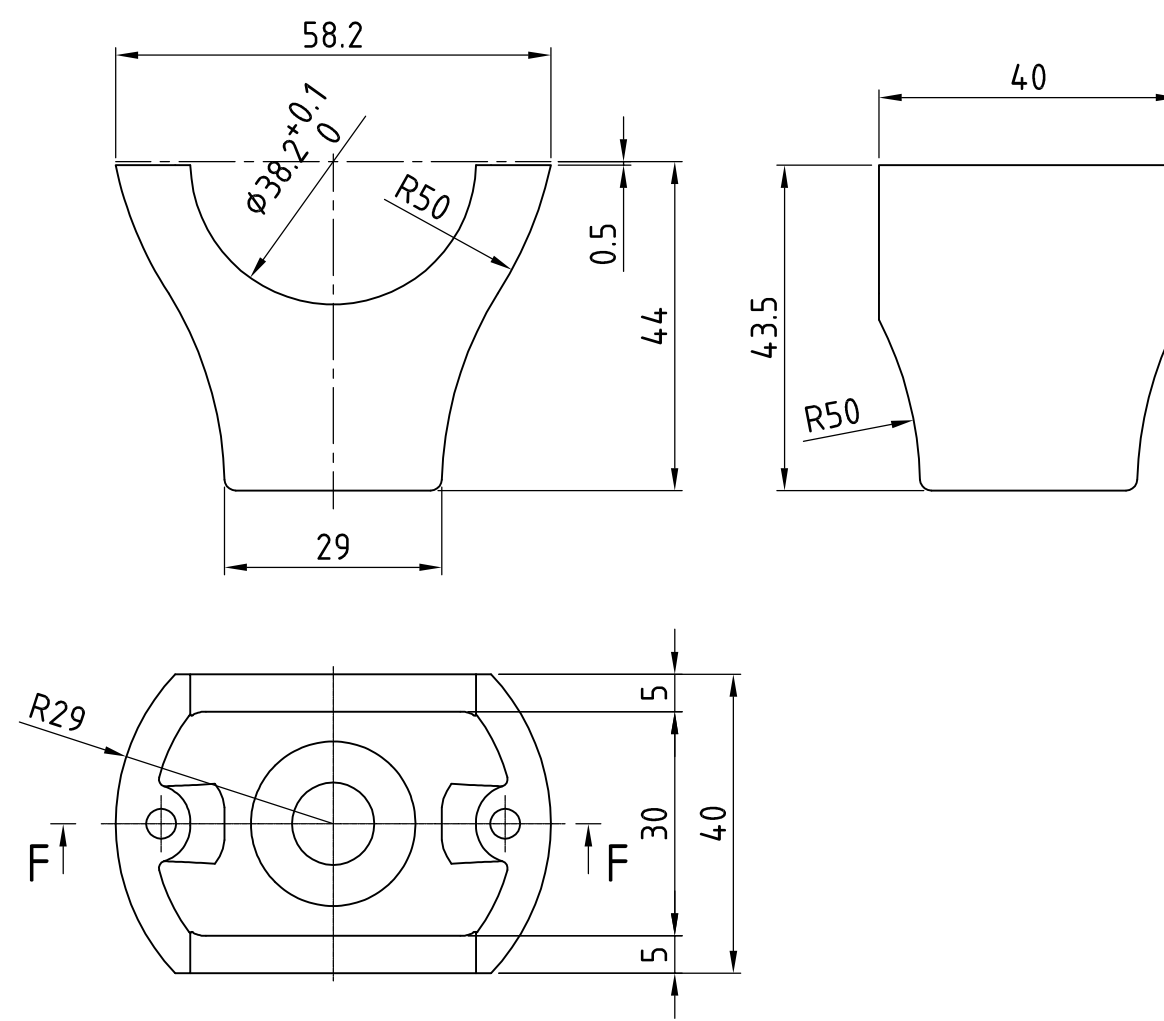
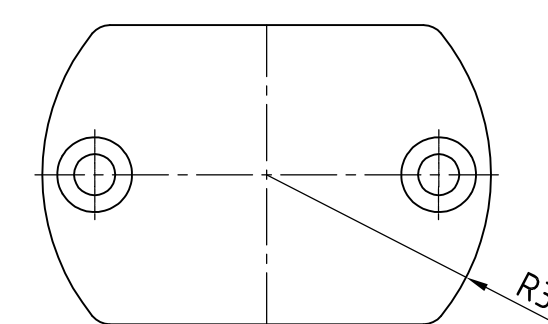
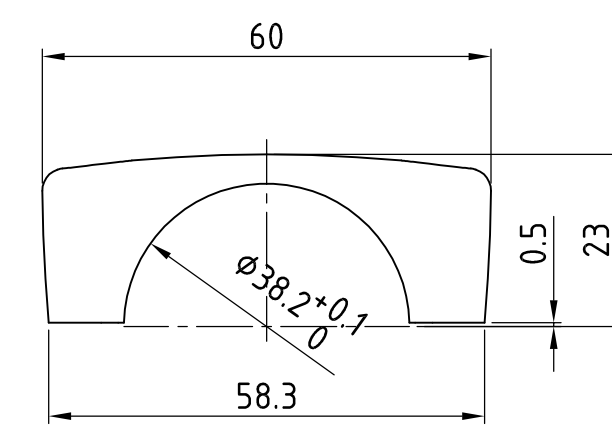
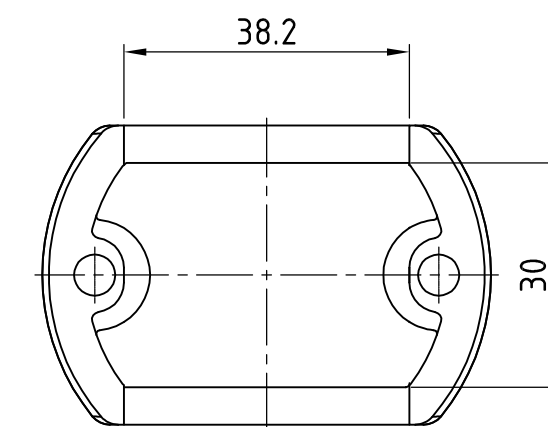
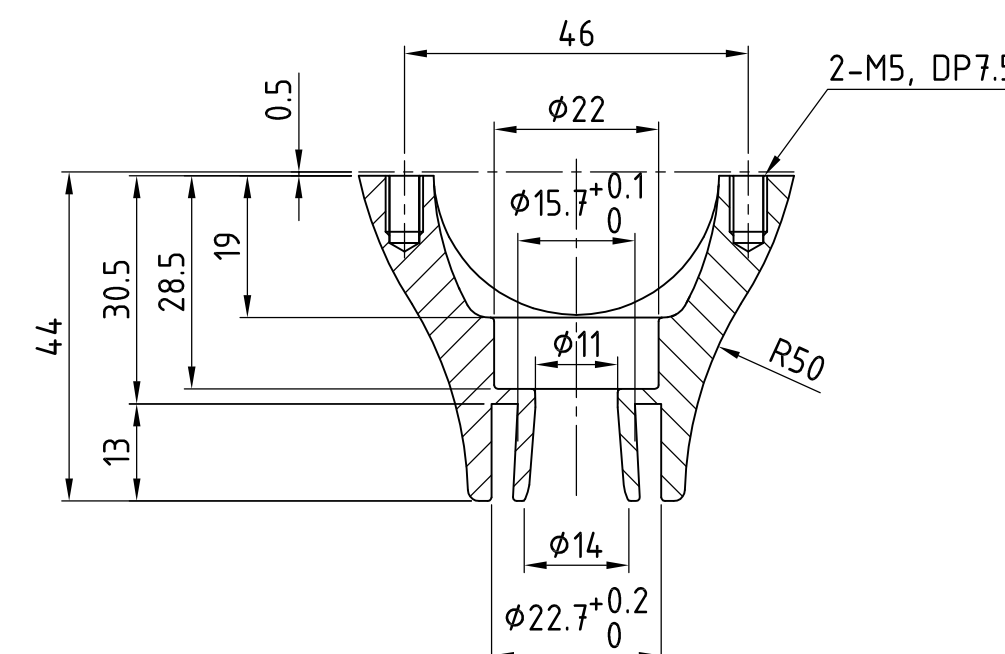
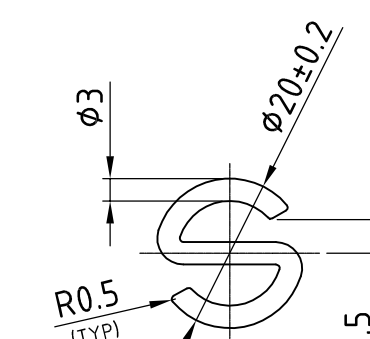
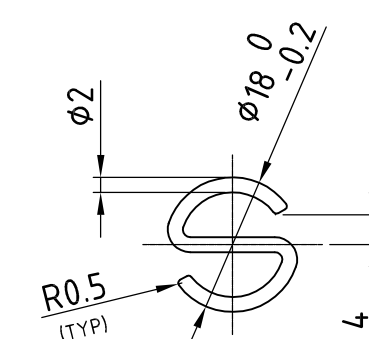
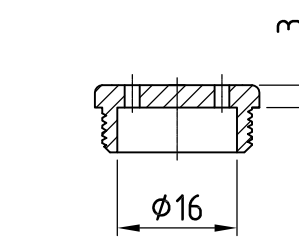
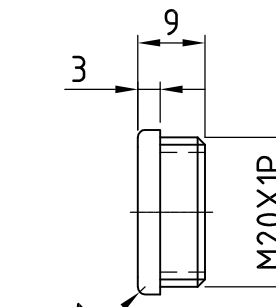
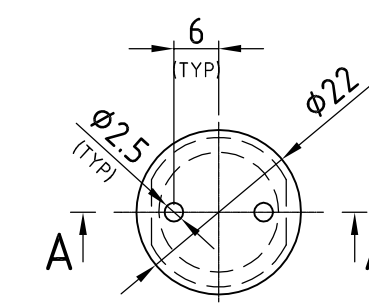
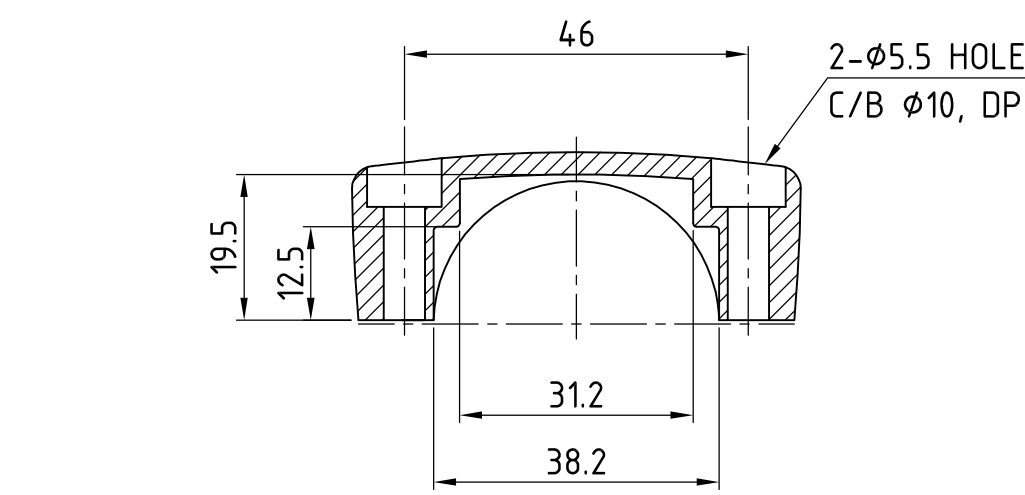
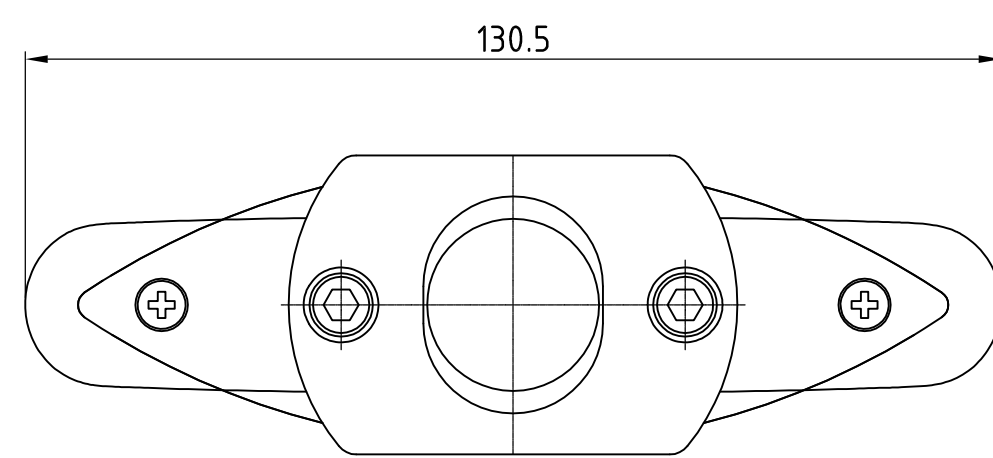
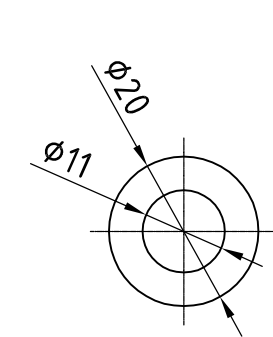
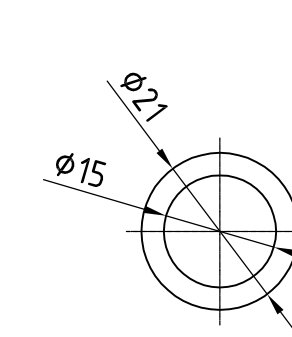
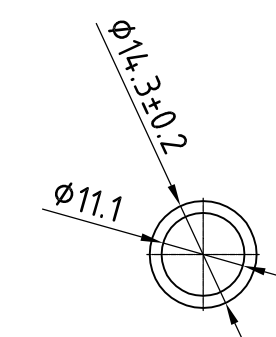
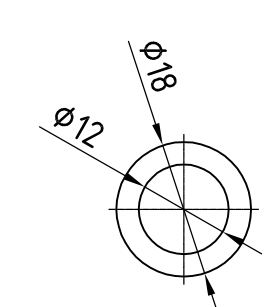
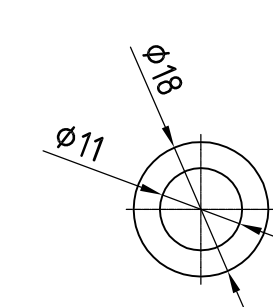
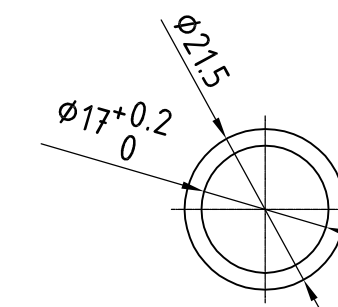
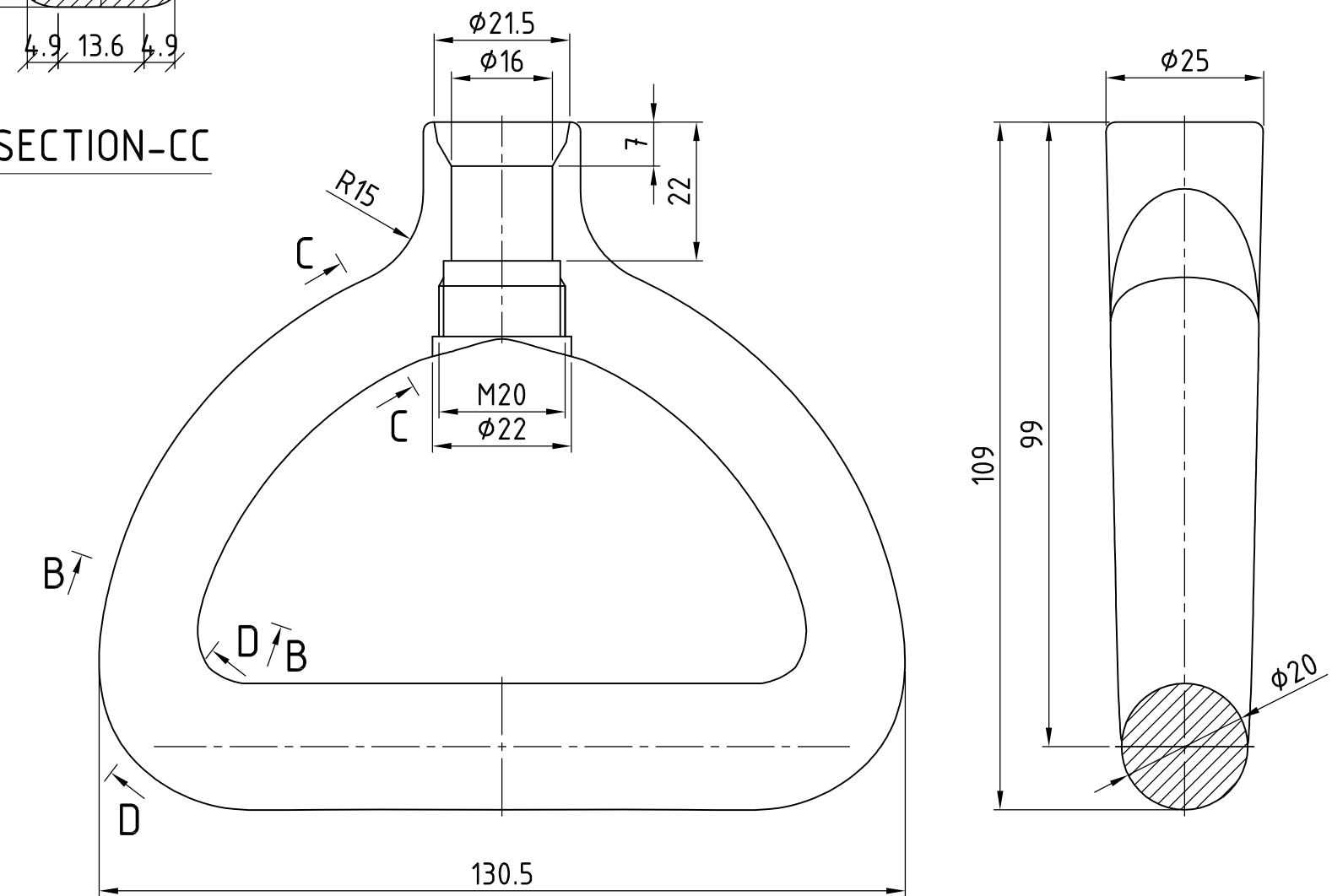
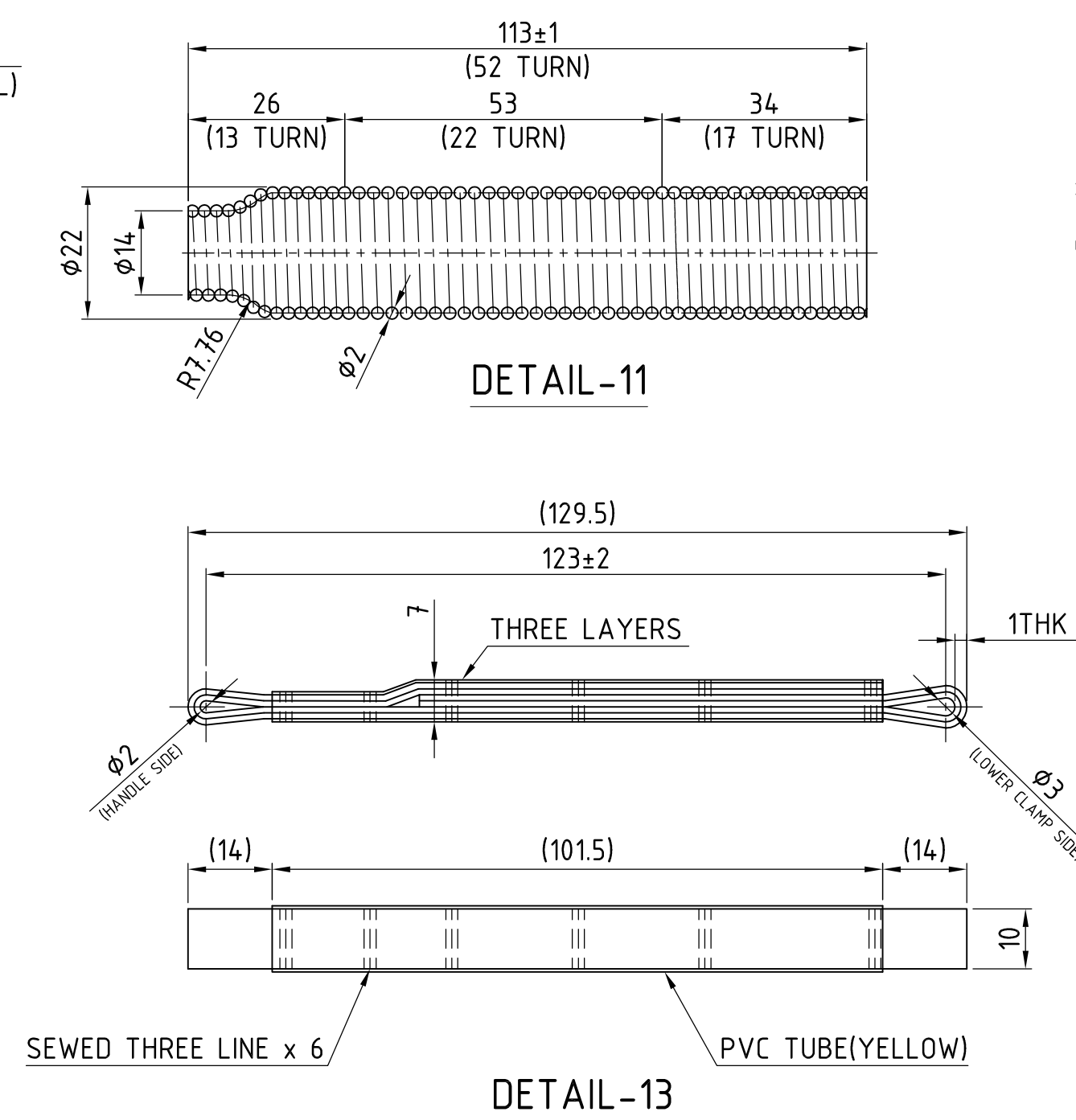
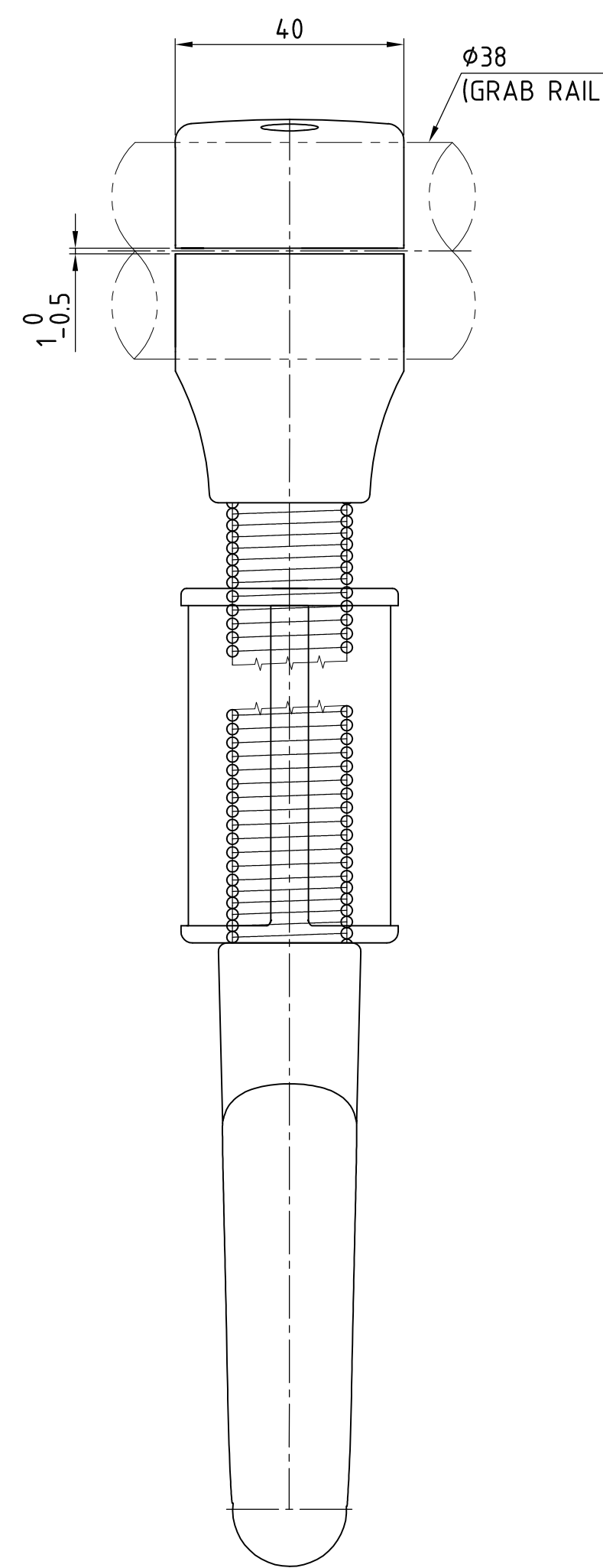
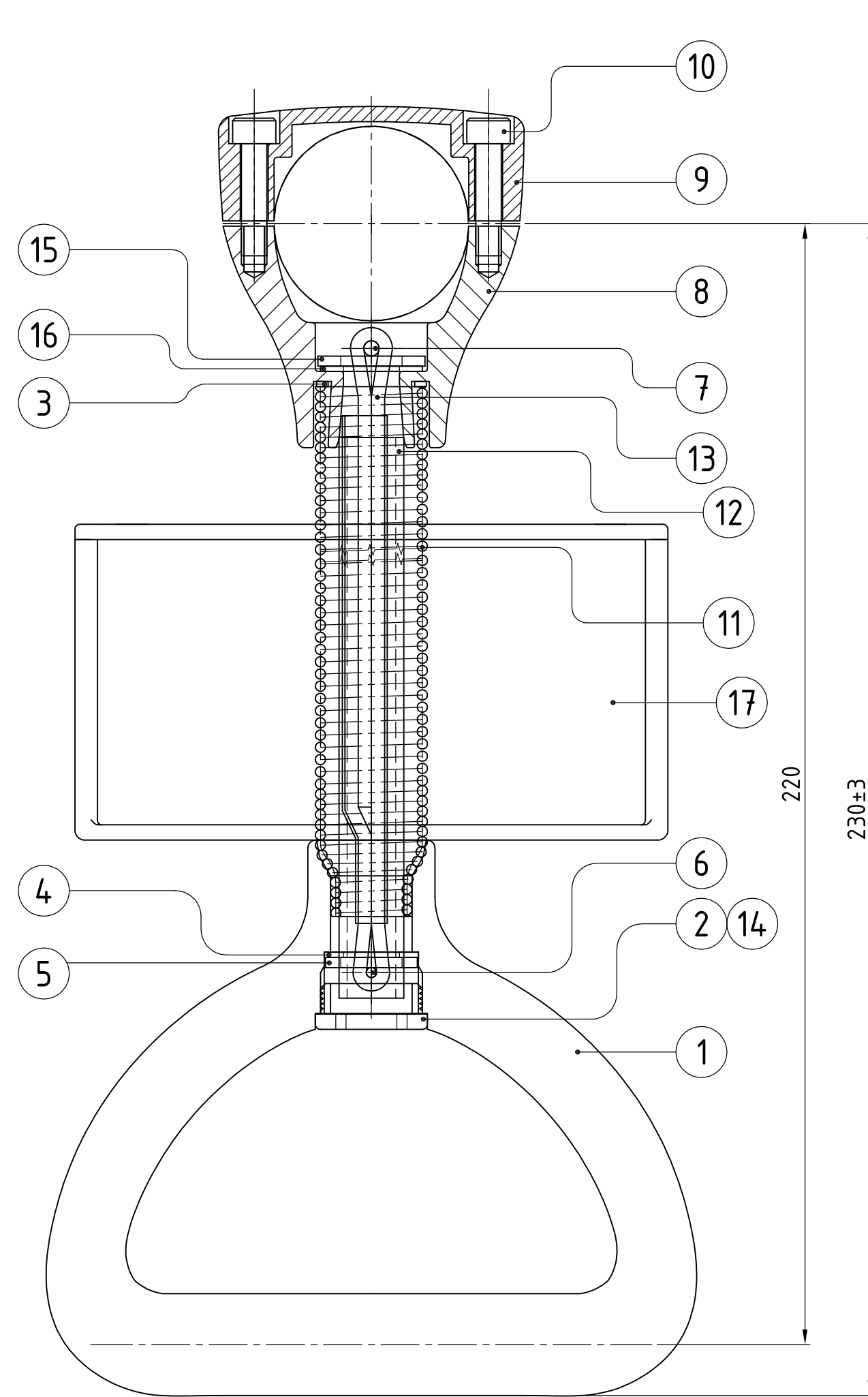


3		2						1			
MACHINING DEVIATIONS		RANGE	0 - 6	6 - 30	30 - 120	120 - 315	315-1000	1000-2000	2000-4000	ABOVE 4000	RA
FOR LINEAR DIMENSIONS		TOLERANCE	+0.1	+0.2	+0.3	+0.5	+0.8	+1.2	+2	+3	~
FOR DIMENSIONAL TOLERANCES OF SHEET METAL PARTS AND WELDED STRUCTURES, REFER STD. RD-227											
UNSPECIFIED TOLERANCE FOR LINEAR AND ANGULAR DIMENSIONS REF IS 202 (PT-1) (MEDIUM)								QUALITY OF WELD JOINTS REF. RD 230 MEDIUM			
VALUES OF SURFACE TEXTURE SHALL BE AS PER COMPANY'S STD DS. 1012.C								STATUS: PROTO/PRODUCTION			
WELDING SHALL BE CARRIED OUT AS PER IS. 9595-96											








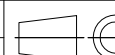


UNCONTROLLED

NOTE

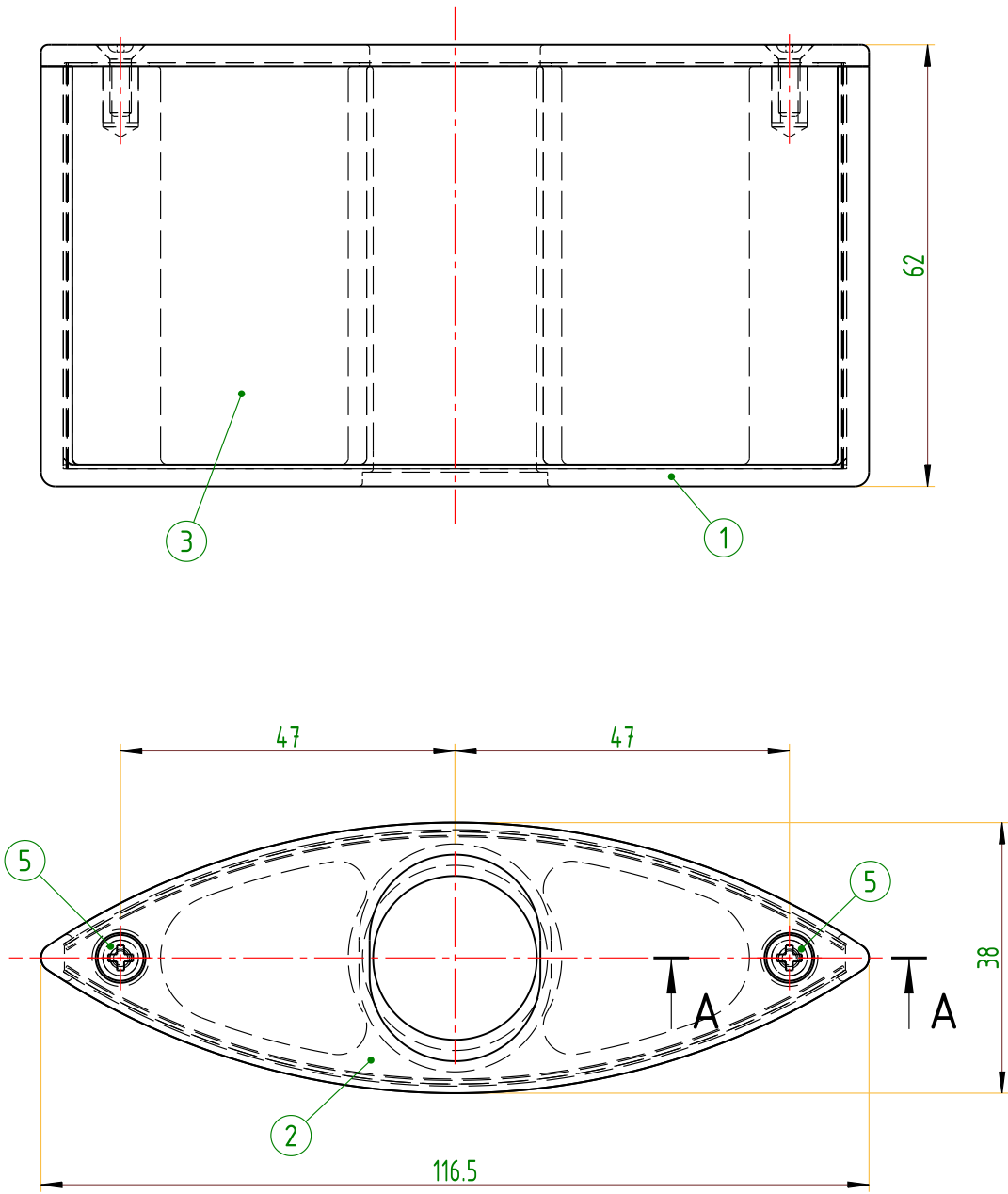
1. ALL DIMENSIONS ARE IN mm.
2. ITEM 2 SHALL BE TIGHTLY SCREWED. BEFORE TIGHTENING, ONE SMALL DROP OF LOCTITE 425 SHALL BE APPLIED ON THE THREADED PORTION OF ITEM 2.
- * 3. HANDLE AND COVER COLOUR FOR LINE 2 SHALL BE RAL-1021 (YELLOW) AND FOR LINE 7 SHALL BE RAL-3028 (RED).
4. THE STRAP HANGER ASSEMBLY SHALL CONFORM TO PTS DOC. No. GR/TD/4988.

17	1	525-29081	ADVERTISEMENT HOLDER	-	-
16	1	-	WASHER	1 THK	TEFLON
15	1	-	WASHER	2 THK	SUS 304 / AISI 304
14	AR	-	LOCTITE 425	-	(REFER NOTE 2)
13	1	-	KEVLAR BAND	-	ARAMID FIBER WITH HEAT SHRINK PVC COVER
12	1	-	TUBE (COLOUR CLEAR)	L=100	SILICONE, HARDNESS 65 ± 5 SHORE A
11	1	-	SPRING	Ø2	SUS 304 / AISI 304 E.P / BUFFING
10	2	-	HEX. SOCKET HEAD CAP SCREWS WITH PRE APPLIED NYLOK BLUE PATCH	M5x25	ISO 4762 / MATL. ISO 3506-1 GR. A2-70
9	1	-	UPPER CLAMP	-	SUS 304 / CF8 OF ASTM A743
8	1	-	LOWER CLAMP	-	SUS 304 / CF8 OF ASTM A743
7	1	-	S-PIN	Ø3	SUS 304 / AISI 304
6	1	-	S-PIN	Ø2	SUS 304 / AISI 304
5	1	-	WASHER	2 THK	SUS 304 / AISI 304
4	1	-	WASHER	1 THK	TEFLON
3	1	-	WASHER	1 THK	TEFLON
★ 2	1	-	COVER	-	FIRE RETARDANT POLYCARBONATE
★ 1	1	-	HANDLE	-	EN 45545, HL3, R6

SL No.	QTY	PART / STOCK No.	DESCRIPTION	SIZE	COMPANY STD./I/S	WT. (Kg)
					MATERIAL	
			PRODUCT	MUMBAI METRO CARS L2 & L7		
			REF DRG	-		
			MATERIAL	-		
			HEAT TREAT.	-		
			SURFACE TREAT.	-		
			ATTN: E			
			STRAP HANGER WITH ADVERTISEMENT HOLDER			
				APPD 		12/02/2020
				REVD 		12/02/2020
				CHKD 		12/02/2020
				DRWN 		12/02/2020
				SCALE 1:1 	SHEET 1 OF 1	WT (Kg) -
ALT.No.	ECN No./CHANGES	DATE	BY	CHKD	APPD	ALT
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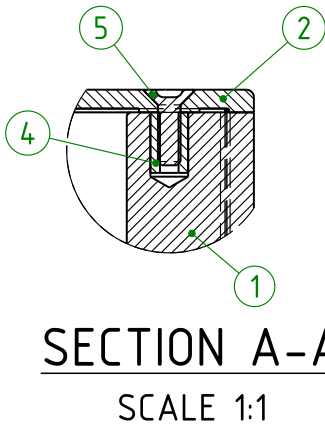
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GRADE No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	SYMBOL
VALUE	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50	
SURFACE ROUGHNESS													





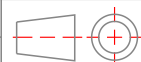




NOTE:
1. ALL DIMENSIONS ARE IN mm.
2. THE ADVERTISEMENT HOLDER ASSEMBLY SHALL CONFORM TO PTS DOC. No. GR/TD/4988.

MACHINING DEVIATIONS FOR LINEAR DIMENSIONS	RANGE	0 – 6	6 – 30	30 – 120	120 – 315	315-1000	1000-2000	2000-4000	ABOVE 4000	RA
	TOLERANCE	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	~
FOR DIMENSIONAL TOLERANCES OF SHEET METAL PARTS AND WELDED STRUCTURES, REFER STD. RD-227										
UNSPECIFIED TOLERANCE FOR LINEAR AND ANGULAR DIMENSIONS REF. IS 2102 (PT-1) (MEDIUM)							QUALITY OF WELD JOINTS REF, RD 230 MEDIUM			
VALUES OF SURFACE TEXTURE SHALL BE AS PER COMPANY STD DS. 1012.C.						STATUS:	PROTO/PRODUCTION			
WELDING SHALL BE CARRIED OUT AS PER IS: 9595-96										



UNCONTROLLED

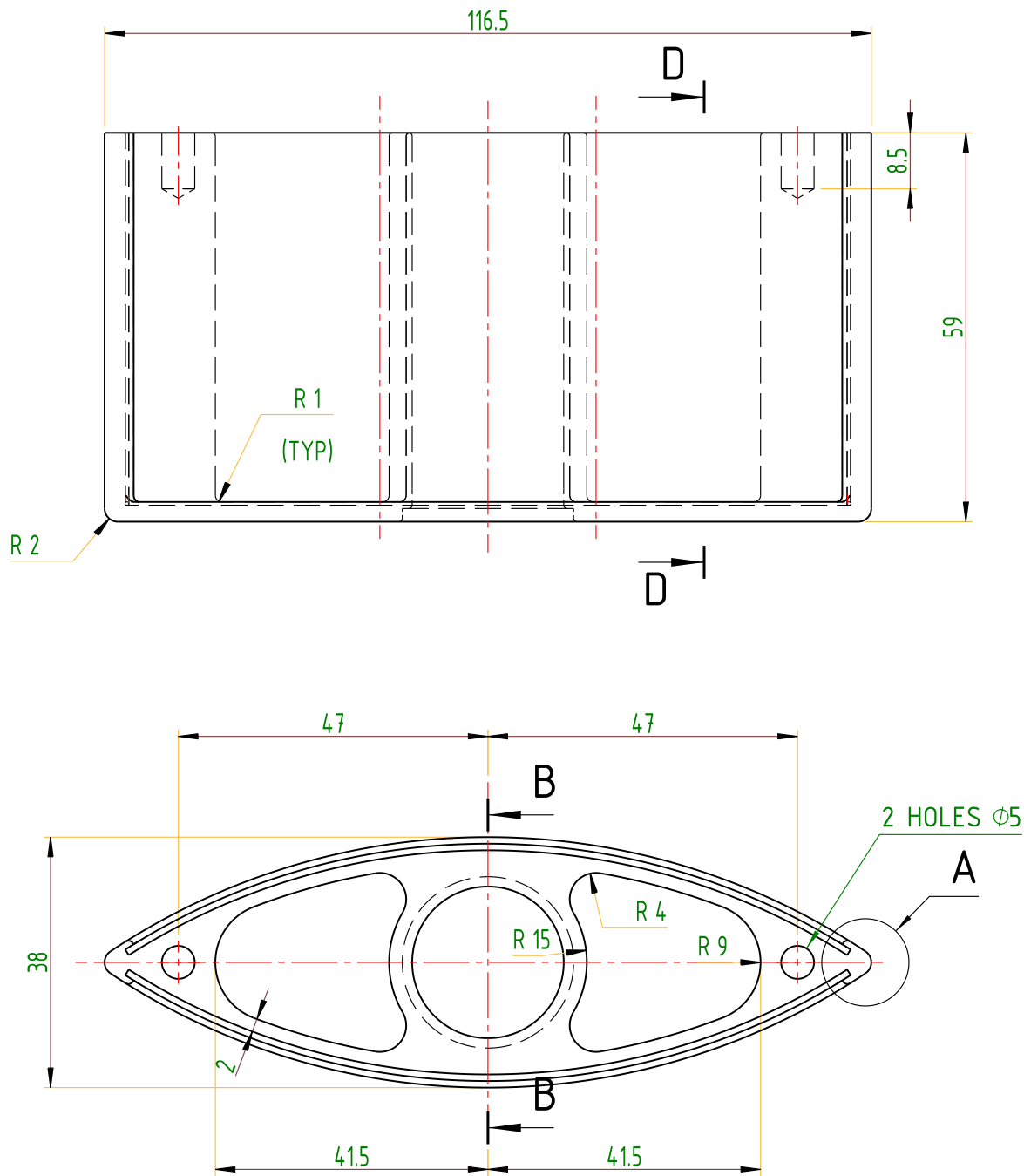
5	2	-	CROSS RECESSED CSK HEAD SCREW	M3x8	IS:7485 / MATL. ISO:3506, GR:A2-70	
4	2	-	NUT INSERT	M3	SUS 304	
3	2	525-29163	TRANSPARENT COVER			
2	1	525-29162	COVER			
1	1	525-29161	ADVERTISEMENT HOLDER			
SL.No.	QTY	PART / STOCK No.	DESCRIPTION	SIZE	COMPANY STD./I.S	Wt. (Kg)
					MATERIAL	
			PRODUCT	MUMBAI METRO CARS L2 & L7		
			REF DRG	-		
			MATERIAL	-		
			HEAT TREAT.	-	APPD	04/01/2020
			SURFACE TREAT.	-	REVD	03/01/2020
			TITLE	ADVERTISEMENT HOLDER		
				CHKD	03/01/2020	
				DRWN	03/01/2020	
				SCALE		SHEET
				1:1		1 OF 1
						Wt.

ALT.NO.	ECN NO/CHANGES	DATE	BY	CHKD	APPD	DRG No.
 BEM LIMITED						525-29081
						ALT
						



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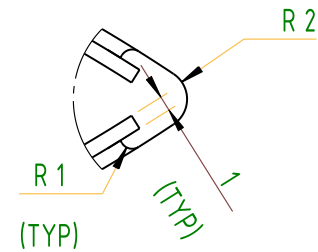
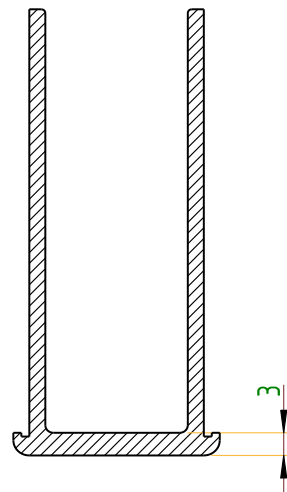
N1	0.025	▽
N2	0.05	▽
N3	0.1	▽
N4	0.2	▽
N5	0.4	▽
N6	0.8	▽
N7	1.6	▽
N8	3.2	▽
N9	6.3	▽
N10	12.5	▽
N11	25	▽
N12	50	▽
GRADE No.		
VALUE		
SYMBOL		
SURFACE		
ROUGHNESS		



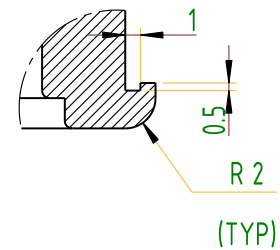
NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. REMOVE ALL THE SHARP EDGES.
3. COLOUR: OFF-WHITE TO RAL 9010.
4. THE ADVERTISEMENT HOLDER SHALL CONFORM TO PTS DOC. No. GR/TD/4988.

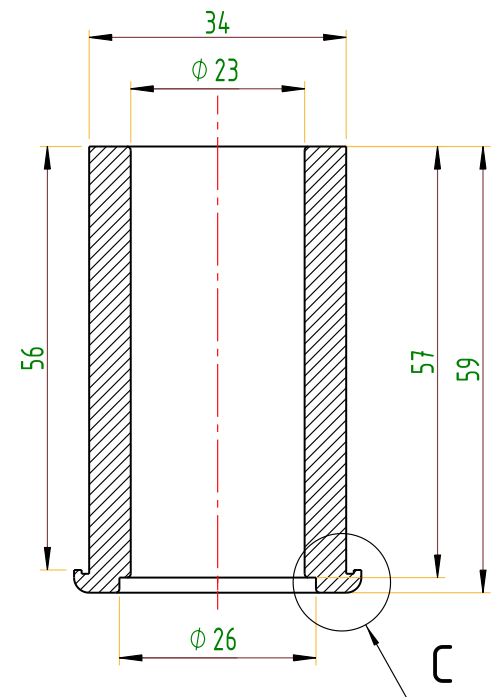
MACHINING DEVIATIONS FOR LINEAR DIMENSIONS	RANGE	0 – 6	6 – 30	30 – 120	120 – 315	315-1000	1000-2000	2000-4000	ABOVE 4000	RA
	TOLERANCE	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	~
FOR DIMENSIONAL TOLERANCES OF SHEET METAL PARTS AND WELDED STRUCTURES, REFER STD. RD-227										
UNSPECIFIED TOLERANCE FOR LINEAR AND ANGULAR DIMENSIONS REF. IS 2102 (PT-1) (MEDIUM)							QUALITY OF WELD JOINTS REF, RD 230 MEDIUM			
VALUES OF SURFACE TEXTURE SHALL BE AS PER COMPANY STD DS. 1012.C.						STATUS:	PROTO/PRODUCTION			
WELDING SHALL BE CARRIED OUT AS PER IS: 9595-96										



DETAIL A
SCALE: 2:1



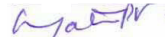
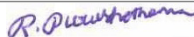

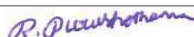


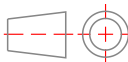




DETAIL C
SCALE: 2:1



SECTION B-B
SCALE: 1:1

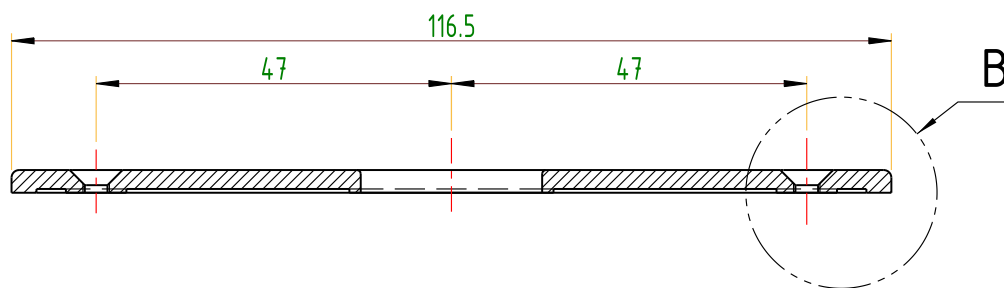
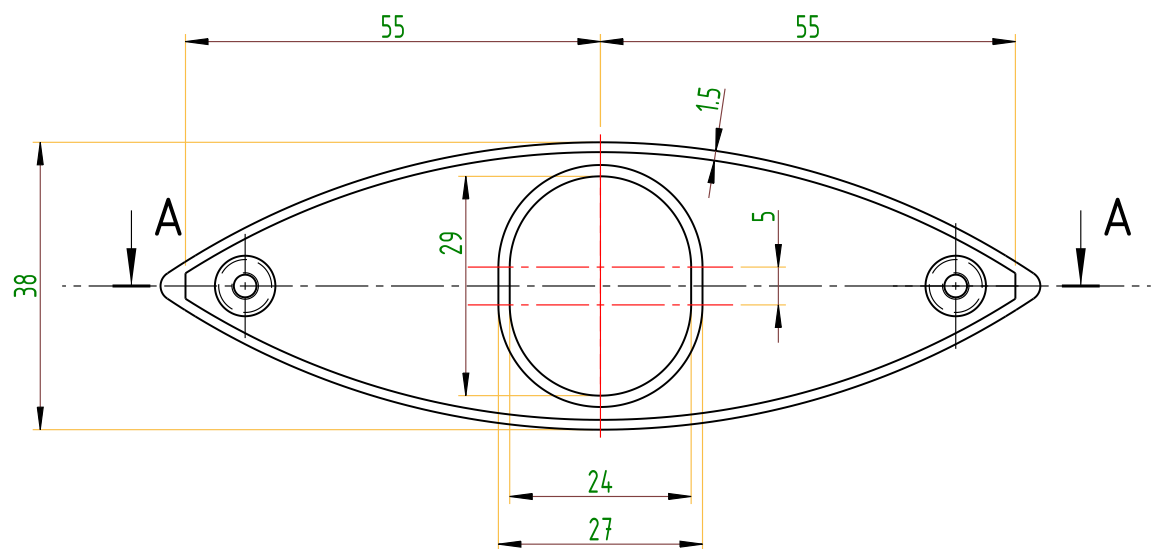
UNCONTROLLED

SL.No.	QTY	PART / STOCK No.				DESCRIPTION	SIZE	COMPANY STD./I.S		Wt. (Kg)	
								MATERIAL			
					PRODUCT	MUMBAI METRO CARS L2 & L7					
					REF DRG	-					
					MATERIAL	POLYCARBONATE CONFORMING TO EN 45545, HL3, R6					
					HEAT TREAT.	-	APPD		04/01/2020		
					SURFACE TREAT.	-	REVD		03/01/2020		
					TREAT. TITLE	-	CHKD		03/01/2020		
					ADVERTISEMENT HOLDER			DRWN		03/01/2020	
								SCALE		SHEET	Wt.
					1:1		1 OF 1	---			
 BEM LIMITED <small>NEW FRONTIERS. NEW DREAMS</small>							DRG No.			ALT	
							525-29161				
ALT.NO.	ECN NO/CHANGES				DATE	BY	CHKD	APPD			

A3

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GRADE No.	N12	N11	N10	N9	N8	N7	N6	N5	N4	N3	N2	N1
VALUE	50	25	12.5	6.3	3.2	1.6	0.8	0.4	0.2	0.1	0.05	0.025
SYMBOL												

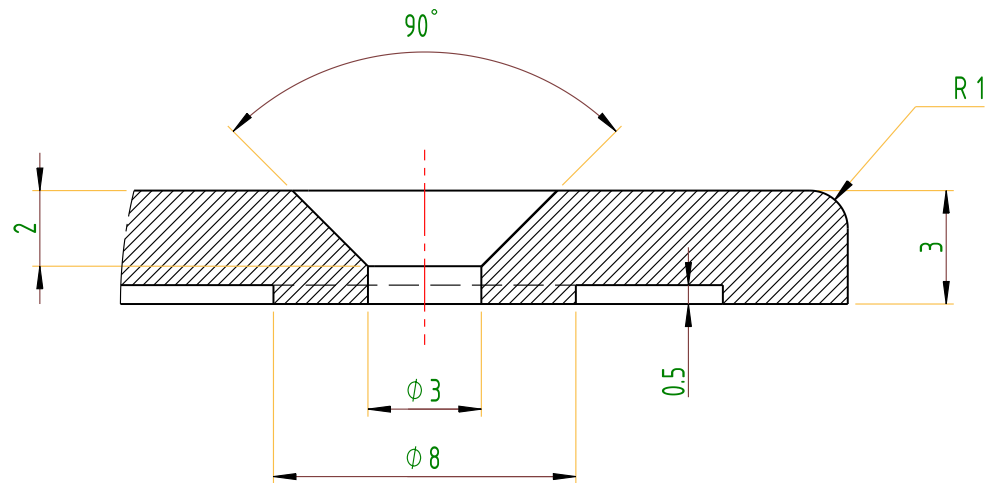


SECTION A-A
SCALE 1:1

NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. REMOVE ALL THE SHARP EDGES.
3. COLOUR: OFF-WHITE TO RAL 9010.
4. THE COVER SHALL CONFORM TO PTS DOC. No. GR/TD/4988.



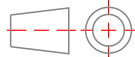
MACHINING DEVIATIONS FOR LINEAR DIMENSIONS	RANGE	0 - 6	6 - 30	30 - 120	120 - 315	315-1000	1000-2000	2000-4000	ABOVE 4000	RA
	TOLERANCE	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	~
FOR DIMENSIONAL TOLERANCES OF SHEET METAL PARTS AND WELDED STRUCTURES, REFER STD. RD-227										
UNSPECIFIED TOLERANCE FOR LINEAR AND ANGULAR DIMENSIONS REF. IS 2102 (PT-1) (MEDIUM)							QUALITY OF WELD JOINTS REF, RD 230 MEDIUM			
VALUES OF SURFACE TEXTURE SHALL BE AS PER COMPANY STD DS. 1012.C.						STATUS:	PROTO/PRODUCTION			
WELDING SHALL BE CARRIED OUT AS PER IS: 9595-96										



DETAIL B

SCALE: 1:1

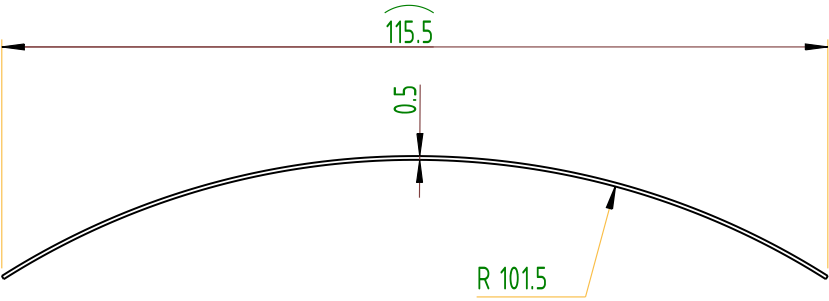
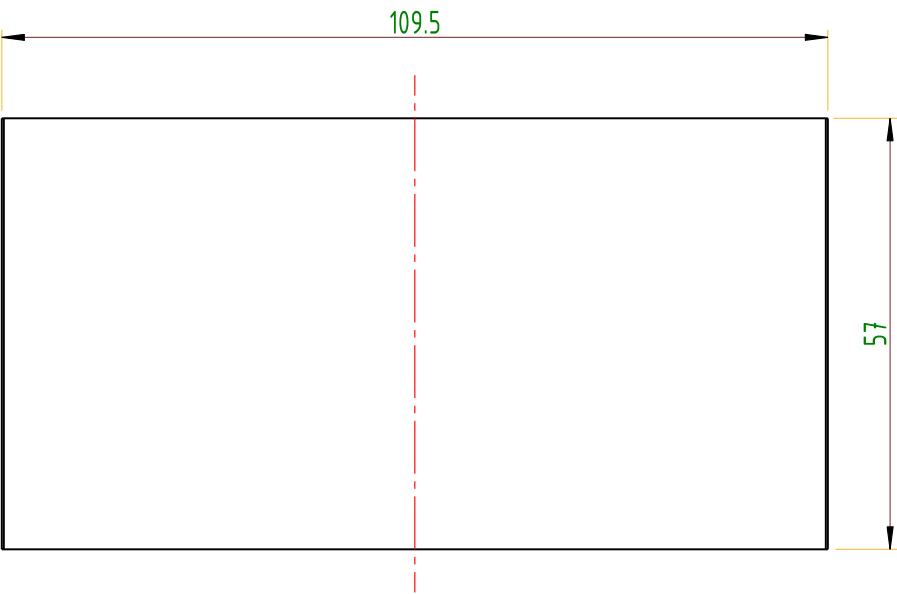
UNCONTROLLED

SL.No.	QTY	PART / STOCK No.				DESCRIPTION	SIZE	COMPANY STD./I.S		Wt. (Kg)								
								MATERIAL										
						PRODUCT	MUMBAI METRO CARS L2 & L7											
						REF DRG	-											
						MATERIAL	POLYCARBONATE CONFORMING TO EN 45545, HL3, R6											
						HEAT TREAT.	-	APPD		04/01/2020								
						SURFACE TREAT.	-	REV D		03/01/2020								
						TITLE	COVER		CHKD		03/01/2020							
						DRWN			03/01/2020									
						SCALE		SHEET	Wt.									
						1:1	1 OF 1		---									
ALT.No.						ECN NO/CHANGES		DATE		BY	CHKD	APPD	BEML LIMITED		525-29162		ALT	
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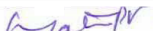
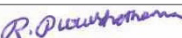

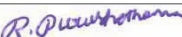

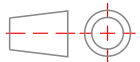



GRADE No.	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	SYMBOL
VALUE	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50	
ROUGHNESS													



- NOTE:
1. ALL DIMENSIONS ARE IN mm.
 2. REMOVE ALL THE SHARP EDGES.
 3. COLOUR: CLEAR TRANSPARENT.
 4. THE COVER SHALL CONFORM TO PTS DOC. No. GR/TD/4988.
 5. THE TRANSPARENT COVER SHALL BE CURVED AS SHOWN IN THE DRAWING.

MACHINING DEVIATIONS FOR LINEAR DIMENSIONS	RANGE	0 – 6	6 – 30	30 – 120	120 – 315	315-1000	1000-2000	2000-4000	ABOVE 4000	RA
	TOLERANCE	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	~
FOR DIMENSIONAL TOLERANCES OF SHEET METAL PARTS AND WELDED STRUCTURES, REFER STD. RD-227										
UNSPECIFIED TOLERANCE FOR LINEAR AND ANGULAR DIMENSIONS REF. IS 2102 (PT-1) (MEDIUM)							QUALITY OF WELD JOINTS REF, RD 230 MEDIUM			
VALUES OF SURFACE TEXTURE SHALL BE AS PER COMPANY STD DS. 1012.C.						STATUS:	PROTO/PRODUCTION			
WELDING SHALL BE CARRIED OUT AS PER IS: 9595-96										

UNCONTROLLED

SL.No.	QTY	PART / STOCK No.				DESCRIPTION	SIZE	COMPANY STD./I.S		Wt. (Kg)							
								MATERIAL									
						PRODUCT	MUMBAI METRO CARS L2 & L7										
						REF DRG	-										
						MATERIAL	POLYCARBONATE CONFORMING TO EN 45545, HL3, R6										
						HEAT TREAT.	-	APPD		04/01/2020							
						SURFACE TREAT.	-	REVD		03/01/2020							
						TITLE	TRANSPARENT COVER	CHKD		03/01/2020							
								DRWN		03/01/2020							
								SCALE		SHEET	Wt.						
								1:1		1 OF 1	---						
ALT.No.							ECN NO/CHANGES			DATE	BY	CHKD	APPD	 BEML LIMITED		525-29163	ALT
																	



BEML LIMITED
BENGALURU
R & D CENTER

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MRS1 Project

**Procurement Technical Specification
of Strap Hanger Assembly with
Advertisement Holder**

	Name	Date	Signature
Approved By	PV Gayathri	14.03.2020	
Reviewed By	R Purushothaman	14.03.2020	
Prepared By	Ram Krishna Rajput	14.03.2020	

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1. Introduction

1.1. General

This Procurement Technical specification (PTS) specifies the technical requirements of strap hanger assembly with advertisement holder (here after called as strap hanger) to be fitted in the Metro cars of 'MRS1' project for Mumbai Metro Line-2 & 7.

BEML will carry out all required works and activities as Contractor to the Employer for MRS1 project, while the subcontractor shall be responsible for all works required in this PTS with regard to strap hanger and shall be responsible for supporting the BEML activities as contractor for MRS1 project.

The scope of work includes all items of work which may be required to meet the performance requirements, reliable and efficient operation of trains and meeting the best international practices even if not specifically mentioned in this PTS.

1.2. Train Composition

The rake formation shall generally be as follows:

3 Car unit formation : DM – T – M –
6 Car Train formation: DM –T–M – M – T – DM

In case of 8-car formation (if required):

2 Car train formation : – T – M –
8 Car Train formation: DM – T – M – T – M – M – T – DM

where,

DM : Driving Motor Car
T : Trailer Car with pantograph
M : Non -Driving Motor Car

1.3. Climatic & Environmental Conditions

The Metro cars shall operate reliably and safely under the climatic and environmental conditions of Mumbai. Accordingly, the strap hanger shall be designed to operate with satisfactory performance under the following conditions.

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Description	Limiting Values
Maximum ambient temperature (See note below)	36°C
Minimum temperature	14.3°C
Humidity	≥ 95% RH
Rainfall	The annual precipitation is 2,078 mm with 34%(709mm) falling in the month of July.
Atmosphere during hot season	Extremely dusty including bird feathers
Maximum wind speed	150 km/h
Vibration and Shocks	The sub-systems & their mounting arrangements shall be designed to withstand satisfactorily the vibration and shocks encountered in service as specified in IEC 61373 and IEC 60571.
SO ₂ level in atmosphere	80 – 120 mg/m ³
Suspended particulate matter in atmosphere (TSPM)	360 – 540 mg/m ³
Flood Proofing	The traction sub-systems mounted on the under-frame will be designed to permit propulsion of the train at 10 kmph through water up to a depth of 50mm above rail level. Traction sub-systems shall be made splash proof in accordance with International Standards
Life	The Metro car is designed for min. 35 years of life. Accordingly, the subject items & accessories shall also not deteriorate in their performance for 35 years

Note:

- 1) The temperature of the metal surfaces of the vehicles when exposed directly to the sun, for long periods of time, may be assumed to rise to 70°C.
- 2) Any moisture condensation shall not lead to any malfunction or failure.
- 3) Adequate margin shall specially be built into the design particularly to take care of the higher ambient temperatures, high humidity, dusty and corrosive conditions, etc. prevailing in Mumbai area.

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2. Definitions

The following definitions are applicable to the PTS.

- **“Employer”** means Delhi Metro Rail Corporation Limited (DMRC), its legal successors and assignees.
- **“Subcontractor”** means the Supplier who supplies the required strap hanger to BEML for MRS1 project.
- **“Contractor”** means the persons or person appointed by the Employer to undertake the execution of the works for MRS1 project..
- **“Contract”** means the contract between Subcontractor and BEML in relation to the supply of strap hanger for MRS1 project.
- **“Engineer”** means any person nominated or appointed from time to time by the Employer to act as the Engineer for the purposes of the Contract and notified as such in writing to the Contractor.
- **“Engineer's Representative”** means any Assistant of the Employer appointed from time to time by the Employer.
- **“BEML”** means the Contractor to procure the strap hanger for MRS1 project cars.

3. Qualification Criteria

- (i) Subcontractor shall have manufactured and supplied strap hanger for Railway Metro Rolling Stock having experience in design, manufacturing, testing and commissioning for strap hanger.
- (ii) The subcontractor shall have manufactured and supplied similar type of strap hanger and such supplies should have been in use and have established their satisfactory performance and reliability on at least three Mass Rapid Transit Systems in revenue service over a period of three years or more (in each MRTS) either outside the country of origin in three different countries or in an MRTS in India. Supporting documents for the same shall be submitted along with the technical offer, preferably, satisfactory Revenue service performance certificates for a period of 3 years or more from end users/ Metro Operators.
- (iii) Indian OEMs of Strap hanger assembly not meeting the above criteria at (ii) but have manufactured and supplied similar strap hangers to any of the Indian Metro projects may submit complete details of the type of supplies made, technical specifications, manufacturing methods, process details, type test carried out, list of parts supplied etc., for BEML/DMRC review and consideration. However, BEML/DMRC decision on sub-contractor proposal shall be final and binding.
- (iv) Along with the technical offer, the subcontractor shall submit the filled vendor approval form along with all the required supporting documents for obtaining the vendor approval from DMRC. Selection of Vendor is subject to DMRC approval.

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- (v) The firm should undertake to provide the support during DLP period either by themselves or through sister company or a partner in India. The firm shall submit detailed proposal in this regard along with the technical offer.
- (vi) The firm should give an undertaking to supply spares for a minimum period of 10 years from the date of last car supplied by BEML under this contract.

4. Standards

The design, testing and manufacturing of the strap hanger shall conform to the latest editions of internationally recognized Standards viz., Indian, American, European, Japanese, ISO, etc.

5. Design Criteria

The strap hanger assembly proposed by the subcontractor shall comply with the following Design criteria.

- (i) The design of strap hanger shall be safe under all conditions of passenger.
- (ii) All the parts of the strap hanger shall be finished with good blending and good slow ageing properties to provide a pleasant, high-quality interior and for ease of cleaning and maintenance. No material shall degrade or stain when exposed to food, drink, graffiti, or any cleaners used by the maintenance personnel. No material shall produce any odour that would be noticeable or irritating to passengers.
- (iii) The strap hanger shall conform to fire safety requirements as per EN 45545, HL3.
- (iv) When the passenger hits the strap hanger, it shall not injure the passenger.
- (v) The handle in the strap hanger shall be ergonomically designed for passenger to hold it comfortably.
- (vi) The strap hanger shall be mounted on the grab rail and shall be flexible for the passenger to hold comfortably.
- (vii) No parts of strap hanger shall be able to damage by passengers.

6. Technical Requirements

The subcontractor shall meet the strap hanger requirements as per design criteria at section 5 above, as a minimum.

The strap hanger shall comply with the environmental conditions specified at clause 1.3.

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6.1. Material Specification

6.1.1. Polycarbonate

6.1.1.1. Handle and Cover

The handle and the cover of the strap hanger assembly shall be made from high Gloss pre-coloured polycarbonate material. The handle along with cover has to be produced in two different colours i.e. RAL 1021 (yellow) and RAL 3028 (red). The polycarbonate material shall conform to the fire safety requirements as per EN 45545, HL3. The fire safe Polycarbonate shall be sourced from reputed manufacturers like M/s.Sabic or M/s. Covestro. The subcontractor shall submit the TDS of the polycarbonate along with the technical offer.



RAL 1021



RAL 3028

Strap Hanger

The process adopted for manufacture of the handle shall ensure that a very smooth surface is obtained and there no parting line is visible on the outer surface of the handle and the resin infusion point shall not be from the outer visible side. The process shall also ensure that there are no internal stresses and the handle is able to withstand the design loads without cracking, in revenue service. The details shall be submitted along with the technical offer.

6.1.1.2. Advertisement Holder

The advertisement holder shall be made of polycarbonate material. The polycarbonate material shall conform to the fire safety requirements as per EN 45545, HL3. The colour of holder shall be off-white to RAL 9010 and the protective cover for the advertisement display shall be made of clear transparent polycarbonate material.

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6.1.2. Kevlar Band

The band shall be made from M/s. DuPont, kevlar brand aramid fibre to have light weight and flexibility. The kevlar band shall be flat braid and braiding shall be $\pm 45^\circ$. The flat braid shall be 10mm width and 1mm thickness. The strand shall be densely woven with strand thickness of 1mm. The stitching of band shall also be done by aramid fibre. Please refer the drg. for the no. of foldings of the braid, stitches and the pattern. The subcontractor shall submit the TDS of the DuPont kevlar aramid fibre along with the technical offer.

The Kevlar band shall be tested independently and shall be able to withstand the design load of 2500 N.

6.1.3. Stainless steel Casting

The upper clamp and lower clamp of the strap hanger shall be stainless steel casting to grade SUS 304 / CF8 of ASTM A743. The clamps shall be brush finished as per ASTM ASTM A 480, No. 6 Finish. The clamp is mounted on the grab rail and there shall be no offset and sharp edges.

6.1.4. Stainless Steel Pin

The kevlar band link between the handle and clamp is made by 'S' shaped pin made from stainless steel. The stainless steel pin shall be able to rotate freely. When the load of 2500N is applied to the strap hanger the pin shall not deform and damage.

6.1.5. Spring

The spring shall be made of stainless steel to grade AISI 304 / SUS 304 and shall be buff finished. The spring shall be bend by 180° and shall be checked for the coils not overlapping.

6.1.6. Tube

The tube is a protective cover for the kevlar band and shall be made of soft silicone rubber with hardness of 65 ± 5 Shore A. The subcontractor shall submit the TDS of the silicone rubber along with the technical offer.

6.1.7. Nut Insert

The nut insert shall be fixed to the advertisement holder rigidly by suitable adhesive and checked for the breaking torque for M3 CSK screw.

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6.2. Test Requirement

Sl. No.	TEST	TEST Procedure	Requirement
1	Raw material	-	Chemical analysis
			Mechanical properties
2	Visual inspection	-	Each components shall be free from defects like cracks, tool marks, manufacturing defects and other visual defects
3	Dimensional inspection	-	As per drawing dimensions
4	Strap Hanger Assembly		
i	Tensile test	Tensile load of 2500 N shall be applied to the handle of the strap hanger vertically downward.	The Handle, Kevlar Band and s-pin shall not break. The upper and lower clamp shall not get loosened. The cover in the handle shall not come out
ii	Endurance test	Load: 35 kg vertical. Cycles: 300,000 cycles minimum. Bending Angle: ± 45 degrees. Frequency: Each cycle to consist of movement of the handle from one extreme to another extreme and back within one second.	The Handle, Kevlar Band and s-pin shall not break. The upper and lower clamp shall not get loosened. The cover in the handle shall not come out
5	Polycarbonate (Strap hanger assembly handle and the advertisement Holder)		
i	Colour	RAL 1021, RAL 3028 & RAL 9010	As per approved sample
ii	Colour Fastness	ISO 4582	≤ 3
iii	Scratch Resistance	ISO 19252	Resistant to Ploughing, Wedge Formation & Cutting
iv	Anti Graffiti	ASTM D 6578	Level 8 Minimum
v	Gloss Level	ASTM D 2457	High Gloss (Gloss angle 20°)

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6	Silicone Rubber Hardness	ASTM D 2240	65 ± 5 Shore A
7	Kevlar Band		
i	Material	-	DuPont kevlar brand aramid fibre
ii	Braiding	-	±45° flat braided
iii	Tensile test for kevlar band construction as per drawing	Tested independently for tensile load of 2500 N applied vertically downward.	Kevlar Band shall not break.
8	Nut Insert		
i	Breaking torque	ISO 3506-1	Minimum 1.6 Nm

6.3. Fire Safety

The Strap hanger shall be selected to reduce to the maximum extent practical the heat load, rate of heat release, propensity to ignite, rate of flame spread, smoke, emission and toxicity of combustion gases.

The Strap hanger assembly shall confirm to fire safety requirements of EN 45545, Category 4-A (HL3) R6 requirements.

The fire performance deliverables shall be provided in accordance with following table.

Sl. No.	Deliverables	Remarks
1	Fire safety plan	As per EN45545 HL3
2	Fire safety Test Reports including heat release rate.	As per EN45545 HL3

Fire safety test reports as per EN 45545 of Strap hanger assembly supplied to previous projects shall be submitted for reference.

6.4. Service Life

The subcontractor shall ensure a guaranteed revenue service life of 35 years for the strap hanger.

6.5. Weight

The weight of the strap hanger shall be < 1kg. The subcontractor shall submit the estimated weight of the strap hanger.

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6.6. Workmanship and Finish

The subcontractor shall ensure that the finished strap hanger shall be free from surface defects, crack, porosity, pin hole, dent and other visual defects that would impair usability of the strap hanger.

7. Quality Assurance Program

The subcontractor shall hold ISO 9001/ IRIS certification and shall manufacture the product accordingly. The subcontractor shall submit a copy of ISO 9001 / IRIS certification along with the offer. The subcontractor shall monitor and control the Quality systems as per ISO 9001/IRIS guidelines. BEML and/or DMRC's representative may periodically conduct compliance audits of the Subcontractor's Quality management system.

The subcontractor shall submit Quality Assurance Plan (QAP) based on ISO 9001 / IRIS guidelines.

8. Scope of Supply

8.1. Strap hanger

The strap hanger shall be supplied confirming to tender drawing and PTS, as a minimum. The strap hanger handle colour shall be RAL 1021 (yellow) and RAL 3028 (red). The no. of strap hangers which have to be supplied in Yellow and the no. of strap hangers which have to be supplied in Red will be indicated in the Purchase Order.

8.2. Maintenance Tool

The subcontractor shall supply 3 sets of tools required for disassembly and assembly of strap hanger along with the first supply. The details of the tools shall be submitted along with the technical offer.

8.3. Submission of Documents

The subcontractor shall submit the following documents as a minimum, as per the timelines specified by BEML.

- ✓ Type test procedure document covering all the physical, mechanical & fire safety type tests.
- ✓ FAI Procedure document.
- ✓ Type test & FAI reports.
- ✓ Fire safety test reports on the panels produced for this project.
- ✓ Weighment document with actual weight of strap hanger.

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- ✓ Material test certificates.
- ✓ Dimensional check sheets for Strap hanger.

8.4. Submission of Samples

The subcontractor shall submit 1 no. each of strap hanger assembly sample for RAL 1021 and RAL 3028 colours and advertisement holder sample, meeting the technical requirements of this PTS and drawing dimensions, before FAI.

8.5. Packing

The subcontractor shall pack properly in order that in transit and after supply of the strap hanger to the place allocated by BEML, no damage to the strap hanger shall occur.

9. Type Tests & Routine Tests

The strap hanger shall be type and routine tested in accordance with relevant standards and specifications. All such tests shall be carried out at the subcontractor's cost, wherever performed, in the presence of and to the satisfaction of BEML and DMRC, who reserves the right to witness any or all of the tests and to require submission of any or all test specifications and reports.

BEML and DMRC reserve the right to reasonably call for additional tests, if necessary.

The subcontractor shall carryout the following type tests and routine tests, as a minimum.

Sl. No.	Kind of Test	Test Method	Type Test	Routine Test
1	Visual Inspection	-	O	O (100% Supplies)
2	Dimensional Inspection	-	O	O (100% Supplies)
3	Raw material Chemical analysis	-	O	O (For every lot)
4	Raw material Mechanical properties	-	O	O (For every lot)
5	Weight	-	O	O (100% Supplies)
6	Polycarbonate			

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i	Colour	RAL 1021	As per approved sample	O	O (100% Supplies)
		RAL 3028			
		RAL 9010			
ii	Colour Fastness	ISO 4582		O	O (For every lot)
iii	Scratch Resistance	ISO 19252		O	O (For every lot)
iv	Anti Graffiti	ASTM D 6578		O	O (For every lot)
v	Gloss Level	ASTM D 2457		O	O (For every lot)
7	Silicone Rubber Hardness	ASTM D 2240		O	O (For every lot)
8	Kevlar Band				
i	Material	-		O	O (For every lot)
ii	Braiding	-		O	O (For every lot)
iii	Tensile test for kevlar band construction as per drawing	Kevlar band tested independently for tensile load of 2500 N applied vertically downward.		O	O (For every lot)
9	Spring	Bending 180°		O	O (100% Supplies) (This test to be done before assembling the spring to the strap hanger)
10	Nut Insert				
i	Breaking torque	ISO 3506-1		O	O (For every lot)
11	Strap Hanger Assembly				

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i	Tensile test	Tensile load of 2500 N shall be applied to the handle of the strap hanger vertically downward.	O	O (For every lot)
ii	Endurance test	Load: 35 kg vertical. Cycles: 300,000 cycles minimum. Bending Angle: ± 45 degrees. Frequency: Each cycle to consist of movement of the handle from one extreme to another extreme and back within one second.	O	O (For every lot)
12	Fitment trials on grab rail	No offset and sharp edges	O	O (100% Supplies)

The type test procedure document shall be prepared by the subcontractor and BEML/DMRC approval shall be obtained before conducting the tests.

The routine test reports shall be submitted along with every batch of supplies.

9.1. First Article Inspection (FAI)

The subcontractor shall offer the Strap hanger assembly and advertisement holder for First Article Inspection by BEML/ DMRC in accordance with the BEML/DMRC approved FAI plan prior to serial production in order to confirm that the item produced fully complies with the technical specifications, System design and manufacturing process.

The Subcontractor shall ensure that the produced Strap hanger assembly is compliant to all requirements prior to inviting for testing and FAI. The pre-test result prior to official testing/FAI shall be submitted with the invitation letter to request BEML/ DMRC witness.

At the FAI, the subcontractor shall make available all pertinent design and

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manufacturing process documentation, test records, material certifications, etc.

During FAI, if any inspections or tests indicate that specific hardware or documentation does not meet the specified requirements, the appropriate items shall be repaired, replaced, upgraded, or added by the Subcontractor at their own cost, as necessary to correct the noted deficiencies. After correction of deficiency, all tests necessary to verify the effectiveness of the corrective action shall be repeated.

If FAI has to be repeated due to non-compliances/ deficiencies noticed, the cost towards the same and the cost towards BEML/DMRC visit to subcontractor's place for witness of re-FAI shall be to subcontractor's responsibility.

Upon acceptance of the FAI by BEML/DMRC, the subcontractor can proceed to manufacture all pertinent hardware. The hardware must meet or exceed the quality standards set at the FAI, and must incorporate any comments made by BEML/DMRC at the FAI.

Subcontractor shall note that BEML/DMRC FAI clearance will not relieve the subcontractor's responsibility towards design, development, testing, manufacture and supply during the revenue service.

At any point of time, during the execution of the contract, if BEML/DMRC has any concerns about the quality of the product supplied, BEML/DMRC reserves the right to randomly draw samples from any of the supply lots and the subcontractor shall carry out the type tests at accredited outside labs and shall submit the reports.

10. Appendices

- Vendor approval Documents.
- Technical offer Submittals Check List.

11. Submittals with Technical Offer

The Subcontractor shall provide as a minimum, the following along with the technical offer. The submittals check-list of this PTS shall also be submitted.

1. Complete Technical Offer for Strap hanger assembly.
2. Clause wise comments against PTS Document No. GR/TD/4988.
3. Technical data sheet of polycarbonate, silicone rubber, kevlar brand aramid fiber, nut insert, adhesive and teflon.
4. Load test and fire safety test report copies of earlier projects.
5. Supporting documents for Qualification Criteria compliance (Clause 3).

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6. Duly filled Vendor approval form along with supporting documents including QAP & ITP for MRS1 project, company profile with infrastructure facilities, product range etc., and satisfactory revenue service performance certificate from end user/Metro corporations for the bucket type stainless steel saloon seat.

Date:

Proforma No: MRS1/BEML/V.NNO/CAT-___/___/M/___

CHECKSHEET FOR SUBMISSION OF DOCUMENTS FOR NOTICE OF NO OBJECTION FOR SUB-CONTRACTOR/VENDOR FROM DMRC			
ITEMS:			
Category	A	Items manufactured outside India and proposed to be used in all MRS1 trains.	<input type="checkbox"/>
	B	Items manufactured outside India and proposed to be used in all MRS1 trains but likely to be localised after some part quantity from OEM (shall be declared by BEML).	<input type="checkbox"/> Equivalent Localisation Quantity : __ Trainsets
	C	Locally manufactured items proposed to be used in all MRS1 trains.	<input type="checkbox"/>
1	Proforma for Submission of documents		<input type="checkbox"/> YES <input type="checkbox"/> NO
2	Vendor Details	Annexure-I	<input type="checkbox"/> YES <input type="checkbox"/> NO
3	Sub-Vendor Detail	Annexure-I	<input type="checkbox"/> YES <input type="checkbox"/> NO
4	Certificate from BEML	Annexure-II	<input type="checkbox"/> YES <input type="checkbox"/> NO
5	Copy of technical purchase specification of BEML		<input type="checkbox"/> YES <input type="checkbox"/> NO
6	Inspection and Test Plan		<input type="checkbox"/> YES <input type="checkbox"/> NO
Note:	1	Incomplete documents will not be reviewed by DMRC.	
	2	Items used in DMRC's existing rolling stock do not automatically qualify for use unless specifically approved by DMRC for this project.	
<div style="display: flex; justify-content: space-between; align-items: flex-end; padding-top: 20px;"> (BEML Limited) _____ (Proposed Vendor) </div>			

Date: _____

Proforma No: MRS1/BEML/V.NNO/CAT-___/_____/P1/_____

**PROFORMA FOR SUBMISSION OF DOCUMENTS FOR NOTICE OF NO OBJECTION FOR SUB-CONTRACTOR/VENDOR
FROM DMRC**

1	Item description					
2	Vendor particulars along with proposed manufacturing unit submitted in Annexure-I	<input type="checkbox"/> YES <input type="checkbox"/> NO				
3	Technical Specification & Inspection Plan	—				
3.1	Enclosed copy of Technical Purchase Specification of BEML	<input type="checkbox"/> YES <input type="checkbox"/> NO				
4	Details of experience/ satisfactory performance to establish compliance with ERTS 3.2.2.					
The Information shall be submitted in following format:						
S.No.	Mass Rapid Transit System where proposed sub-system/equipment/component has been used	Country	Quantity Used	Period in satisfactory Revenue Service [from/to] (Min 3 yrs in each MRTS)	Manufacturing Unit	
	1	2	3	4	5	
1	1					
	2					
	3					
2	1					
	2					
	3					
3	1					
	2					
	3					
4	1					
	2					
	3					
4.1	Based on above, is the proposed item compliant with ERTS 3.2.2					<input type="checkbox"/> YES <input type="checkbox"/> NO
4.2	Is the proposed manufacturing unit compliant with ERTS 3.2.2					<input type="checkbox"/> YES <input type="checkbox"/> NO
4.3	Confirmation that the subsystems used in MRS1, as proposed herein, shall have NO CHANGE in source, manufacturing unit, components, specification, material etc. from those approved unless got specifically approved from DMRC.					<input type="checkbox"/> CONFIRMED <input type="checkbox"/> NOT CONFIRMED
4.4	Information submitted herein as above is certified as correct, strictly in accordance with the MRS1 contract conditions and has been verified by BEML. In case any information is found to be factually incorrect or at variance with contract conditions at any stage, BEML commits to replace the concerned 'sub-system' in complete fleet as per the instructions of engineer, which shall be final and binding. In such case, BEML shall not be eligible either for seeking any claim whatsoever or for seeking extension of contract delivery period.					<input type="checkbox"/> CONFIRMED <input type="checkbox"/> NOT CONFIRMED
4.5	Confirmation that DMRC may depute a team of Engineers (around six) at Sub-contractor/vendor's office for requisite duration with a view to expedite finalization of designs in accordance with contract 'MRS1' conditions ERGS 5.11.3.					<input type="checkbox"/> CONFIRMED <input type="checkbox"/> NOT CONFIRMED
5	Notwithstanding the vendor approval communicated by DMRC on the proposal of BEML, responsibility for manufacture, testing, supply, commissioning and quality control shall continue to rest solely with BEML and BEML will be solely responsible for meeting all contractual requirements.					<input type="checkbox"/> CONFIRMED <input type="checkbox"/> NOT CONFIRMED
<div style="display: flex; justify-content: space-between; align-items: flex-end;"> <div>(BEML Limited)</div> <div>_____ (Proposed Vendor)</div> </div>						

Date: _____

Proforma No: MRS1/BEML/V.NNO/CAT- ____ / ____ /P2/ _____

6	Category B - Sourcing from facilities in India after supply of agreed quantity from approved manufacturing unit.	
6.1	In case OEM wants to use manufacturing facilities in India (other than his own) for items for which the OEM has been approved, it shall enter into an agreement with such selected Indian equipment manufacturer and obtain prior approval from DMRC. No change in composition, rating, type, model no., manufacturing process, quality standards, design, etc. and make of the components used in assemblies/sub-assemblies of such equipment as manufactured by the approved parent vendor shall be made without specific prior approval of the Engineer.	
6.2	In case the vendor uses his own facilities for indigenization after part supply of equipment from the approved manufacturing unit, no change in design, component type/make, quality standards, manufacture procedure, sourcing of materials etc. shall be made without specific prior approval of the Engineer.	
6.3	In case OEM wishes to change/make/type specifications, etc. of any sub-components for supplies to be sourced from Indian facility, specific prior approval of the Engineer shall be obtained for changes made, model, specification, etc. Responsibility for obtaining such prior approval shall rest solely with the contractor.	
6.4	In case of local manufacturing of carbody or any other item(s) manufactured by BEML/OEM and used in initial trains, BEML shall be exclusively responsible for all quality assurance and inspection and their implementation and also ensure provision of physical partition as per the ERGS 1.1.7	
7	Category C- Locally Manufactured Items	
7.1	Does the manufacturing unit satisfy ERTS 3.2.2	<input type="checkbox"/> YES <input type="checkbox"/> NO
7.2	If not, basis/justification for proposal to be submitted for DMRC review	<input type="checkbox"/> YES <input type="checkbox"/> NO
8	BEML confirms that in terms of ERTS 3.2.2, they would seek Notice of No Objection for Sub-Contractor/Vendor from DMRC notwithstanding the item(s) being used in DMRC's existing rolling stock.	<input type="checkbox"/> YES <input type="checkbox"/> NO
9	BEML shall submit Certificate as per enclosed Annexure-II confirming:	
9.1	Compliance with Clause 6.6 of ERGS and GCC Clause 5.8 regarding supply of software tools/documents/materials etc.	
9.2	Compliance with Clause 8.12 of ERGS regarding supply of all drawings, specifications, patterns etc. in case the manufacture of these items is discontinued by the proposed vendor.	
10	Commitment from the vendor that in case of any future procurement action by DMRC, he shall quote directly to DMRC.	
11	Commitment from the Vendor to provide technical support through permanent positioning of Vendor's staff at depots for meeting DLP obligations as per ERTS clause 3.2.5.	
12	BEML commits that the vendor shall be complying with all relevant contract clauses.	
<div style="display: flex; justify-content: space-between; align-items: flex-end; padding-top: 20px;"> <div>(BEML Limited)</div> <div>_____ (Proposed Vendor)</div> </div>		

Date:

Proforma No: MRS1/BEML/V.NNO/CAT- ___/___/___/A1/___

Annexure-I	
SUB-Contractor/VENDOR/SUB-SUPPLIER DETAILS	
1	Vendor/Sub-supplier OEM Name
2	Details of item proposed to be sourced
3	Sourcing by: <div style="display: flex; justify-content: space-between;"> (a) BEML <input type="checkbox"/> (b) Proposed Main vendor <input type="checkbox"/> </div>
4	Marketing Office/Head Office
4.1	Complete address (including website)
4.2	Contact person details in Head Office
	<ul style="list-style-type: none"> • Name • Designation • Telephone • Fax • Mobile • Email
5	Details of proposed compliant plant/manufacturing unit from where item is proposed to be sourced
5.1	Complete address (including website)
5.2	Contact person details
	<ul style="list-style-type: none"> • Name • Designation • Telephone • Fax • Mobile • Email
5.3	Supply details of the manufacturing unit for the proposed item or item with similar design.
5.4	It is confirmed that the proposed manufacturing unit and the vendor are fully compliant with ERTS 3.2.2
5.5	We commit that in case of any future procurement action by DMRC, the proposed vendor shall quote directly to DMRC without any involvement of BEML.
5.6	We confirm that we will provide technical support through permanent positioning of our staff at depots for meeting DLP obligations as per ERTS clause 3.2.5.
5.7	We have carefully gone through all relevant clauses of the MRS1 Contract and shall fully abide by the contract conditions and decisions communicated by DMRC during contract execution without exception.
<div style="display: flex; justify-content: space-between;"> (BEML Limited) _____ (Proposed Vendor) </div>	

Date:

Proforma No: MRS1/BEML/V.NNO/CAT- __ / __ /A2/ __

Annexure-II	
<u>Certificate for compliance with Contract conditions regarding Software requirements.</u>	
<p>This is certified that in the contract between BEML and _____ (proposed vendor) for supply of _____, specific conditions for confirming total compliance with the following contract condition/clauses have been included and agreed to between BEML and _____(proposed vendor):</p>	
(a)	<p>Clause 6.6 of ERGS and GCC 5.8</p> <p>It is certified that we shall provide full access of application software(s) and any other software /hardware tools to DMRC which they may specifically require for the intended purpose specified in this specification. For all commercial software BEML shall provide all available documentation for the application and maintenance of that software.</p> <p>Complete documentation along with the software to be supplied by BEML and its Vendor(s) shall comprise of Signal flow diagram, flow charts, functional blocks, details of signals, interpretations so as to enable engineer to debug and implement vehicle/train level modifications based on DMRC's experience, operational & maintenance requirements. Full access to the application software to DMRC shall be provided for this purpose.</p> <p>It shall be possible for DMRC to modify/change various parameters/logics used in the software and implement the changes on trains. Full facilities including any software/hardware tools, simulation/test bench which are essential for this purpose shall be supplied.</p> <p>It is committed to supply the software/hardware etc. within the scope specified in respective clauses of ERTS relevant for the proposed item/vendor and we would be fully complying with GCC 5.8</p>
(b)	<p>Clause 8.12 of ERGS:</p> <p>It is certified that _____ (proposed vendor) will supply all drawings, specifications, patterns and any other information required by DMRC for arranging such items in case the manufacture of these items is discontinued within 10 years by the proposed vender.</p>
<div style="display: flex; justify-content: space-between;"> (BEML Limited) _____ (Proposed Vendor) </div>	

Undertaking for Technical/Service Support

Appendix -1
Page 6 of 6

To Delhi Metro Rail Corporation Ltd.

We _____ (proposed Vendor) shall provide Technical/Service support during Commissioning and post Commissioning period, till completion of the Defect Liability Period, for Mumbai Metro Line 2 & 7, 'MRS1' Project from their local office in India.

BEML Limited

(sign, Name & designation with stamp)

Proposed Vendor

(sign, Name & designation with stamp)

	TECHNICAL OFFER SUBMITTALS CHECK SHEET	Project MRS1
Aggregate	Strap Hanger with Advertisement Holder	PTS DOC No.: GR/TD/4988
BEML Enquiry/ RFQ Reference :		

Sl. No.	DETAILS	SUBMITTED	NOT SUBMITTED
1	Complete Technical Offer for Strap hanger assembly.	<input type="checkbox"/>	<input type="checkbox"/>
2	Clause wise comments against PTS Document No. GR/TD/4988.	<input type="checkbox"/>	<input type="checkbox"/>
3	Technical data sheet of polycarbonate, kevlar brand aramid fiber, silicone rubber, nut insert, adhesive and teflon.	<input type="checkbox"/>	<input type="checkbox"/>
4	Load test and fire safety test report copies of earlier projects.	<input type="checkbox"/>	<input type="checkbox"/>
5	Supporting documents for Qualification Criteria compliance (Clause 3).	<input type="checkbox"/>	<input type="checkbox"/>
6	Duly filled Vendor approval form along with supporting documents including QAP & ITP for MRS1 project, company profile with infrastructure facilities, product range etc., and satisfactory revenue service performance certificate from end user/Metro corporations for the bucket type stainless steel saloon seat.	<input type="checkbox"/>	<input type="checkbox"/>

Note : Incomplete submissions are liable for Rejection.

Signature of the Bidder with Seal