Checklist for Custody Transfer Meters: Mass Flowmeter

S.No.	Area	Checklist Item	Status
METER & PIPING			
1	Meter & Piping	Verify meter size, pressure rating, material and end connections against approved datasheet/P&ID.	
2	Meter & Piping	Confirm orientation (horizontal/vertical) and that the tube is always full—no cavitation pockets.	
3	Meter & Piping	Check flow-direction arrow and ensure meter is not reverse-installed.	
4	Meter & Piping	Verify required upstream/downstream straight runs or flow conditioner as per OEM.	
5	Meter & Piping	Confirm operating flow range and Reynolds number fall within meter turndown limits for custody accuracy.	
6	Meter & Piping	Inspect reducers/expanders (if used) for correct beta ratio and eccentric orientation.	
7	Meter & Piping	Check insulation or heat tracing if medium requires temperature control to maintain viscosity/density.	
SKID / SUPPORTS / LAYOUT			
8	Skid / Supports / Layout	Ensure skid is provided (where applicable) with lifting lugs, earthing points and proper drainage.	
9	Skid / Supports / Layout	Verify skid/pipe supports eliminate vibration and mechanical stress on the meter body.	
10	Skid / Supports / Layout	Check adequate access space for instruments, valves, prover connections and maintenance activities.	
11	Skid / Supports / Layout	Verify vent and drain points are available and piped to a safe location.	
FILTRATION & AIR ELIMINATION			
12	Filtration & Air Elimination	Confirm strainer is installed upstream with specified mesh size and easy access for cleaning.	
13	Filtration & Air Elimination	Check air eliminator/deaerator (for liquids) is installed and operational to remove entrained gas.	
14	Filtration & Air Elimination	Verify DP element provided across strainer; isolation valves and impulse lines are correct.	
15	Filtration & Air Elimination	Check DP transmitter installation, calibration status and trending in control system (if fitted).	
16	Filtration & Air Elimination	Ensure any strainer bypass is locked/blinded and seals are intact during custody operation.	
PROCESS & AUX INSTRUMENTATION			
17	Process & Aux Instrumentation	Pressure transmitter downstream of MFM located at correct tapping; impulse line clear.	
18	Process & Aux Instrumentation	Temperature element (RTD/Thermocouple) downstream of MFM has proper immersion length/thermowell contact.	
19	Process & Aux Instrumentation	Impulse lines slope correctly / are vented or drained; manifolds installed for isolation.	
20	Process & Aux Instrumentation	Calibration stickers on PT/TT are current; certificates filed and traceable.	
21	Process & Aux Instrumentation	Local pressure/temperature gauges provided for quick verification.	
22	Process & Aux Instrumentation	Transmitter diagnostics/health indicators show no active faults.	
DENSITY / SAMPLING / ANALYZER			
23	Density / Sampling / Analyzer	Densitometer installed (if required); location minimizes bubbles/stratification.	
24	Density / Sampling / Analyzer	Densitometer calibration date and integration to flow computer/NOC confirmed.	

S.No.	Area	Checklist Item	Status
25	Density / Sampling / Analyzer	Auto-sampler or manual sample point installed and functional for quality proving.	
26	Density / Sampling / Analyzer	Sample lines insulated/heat traced (if viscous fluids) to avoid solidification.	
27	Density / Sampling / Analyzer	Gas chromatograph / water cut meter installed; outputs wired and scaled correctly in FC.	
28	Density / Sampling / Analyzer	Analyzer access safe; purge/vent arrangements verified.	
POWER & GROUNDING			
29	Power & Grounding	Critical devices powered through UPS; autonomy meets requirement.	
30	Power & Grounding	UPS alarms wired to control room; breakers/fuses labelled.	
31	Power & Grounding	Instrument earthing provided; resistance within site limit (record value).	
32	Power & Grounding	Bonding jumpers across meter flanges installed where required to prevent static.	
33	Power & Grounding	Power cables segregated from signal cables; no shared conduits with HV lines.	
ISOLATION / BYPASS / SEALS			
34	Isolation / Bypass / Seals	Upstream/downstream isolation valves installed, operable and leak-free.	
35	Isolation / Bypass / Seals	Bypass line (if provided) is closed, blinded/locked and sealed during custody operation.	
36	Isolation / Bypass / Seals	Bleed/drain valves provided for prover connection and safe depressurization.	
37	Isolation / Bypass / Seals	Mechanical/software seals recorded after any intervention; seal numbers updated in register.	
38	Isolation / Bypass / Seals	Check valves provided where reverse flow could damage meter or affect proving.	
HAZARDOUS AREA & CABLING			
39	Hazardous Area & Cabling	Equipment certification (Ex/ATEX/IECEx) matches zone/classification; nameplates legible.	
40	Hazardous Area & Cabling	Cable glands/barrier glands installed and tightened; sealing compound applied where required.	
41	Hazardous Area & Cabling	Shielded signal cables grounded at single point to avoid loops.	
42	Hazardous Area & Cabling	Cable trays routed away from HV, heat sources and sharp edges; bend radius maintained.	
43	Hazardous Area & Cabling	Junction boxes/panels have adequate IP rating; no water ingress or corrosion.	
IDENTIFICATION & LABELLING			
44	Identification & Labelling	All instruments and valves carry permanent tags matching P&ID and asset register.	
45	Identification & Labelling	Flow direction arrows and line numbers clearly indicated and visible.	
46	Identification & Labelling	Safety/warning signs (hot surface, high pressure) installed where needed.	
47	Identification & Labelling	Nameplates show serial number, model, accuracy class and year of manufacture.	
CONFIGURATION INTEGRITY			
48	Configuration Integrity	All configuration parameters loaded exactly as per approved configuration sheet (retain backup).	
49	Configuration Integrity	K-factors / meter factors updated after most recent proving and documented.	
50	Configuration Integrity	Engineering units, decimal places and rounding rules set correctly.	
51	Configuration Integrity	Backup of configuration files and firmware stored securely (offline).	
FLUID & BASE CONDITIONS			

S.No.	Area	Checklist Item	Status
52	Fluid & Base Conditions	Base/dry density, compressibility and other PVT data entered from latest certified lab report.	
53	Fluid & Base Conditions	Pressure and temperature base conditions match contract/API requirement.	
54	Fluid & Base Conditions	Procedure exists for updating density/water cut values; change history maintained.	
55	Fluid & Base Conditions	Water cut / quality limit settings configured where applicable.	
ALGORITHMS & CALCULATIONS			
56	Algorithms & Calculations	Correct flow calculation method selected (AGA-11 / API MPMS, etc.).	
57	Algorithms & Calculations	No-flow cutoff threshold configured and documented.	
58	Algorithms & Calculations	Interpolation/extrapolation or averaging methods defined and justified.	
59	Algorithms & Calculations	Totalizers (mass/volume/energy) reset policy defined and controlled.	
SECURITY (PHYSICAL & CYBER)			
60	Security (Physical & Cyber)	Physical security switch/jumper on FC/NOC set to secure and sealed.	
61	Security (Physical & Cyber)	Unique user IDs with role-based permissions configured; default passwords removed.	
62	Security (Physical & Cyber)	Password complexity/expiry policy implemented; failed login lockout enabled.	
63	Security (Physical & Cyber)	Change management process followed for any configuration edit; approvals recorded.	
64	Security (Physical & Cyber)	Anti-virus or whitelisting applied if FC/NOC uses general-purpose OS.	
COMMUNICATION & TIME SYNC			
65	Communication & Time Sync	Modbus/OPC/Pulse/Analog communication tested end-to-end; no recurrent errors.	
66	Communication & Time Sync	Polling rate, timeouts and checksum settings optimized; communication logs reviewed.	
67	Communication & Time Sync	Device clocks synchronized to plant NTP/GPS server; drift monitored and corrected.	
68	Communication & Time Sync	Timestamps are consistent across FC, NOC and SCADA historians.	
LOGS, AUDIT & DATA HANDLING			
69	Logs, Audit & Data Handling	Event, alarm and history logs enabled; retention period meets requirements.	
70	Logs, Audit & Data Handling	Audit trail records user, time and parameter changed; download tested.	
71	Logs, Audit & Data Handling	Procedure exists for periodic extraction/archiving of logs; checksum/CRC validated.	
72	Logs, Audit & Data Handling	Daily/shift totalizers stored and protected from overwriting.	
73	Logs, Audit & Data Handling	Backup/restore procedure of historical data verified.	
CONTROL SYSTEM / ERP INTERFACES			
74	Control System / ERP Interfaces	All key variables mapped to SCADA/DCS and trending checked.	
75	Control System / ERP Interfaces	Historical trending interval sufficient for diagnostics and audits.	
76	Control System / ERP Interfaces	Automatic transfer of totals to SAP PRA/ERP exists and reconciliation performed.	

S.No.	Area	Checklist Item	Status
77	Control System / ERP Interfaces	Discrepancies between FC totals and ERP/SCADA totals investigated and closed out.	
78	Control System / ERP Interfaces	Standard daily/monthly reports generated automatically and archived.	
PROCEDURES & CERTIFICATES			
79	Procedures & Certificates	Approved SOPs/work instructions for calibration, proving and maintenance are current.	
80	Procedures & Certificates	Flow computer and mass flow meter conformity certificates filed and valid.	