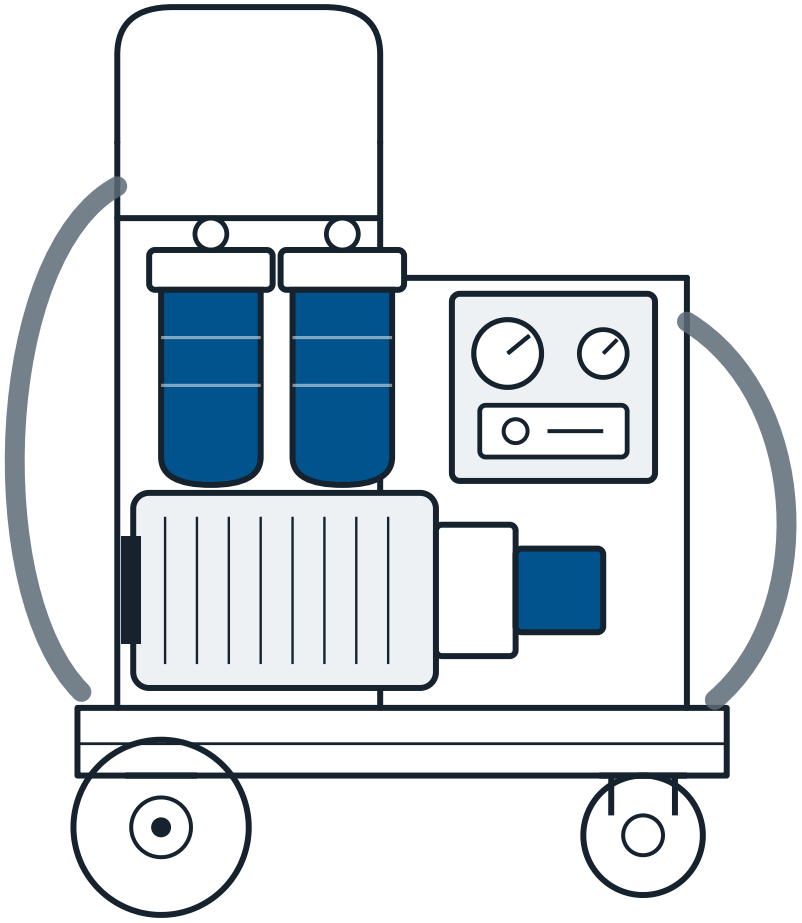


PORTABLE FLUSHING TROLLEY

Models SHS-FLT-60 · FLT-100 · FLT-150

SUYOG HYDROSYSTEMS
PUNE · INDIA

FLT SERIES

What flushing does, and what it needs

Pipework, manifolds and reservoirs leave the fabrication shop carrying weld spatter, mill scale, cutting swarf, thread sealant and airborne dust. None of it comes out by filling the system and running it. It comes out by pushing oil through the pipework fast enough to lift settled debris off the bore wall and carry it to a filter.

That is flushing, and it is a different duty from filtering. Filtering needs a filter. Flushing needs **flow**. Oil moving slowly through a pipe runs in smooth layers and slides over debris without disturbing it. Only when the flow becomes turbulent does it scour the wall.

The FLT series is built for that duty: enough flow to reach turbulence in the bore being cleaned, enough pressure to push it through the system's own valves and coolers, and two filter stages to hold what comes loose.

Where it is used

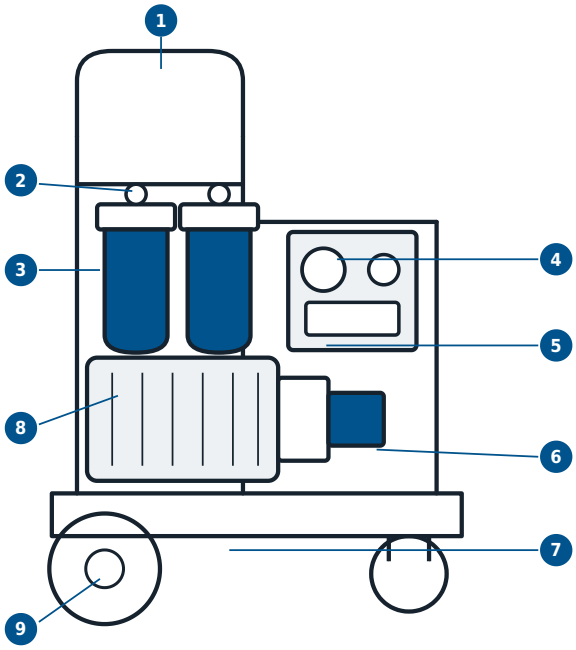
- Flushing newly erected pipework before a machine is commissioned
- Cleaning a system after a pump or valve failure has shed debris
- Flushing after a major overhaul or pipe modification
- Flushing hydraulic power packs, manifolds and coolers on the bench
- Bulk transfer and filtration between flushing jobs
- Hydraulic, gear, lube and turbine oils

> **Flushing is finished when a sample says so,** not when the clock says so. Every FLT unit carries a sampling valve on the return line so cleanliness can be measured against an agreed ISO 4406 target and recorded.

Feature	Advantage	Benefit
High flow at pressure, up to 28 bar	Reaches turbulent flow in the pipework being flushed and still pushes through valves, coolers and long lines	Debris is actually lifted and removed rather than being pushed to the far end of the system
Two filter stages in series	A coarse first stage takes the bulk of the debris; a fine second stage takes what passes	The fine element is not wasted on weld scale, so it lasts through the job
Differential indicator on each stage	Element condition is read separately for each stage	The right element is changed at the right time
Full flow relief valve, set 30 bar	Pressure is limited whatever the operator connects downstream	Neither the unit nor the system being flushed can be over-pressurised
Suction vacuum gauge	Suction trouble is visible before the pump is damaged	Pump life is not lost to a blocked strainer or a collapsed hose
Sampling valve on the return line	Oil is sampled under flow, to ISO 4021, without stopping	Cleanliness is proved and recorded, not assumed
Four wheel chassis with tow handle	Moves loaded, over cable and thresholds, on one operator	No lifting tackle needed to get the unit to the machine
5 m suction and 10 m delivery hoses	The unit stands clear while both ends reach the system	Works around a machine without repositioning the trolley
Catalogue components throughout	Pump, motor, filters, valves and starter are all standard items	Spares are available in India, and not only from the builder

FLT SERIES

Features



1	**Tow handle**	Pulls the loaded unit on four wheels. No tipping and no lifting.
2	**Differential indicators**	One per stage, so each element is judged on its own condition.
3	**Stage 1 filter, 25 µm**	Takes the bulk of the debris that flushing lifts, protecting stage 2.
4	**Stage 2 filter, 10 µm**	Holds the fine fraction. Housings rated above the working pressure.
5	**Pressure gauge and vacuum gauge**	Delivery pressure to 40 bar and pump suction, both read while running.
6	**Starter**	Direct on line to 5.5 kW, star delta above. Thermal overload fitted.
7	**Gear pump and relief valve**	Cast iron pump close coupled to the motor. Full flow relief set 30 bar, returning to suction.
8	**Sampling valve**	On the return line, to ISO 4021. Samples drawn under flow without stopping.
9	**Motor, TEFC**	415 V, 3 phase, 50 Hz, class F insulation, foot mounted on the base.

Not shown

Suction strainer with drain · 5 m suction hose and 10 m delivery hose with couplings and wands · supply cable with plug · one spare set of elements · removable drip tray.

FLT SERIES

Specification

Parameter	FLT-60	FLT-100	FLT-150
Delivered flow at 28 bar	60 lpm	100 lpm	150 lpm
Maximum working pressure	28 bar	28 bar	28 bar
Relief valve setting	30 bar	30 bar	30 bar
Electric motor	4.0 kW	7.5 kW	11 kW
Full load current at 415 V	8.5 A	15.5 A	22 A
Starting	Direct on line	Star delta	Star delta
Suction connection and hose bore	1½"	2"	2"
Delivery connection and hose bore	1"	1¼"	1½"
Maximum viscosity at start-up	150 cSt	120 cSt	100 cSt
Chassis	Four wheel	Four wheel	Four wheel
Height × width × depth, mm	1100 × 700 × 600	1200 × 800 × 700	1300 × 900 × 750
Dry weight, without oil	140 kg	200 kg	260 kg

Common to all three models

Filtration
Two stages in series. Stage 1 at 25 µm, stage 2 at 10 µm, glass fibre media, in housings rated above the working pressure of the unit.

Element bypass
3.5 bar, integral to each element.

Clogging indication
Differential indicator on each stage, visual, three band.

Pressure protection
Full flow relief valve set at 30 bar, discharging to the pump suction.

Instrumentation
Delivery pressure gauge 0 to 40 bar, glycerine filled. Pump suction vacuum gauge.

Sampling
Sampling valve on the return line, to ISO 4021.

Suction strainer
Bowl type, cleanable woven wire, with drain plug.

Pump
External gear, cast iron, rated for continuous duty at 28 bar.

Electrical supply
415 V ±10%, 3 phase, 50 Hz ±5%. Motor TEFC, class F insulation, foot mounted.

Hose set
5 m suction and 10 m delivery as standard. Delivery hose wire reinforced and rated not less than four times the working pressure. Both hoses fitted with couplings and wands.

Fluids and temperature
Mineral hydraulic, gear, lube and turbine oils, −10 °C to +80 °C.

Construction
Frame, base and drip tray in fabricated steel. Two pack epoxy paint over blast cleaned surfaces.

Selecting the model

Do not select on the size of the reservoir. Select on the **largest bore to be flushed** and the temperature the oil will be at during the job. Page 5 gives the flow needed. If the flow is not there, the oil will circulate and the debris will stay where it is.

The unit has no tank and no heater. It draws from the system being flushed and returns to it. Oil temperature is whatever the system and the pump work put into it, so flushing gets easier as the job goes on. If the oil must be heated to reach the flow shown on page 5, that is a separate item and it must be specified at enquiry stage.

Suction line

The suction hose bores in the table are minimums for the flow and the start-up viscosity shown. Do not reduce them, do not add fittings, and keep the lift from oil level to pump below 2 metres. The vacuum gauge should read no worse than 0.4 bar in service; a worse reading means a blocked strainer, a collapsed hose or oil that is too cold.

Rated for continuous duty. Dimensions and weights are nominal, with hoses stowed on the frame.

FLT SERIES

How much flow a flush needs

Debris is lifted only when flow in the pipe is turbulent. The figures below are the flow needed to reach a Reynolds number of 4000 in a given bore at a given oil viscosity.

Flow in lpm required for turbulent flow, Reynolds number 4000

Pipe bore	Oil at 20 cSt (warm, about 60 °C)	Oil at 32 cSt (about 45 °C)	Oil at 46 cSt (about 40 °C)
12 mm, about ⅜"	45	72	104
19 mm, about ¾"	72	115	165
25 mm, about 1"	94	151	217
32 mm, about 1¼"	121	193	277
38 mm, about 1½"	143	229	330

Read the table before promising a flush

Two things follow from it, and both matter more than the size of the filter fitted.

Temperature does most of the work. Taking the oil from 40 °C to 60 °C halves the flow needed. Warm oil flushes; cold oil circulates.

Bore sets the limit, not the machine. An FLT-150 will flush up to about 1¼" bore on warm oil. Above that, flush the circuit in sections, or use a larger unit than this range offers.

Working range of the three models

Model	Largest bore, oil at 20 cSt	Largest bore, oil at 46 cSt
FLT-60	16 mm	Below 12 mm
FLT-100	26 mm	12 mm
FLT-150	40 mm	17 mm

Where a system carries several bores, size on the largest one that must be cleaned, or isolate and flush it in sections.

Cleanliness targets

System built around	ISO 4406 target
Servo valves	16/14/11
Proportional valves	17/15/12
Piston and vane pumps	18/16/13
Directional and pressure valves	18/16/13
Gear pumps and motors	19/17/14
Cylinders and flow controls	20/18/15

Agree the target in writing before the job starts, together with who samples, who tests, and what happens if the target is not met. A flush without an agreed target and an agreed test method cannot be signed off.

Running the flush

- Flush with the system's own actuators isolated and the lines looped, so oil passes through pipework rather than into cylinders
- Bypass or remove servo and proportional valves; flush around them and fit them afterwards
- Rap the pipework with a soft mallet at bends and welds while flow is running
- Reverse the flow direction part way through the job where the pipework allows it
- Draw a sample at intervals under flow, never from a static line or an open tank
- Stop when two consecutive samples meet the target, not when the first one does

Element life on a first flush is short by nature. Fit the spare set during the job rather than trying to make one set last.

FLT SERIES

Operating and maintenance instructions

Before starting

1. Connect the suction hose to the strainer inlet and the delivery hose to the stage 2 filter outlet. Tighten couplings fully.
2. Connect the free ends into the system so oil is drawn from and returned to it, with both connections below oil level.
3. Confirm the flushing loop is complete and that no actuator, servo valve or proportional valve is in the path.
4. Confirm the oil viscosity is at or below the start-up figure for the model.
5. Check the relief valve setting and that the delivery isolating valve is open.
6. Check the earth connection and confirm the supply matches the nameplate.

Running

1. Start and immediately check the direction of rotation against the arrow on the pump. Reversed rotation will destroy the pump in seconds.
2. Allow up to a minute for the filter housings to fill and for flow to establish.
3. Read the vacuum gauge. Worse than 0.4 bar means stop and find out why.
4. Read the delivery gauge. Above 28 bar means the downstream circuit is too restrictive; open it up rather than letting the relief valve carry the flow.
5. Check both differential indicators every hour and change elements as they call for it.
6. Draw samples from the sampling valve at agreed intervals, under flow.
7. Never run the pump dry and never throttle the delivery hose.

Stopping

1. Stop at the starter and isolate the supply.
2. Close the isolating valves before breaking any connection.
3. Cap both hose ends and the unit connections before moving the trolley.
4. Empty the drip tray and stow the hoses on the frame.

Warning. The relief valve limits pressure in the unit. Do not adjust it above 30 bar, and do not restrict or throttle the delivery hose to raise pressure. Oil at 28 bar through a failed connection is dangerous to anyone standing near it.

Changing an element

1. Stop the unit, isolate the supply and allow pressure to fall to zero on the gauge.
2. Place a tray under the housing and drain it through the drain plug.
3. Slacken the cover screws evenly and lift the cover clear.
4. Withdraw the element and bag it. Do not tip debris back into the housing.
5. Wipe the housing bore and the seal faces clean.
6. Fit the new element, checking the seals are seated and the location notch engages.
7. Fit a new cover seal, replace the cover and tighten the screws evenly to 22 to 26 Nm.
8. Restart and check for leaks at low flow before resuming the flush.

Routine maintenance

Clean the suction strainer every 100 hours or whenever the vacuum gauge deteriorates. Check hoses for cuts, kinks and soft spots before every job and replace rather than repair. Have the pressure gauge and relief setting checked annually. Keep a full spare set of elements with the unit at all times.

Problem	Cause	Action
Motor will not start	No supply, tripped overload, blown fuse	Check supply, reset overload, replace fuse
Runs but no flow	Wrong rotation	Stop at once, interchange two phases
	Suction connection above oil level	Submerge the connection
Vacuum gauge worse than 0.4 bar	Strainer blocked, hose collapsed, oil too cold	Clean strainer, replace hose, warm the oil
Pump noisy, flow erratic	Air drawn in on the suction side	Tighten connections, check hose for damage
Delivery pressure at relief setting	Downstream circuit too restrictive, or a valve shut	Open the circuit; do not run on relief
Indicator in the red on stage 1	Element loaded with flushing debris	Change stage 1 element
Indicator in the red on stage 2	Stage 1 element bypassing, or stage 2 overdue	Change both elements
Samples not improving	Flow below turbulent, oil too cold	Warm the oil, or flush in smaller sections
Samples improve then worsen	Debris released from a new part of the circuit	Continue; change elements and keep sampling
Leak at a housing cover	Seal damaged or screws uneven	Fit a new seal, tighten evenly to torque

FLT SERIES

Parts list

Item	Description	Specification	Qty	Make
1	Trolley chassis	Fabricated steel, four wheel, two fixed and two swivel, with tow handle	1	SHS
2	Drip tray	Fabricated steel, removable	1	SHS
3	Gear pump	Cast iron, sized to model, continuous duty at 28 bar	1	Dowty or equivalent
4	Electric motor	4.0 / 7.5 / 11 kW to model, 415 V, 3 ph, 50 Hz, TEFC, class F	1	ABB or Siemens
5	Bell housing and coupling	To suit pump and motor	1	Jacktech or equivalent
6	Suction strainer	Bowl type, cleanable woven wire, with drain plug	1	Reputed
7	Filter housings, stages 1 and 2	In line, rated above unit working pressure, with drain	2	Parker or Hydac
8	Elements, stage 1 and stage 2	25 µm and 10 µm, glass fibre, integral bypass 3.5 bar	1 ea	Parker or Hydac
9	Differential indicator	Visual, three band, one per stage	2	Parker or Hydac
10	Relief valve	Full flow, set 30 bar, returning to suction	1	Parker or equivalent
11	Pressure and vacuum gauges	0 to 40 bar glycerine filled, and −1 to 0 bar, both 63 mm	2	Reputed
12	Sampling valve	To ISO 4021, on the return line	1	Reputed
13	Isolating ball valves	Suction and delivery, full bore	2	Reputed
14	Suction hose assembly	5 m, bore to model, with coupling and wand	1	Reputed
15	Delivery hose assembly	10 m, bore to model, wire reinforced, with coupling and wand	1	Reputed
16	Starter	DOL to 5.5 kW, star delta above, with thermal overload, enclosed	1	Siemens or equivalent
17	Supply cable and plug	Flexible copper, 4 core, sized to motor, with industrial plug	1	Reputed
18	Pipework, fittings and fasteners	Carbon steel, rated above unit working pressure	Set	Reputed
19	Spare element set	One each of stage 1 and stage 2	1	Parker or Hydac

Replacement elements and consumables

Part number	Description
SHS-FE-25Q	Element, stage 1, 25 µm
SHS-FE-10Q	Element, stage 2, 10 µm
SHS-FS-STR	Suction strainer screen
SHS-FK-SEAL	Housing seal kit, both stages
SHS-FH-SET	Hose set, 5 m suction and 10 m delivery

Quote the full unit model code when ordering, as element and hose sizes differ between models.

Documents issued with each unit

- Operation and maintenance manual in English, three sets per vessel or per unit as ordered
- General arrangement drawing and hydraulic circuit diagram
- Electrical schematic and terminal chart
- Works test certificate
- Manufacturing guarantee certificate, four copies
- Material test certificates for pressure containing parts
- Parts list, packing list and preservation record

Tested before despatch

- Flow at rated speed and rated pressure
- Relief valve setting and full flow pass
- Pressure hold and leak test on the pressure side
- Differential indicator operation, both stages
- Insulation resistance and earth continuity
- Continuous run on oil, two hours

Manufactured and tested under our own QA inspection against an approved quality assurance plan and inspection and test plan. Customer witnessed or third party inspection can be arranged at order stage.

FLT SERIES

How to order

BOX 1	BOX 2	BOX 3	BOX 4	BOX 5
FLT60	**25Q**	**10Q**	**N**	**S**

Example: **FLT60-25Q-10Q-N-S** — 60 lpm at 28 bar, 25 µm stage 1, 10 µm stage 2, nitrile seals, 5 m suction and 10 m delivery hose set.

Box 1 — Model

Symbol	Description
FLT60	60 lpm
FLT100	100 lpm
FLT150	150 lpm

Box 2 — Stage 1

Symbol	Description
25Q	25 µm
10Q	10 µm

Box 3 — Stage 2

Symbol	Description
10Q	10 µm
25Q	25 µm

Box 4 — Seal

Symbol	Description
N	Nitrile
V	Fluorocarbon

Box 5 — Hose set

Symbol	Description
S	5 m suction, 10 m delivery
X	Special, state lengths with the order

Compliance with enquiry requirements

Cl.	Requirement	Offered
1	Portable unit built into a trolley frame which makes it easily manoeuvrable	Complied. Fabricated steel chassis on four wheels, two fixed and two swivel, with tow handle. One operator can move the unit loaded.
3	Pressure up to 28 bar	Complied. Maximum working pressure 28 bar, protected by a full flow relief valve set at 30 bar. Delivery gauge reads 0 to 40 bar.
3	Supplied with 5 metre suction and 10 metre delivery hoses	Complied. 5 m suction and 10 m delivery hose assemblies supplied with couplings and wands, bore sized to the model.
4	Three sets of instruction, operation and maintenance manual in English per vessel	Complied. Three sets in English supplied per vessel with the equipment.
5	Equipment manufactured and supplied under firm's QA inspection	Complied. Manufactured and tested against an approved quality assurance plan and inspection and test plan under our own QA inspection.
5	Four copies of manufacturing guarantee certificate	Complied. Four copies supplied with the equipment.
6	Leaflet or catalogue of the offered item to accompany the offer	Complied. This catalogue is submitted with the offer.

One parameter is not stated in the enquiry. Flow rate is not specified, and flow is what decides whether a flush succeeds. The model offered has been selected on the assumption stated in our covering letter. If the largest bore to be flushed and the oil temperature during the job are confirmed, we will confirm the model or offer the correct one.